ROBERT J. LOVERO
MAYOR

AGENDA
BERWYN CITY COUNCIL
September 11, 2018
8:00 PM

MARGARET PAUL
CLERK

The Mayor and City Council welcome you. Please note: comments are permitted only during Open Forum and only for items not already on the agenda. When called upon by the Mayor, kindly state your name and address for the record. Thank you for your participation.

A. **Pledge of Allegiance and Moment of Silence**
B. **Open Forum**
C. **Approval of Minutes**
   1. Regular City Council meeting held on 8/28/2018
D. **Bid Openings**
E. **Berwyn Development Corp., Berwyn Township/Health District**
F. **Reports from the Mayor**
   1. Auxiliary Review Board Appointment: Frank Cimaglia
   2. Auxiliary Review Board Appointment: James Woywod
   3. Emergency Telephone System Board Reappointments: Frank Cimaglia, Kris Coniglio, Thomas Hayes, Denis O'Halloran and Thomas O'Halloran
   4. Proclamation: International Walk to School Day
   5. Proclamation – National Rail Safety Week
G. **Reports from the Clerk**
   1. Resolution to allow the City of Berwyn to close Cermak Road for the Houby Day Parade
H. **Zoning Boards of Appeals**
I. **Reports from the Aldermen, Committees and Board**
   1. Probationary Police Officer Appointment of Brian O"Malley
   2. Alderman Ramirez: A Request for Finance Director Rasheed Jones to send Third Party Collections contract out for competitive bid
   3. Alderman Santoy: 2018 Lead Poisoning Ad Hoc Committee Final Report and Recommendation Issuance
   4. Alderman Avila: Handicap Parking Application #1207 – 1529 S. Kenilworth
J. **Reports from the Staff**
   1. City Attorney: Settlement of Case No. 17 CV-06485
   2. Asst. City Administrator: 2018 Holiday Decoration RFP
   3. Battalion Chief Manfredini – Fire Prevention Week Open House
K. **Consent Agenda**
   1. Payroll: 9/5/2018 in the amount of $1,239,653.22
   2. Payables: 9/11/2018 in the amount of $1,736,805.73
   3. North Berwyn Park District : Fall Festival 10/27/2018
   4. Girl Scouts: Fall Product Program October, 2018 & Cookie Program January – May, 2019
   5. Block Party: 1900 block of Home 9/29/2018
   6. Block Party: 1900 block of Wenonah 9/29/2018 RD 10/6/2018
   7. Building & Local Improvement Permits for the month of August, 2018

_____ City Clerk Margaret Paul

Total Items: 21

In accordance with the provisions of the Americans with Disabilities Act, any individual in the need of a reasonable accommodation in order to participate in or benefit from attendance at a City of Berwyn public meeting should contact City Clerk Margaret Paul at (708) 788-2660 as early in advance as possible.

C-1

MINUTES
Regular Berwyn City Council Meeting
August 28, 2018

1. The Regular Meeting of the Berwyn City Council was called to order by Mayor Lovero at 8:00 p.m. The following Aldermen responded present upon the call of the roll: Lennon, Ramirez, Reardon, Fejt, Santoy, Ruiz, Avila and Garcia.

2. The Pledge of Allegiance was recited. A moment of silence was given for the safety of the men and women protecting us on the streets of Berwyn.

3. The Open Forum portion of the meeting was announced. Alderman Lennon thanked everyone for their assistance with the Route 66 Auto Show and thanked Amy M. Crowther for her hard work and dedication for the past 10 years with the Berwyn Development Corporation. Alderman Ruiz announced a 6th Ward meeting for September 20th at 6:30 pm at the Italian-American Civic Organization. Alderman Avila thanked everyone for their support at the North Berwyn Park District 5K Run. Alderman Avila noted more than 700 runners and walkers participated and estimated that 65% of the participants were non-Berwyn residents.

4. Minutes for the following meetings were submitted: Committee of the Whole and the Regular Berwyn City Council of August 14, 2018. Thereafter, Avila made a motion, seconded by Fejt, to approve the minutes as submitted and place same on file for audit. The motion carried by a voice vote.

5. Mayor Lovero submitted a communication requesting the appointment of Wayne D. Sedore to the 9-1-1 Board for a two year term. Avila made a motion, seconded by Lennon, to concur and approve the appointment as submitted. The motion carried by a voice vote. Thereafter, Clerk Paul administered the Oath of Office.

6. Mayor Lovero submitted a communication requesting the appointment of Richard Leja to the 9-1-1 Board for a two year term. Avila made a motion, seconded by Ruiz, to concur and approve the appointment as submitted. The motion carried by a voice vote. Thereafter, Clerk Paul administered the Oath of Office.

7. Mayor Lovero submitted a communication requesting the reappointments of Tracy Cipriani and James Malizzio to the Auxiliary Review Board; each to serve a two year term. Avila made a motion, seconded by Reardon, to concur and approve the reappointments as submitted. The motion carried by a voice vote. Thereafter, Clerk Paul administered the Oaths of Office.

8. Mayor Lovero submitted a communication requesting the reappointment of Cynthia Hayes to the Library Board for a three year term. Thereafter, Lennon made a motion, seconded by Fejt, to concur and approve the reappointment as submitted. The motion carried by a voice vote.

9. Mayor Lovero submitted a communication requesting the reappointments of Queenie Costa, Susan Greenberg, Joel Oswald, Gil Pena, Joseph Schejbal and Amanda Venditti to the Berwyn Community Relations Commission; each to serve a three year term. Avila made a motion, seconded by Ruiz, to concur and approve the reappointments as submitted. The motion carried by a voice vote. Thereafter, Clerk Paul administered the Oaths of Office.

10. Alderman Santoy made a motion, seconded by Ruiz, to suspend the rules and bring forward agenda item I-1 from the Berwyn Police and Fire Commission and J-1 from Police Chief Michael Cimaglia. The motion carried by a voice vote.

11. Berwyn Police and Fire Commission submitted a communication requesting the appointment of Spencer J. Hill to the rank of Probationary Firefighter/Paramedic. Avila made a motion, seconded by Ruiz, to concur as submitted. The motion carried by a voice vote. Thereafter, Clerk Paul administered the Oath of Office.

12. Police Chief Michael Cimaglia submitted a communication asking to recognize the Berwyn Police Explorers. Avila made a motion, seconded by Fejt, to concur. The motion carried by a voice vote.

Thereafter, Mayor Lovero recognized Chief Cimaglia and residents of the 3500 block of Highland who had requested to be allowed to present the Police Explorers with a plaque recognizing their service, dedication and commitment to the community. Members of the Police Explorers stepped forward to receive the recognition.

13. The Zoning, Planning and Development Commission submitted a communication and ordinance entitled: **An Ordinance Approving Side Yard Setback Variations to Build a Single-Family Residence that Encroaches into the Side Yard Setbacks on Property Located within the C-1 Neighborhood Mixed-Use Zoning District, at the Address Commonly Known as 6535 W. 16th Street, Berwyn, Illinois – Jaime Garcia D/B/A Merriment Homes, Inc.** Thereafter, Ruiz made a motion, seconded by Lennon, to concur, **adopt** the ordinance as presented and authorize the corporate authorities to affix their signatures thereto. The motion carried by a unanimous roll call vote.

14. Alderman Reardon submitted the minutes of the Ad-hoc Sexual Harassment Policy Committee meetings held on May 7, 2018 and August 20, 2018. Thereafter, Reardon made a motion, seconded by Santoy, to accept as informational. The motion carried by a voice vote.

15. Alderman Reardon submitted a communication to recognize and thank South Berwyn District 100 summer school students, mentored and led by Youth Crossroads teenagers, Joel Wallen, Sandro Murillo, Berwyn Park District Executive Director Jeff Janda, and others for their help to design and paint art work on the walls of the CN underpass on Oak Park Avenue. Thereafter, Reardon made a motion, seconded by Garcia, to accept as informational. The motion carried by a voice vote.

16. Alderman Reardon submitted a communication requesting the reformat of the Accounts Payable report provided to City Council and requesting that the Finance Department to report back at the September 11, 2018 meeting. Alderman Ruiz requested that the matter be considered at the September 25, 2018 meeting. Thereafter, Reardon made a motion, seconded by Fejt, to refer the matter to the Finance Department and City Treasurer to draft a report for the Committee of the Whole meeting on September 25, 2018. The motion carried by a voice vote.

17. Alderman Santoy submitted minutes of the Budget and Finance Committee meeting held on August 8, 2018 along with Budget Improvements Ideas prepared by Finance Director Rasheed Jones. Thereafter, Santoy made a motion, seconded by Lennon, to accept as informational. The motion carried by a voice vote.

18. City Attorney Anthony Bertuca submitted a communication regarding the Settlement of Case No. 16 WC 011673. Thereafter, Avila made a motion, seconded by Lennon, to concur and approve for payment in the amount not to exceed $183,842.50. The motion carried by the following call of the roll: Yeas: Lennon, Ramirez, Fejt, Santoy, Ruiz and Avila. Nays: Reardon and Garcia.

19. Interim Library Director Tammy Sheedy submitted a communication requesting authorization to advertise and hire library staff to fill the vacancies of Administrative Assistant (proposed Office Manager) (40 hours), Head of Outreach (proposed Community Engagement) (40 hours), Library Assistant II – Youth Services (40 hours) and Library Assistant I – Circulation (20 hours). Thereafter, Lennon made a motion, seconded by Fejt, to concur and approve as submitted. The motion carried by a voice vote.

20. Assistant Finance Director Ben Daish submitted a communication regarding Third Party Collections and recommending that Council waive the seal bid process and authorize staff to execute a contract with Sonnenschein Financial Services (SFS) for a collection fee not to exceed 22% for one year term renewable by mutual agreement. On the question by Alderman Ramirez concerning the process staff used to choose SFS, discussion ensued. Thereafter, Ruiz made a motion, seconded by Santoy, to concur, waive the seal bid process and authorize the corporate authorities to enter into contract. The motion carried by the following call of the roll: Yeas: Lennon, Santoy, Ruiz, Avila and Lovero. Nays: Ramirez, Reardon, Fejt and Garcia.

21. Ruiz made a motion, seconded by Avila, to suspend the rules and bring forward Consent Agenda item K-10. The motion carried by a voice vote. Item K-10 is a recommendation for denial of Handicap Parking Application #1209 at 1820 S. Wesley. Thereafter, Ruiz made a motion, seconded by Fejt, to override the recommendation and approve a Drop-Off Zone. The motion carried by a voice vote.

22. The consent agenda with items K-1 through K-9 and K-11 through K-14 were submitted.
    1. Payroll: 8/22/2018 in the amount of $1,211,320.21
    2. Payables: 8/28/2018 in the amount of $1,200,455.95
    3. Ald. Ruiz: Annual End of Summer 6th Ward Block Party 9/29/2018
    4. Block Party: 1800 block of Lombard 9/1/2018 RD 9/2/2018
    5. Block Party: 1300 block of Clarence 9/2/2018
    6. Block Party: 1500 block of Clarence 9/8/2018 RD 9/15/2018
    7. Block Party: 3100 block of Maple 9/15/2018 RD 9/16/2018
    8. Block Party: 1900 block of Wisconsin 9/15/2018 RD 9/22/2018
    9. Handicap Parking Application #1205 – 1507 S. East Ave – Deny
    10. ~~Handicap Parking Application #1209 – 1820 S. Wesley – Deny~~
    11. Handicap Parking Application #1210 – 3842 S. Harvey – Approve Zone
    12. Handicap Parking Application #1212 – 2118 S. Wesley – Approve Space
    13. Handicap Parking Application #1213 – 3642 S. Euclid – Approve Space
    14. Handicap Parking Application #1216 – 1341 S. Kenilworth – Approve Space

    Thereafter, Avila made a motion, seconded by Ruiz, to concur and approve the Consent Agenda as submitted by omnibus vote designation. The motion carried by a voice vote.

23. Aldermanic Committees: Alderman Lennon called for an Outreach Committee meeting for Wednesday, September 5th at 6:30 pm.

24. There being no further business to come before the Council, Avila made the motion, seconded by Ruiz, to adjourn at the hour of 8:45 pm. The motion carried by a voice vote.

Respectfully submitted,

Margaret Paul

Margaret Paul, City Clerk

F-1

The City of Berwyn

Robert J. Lovero
Mayor

A Century of Progress with Pride

September 11, 2018

Members of City Council

Re: Appointment to the Auxiliary Review Board

City Council Members:

With the promotion of Michael Cimaglia to Police Chief, there is a vacancy on the Auxiliary Review Board that requires it to be filled by a Berwyn Police Division Commander. As Frank Cimaglia is the Division Commander responsible for the auxiliary officers, I believe that he is the most qualified individual.

Please concur with my recommendation to appoint Frank Cimaglia to the Auxiliary Review Board.

Respectfully,

Robert J. Lovero
Mayor

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2567 www.berwyn-il.gov

F-2

The City of Berwyn

Robert J. Lovero
Mayor

A Century of Progress with Pride

Date: September 11, 2018

To: Members of City Council

Re: Appointment to the Auxiliary Review Board

With the opening of one of the resident Auxiliary Review Board positions, I am seeking to appoint James Woywod to the position. Mr. Woywod is a very community minded resident participating in many local boards and organizations (see attached resume). I deem that he possesses the skills to serve on an at-will basis for the two year term.

I ask that you concur with my recommendation to appoint Mr. James Woywod to the Auxiliary Review Board.

Respectfully,

Robert J. Lovero
Mayor

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2567 www.berwyn-il.gov

JAMES WOYWOD, MSW

[redacted]

Professional Experience

Hephzibah Children's Association **1985 – present**

Director of Group Homes ***(2001-present)***

- Responsible for the planning, development, implementation and administration of the residential Group Homes Program in compliance with licensing and accreditation standards with various state regulators
- Assure that agency wide policies and procedures are followed
- Provide trend analysis, statistical data and recommendations
- Prepare and follow budget guidelines, licensing procedures and monitoring
- Provide supervision, evaluation and performance management to direct reports
- Assure that the educational and medical needs of the children are met

Group Homes Coordinator, Supervisor, Child Care Worker ***(1985-2001)***
Began career as a Child Care Worker and was promoted to progressively more responsible positions. Direct care provider in both the Day Care and the Group Homes programs.

Education
Dominican University, River Forest Illinois- MSW, 2007
University of Illinois at Chicago- BA, 1990

Memberships and Affiliations
Emerson Elementary School Parent Teacher Association
J. Sterling Morton High School Parent Teacher Organization
J. Sterling Morton High School Booster Club

References
Will be furnished upon request

F-3

The City of Berwyn

Robert J. Lovero
Mayor

A Century of Progress with Pride

September 11, 2018

Members of City Council

Re: Emergency Telephone System Board Reappointments

Council Members:

I am seeking to reappoint the following individuals who represent the City of Berwyn's public safety agencies to the Emergency Telephone System Board.

Name	Term Expiration Date
Frank Cimaglia	September 11, 2020
Kris Coniglio	September 11, 2021
Thomas Hayes	September 11, 2021
Denis O'Halloran	September 11, 2020
Thomas O'Halloran	September 11, 2020

I would ask that City Council concur in my recommendation of Frank Cimaglia, Kris Coniglio, Thomas Hayes, Denis O'Halloran, and Thomas O'Halloran and approve their reappointments.

Respectfully,

Robert J. Lovero
Mayor

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The City of Berwyn

F-4

Robert J. Lovero
Mayor

A Century of Progress with Pride

Proclamation

WHEREAS, the City of Berwyn, School District 98, School District 100 and School District 201 place the safety and well being of children as their utmost concern; and

WHEREAS, a lack of physical activity plays a leading role in rising rates of obesity, diabetes and other health problems among children, and being able to walk or bicycle to school offers an opportunity to build activity into daily routine; and

WHEREAS, driving students to school by private vehicle contributes to traffic congestion on our streets in and around our schools and contributes to air pollution; and

WHEREAS, the City of Berwyn recognizes the important role for parents and caregivers for teaching children about pedestrian safety and making children aware of the difficulties and dangers posed by congested streets, and making children aware of the dangers to their health caused by air pollution and effects of inactivity to their well being; and

WHEREAS, the City of Berwyn, in partnership with parents, seeks to save and protect children by taking steps to make pedestrian safety a priority; and

WHEREAS, children, parents and community leaders around the world are joining together to walk to school in support for safer routes to school, safer streets for pedestrians, and cleaner air in our communities.

NOW THEREFORE, BE IT RESOLVED that I Robert J. Lovero, Mayor of Berwyn, proclaim October 10, 2018, "International Walk to School Day" in Berwyn, IL and encourage everyone to consider the safety and health of children today and everyday.

Entered upon the records of the City of Berwyn this 9th day of October 2018.

Robert J. Lovero – Mayor

Margaret Paul – City Clerk

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The City of Berwyn

Robert J. Lovero
Mayor

F-5

A Century of Progress with Pride

Proclamation
National Rail Safety Week

WHEREAS, 2,105 rail grade crossing collisions resulted in 807 personal injuries and were responsible for 274 fatalities in the United States during 2017; and

WHEREAS, 1,027 trespassing incidents have occurred in the United States resulting in 520 pedestrians being killed and another 507 injured while trespassing on railroad property rights of way during 2017; and

WHEREAS, educating and informing the public about rail safety, reminding the public that railroad right of ways are private property, enhancing public awareness of the dangers associated with highway rail grade crossings, ensuring pedestrians and motorists are looking and listening while near railways, and obeying established traffic laws will reduce the number of fatalities and injuries; and

WHEREAS, the International Association of Chiefs of Police, National Operation Lifesaver, United States Department of Transportation, and all local, state, county, and railroad law enforcement officers, first responders, and railroad corporations commit to partnering together in an effort to educate at a national level all aspects of railroad safety, to enforce applicable laws in support of National Rail Safety Week;

THEREFORE, let it be proclaimed that I, Mayor Robert J. Lovero, the Berwyn City Council, on behalf of the City of Berwyn do hereby attest our full support proclaiming September 23rd to 29th, 2018, National Rail Safety Week, and I encourage all citizens to recognize the importance of rail safety education.

Entered upon the records of the City of Berwyn this 11th Day of September, 2018.

Robert J. Lovero, Mayor

Margaret Paul, City Clerk

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G-1

The City of Berwyn
Mayor Robert J. Lovero

Margaret Paul
City Clerk

A Century of Progress with Pride

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2675
www.berwyn-il.gov

RESOLUTION

A RESOLUTION TO ALLOW THE CITY OF BERWYN TO CLOSE CERMAK ROAD FOR THE HOUBY DAY PARADE

WHEREAS, the City of Berwyn and the Town of Cicero will hold the 50th Annual Houby Parade on Sunday, October 7, 2018; and

WHEREAS, the City of Berwyn and Town of Cicero vote to grant permission for the aforesaid activity; and

WHEREAS, the parade participants will begin at 56th Court and proceed west on Cermak Road to Oak Park Avenue; and

WHEREAS, the Berwyn and Cicero Police Department's will have officers controlling traffic on the scheduled route with special attention to major intersections.

NOW, THEREFORE, be it resolved by the Mayor and City Council along with the President and Board of Trustees of the City of Berwyn and Town of Cicero to grant permission for this annual event and to extend to all participants in the Houby Parade, our best wishes and a most successful day.

ADOPTED this ____ day of _____, 2018

_____
Mayor Robert J. Lovero

ATTEST:

_____
Margaret Paul
City Clerk

I-1

City of Berwyn Police and Fire Commission
Carl Reina, Chairman
Gilbert Pena, Commissioner
Tony Nowak, Commissioner
Tony J. Laureto, Secretary

6401 WEST 31ST STREET
BERWYN, IL. 60402
www.berwyn-il.gov

City of Berwyn
The City of Homes

Mayor Robert J. Lovero
Alderman Ralph Avila Chairman of Police and Fire Committee
Police Chief Michael Cimaglia
City Clerk Margaret M. Paul
City Treasurer Cynthia Gutierrez
Members of the City Council

Date: 8/27/18

RE: Probationary Police Officer Appointment

Brian O'Malley has passed all of the requirements of employment for the City of Berwyn Police Department.

As approved by the Mayor and the City Council at the request of Police Chief Mike Cimaglia, the members of the Police and Fire Commission therefore recommend the appointment of Brian O'Malley to the Berwyn Police Department as a Probationary Police Officer.

The introduction and the administration of the oath of office will be conducted at the 9/11/18 Berwyn Council meeting and the effective start date of 8/29/18.

Board of Police and Fire Commissioners

Carl Reina, Chairman
Gilbert Pena, Commissioner
Tony Nowak, Commissioner

Tony J. Laureto
Secretary BPFC
ALaureto@ci.berwyn.il.us

I-2

The City of Berwyn

Jose Ramirez
2nd Ward Alderman

A Century of Progress with Pride

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2675
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Mayor Robert J. Lovero and Members of the Berwyn City Council

September 6, 2018

Re: A Request for City Finance Director Rasheed Jones to send Third Party Collections contract out for competitive bid

Mayor and Members of the City Council:

The vote on the 28th of August was 4 in favor and 4 against with the Mayor voting to break the tie vote. According to ordinance 228.05 CONTRACTS AND PURCHASES, a two-thirds vote by Council is required to bypass the bidding process. Since Council consists of 8 Aldermen and the Mayor, a 2/3 vote on the matter would have required 6 votes to pass and not the 5 it received. Hence Alderman Ruiz's motion to waive the bid process required under our ordinance did not pass. Please see ordinance below.

228.05 CONTRACTS AND PURCHASES

(A) Competitive bidding procedures.

(1) Competitive bidding required. Any work or other public improvement which is not to be paid for, in whole or in part, by special assessment, and all purchases of and contracts for supplies, materials and services, shall, except as specifically provided in this section, be based, whenever possible, on competitive bids.

(2) Formal contracts.

(a) Any work or other public improvement which is not to be paid for, in whole or in part, by special assessment, except as otherwise provided in this section, when the estimated cost thereof exceeds $10,000, shall be purchased by formal, written contract from the lowest responsible bidder after due notice inviting bids, unless competitive bidding is waived by a vote of two-thirds of all the Council members then holding office.

(b) All purchases of and contracts for supplies, materials and services, except as otherwise provided in this section, when the estimated cost thereof exceeds $10,000, shall be purchased by formal, written contract from the lowest responsible bidder after due notice

inviting bids, unless competitive bidding is waived by a vote of two-thirds of the Council members then holding office.

Therefore I am requesting that City Finance Director Rasheed Jones to send the Third Party Collection contract out to bid.

Very truly yours,

2nd Ward Alderman Jose Ramirez

I-3

The City of Berwyn

Cesar A. Santoy
5th Ward Alderman

A Century of Progress with Pride

September 7, 2018

To: Mayor Robert J. Lovero
City Council Members

Re: Lead Poisoning Ad Hoc Committee Final Report and Recommendations Issuance

Attached is the final Report and Recommendations from the Berwyn Lead Poisoning Prevention Committee for presentation to the City Council.

While this report represents months of diligent work by committee members and stakeholders, it is only the first step in addressing this important public health issue. The report calls for the implementation of several recommendations over the next 3 to 12 months. Continued cooperation from the named responsible parties and partners will be critical. To this end I will keep the Lean Poisoning Ad Hoc Committee in formation with the goal of meeting 2 times over the next twelve months to review progress.

I intend to continue leading this initiative to ensure that we improve The City of Berwyn's designation as a high risk community for lead exposure of children. I want to extend sincere gratitude to the committee members, city staff and members of the public for their time and expertise on this matter.

This report is submitted as informational.

Sincerely

Cesar Santoy

Cesar A Santoy
5th Ward Alderman

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2567 www.berwyn-il.gov

ADDRESSING LEAD POISONING IN OUR COMMUNITY:

REPORT AND RECOMMENDATIONS FROM THE BERWYN LEAD POISONING PREVENTION COMMITTEE

JULY 2018

COMMITTEE PURPOSE AND MEMBERSHIP

In the fall of 2017, the Berwyn Ad Hoc Lead Poisoning Prevention Committee was convened, chaired by Alderman Cesar A Santoy, to bring together Berwyn community leaders and stakeholders to respond to the lead poisoning risks faced by Berwyn children. The committee was charged with exploring potential ways to address the threat of lead exposure and create recommendations for protecting our youngest community members. This report summarizes the work of the committee, and respectfully presents recommendations to the City Council and Berwyn Township Health District.

It is the hope of the committee members that the City and Township will work in partnership, and continue to collaborate with other youth-serving systems in our community, to ensure that all of Berwyn's children can enjoy a life free from lead exposure and reach their full potential.

LEAD POISONING AND ITS EFFECTS

A growing body of research supports the assertion that there is no safe level of lead. Children's physical health and social-emotional development are affected at even low levels of lead exposure. Children who experience lead exposure have a more difficult time regulating their behavior, have less capacity for developing reading and learning skills, and suffer loss of IQ potential. Research suggests that lead exposure in childhood can result in speech delays and hearing loss. Adults who were exposed as children are at an increased risk for high blood pressure and cardiovascular disease as they age[1,2].

While this results in personal challenges for the children and families who are affected by lead, there are also impacts on society as a whole. School systems need increased resources to address and behavior problems and learning delays; health systems are burdened by increased need for costly clinical services; governments and tax payers must invest resources for addressing the social problems that can result from exposure to lead.

LEAD POISONING IN BERWYN

The Illinois Department of Public Health designates Berwyn as a community where children aged 6 and younger are at high risk for lead poisoning, and the data bears this out. Prevalence estimates by the The Lead Risk Index indicates almost 800 of our children aged 5 and younger have blood lead levels that meet national recommendations for intervention (5 micrograms per deciliter of lead in the blood). That number represents 14% of our young children. The Risk Index estimates that, if all were tested, results would show that 20% of all of Berwyn's young boys are exposed to lead[3].

Overwhelmingly, lead-based paint is the source of lead exposure in Berwyn. All homes built before 1978 can present a lead risk, as they were constructed before lead was banned from household paint. Approximately 94%[4] of all housing in Berwyn was built before 1980. While national recommendations for addressing lead poisoning also include discussions of lead pipes and service lines, they contribute much less to the burden of lead poisoning in our area than deteriorating lead-based paint. While both need to be addressed, it makes sense to prioritize actions that will address the biggest risks to Berwyn children.

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[1] Hu H. A 50-Year Follow-up of Childhood Plumbism Hypertension: Renal Function, and Hemoglobin Levels Among Survivors. *Am J Dis Child.* 1991;145(6):681-687.

[2] White RF, Diamond R, Proctor S, Morey C, Hu H. Residual cognitive deficits 50 years after lead poisoning during childhood *Occupational and Environmental Medicine.* 1993;50:613-622

[3] www.leadriskindex.org. Accessed 1/23/18.

[4] Physical Housing Characteristics for Occupied Housing Units, 2012-2016 American Community Survey 5-Year Estimates, accessed 1/31/18 from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF

PREVENTION AND RESPONSE

Lead poisoning is entirely preventable. Economists estimate that every dollar invested in lead poisoning prevention can result in a savings of $17-$221. And research indicates that prevention efforts work: the Illinois Department of Public Health found that focused initiatives in Illinois to identify children, identify sources of exposure, and remediation of lead hazards resulted in a 93% reduction in the number of children with blood lead levels of 10 mcg/dL and greater during a 16-year period.[5] We can and must address the burden of lead poisoning in Berwyn's young children.

RECOMMENDATIONS

This report provides a set of recommendations to the City of Berwyn and the Berwyn Township Health District to address lead poisoning in our community. The recommendations were created by an ad hoc committee of Berwyn City and Township officials, as well as representatives from the Cook County Department of Public Health and medical providers.

Recommendations are grouped into three focus areas: education, testing, and housing improvement/code enforcement. All of the recommendations reflect the evidence base and represent best practices for addressing and preventing lead poisoning.

RECOMMENDATIONS:

FOCUS AREA 1: EDUCATION AND PRIMARY PREVENTION

GOALS:

1. Increase knowledge of lead risks in Berwyn so that community members will better understand how to protect children and prevent lead exposure.
2. Educate local businesses about lead risk in Berwyn, and how they can play a role in preventing childhood lead exposure.

RECOMMENDED ACTIVITIES:

1. Send information on the sources of lead, steps to take to prevent exposure, and resources available for testing to all Berwyn residents through their water bills.
2. Add information on lead poisoning sources, prevention and resources to appropriate pages on the City of Berwyn and Berwyn Township Health District websites.
3. Use social and traditional media to send out lead poisoning prevention messages (Press release, City of Berwyn Facebook; billboards; Suburban Life, other local media, including Spanish language media).
4. Educate hardware store owners on their obligations to post signs regarding lead poisoning and lead paint use/exposure.

[5] Fokum F.D., Shahidullah M., Jorgensen E., Binns H. (2017) Prevalence and Elimination of Childhood Lead Poisoning in Illinois, 1996–2012. In: Hoque M., Pecotte B., McGehee M. (eds) Applied Demography and Public Health in the 21st Century. Applied Demography Series, vol 8. Springer, Cham.

5. Provide education resources (handouts, posters, etc.) to businesses that interact with contractors and community members who work on housing renovation in order to promote awareness of lead safe work practices.
6. Educate landlords about the risks of lead based paint.

FOCUS AREA 2: BLOOD LEAD TESTING AND SECONDARY PREVENTION

GOAL:

Increase lead testing of Berwyn children to better identify and intervene with children with elevated blood lead levels.

RECOMMENDED ACTIVITIES:

1. Increase opportunities for community children to access screening and testing for lead exposure offered by the Berwyn Township Health District.
2. Create information sharing systems so that children screened at the Health District in need of further follow up will receive it from their primary medical provider.
3. Increase medical provider compliance with the requirements of the Lead Poisoning Prevention Act for screening, reporting and treatment of children exposed to lead through regular informational mailings and meetings.
4. Host a community "Lead Summit" with medical providers and youth-serving organizations (schools, child care centers, mental health providers, etc.) to identify opportunities for collaboration in order to increase identification of, and service provision to, lead-exposed children.

FOCUS AREA 3: HOUSING IMPROVEMENT AND CODE ENFORMCEMENT

GOAL:

1. Protect children from lead exposure resulting from deteriorated lead-based paint and lead pipes by promoting housing improvements and enforcing housing and renovation codes and laws.

RECOMMENDED ACTIVITIES:

1. Promote window replacement through the Community Development Block Grant program.
2. Explore implementation of a prospective rental inspection (PRI) program for multi-unit housing to identify lead hazards and require their correction.
3. Provide lead-safe work information to all residents and contractors applying for building permits where paint and pipes will be disturbed.
4. Conduct analysis of building permit and contractor registration and documentation requirements to identify ways to strengthen compliance with the federal Renovation, Repair and Painting rule (RRP).
5. Identify activities the building department can implement to ensure that lead safe work practices are being developed.
6. Connect contractors to free lead-safe work practice trainings.

7. Add safe correction of chipping paint to building code issues that must be addressed before real estate transfer can take place.
8. Explore feasibility and value of implementing a Berwyn healthy homes or lead safe ordinance.
9. Explore ways to fund low-interest loans or grants for low income home owners and landlords to remediate potential hazards.
10. Promote lead hazard remediation grant programs administered by the Cook County Department of Public Health.

COMMITTEE MEMBERSHIP

Members of the Berwyn Ad Hoc Lead Poisoning Prevention Committee:

- Cesar Santoy, Committee Chair, Alderman 5th Ward
- David Avila, Treasurer, Berwyn Township Public Health District
- Deanna Durica, Cook County Department of Public Health
- Edgar Garcia, Alderman, 8th Ward
- Regina Mendicino, Director, City of Berwyn Community Development Department
- Elizabeth Pechous, President, Berwyn Township Public Health District
- Jeanine Reardon, Alderman, 3rd Ward
- Dr. Abdul Bhurgi, Dr. Guerra, Alivio Medical Center

Additional input was received from

- Charles Lazzara, Director, City of Berwyn Building Department
- Tina Kloss, Berwyn Township Public Health District

NEXT STEPS

Committee members recognize that no recommendations can be enacted without the support and work of Berwyn City Council members, City employees, Township Health District officials, committee members, and other partners. To support implementation of their recommendations, the committee had provided detailed action steps and evaluation measures for all of its recommendations in the Berwyn Lead Action Plan, a companion to this report. The Action Plan provides a roadmap for moving forward in our commitment to protect Berwyn's children from the harmful effects of lead poisoning.

BERWYN LEAD ACTION PLAN

FOCUS AREA 1: EDUCATION AND PRIMARY PREVENTION

GOALS:

1. Increase knowledge of lead risks in Berwyn so that community members will better understand how to protect children and prevent lead exposure.
2. Educate local businesses about lead risk in Berwyn, and how they can play a role in preventing childhood lead exposure.

Recommendation	Responsible parties and partners	Evaluation measures and timeline
1. Send information on the sources of lead, steps to take to prevent exposure, and resources available for testing to all Berwyn residents through their water bills.	City of Berwyn (specific Department TBD), in partnership with Cook County Department of Public Health (CCDPH), which will provide data and health education information.	1. Mailer sent to all Berwyn residents within 12 months of start of the initiative.
2. Add information on lead poisoning sources, prevention and resources to appropriate pages on the City of Berwyn and Berwyn Township Health District websites.	City of Berwyn (specific Department TBD), in partnership with CCDPH, which will provide data and health education information, and will act as the referral source for lead poisoning information.	1. "Lead In Berwyn" section added to the "Services" tab on the City of Berwyn and Berwyn Township websites. 2. Add lead testing and lead paint hazard information to the Berwyn Township Resource Directory. 3. Add the Lead Action Plan to the "Initiatives" tab on the city website. 4. Add Cook County lead abatement grant opportunity information to appropriate tabs on City and Township websites. 5. Add lead hazard remediation brochure to the " handouts" section of the building department page on the City website. All completed within 6 months of the start of the initiative

3. Use social and traditional media to send out lead poisoning prevention messages (Press release, City of Berwyn Facebook; billboards; Suburban Life, other local media, including Spanish language media outlets).	Mayor's Office in collaboration with CCDPH.	1. At least one lead poisoning prevention message per month on the City Facebook page. 2. At least one story in the Suburban Life during the first six months of the initiative. 3. Explore cost of messaging on one billboard in Berwyn within 6 months of initiative start.
4. Educate hardware store owners on their obligations to post signs regarding lead poisoning and lead paint use/exposure.	City of Berwyn Licensing Department, in collaboration with CCDPH.	1. Inventory all hardware stores in Berwyn within 2 months. 2. Visit all stores within Berwyn within 6 months. 3. Ensure that all stores have required poster displayed within 6 months. Re-visit in 12 months to ensure posters still displayed.
5. Provide education resources (handouts, posters, etc.) to businesses that interact with contractors and community members who work on housing renovation in order to promote awareness of lead-safe work practices.	City of Berwyn (specific Department TBD), in collaboration with the CCDPH.	1. Inventory businesses within 9 months of initiative start. 2. Based on inventory, determine what information to provide. 3. Visit all and provide information within 12 months.
6. Educate landlords about the risks of lead-based paint.	City of Berwyn (specific Department TBD), in collaboration with the CCDPH.	1. Establish process for landlord education (meeting or mailing), and develop information to be shared. 2. All Berwyn landlords of buildings built before 1978 receive information/education within 12 months.

FOCUS AREA 2: BLOOD LEAD TESTING AND SECONDARY PREVENTION

1. Increase lead testing of Berwyn children to better identify and intervene with children with elevated blood lead levels.

Recommendation	Responsible parties and partners	Evaluation measures and timeline
1. Increase opportunities for community children to access screening and testing for lead exposure offered by the Berwyn Township Health District.	Berwyn Township Health District	1. Increase in the number of children tested. 2. Ongoing evaluation- This is a continuation of a current activity.
2. Create information-sharing systems so that children screened at the Health District needing follow up can receive it from their primary medical provider.	Berwyn Township Health District and CCDPH.	1. System designed and piloted within 9 months.
3. Increase medical provider compliance with the requirements of the Lead Poisoning Prevention Act for screening, reporting and treatment of children exposed to lead through regular informational mailings and meetings.	Berwyn Township Health District and CCDPH. Other potential partners: MacNeal Hospital, Alivio Medical Center, PCC Wellness, other medical providers.	1. Mailing with information on lead risks and need for testing of all children due to Berwyn's high –risk ZIP Code designation sent to all medical providers. *Completed during committee meetings. 2. Pilot initiative to evaluate provider reporting compliance (CCDPH will lead) within 12 months 3. Lead poisoning prevention education/grand rounds presented to at least one provider group during 2018 (CCDPH will lead)
4. Host a community "Lead Summit" with medical providers and youth-serving organizations (schools, child care centers, mental health providers, etc.) to identify opportunities for collaboration in order to increase identification of, and service provision to, lead-exposed children.	City of Berwyn, Berwyn Township Health District, and CCDPH. Other potential partners: health providers, service providers, schools and child care centers, 708 board, and library.	1. Summit convened and Action Plan shared by summer 2019. 2. Recommendations for collaboration created and agreed to by participants. 3. Report created (CCDPH will lead).

CITY COUNCIL (FULL PACKET) SEPTEMBER 11, 2018 PAGE 23

FOCUS AREA 3: HOUSING IMPROVEMENT AND CODE ENFORMCEMENT

GOAL:

1. Protect children from lead exposure resulting from deteriorated lead-based paint and lead pipes by promoting housing improvements and enforcing housing and renovation codes and laws.

Recommendation	Responsible parties and partners	Evaluation measures and timeline
1. Promote window replacement through the Community Development Block Grant program (CDBG).	CDBG program, CCDPH	1. Update CDBG program handout within 3 months. 2. Increase in number of applications to CDBG program.
2. Explore implementation of a prospective rental inspection (PRI) program in multi-unit housing to identify hazards and require their correction.	Building, Planning and Zoning Committee, CCDPH	1. Review whitepaper (CCDPH) summarizing approaches to PRI, and share sample program information (including current recommendations to Chicago). 2. Discussions to take place in committee to identify potential issues/ feasibility within 9 months.
3. Provide lead-safe work information to all residents and contractors applying for building permits where paint and pipes will be disturbed.	Building Department and Licensing Department to identify handout & establish protocol for providing handout.	1. Provide handout within 1 month of initiative beginning. 2. All building permit applicants receive the information. 3. Send mailer to all licensed contractors who are registered with the City of Berwyn with lead safe work information and Berwyn expectations/requirements.
4. Conduct analysis of building permit and contractor registration requirements and documentation to identify places to where licensure/certification should be documented and compliance with RRP can be strengthened.	Building Department, Building, Planning and Zoning Committee, CCDPH	1. Review conducted within 6 months. 2. Updated forms available within 9 months.
5. Identify activities the building department can implement to ensure that lead safe work	Building Department, Building, Planning and Zoning Committee,	1. Explore feasibility of spot-check inspections of building renovations or dumpster contents to

CITY COUNCIL (FULL PACKET) SEPTEMBER 11, 2018 PAGE 24

practices are being followed.	CCDPH	ensure compliance with RRP and lead safe work practices required by law. 2. Explore fine structure for those found to be in violation. Implemented within 12 months.
6. Connect contractors to free lead-safe work practice trainings.	Building Department, CCDPH	1. Refer contractors to free ongoing Future Energy Jobs Act (FEJA) training programs, which will provide free RRP certification. Trainings are provided by the Hispanic American Construction Industry Association - HACIA. Provide handout to all contractors requesting building permits by fall 2018. 2. Provide one free lead supervisor training by summer 2019 for at least 5 contractors (CCDPH will lead)
7. Add safe correction of chipping paint to building code issues that must be addressed before real estate transfer can take place.	Building Department, Building, Planning and Zoning Committee	3. Lead-safe correction of chipping paint will be added to the inspection criteria for Berwyn Housing Inspectors. 4. Pamphlet created /adapted for homeowners detailing lead-safe work practices to guide hazard correction. 5. Create and maintain a list of local contractors (lead licensed and RRP certified) Implemented within 12 months.
8. Explore feasibility and value of implementing a Berwyn healthy homes or lead safe ordinance.	Building Department, Building, Planning and Zoning Committee, CCDPH	1. CCDPH presents the National Healthy Housing Standard model and data to committee. 2. Committee and departments explore feasibility of adding first tier healthy housing code to Berwyn code. Completed within 12 months.
9. Explore ways to fund low-interest loans or grants for low income home owners and land lords to remediate potential hazards.	Berwyn Community Development Department, City Council, Berwyn Township Health District, Housing Committee, CCDPH. Other potential partners: private	1. Discuss potential opportunities in City of Berwyn and Berwyn Township budgets to program. 2. Identify and meet with other potential partners.

	funders; public grants.	Exploration and feasibility determined for FY19 budget cycle.
10.Promote lead hazard remediation grant programs administered by the Cook County Department of Public Health.	City of Berwyn (specific Department TBD), CDBG program, Berwyn Township, CCPDH.	1. Provide links to CCDPH lead remediation grant program on City & Township web page. 2. CCDPH to provide program information and application FAQs to CDBG program for outreach. 3. CCDPH to conduct outreach with other city organizations to share information and recruit applicants.

Lead Poisoning Facts

- Young children are exposed to lead in Berwyn primarily through peeling and deteriorating lead-based paint
- Children inhale or ingest lead dust or paint chips, which results in elevated levels of lead in their bodies
- Elevated blood lead levels can:
    - Make it difficult to concentrate, pay attention, control moods and behavior
    - Lower IQ
    - Result in lower standardized test scores
    - Increase the risk of school failure

- No amount of lead is safe, but lead poisoning prevention programs use an "intervention level" to target resources and services
- Current intervention level in IL is 10µg/dL (micrograms per deciliter) – level is determined by a blood test.
- CDC recommendation is to intervene at 5 µg/dL.
- CCDPH currently provides services to children throughout suburban Cook County with blood lead levels at the state intervention level- 10µg/dL
- Of all children on the CCDPH caseload:
    - The second highest number of lead poisoned children reside in Berwyn, accounting for almost 14% of all children served by the health department
- Estimates indicate that almost 800 kids in Berwyn have blood lead levels of 5 µg/dL or greater.

- The only way to know if children have elevated blood lead levels is to test them.
- Berwyn (60402) is designated a high-risk ZIP Code by the Illinois Department of Public Health. That requires medical providers to annually test ALL children aged 6 months through 6 years.
- We know that not all children who should get tested receive a test – so we are not helping all the kids who need it.

- The best way to address lead poisoning is to prevent it in the first place.

- Window replacement programs have been proven to be effective in reducing lead levels in children. In these programs, no or very little lead abatement takes place. Because windows are such a big source of lead exposure, just replacing the windows without doing anything else does a lot to protect children from lead poisoning.

Risk by selected ZIPs in SCC

High Risk ZIPs		Est # kids under 6 living in pre -1980 housing	% pre-1980 housing	Est % EBL 5mcg/dL or greater	Est # of kids
60043	Kenilworth	181	94.62	11.6	21
60104	Bellwood	1,406	96	19.3	271
60153	Maywood	2,025	94.7	19.8	401
60305	River Forest	688	96.6	12	83
60402	Berwyn	5,744	96.3	13.8	793
60406	Blue Island	2,344	89.5	16.3	382
60456	Hometown	265	99.2	12.2	32
60501	Summit	1,134	92.5	14.5	164
60513	Brookfield	1361	95.4	12.3	167
60534	Lyons	785	90	13.2	104
60546	Riverside	1,055	97.4	12	127
60804	Cicero	9,333	95.3	14.50%	1353
Not DESIGNATED High Risk ZIP					
60426	Harvey	2,615	90.6	21.2	554
60472	Robbins	448	96.7	25	112
60411	Chicago Heights	4,789	86.2	18.6	891
60165	Stone Park	521	85	14.4	75
60707	Elmwood Park	3,046	94.6	13.3	405
60068	Park Ridge	2,156	90	11	237

Cook County Department of Public Health

Leadriskindex.org

Municipality Comparison of all CCDPH cases

City	# Children with Blood Lead Levels ≥10µg/dL	% of Total cases
Cicero	116	27.4%
Berwyn	62	14.6%
Maywood	25	5.9%
Schaumburg	13	3.1%
Blue Island	12	2.8%
Chicago Heights	12	2.8%
Melrose Park	9	2.1%
Calumet City	8	1.9%
Forest Park	7	1.7%
Summit	7	1.7%
Bellwood	3	0.7%

 # and % of current CCDPH cases, by selected municipality
Total number of cases (N) = 424

Cook County Department of Public Health

Municipality Comparison CCDPH Cases BLL ≥20µg/dL

City	# Children with Blood Lead Levels ≥20µg/dL	% of CCDPH cases
Cicero	19	21.8%
Berwyn	16	18.4%
Maywood	8	9.2%
Schaumburg	3	3.4%
Blue Island	4	4.6%
Melrose Park	4	4.6%
Chicago Heights	2	2.3%
Bellwood	2	2.3%
Forest Park	2	2.3%

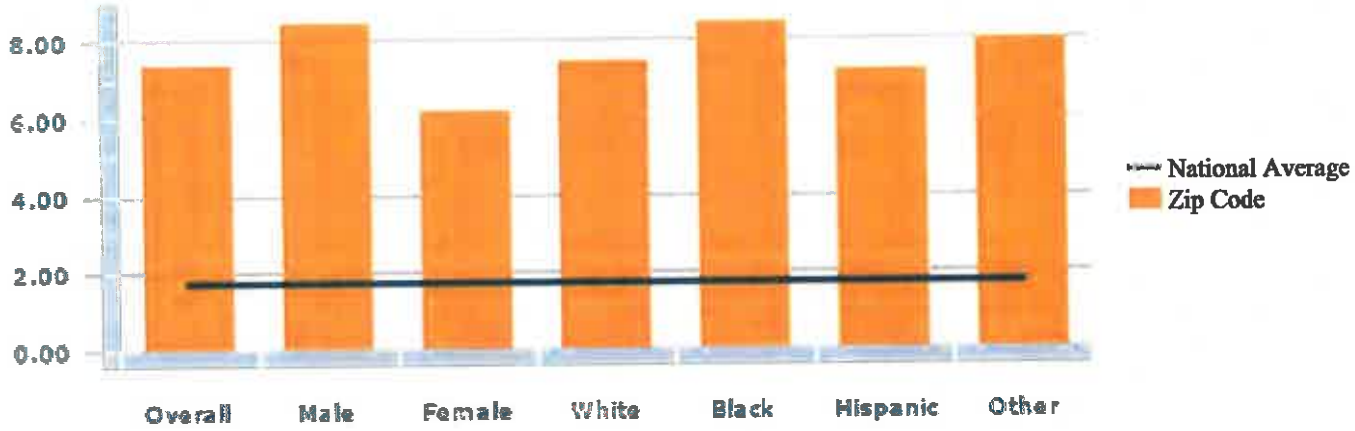
Total number of cases in 2015 (N) = 87

Cook County Department of Public Health

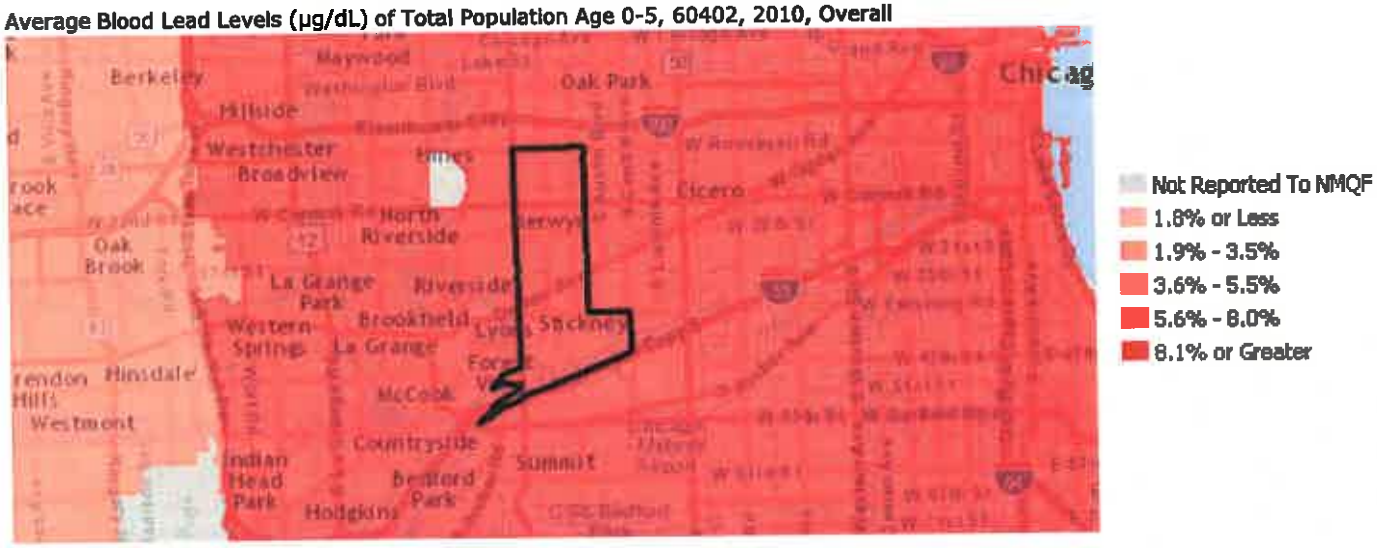
LEADRiskINDEX

Thursday, June 22, 2017
www.leadriskindex.com

Average Blood Lead Levels (µg/dL) of Total Population Age 0-5, 60402, 2010



Average Blood Lead Levels (µg/dL) of Total Population Age 0-5, 60402, 2010, Overall



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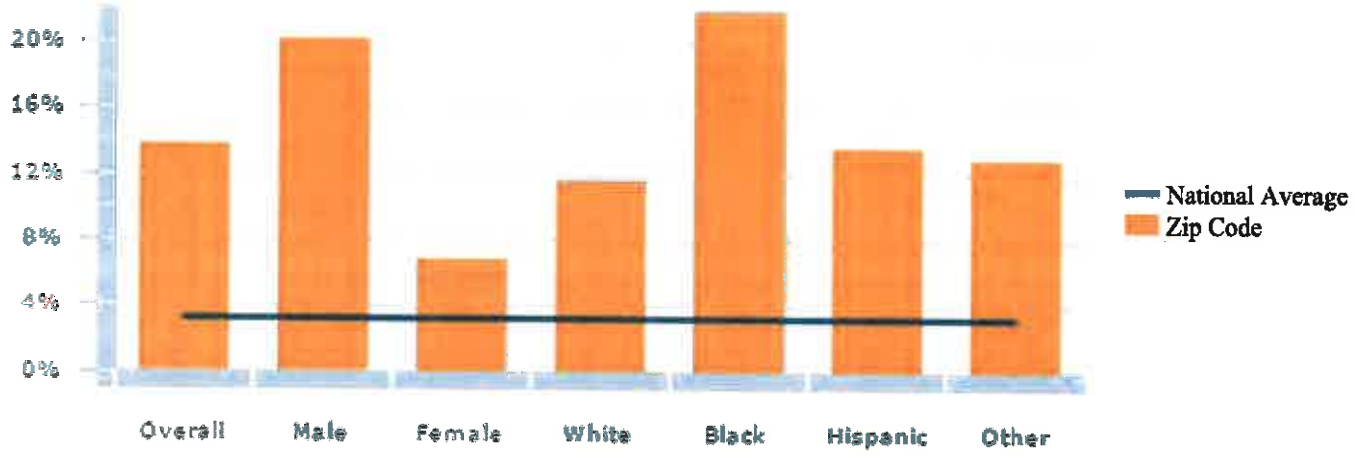
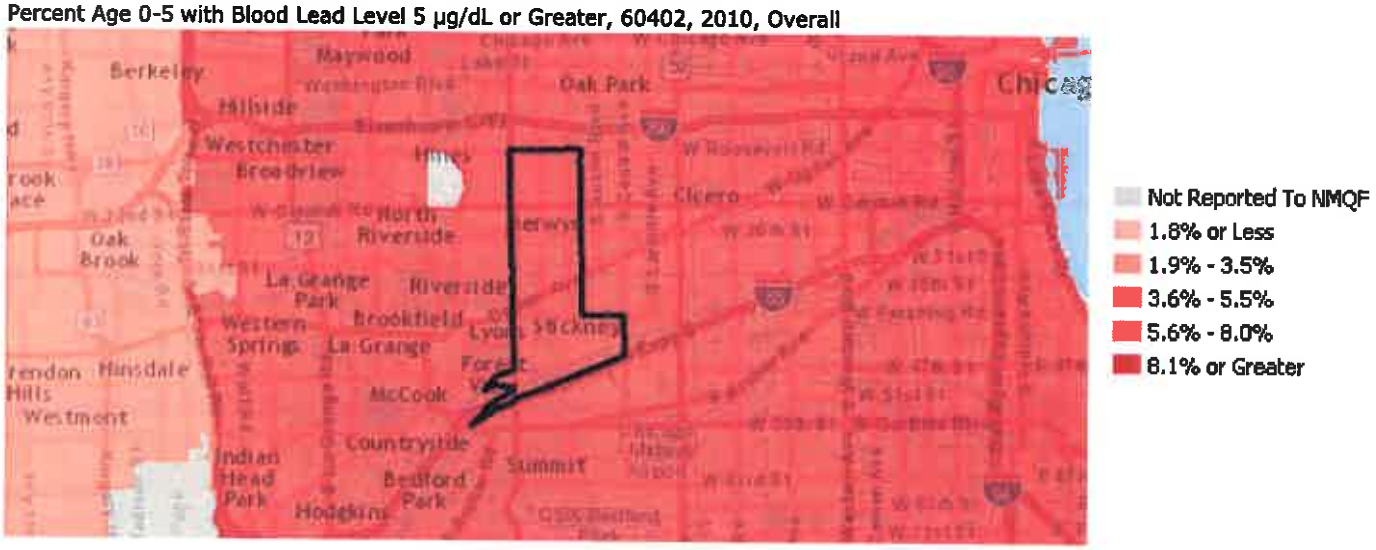
LEADRiskINDEX

Wednesday, June 21, 2017
www.leadriskindex.com

Percent Age 0-5 with Blood Lead Level 5 µg/dL or Greater, 60402, 2010



Percent Age 0-5 with Blood Lead Level 5 µg/dL or Greater, 60402, 2010, Overall



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Lead Poisoning – Risks

- Even a small amount of lead can cause changes in the brain that make it difficult for children to learn, pay attention, and control their moods and behavior.
- Lead exposure can lower I.Q., meaning many children never reach their full academic potential.
- Often there are no obvious physical symptoms
- A recent study of almost 50,000 children in Chicago Public Schools found low-level exposure lowers standardized test performance and increases risk of school failure.

Cook County Department of Public Health

Sources of Lead Exposure

- Overwhelmingly paint-based hazards
  - Homes built before 1978, the year lead was removed from household paints
- Lead is mostly found in:
  - Dust that is created when home surfaces are scraped, sanded or rubbed together.
  - Paint chips and dust that contain lead can gather on surfaces and objects that people touch or children put in their mouths.
- Also see exposure through makeup, pottery, spices, homeopathic remedies
- Water (potential route of exposure, but not primary route in Cook County)
  - EPA estimates nationwide 10-20% of exposure attributable to water

Cook County Department of Public Health

Cook County Dpt of Public Health Lead Poisoning Prevention

- Home inspections and nursing case management for children with elevated blood lead levels
- Grant Programs for lead abatement
  - Local $: over 1,000 remediated in 10 years, ongoing. *50 units in Berwyn remediated; 9 more units currently pending.*
  - Federal $: Begins fall 2017;Berwyn is one of 9 target communities
- Policy research, technical assistance, data, education and outreach

Risk by selected ZIPs in SCC – How does Berwyn compare?

IDPH-Designated High Risk ZIPs		Est # kids under 6 living in pre -1980 housing	% pre-1980 housing	Est % EBL 5mcg/dL or greater	Est # of kids
60104	Bellwood	1,406	96	19.3	271
60402	Berwyn	5,744	96.3	13.8	793
60406	Blue Island	2,344	89.5	16.3	382
60513	Brookfield	1361	95.4	12.3	167
60804	Cicero	9,333	95.3	14.50%	1353
60456	Hometown	265	99.2	12.2	32
60043	Kenilworth	181	94.62	11.6	21
60534	Lyons	785	90	13.2	104
60153	Maywood	2,025	94.7	19.8	401
60305	River Forest	688	96.6	12	83
60546	Riverside	1,055	97.4	12	127
60501	Summit	1,134	92.5	14.5	164

Current IL law = 10µg/dL is blood lead level at which children receive intervention, but studies show damage happens to children at much lower levels. Current intervention recommendation: intervene at 5µg/dL, but no level is considered safe.

Lead Risk Index: Leadriskindex.org

Illinois Department of Public Health (IDPH) http://www.dph.illinois.gov/topics-services/environmental-health-protection/lead-poisoning-prevention

Cook County Department of Public Health

Municipality Comparison of all current CCDPH lead cases

Municipality	# Children with Blood Lead Levels ≥10µg/dL	% of Total children
Cicero	139	26.8%
Berwyn	72	13.9%
Maywood	29	5.6%
Schaumburg	19	3.7%
Blue Island	12	2.3%
Chicago Heights	12	2.3%
Calumet City	11	2.1%
Melrose Park	10	1.9%
Summit	9	1.7%
Forest Park	8	1.5%

Current IL law = 10µg/dL is blood lead level at which children receive intervention, but studies show damage happens to children at much lower levels. Current recommendation = intervene at 5µg/dL

 # and % of current CCDPH cases, by selected municipality. Total number of cases (N) = 519

Cook County Department of Public Health

Municipality Comparison CCDPH Cases BLL ≥20µg/dL

City	# Children with Blood Lead Levels ≥20µg/dL	%
Cicero	25	22.9%
Berwyn	22	20.2%
Maywood	10	9.2%
Schaumburg	6	5.5%
Blue Island	4	3.7%
Melrose Park	4	3.7%
Elgin	3	2.8%
Bellwood	2	1.8%
Forest Park	2	1.8%

Total number of cases as of June 2017 (N) = 109

Cook County Department of Public Health

Possible Program and Policy options

- Educate residents on lead poisoning risks
- Encourage medical providers and township health district to test children (annual tests for children under 6)
- Review building permit processes and standards to ensure that lead safe work practices are required
- Fund window replacement programs
  - Use current funding; encourage window replacement through marketing and outreach
  - Allocate new funding
- Create a municipal rental inspection program to identify and correct unsafe units

Education and Health Services

- Provide free tests for children
- Education and outreach could include:
  - Seminars for parents
  - Outreach at events where young children and their families gather ("Meet the Coach" nights for Mighty Mites, or Back to School picnic, for example)
  - Training for local child care providers so they understand the risk in Berwyn and work with parents to get their children tested
  - "Grand rounds" education for physicians and nurses at MacNeal hospital regarding testing requirements
  - Education for homeowners on lead-safe renovation (partnerships with Jack's, or hardware stores)

Window Replacement - Clear Win Study

Window Replacement reduces lead risk, increases energy efficiency, and promotes health. Avg cost per unit = $7,400

"Clear Win" was an IL window replacement program. A study of the program found that window replacement only – no lead abatement – yielded:

- Reduced lead dust in window sills and wells – a primary route of lead exposure for young children.
- Improvements in uncomfortable indoor, temperatures, water leakage and dampness in the home
- Significantly reduced percentages of children experiencing headaches, respiratory allergies, and 3 or more ear infections
- Economic benefits were estimated at $5,912,219 compared with a cost of $3,451,841, resulting in a net monetary benefit of $2,460,378.
- "Conclusion: Local and state governments should fund and operate window replacement programs to eliminate a major source of childhood lead exposure, improve energy bills, increase home market value, and create local construction and industrial jobs."

Cook County Department of Public Health

Jacobs, et. al; J Public Health Management Practice, 2016, 00(00), 1–10

Building Permits

- Ensure that lead licensure is required and documented for work that will disturb lead-based paint
- For residents in pre-1978 homes completing any work themselves, provide information on lead risk

(ex: http://www.leadsafeillinois.org/uploads/images/hardware-poster.jpg)

Proactive Rental Inspection (PRI)

- A PRI program, or a rental inspection program, creates a system for inspection of rental units in a municipality.
- Rental units inspected on a periodic basis
- Consistent with current code enforcement and housing requirements
- Ensure that units are safe, habitable and properly maintained
- Support anti-blight efforts
- Preserve property values

- "In many instances, prospective rental inspection programs may be more effective than complaint-based programs in ensuring safe and healthy housing, preserving housing stock, protecting vulnerable tenants, and maintaining neighborhood property values." [1]

[1] *A Guide to Proactive Rental Inspection Programs, ChangeLab Solutions, http://www.changelabsolutions.org/sites/default/files/Proactive-Rental-Inspection-Programs_Guide_FINAL_20140204.pdf*

EPA's 2008 Lead-Based Paint Renovation, Repair and Painting (RRP) Rule (as amended in 2010 and 2011), aims to protect the public from lead-based paint hazards associated with renovation, repair and painting activities. These activities can create hazardous lead dust when surfaces with lead paint, even from many decades ago, are disturbed. The rule requires workers to be certified and trained in the use of lead-safe work practices, and requires renovation, repair, and painting firms to be EPA-certified. These requirements became fully effective April 22, 2010.

The RRP Rule requires that renovators are trained in the use of lead safe work practices, that renovators and firms be certified, that providers of renovation training be accredited, and that renovators follow specific work practice standards. Additional information on this rule can be found at http://epa.gov/lead/rrp/index.html.

https://www.epa.gov/lead/renovation-repair-and-painting-program-contractors

Firms that require certification

In general, anyone who is paid to perform work that disturbs paint in housing and child-occupied facilities built before 1978 must be certified. This includes all firms, even sole proprietorships. Examples of the types of firms covered:

- Residential rental property owners/managers
- General contractors
- Special trade contractors, including
  - Painters
  - Plumbers
  - Carpenters
  - Electricians

Firms can't advertise or perform renovation activities covered by the regulation in homes or child occupied facilities built before 1978 without firm certification.

Activities covered by the rule

- In general, any activity that disturbs paint in pre-1978 housing and child-occupied facilities is covered, including:
  - Remodeling and repair/maintenance
  - Electrical work
  - Plumbing
  - Painting preparation
  - Carpentry
  - Window replacement
- The following housing or activities are not covered by the rule
  - Housing built in 1978 or later
  - Housing specifically for elderly or disabled persons, unless children under 6 reside or are expected to reside there
  - "Zero-bedroom" dwellings (studio apartments, dormitories, etc.)

- Housing or components declared lead-free by a certified inspector or risk assessor. Also, a certified renovator may declare specific components lead-free using an EPA recognized test kit or by collecting paint chip samples for analysis by an EPA recognized laboratory
- Minor repair and maintenance activities that disturb 6 square feet or less of paint per room inside, or 20 square feet or less on the exterior of a home or building. (Note: Window replacement, and partial and full demolition activities, are always covered regardless of square footage. Activities designated as "prohibited" are prohibited regardless of square footage.)

Paint testing

Paint testing is not required by the regulation, but unless you have documentation that the paint is not lead-based, then the requirements of the renovation regulation apply.

If you or your client chooses to have the paint tested prior to renovation, testing must be done on all surfaces to be affected by the work, by the appropriate qualified professional.

Type of Paint Testing for Renovations	Who can do the testing?
EPA-recognized test kits	Certified renovators
X-Ray Fluorescence instruments	Certified lead-based paint inspectors or risk assessors
Paint chip sampling	Certified renovator, inspector or risk assessor

Title 40: Protection of Environment

PART 745—LEAD-BASED PAINT POISONING PREVENTION IN CERTAIN RESIDENTIAL STRUCTURES

Subpart E—Residential Property Renovation

Contents

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§745.87 Enforcement and inspections.
§745.88 Recognized test kits.
§745.89 Firm certification.
§745.90 Renovator certification and dust sampling technician certification.
§745.91 Suspending, revoking, or modifying an individual's or firm's certification.
§745.92 Fees for the accreditation of renovation and dust sampling technician training and the certification of renovation firms.

SOURCE: 63 FR 29919, June 1, 1998, unless otherwise noted.

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§745.80 Purpose.

This subpart contains regulations developed under sections 402 and 406 of the Toxic Substances Control Act (15 U.S.C. 2682 and 2686) and applies to all renovations performed for compensation in target housing and child-occupied facilities. The purpose of this subpart is to ensure the following:

(a) Owners and occupants of target housing and child-occupied facilities receive information on lead-based paint hazards before these renovations begin; and

(b) Individuals performing renovations regulated in accordance with §745.82 are properly trained; renovators and firms performing these renovations are certified; and the work practices in §745.85 are followed during these renovations.

[73 FR 21758, Apr. 22, 2008]

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§745.81 Effective dates.

(a) *Training, certification and accreditation requirements and work practice standards.* The training, certification and accreditation requirements and work practice standards in this subpart are applicable in any State or Indian Tribal area that does not have a renovation program that is authorized under subpart Q of this part. The training, certification and accreditation requirements and work practice standards in this subpart will become effective as follows:

(1) *Training programs.* Effective June 23, 2008, no training program may provide, offer, or claim to provide training or refresher training for EPA certification as a renovator or a dust sampling technician without accreditation from EPA under §745.225. Training programs may apply for accreditation under §745.225 beginning April 22, 2009.

(2) *Firms.* (i) Firms may apply for certification under §745.89 beginning October 22, 2009.

(ii) On or after April 22, 2010, no firm may perform, offer, or claim to perform renovations without certification from EPA under §745.89 in target housing or child-occupied facilities, unless the renovation qualifies for one of the exceptions identified in §745.82(a) or (c).

(3) *Individuals.* On or after April 22, 2010, all renovations must be directed by renovators certified in accordance with §745.90(a) and performed by certified renovators or individuals trained in accordance with §745.90(b)(2) in target housing or child-occupied facilities, unless the renovation qualifies for one of the exceptions identified in §745.82(a) or (c).

(4) *Work practices.* (i) On or after April 22, 2010 and before July 6, 2010 all renovations must be performed in accordance with the work practice standards in §745.85 and the associated recordkeeping requirements in §745.86 (b)(6) in target housing or child-occupied facilities, unless the renovation qualifies for one of the exceptions identified in §745.82(a). This does not apply to renovations in target housing for which the firm performing the renovation has obtained a statement signed by the owner that the renovation will occur in the owner's residence, no child under age 6 resides there, the housing is not a child-occupied facility, and the owner acknowledges that the work practices to be used during the renovation will not necessarily include all of the lead-safe work practices contained in EPA's renovation, repair, and painting rule. For the purposes of this section, a child resides in the primary residence of his or her custodial parents, legal guardians, and foster parents. A child also resides in the primary residence of an informal caretaker if the child lives and sleeps most of the time at the caretaker's residence.

(ii) On or after July 6, 2010, all renovations must be performed in accordance with the work practice standards in §745.85 and the associated recordkeeping requirements in §745.86(b)(1) and (b)(6) in target housing or child-occupied facilities, unless the renovation qualifies for the exception identified in §745.82(a).

(5) The suspension and revocation provisions in §745.91 are effective April 22, 2010.

(b) *Renovation-specific pamphlet.* Before December 22, 2008, renovators or firms performing renovations in States and Indian Tribal areas without an authorized program may provide owners and occupants with either of the following EPA pamphlets: *Protect Your Family From Lead in Your Home* or *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools.* After that date, *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools* must be used exclusively.

(c) *Pre-Renovation Education Rule.* With the exception of the requirement to use the pamphlet entitled *Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools*, the provisions of the Pre-Renovation Education Rule in this subpart have been in effect since June 1999.

[73 FR 21758, Apr. 22, 2008, as amended at 75 FR 24818, May 6, 2010]

A report from the Health Impact Project | Aug 2017

HEALTH IMPACT PROJECT

Robert Wood Johnson Foundation

THE PEW CHARITABLE TRUSTS

10 Policies to Prevent and Respond to Childhood Lead Exposure

An assessment of the risks communities face and key federal, state, and local solutions

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Advisory Group

This report benefited from the guidance of a formal advisory group with diverse perspectives and expertise. Although the research team gave substantial weight to the committee's input and advice, it retained final authority over and responsibility for the process, findings, and recommendations. Additionally, although the committee members found the approach and methodology to be sound, neither they nor their organizations necessarily endorse the findings or conclusions.

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Overview

The ongoing lead contamination crises in Flint, Michigan, and East Chicago, Indiana, as well as the surge of news reports about lead risks in communities across the country have shone a national spotlight on the problem of childhood lead exposure. The increased public awareness and scientific evidence that lead poisoning is completely preventable make this a critical moment for action to protect the nation's children, enhance their opportunities to succeed, and reduce costs to taxpayers.

With that background, the Health Impact Project convened a team of researchers to assess the implications of childhood lead exposure and perform a cost-benefit analysis of various policies to prevent and respond to the problem. The study team conducted a literature review, case studies, interviews, national listening sessions, focus groups, and quantitative analyses using models developed by Altarum Institute and by the Brookings Institution, Child Trends, and Urban Institute. The team included staff from Altarum, Child Trends, Urban Institute, Trust for America's Health, the National Center for Healthy Housing, and the Health Impact Project, a collaboration of the Robert Wood Johnson Foundation and The Pew Charitable Trusts.

Lead's adverse health impacts have been recognized since at least the second century B.C. Since then, thousands of studies have concluded that lead has wide-ranging effects on the health of young children and significant costs to taxpayers. Even at very low levels, lead exposure affects the brain's ability to control impulses and process information. Lead-poisoned children are more likely to struggle in school, drop out, get into trouble with the law, underperform in the workplace, and earn less throughout their lives, independent of other social and economic factors. The financial consequences of these outcomes include billions of dollars in public spending on special education, juvenile justice, and other social services.

Despite the evidence, the U.S. lagged many European nations by nearly 50 years in reducing the sources of exposure to lead. The delay resulted in greater quantities of lead in the environment, higher rates of childhood lead poisoning, and the need for more resources for remediation. Various federal agencies have imposed restrictions on lead during the past 40 years, yet lead persists in many places, mainly in drinking water and in existing paint in older homes and the dust and soil contamination it generates. Many states and communities have implemented laws to address lead exposure, but those efforts have been fragmented and underfunded. As a result, lead continues to adversely affect millions of children, particularly those in low-income communities and those of color because of their disproportionate risk of exposure to sources of lead in older homes and under-resourced neighborhoods.

The study team analyzed existing policies for their impacts on public health and health equity—the concept that every person should have the same opportunity to be healthy. The effort was guided by a diverse group of advisers and experts from fields including environmental and public health, child development, economics, housing, health care, environmental and social justice, and drinking water engineering. In addition, input from stakeholders, including families whose children have suffered the toxic effects of lead, provided valuable insights.

Where economic benefits are estimated, they are referred to as "future benefits"—meaning they are discounted at a rate of 3 percent per year to account for changes in the value of money over time. The cost-benefit analyses are based on the lifelong impacts of interventions for a single cohort of U.S. children, those who will be born in 2018. Where appropriate, the analysis includes benefits that would accrue for additional children born into the same households within 10 years. In some cases, costs were unavailable so a cost-benefit ratio is not provided.

Key findings include:

- **Removing leaded drinking water service lines from the homes of children born in 2018 would protect more than 350,000 children and yield $2.7 billion in future benefits, or about $1.33 per dollar invested.** Of those benefits, about $2.2 billion in higher lifetime earnings, better health, and other gains would accrue to 272,000 children born in the 2018 cohort, and $550 million would come from protecting the roughly 80,000 other children born into those homes over the next 10 years. The total includes $480 million for the federal government and $250 million for states and municipalities from health and education savings and increased tax revenue associated with higher earnings among the cohort. Replacing these lead pipes would cost an estimated $2 billion.
- **Eradicating lead paint hazards from older homes of children from low-income families would provide $3.5 billion in future benefits, or approximately $1.39 per dollar invested, and protect more than 311,000 children.** About $2.8 billion of those benefits would accrue to roughly 244,000 of the 4 million children in the 2018 cohort. The other $670 million in benefits would accrue from protecting approximately 67,000 additional children born into those homes over the next 10 years. The total benefits include $630 million in federal and $320 million in state and local health and education savings and increased revenue. Controlling lead paint hazards would cost $2.5 billion for the 2018 cohort.
- **Ensuring that contractors comply with the Environmental Protection Agency's rule that requires lead-safe renovation, repair, and painting practices would protect about 211,000 children born in 2018 and provide future benefits of $4.5 billion, or about $3.10 per dollar spent.** This includes $990 million in federal and $500 million in state and local health and education savings and increased revenue. The effort would cost about $1.4 billion.
- **Eliminating lead from airplane fuel would protect more than 226,000 children born in 2018 who live near airports, generate $262 million in future benefits, and remove roughly 450 tons of lead from the environment every year.**
- **Providing targeted evidence-based academic and behavioral interventions to the roughly 1.8 million children with a history of lead exposure could increase their lifetime family incomes and likelihood of graduating from high school and college and decrease their potential for teen parenthood and criminal conviction.** No studies have specifically assessed the effectiveness of such programs for lead-exposed children. However, research shows that for children at similar developmental risk from trauma, poverty, and other adverse experiences, certain high-quality interventions can increase the likelihood of earning a high school diploma and a four-year college degree and reduce the chance of becoming teen parents. The estimated benefits presume comparable impacts on lead-exposed children.

The costs and benefits outlined in the bullets above are based on a targeted approach to implementing the interventions, such as focusing on older homes with the highest probability of having lead hazards, and on populations at greatest risk, including low-income families. These economic calculations do not include emotional distress or other potentially large costs to families, such as time away from work.

Preventing childhood lead exposure will require significant policy and regulatory action, coordination across levels of government, and public and private investments, but it has the potential to generate substantial economic and public health gains in the short and long terms. The maximum potential future benefits of preventing all lead exposure for the 2018 birth cohort, such that those children's blood lead levels could be kept from rising above zero, could reach $84 billion, not including the costs to achieve such total prevention. This figure includes nearly $18.5 billion for the federal government and $9.6 billion for states in the form of increased revenue and savings to

the health care, education, and criminal justice systems. Calculating the cost of such hypothetical total prevention was beyond the scope of this study, but as shown above, the models for the individual interventions, which together could address a significant share of children's exposure risk, do include cost estimates.

No recent conclusive epidemiologic evidence exists on the relative contribution of different sources to children's blood lead levels,[1] so based on the results of its research, the study team has prioritized policies that the research literature strongly indicated could have the greatest positive population-wide effect on blood lead levels and could protect the most children. Secondarily, the team proposes focusing on other sources that contribute to the overall amount of lead, including nonessential uses of lead, which may cause individual acute cases of lead poisoning, but account for a smaller proportion of lead in children's blood overall. Concurrent with efforts to prevent exposure, the team also encourages the adoption of policies for intervening with children already poisoned by lead and for improving the data available to policymakers and the public.

The study team recommends:

Priority sources

- **Reduce lead in drinking water in homes built before 1986 and other places children frequent.** States and municipalities, with support from federal agencies, should fully replace lead service lines, from street to structure, that provide drinking water to homes built before the EPA banned their use. The EPA should strengthen its requirements to reduce the corrosivity of drinking water, improve water sampling protocols, and create a science-based household water lead action level—the amount that requires intervention—to help families and communities assess their risks. States and localities should investigate and mitigate drinking water hazards in schools and child care facilities.
- **Remove lead paint hazards from low-income housing built before 1960 and other places children spend time.** According to the Department of Housing and Urban Development, about 3.6 million homes nationwide that house young children have lead hazards such as peeling paint, contaminated dust, or toxic soil. HUD, the EPA, and the Centers for Disease Control and Prevention should work with states and local governments to support replacement of windows coated with lead paint, fix peeling paint, clean up contaminated dust, and treat toxic soil in and around those homes. States should require school districts and child care facilities to identify and remediate lead paint hazards.
- **Increase enforcement of the federal renovation, repair, and painting rule.** The EPA and its state agency partners should conduct more investigations to ensure that contractors are in compliance with federal regulations requiring training and certification to minimize dust and debris when working with lead-based paint. The EPA and states should emphasize enforcement for work done at child care facilities and in housing built before 1960.

Additional sources

- **Reduce lead in food and consumer products.** The federal government, through participation in the international Codex Alimentarius Commission—a cooperative effort of the United Nations and World Health Organization—should encourage expedited reduction of international limits on lead in foods, particularly those that young children and babies are likely to consume. Further, where local data indicate that children are being exposed to lead from sources such as candy, health remedies, or cosmetics, state and local agencies should target education and outreach to at-risk neighborhoods; support cultural awareness among physicians; and increase investigation and enforcement of small retailers.

- **Reduce air lead emissions.** The EPA and other federal agencies should collaborate to curtail new discharges by reducing concentrations of lead into the environment, such as from aviation gas and lead smelting and battery recycling facilities.
- **Clean up contaminated soil.** The EPA should collaborate with business to remediate dangerous conditions at and near facilities that extract lead from batteries and other electronics.

Poisoning response

- **Improve blood lead testing among children at high risk of exposure and find and remediate the sources of their exposure.** Federal and state health agencies should work with parents of lead-poisoned children, providers, Medicaid, and the Children's Health Insurance Program to remove barriers to blood lead testing and reporting, and to reduce sources of lead in children's home environments.
- **Ensure access to developmental and neuropsychological assessments and appropriate high-quality programs for children with elevated blood lead levels.** The U.S. Departments of Health and Human Services and Education and state and local health and education agencies should invest in education and care programs, and the federal Centers for Medicare & Medicaid Services should increase children's access to developmental assessments and neuropsychological testing so that the services provided address each child's individual needs.

Data and research

- **Improve public access to local data.** Federal, state, and local authorities should work together to make lead-risk data available to families, policymakers, and other stakeholders who need information about sources of exposure, such as property-specific information on leaded drinking water pipes and lead in the water, dust, paint, and soil at or near homes, schools, and child care facilities.
- **Fill gaps in research to better target state and local prevention and response efforts.** Federal, state, and local agencies and philanthropic organizations should support new studies and conduct their own research to identify sources of lead exposure and populations at greatest risk.

Policy initiatives such as these, while ambitious, are not without precedent, and this report includes illustrative case studies from states and municipalities that have tackled significant lead-exposure problems.

The report begins with a brief history of lead in the U.S. and the policies enacted to address it, a discussion of the impact of lead on children's brains and the disproportionate risks to low-income children and children of color, and a description of the study methods and limitations. It then examines policies to prevent exposure, including interventions focused on lead in drinking water, paint, dust, air emissions, and soil, as well as research gaps revealed during the study of those policy options. Later sections look at strategies for improving blood lead testing in children and at nutritional, educational, and behavioral programs to help mitigate the effects of lead in children already exposed. Each policy discussion includes literature review findings; case studies; input from stakeholders; potential challenges; and, when possible, costs, benefits, and simulated effects on children's lifetime outcomes. The study concludes with a detailed list of actions federal, state, and local policymakers can take to implement the above recommendations. (See Page 79.)

The history of lead in the United States

By the 20th century, lead had permeated every aspect of American life, from air in cities to windows and plumbing of homes across the country. In 1900, "more than 70 percent of [the nation's] cities with populations greater than 30,000 used lead water lines."[2] Then in 1923, leaded automobile gasoline entered the public market and quickly surpassed other fuels, becoming one of the most important sources of lead exposure.[3] Further, between 1900 and 1950, paint containing high concentrations of lead pigments replaced wallpaper as the primary wall covering in homes.[4]

Lead's harmful effects on children were first documented in Australia during the 1890s, and by the 1920s, several European nations had adopted laws limiting lead in paint.[5] For example, France, Belgium, and Austria banned white-lead interior paint in 1909. Then, in 1921, the International Labour Organisation adopted a proposal to prohibit the use of lead-based paint in all member countries, but the U.S. declined to adopt the rule.[6] During this same period, public concern led some American towns and cities to prohibit the use of leaded drinking water lines.[7] In the 1930s, the FDA recognized the need to control potential lead exposure from food and limited the use of lead-containing substances, such as pesticides.[8]

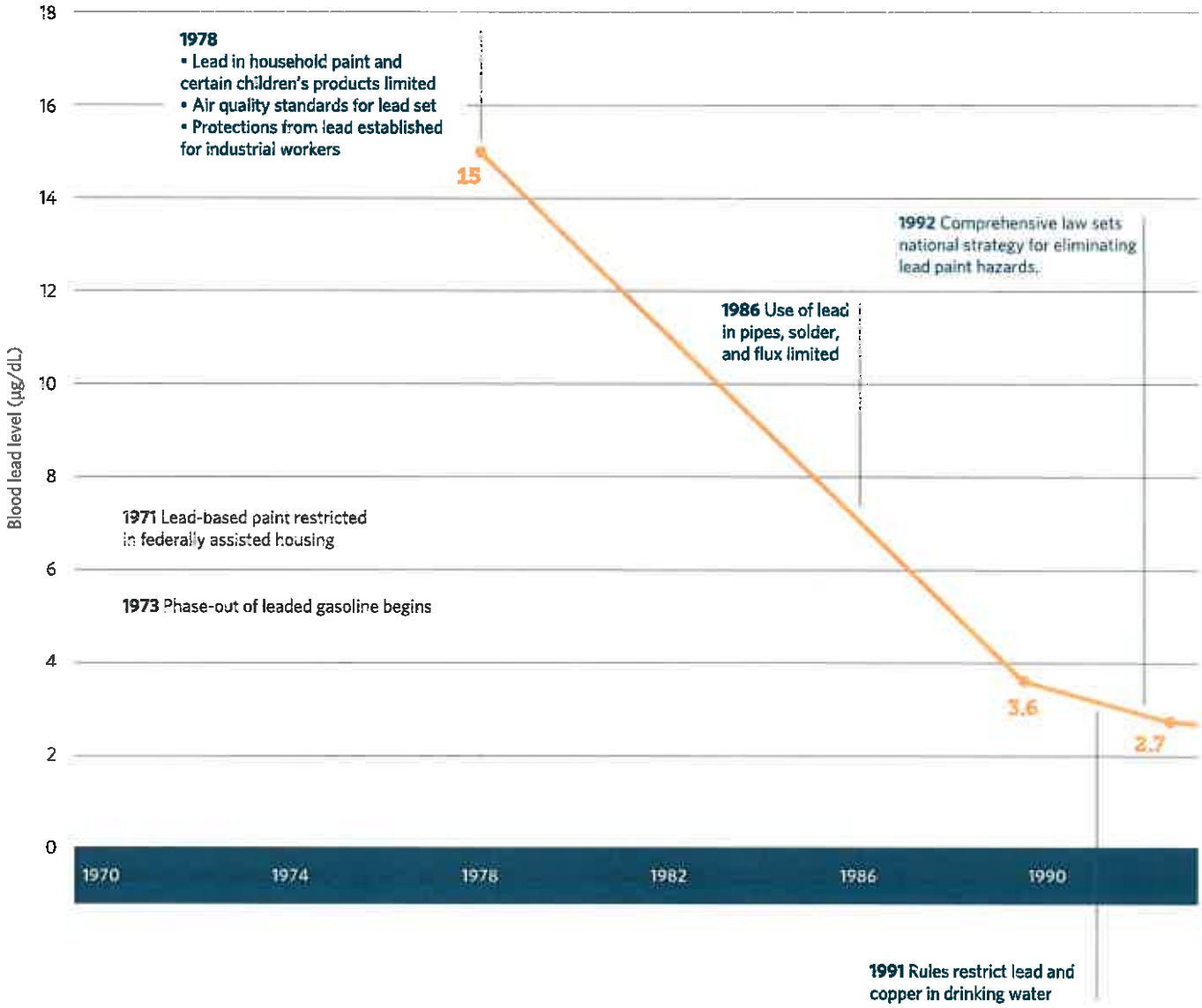
But despite the growing evidence of lead's toxic effects on children, during the 20th century the Lead Industries Association aggressively promoted lead as a superior product while downplaying public health risks and undercutting larger-scale regulatory efforts.[9] Notably, the industry developed model building codes for lead in plumbing and paint and successfully lobbied for their adoption by federal, state, and municipal governments.[10]

Additional federal action lagged until the Clean Air Act of 1970, which regulated air pollution and required that all cars manufactured in the U.S. after 1975 be built with catalytic converters—emission control devices that turned out to be incompatible with leaded gas.[11] The 1971 Lead-Based Paint Poisoning Prevention Act, which prohibited the use of lead paint in government-funded housing, was largely driven by the determined efforts of the scientific community, whose work would help to shape the next 40 years of federal guidelines and policies to protect children.[12] In 1973, the EPA announced a phase-out of lead in gasoline, although the process took more than 20 years.[13] Thanks to key policy actions, including the elimination of leaded gasoline, reductions in industrial emissions, limits placed on lead in residential paint in 1978, the 1974 Safe Drinking Water Act, the 1986 prohibition against use of lead pipes and plumbing, and a shift in the 1990s to welded (nonsoldered) food cans, average blood lead levels among U.S. children have declined by about 94 percent from 15 micrograms per deciliter (µg/dL) in 1976 to 0.86 µg/dL today.[14] (See Figure 1.) In the early 1970s, the U.S. Centers for Disease Control and Prevention (CDC) called for public health action at a blood lead level of 40 µg/dL. Since that time the agency has incrementally lowered the threshold for action. In October 2012, the CDC established a reference value—the level at which a child's blood lead level is much higher than most children's and public health interventions are recommended—of 5 µg/dL and declared, "No safe blood lead level in children has been identified."[15] The CDC's scientific advisers recommended lowering the reference level to 3.5 µg/dL, and agency officials were considering the change as of the writing of this report.[16]

Figure 1

Exposure Prevention Effectively Lowers Children's Lead Levels

Average blood lead levels in children 1 to 5 and federal policies



Sources: Reproduced and modified from Mary Jean Brown & H. Falk, "Toolkit for Establishing Laws to Control the Use of Lead Paint. Module C.iii. Conducting Blood Lead Prevalence Studies," Global Alliance to Eliminate Lead Paint (2016); President's Task Force on Environmental Health Risks and Safety Risks to Children, "Key Federal Programs to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts" (November 2016), https://ptfceh.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf

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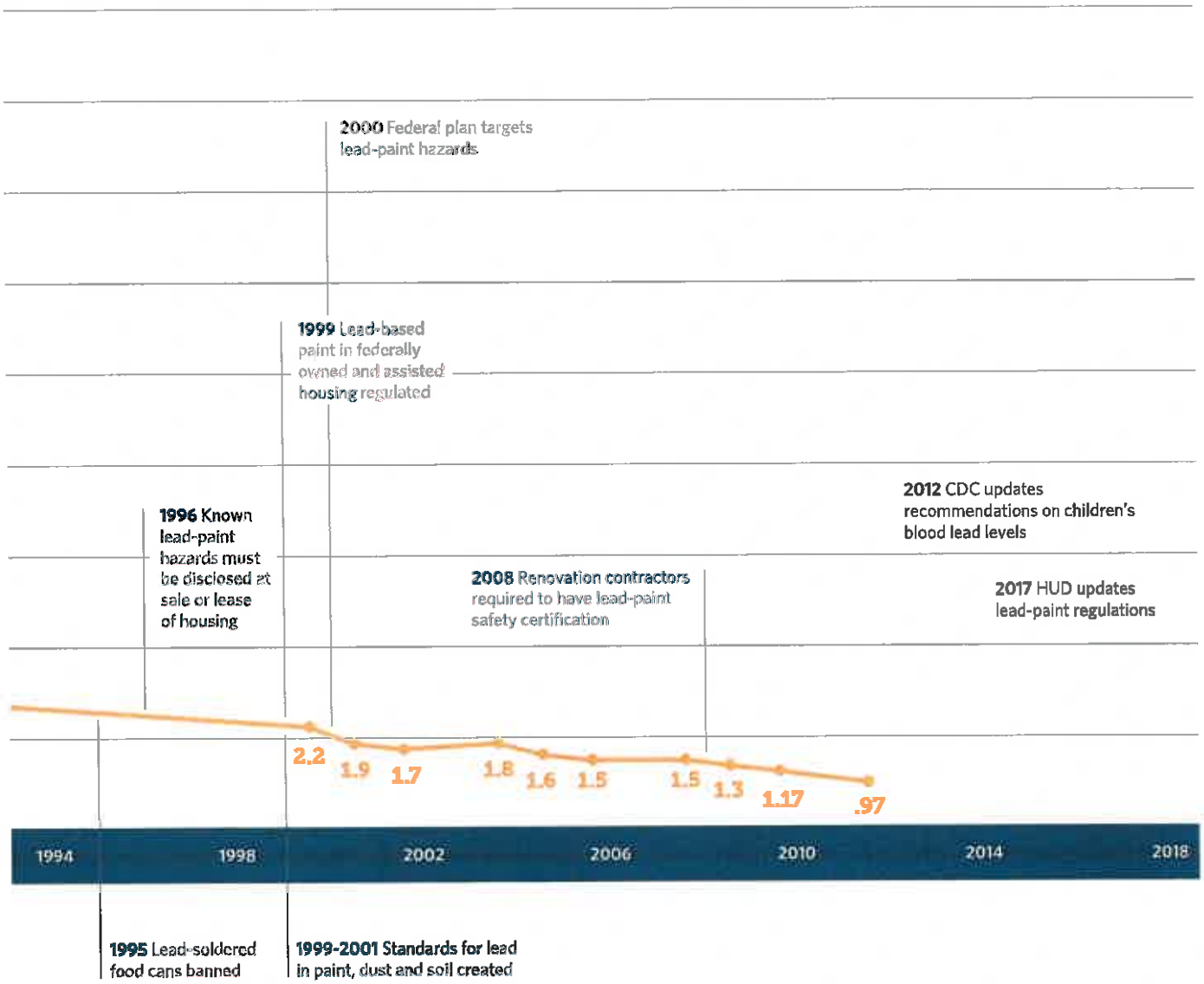
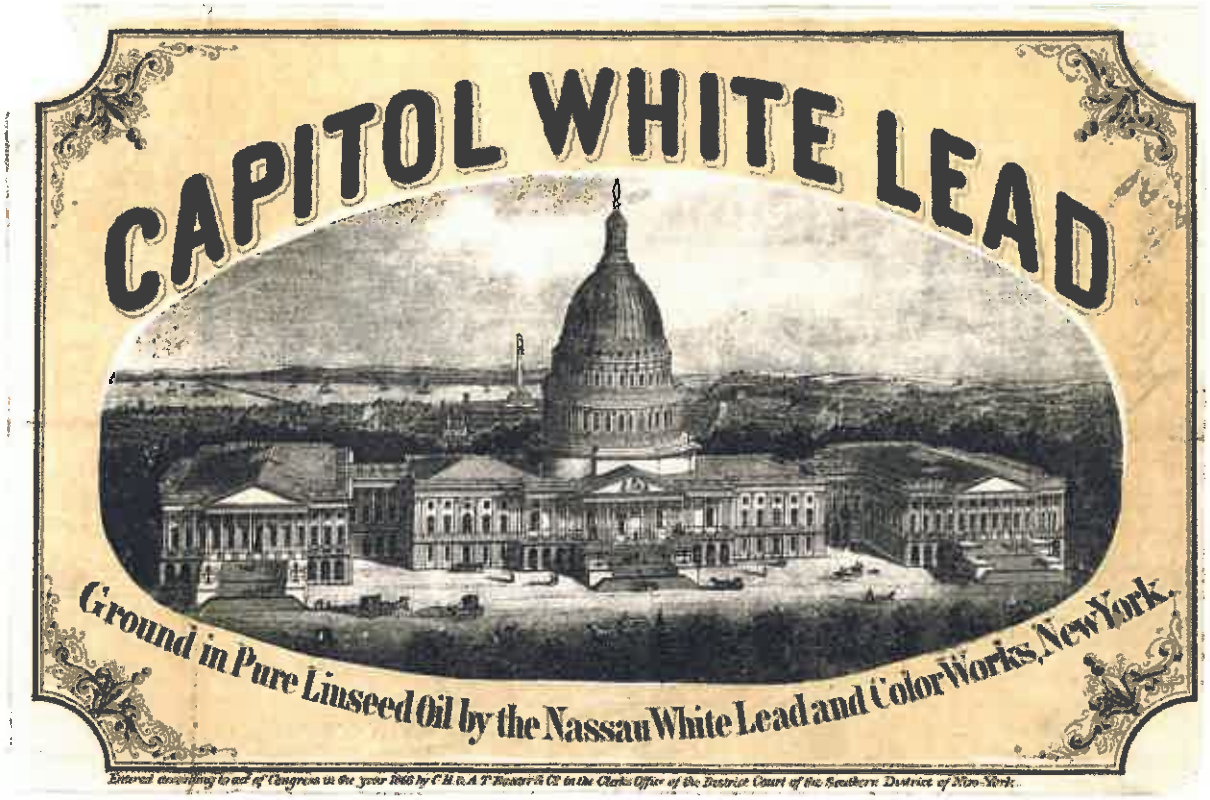

2000 Federal plan targets lead-paint hazards
1999 Lead-based paint in federally owned and assisted housing regulated
1996 Known lead-paint hazards must be disclosed at sale or lease of housing
2012 CDC updates recommendations on children's blood lead levels
2008 Renovation contractors required to have lead-paint safety certification
2017 HUD updates lead-paint regulations
2.2
1.9
1.7
1.8
1.6
1.5
1.5
1.3
1.17
.97
1994
1998
2002
2006
2010
2014
2018
1995 Lead-soldered food cans banned
1999-2001 Standards for lead in paint, dust and soil created



An advertisement for leaded paint from 1866.
Photo: Library of Congress

Despite this progress, U.S. children remain at risk from lead exposure. The CDC found in 2016 that approximately 500,000 children ages 1-5 tested at or above the reference value.[17] Additionally, many federal limits on lead in the environment have not been updated to reflect new evidence about the effects of low-level exposure, and most agencies have not set standards to protect unborn babies and pregnant women.[18] For example, in 2016, during the most recent such review, the EPA opted not to update the 2008 air standards for lead. Standards for paint, dust, soil, water, and occupational hazards are 15 to 40 years old, despite calls to modernize them, such as from the EPA's Science Advisory Board.[19] For example, the EPA's soil lead standard is 400 parts per million (ppm) for areas where children play, while, by comparison, California's guideline is 80 ppm.

Lead and the brain

Very high doses of lead, which are rarely seen in the U.S. today, can cause seizures, coma, and death.[20] However, even much lower levels, between 3 and 5 µg/dL, can lead to neurologic damage, including impaired memory and executive function,[21] which is the ability to plan, remember instructions, and juggle multiple tasks. Such levels can lead to decreased IQ and academic performance and can also cause behavioral problems, such as impulsivity, hyperactivity, and attention disorders.[22] Some studies suggest that lead exposure may also cause conduct disorders, depression, anxiety, and withdrawn behavior[23]—the tendency to avoid the unfamiliar, either people, places, or situations.

The mechanisms by which lead causes harm are complex and not completely understood, but one important way it is known to affect children's brains is by mimicking or competing with other metals such as calcium, zinc, iron, and copper. Young children, particularly from birth to age 6, require large amounts of these essential metals for growth and development, especially to build brain cells and send signals throughout the nervous system. The passage of these metals from the blood into the brain is regulated by the blood-brain barrier—a cellular membrane that selectively allows some substances, such as oxygen, immune cells, and nutrients, to pass between the bloodstream and the brain.[24] Lead can masquerade as these essential metals, moving across the barrier, taking the place of important metals in the brain and interfering with the growth of brain cells, which can lead to changes in the way those cells communicate.[25]

Disproportionate Risks and Related Health Disparities

Any child can be affected by lead, but exposure in the United States is unequal across populations. (See Figure 2.) Race and ethnicity are particularly strongly associated with children's risk. A national survey found that African-American children's average blood lead levels were well above those of non-Hispanic white and Mexican-American children.[5] Although the survey did not control for social and economic factors, other studies have shown that race and ethnicity are associated with elevated blood lead levels in children regardless of family income. One study of more than 1 million blood tests from Chicago collected between 1995 and 2013 found that, after controlling for socioeconomic factors, children from predominantly black, and to a lesser extent Hispanic, neighborhoods had higher rates of lead poisoning than their white counterparts, even as blood lead levels fell dramatically citywide. (See the Glossary for the definition of lead poisoning used throughout this report.) Another study of children from Rochester, New York, found that, after adjusting for environmental exposures, behaviors, socioeconomic status, and dietary intake, black children were at higher risk of elevated blood lead than their peers of other races.[1]

These findings reflect the disparate risk that minority communities face from older housing with lead paint hazards, a condition that has its origins in unfair lending practices and social policies, such as redlining—in which even well-qualified black applicants were treated as too risky for federally backed mortgages—and racial covenants, which prohibited people of color from moving into white neighborhoods.[3] These practices contributed to the isolation of impoverished communities and people of color in areas with poorer-quality housing, infrastructure, and air.[8] One national survey found that the extent of serious lead paint hazards in U.S. housing differed significantly by race and income: Twenty-eight percent of African-American households and 29 percent of poorer households faced housing-related exposure risks, compared with 20 percent of white and 18 percent of more affluent families, respectively.[11]

Continued on next page

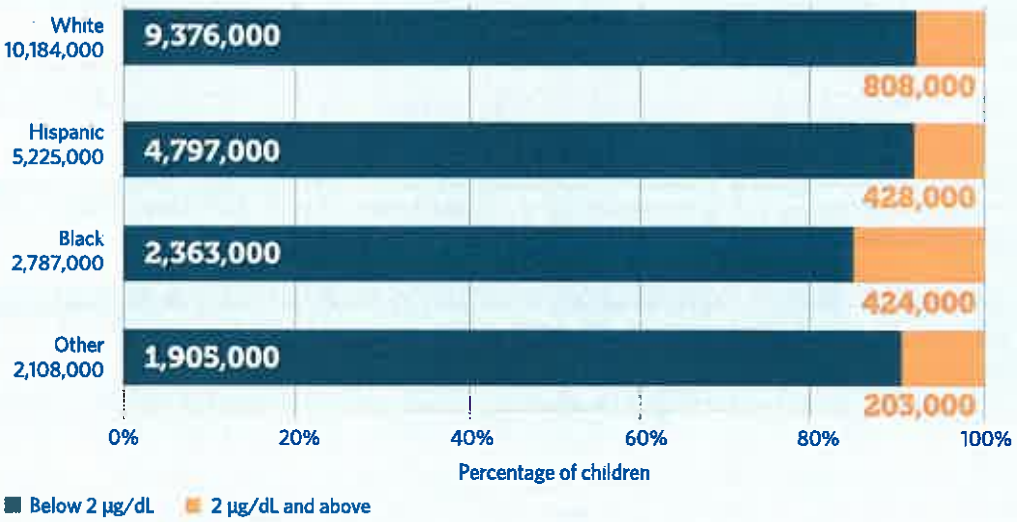
Further, American Indian and Alaska Native children are far more likely than other children to be exposed to potentially lead-contaminated runoff and other effects of former mining sites, and in a 2008 study from New York City, foreign-born children were five times as likely as their U.S.-born counterparts to have elevated blood lead levels.#

Certain ethnic groups also experience disproportionate risk from lead associated with health remedies and consumer products. Lead and other heavy metals are sometimes added to traditional medicines used to treat ailments such as arthritis, infertility, upset stomach, menstrual cramps, teething, and colic. Lead has been found in some candies and spices, such as chili powder and tamarind. In addition, traditional eye cosmetics are still made with ingredients, such as kohl, that are high in lead, and the FDA does not allow importation or marketing of these products in the U.S., though they are sometimes brought in by individual travelers.**

Figure 2

All Children Face Some Exposure Risk, but Racial and Ethnic Disparities Persist

Share and number of 1-5-year-olds with blood lead levels below and above 2 µg/dL by race and ethnicity, 2011-14



Note: All numbers are rounded

Sources: Altarum analysis of National Center for Health Statistics, "National Health and Nutrition Examination Survey 2011-2012," accessed May 26, 2017, https://wwwn.cdc.gov/nchs/nhanes/continuousnhanes/default.aspx?BeginYear=2011, and National Center for Health Statistics, "National Health and Nutrition Examination Survey 2013-2014," accessed May 26, 2017, https://wwwn.cdc.gov/nchs/nhanes/continuousnhanes/default.aspx?BeginYear=2013

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Income also influences rates of lead exposure. According to the CDC, children living in poverty had significantly higher average blood lead levels than their more affluent peers.[††] This is in part because low-income families tend to rent rather than own their homes, and renters are more likely than owners to face issues associated with inadequate housing, such as lack of complete plumbing facilities in the unit, have more serious constraints on funding for improvements, and depend on landlords to make their homes lead-safe.[‡‡]

In addition, some evidence suggests that rural communities may be exposed to contaminated soil resulting from past use of lead in pesticides applied to orchards and other crops; however published research on these risks is limited.[§§]

* William Wheeler and Mary Jean Brown, "Blood Lead Levels in Children Aged 1-5 Years—United States, 1999—2010," *Morbidity and Mortality Weekly Report* 62, no. 13 (2013): 245–48, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6213a3.htm.

† Robert J. Sampson and Alix Winter, "The Racial Ecology of Lead Poisoning: Toxic Inequality in Chicago Neighborhoods, 1995-2013," *Du Bois Review: Social Science Research on Race* 13, no. 2 (2016): 261–83, http://dx.doi.org/10.1017/S1742058X16000151, Bruce Lanphear et al., "Environmental Lead Exposure During Early Childhood," *Journal of Pediatrics* 140, no. 1 (2002): 40–47, https://dx.doi.org/10.1067/mpd.2002.120513

‡ Kirwan Institute for the Study of Race & Ethnicity, "History Matters: Understanding the Role of Policy, Race, and Real Estate in Today's Geography of Health Equity and Opportunity in Cuyahoga County" (February 2015), http://kirwaninstitute.osu.edu/wp-content/uploads/2015/02/history-of-race-real-estate.pdf

§ Ibid.; Alex F. Schwartz, "Housing Policy in the United States: An Introduction" (Routledge, Taylor and Francis Group, 2006): 217–18; Russ P. Lopez, "Public Health, the APHA, and Urban Renewal," *American Journal of Public Health* 99, no. 9 (2009): 1605, http://dx.doi.org/10.2105/AJPH.2008.150136

|| U.S. Department of Housing and Urban Development, "American Healthy Homes Survey: Lead and Arsenic Findings" (2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf

\# Lacey McCormick, "Honoring the River: How Hardrock Mining Impacts Tribal Communities," National Wildlife Foundation, news release, April 25, 2013, http://www.nwf.org/News-and-Magazines/Media-Center/News-by-Topic/Wildlife/2013/04-25-13-Honoring-the-River-Press-Release.aspx, Parisa Tehranifar et al., "Immigration and Risk of Childhood Lead Poisoning: Findings From a Case-Control Study of New York City Children," *American Journal of Public Health* 98, no. 1 (2008): 92–97, http://dx.doi.org/10.2105/AJPH.2006.093229

** U.S. Food and Drug Administration, "Kohl, Kajal, Al-Kahal, Surma, Tiro, Tozali, or Kwalli: By Any Name, Beware of Lead Poisoning," accessed March 6, 2017, https://www.fda.gov/Cosmetics/ProductsIngredients/Products/ucm137250.htm

†† Wheeler and Brown, "Blood Lead Levels in Children Aged 1-5 Years—United States, 1999–2010."

‡‡ Joint Center for Housing Studies of Harvard University, "The State of the Nation's Housing 2016" (Cambridge, MA: Harvard University, 2016): 5, 25, http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs_2016_state_of_the_nations_housing_lowres.pdf.

§§ Carol L. Hanchette, "The Political Ecology of Lead Poisoning in Eastern North Carolina," *Health and Place* 14, no. 2 (2008): 214, http://dx.doi.org/10.1016/j.healthplace.2007.06.003; C. Marjorie Aelion et al., "Associations Between Soil Lead Concentrations and Populations by Race/Ethnicity and Income-to-Poverty Ratio in Urban and Rural Areas," *Environmental Geochemistry and Health* 35, no. 1 (2013): 10, http://dx.doi.org/10.1007/s10653-012-9472-0.

Recent news reports provide stark reminders that lead continues to affect American communities. In September 2015, Dr. Mona Hanna-Attisha found significant blood lead increases among children in Flint, Michigan, which elevated the city's drinking water crisis to a national public health issue. Nearly a year later, roughly 270 families in East Chicago, Indiana, were displaced from a public housing development built near a former smelter and lead refinery, which is now a federally designated Superfund site.[26] Soil at the housing complex had lead levels significantly above the EPA's action level—the concentration of lead above which regulatory or remedial intervention is needed.[27]

Methods

The research team developed a list of more than 100 policies for analysis based on documents from a range of organizations and agencies, including the 2000 President's Task Force on Environmental Health Risks and Safety Risks to Children, the U.S. Centers for Disease Control and Prevention, Earthjustice, the American Academy of Pediatrics, the National Center for Healthy Housing, the National Safe and Healthy Housing Coalition, the Green & Healthy Homes Initiative, the Healthy Schools Network, and the Lead Service Line Replacement Collaborative.[28]

The research team selected policies for analysis based on interviews; focus groups; and a series of meetings with experts, advocates, and community members. The team asked these stakeholders to identify policies for inclusion in the study based on their public health and health equity value and, noting the urgency of action, their potential to be implemented within 18-36 months. Additionally, the team chose policies with the strongest evidence base.

Priority was placed on those that related most directly to preventing children from coming into contact with lead and enabling those who have already been exposed to access services to help improve their lifelong outcomes.[29]

The analysis included qualitative and quantitative research organized according to a modified Sequential Explanatory approach, to develop an understanding of the relevant social, economic, and cultural contexts for lead exposure in children.[30] Studies that use both qualitative and quantitative methods are strengthened by the combination because they are able to present information from multiple perspectives. Qualitative data collection, including focus groups, listening sessions, and interviews, was conducted first, followed by quantitative analyses of costs and benefits.

See the appendix for an in-depth discussion of the methodology used for this report.

Quantitative models

Child Trends, a nonprofit research center focused on child development, led the quantitative work, in partnership with Altarum Institute, a nonprofit health systems research organization, and the Urban Institute, a nonprofit economic and policy research organization.

The study team quantitatively modeled only those prevention interventions for which data on the scope of exposure and the effectiveness of the policy were readily available. For example, data exist on the extent of lead paint, lead service lines, and contaminated dust in homes, as well as on the effectiveness of interventions to address these hazards. However, similarly comprehensive information for these threats and policies to mitigate them in schools and child care facilities was not available. Exposure from sources not tied to a specific structure, such as consumer products and food, was also difficult to estimate, and data regarding the effectiveness of interventions targeted at those sources were lacking. Despite these data constraints, in recognition of the reality that many sources of lead contribute to childhood lead exposure, the team studied those hazards for which

quantitative data were not available using the qualitative methods described later in this chapter. The team selected the inputs for the models from a literature search that identified 176 peer-reviewed articles related to the policies analyzed. The team used the most rigorous literature available as the basis for the quantitative models.

Child Trends and the Urban Institute used the Social Genome Model (SGM), which examines how actions at developmentally significant life stages reverberate through a person's life, to predict the effects of policies to prevent harmful blood lead levels and of interventions for lead-exposed children.[31] The SGM simulated the effects of the prevention and response policies on educational attainment, grade point average, teen parenthood, criminal convictions, and lifetime family income. Using a data set of 8,056 children, the SGM tracks lifelong development starting at birth and employs statistical techniques to assess the relationships between children's early life circumstances and later outcomes. The studied effects build on one another over a child's life: Circumstances at birth influence early childhood, which in turn affects middle childhood circumstances, which translate into a child's situation in adolescence, and so on well into adulthood. For example, robust research shows that, after controlling for other factors, children with lower blood lead levels have better early reading scores than those with higher levels.[32] The SGM calculates how this better reading contributes to greater educational attainment and higher income later in life.

The SGM does not include information on children's blood lead levels, so the team used data from the two most recent editions (2011-14) of the National Health and Nutrition Examination Survey (NHANES), a national population-based survey, to assign blood lead levels to children based on their social and demographic characteristics.

The modeling team used data from the literature to determine the change in children's blood lead that could be expected as a result of the policy interventions and how it would affect reading, math, and behavior. The team then ran the SGM to estimate how those effects would, in turn, impact later life outcomes, such as graduation rates, criminal convictions, and teen pregnancy. The SGM was used to examine five interventions for which effect size estimates were available: lead service line replacement; lead paint hazard control; renovation, repair, and painting rule enforcement; removal of lead from aviation gas; and programs for children with a history of lead exposure. The SGM outputs for this final intervention are presented in the body of the report, while for brevity, the findings from the first four analyses may be found in the appendix.

The analysis also employed Altarum Institute's Value of Prevention (VP) tool, a spreadsheet-based application, which synthesizes research findings and national data sets to quantify the financial and health impacts of various preventive investments. The tool has been applied to investigating the value of smoking and obesity prevention, and of early childhood education. For this study, the team synthesized four types of data to estimate the costs and benefits of the four prevention policies. The tool integrated published findings on the effect of an intervention on blood lead levels and information on the health and social impacts of lead exposure to infer later-life health status, health care costs, and incarceration rates; and data on the effect of lead on IQ and on the relationship between IQ and income to predict lifetime earnings.

The research team modeled the benefits for the cohort of children born in 2018, the next full year that most closely approximates the blood lead level data from the 2011-14 NHANES. According to those data, the mean blood lead level for the population of children 1-5 was 1.1 µg/dL.

These analyses provided an estimate of the benefits of each policy to society and to the federal and state and local governments. These are referred to in the report as "future benefits" and are discounted at a rate of 3 percent per year to account for the changing value of money over time.

To better understand and describe any uncertainty within the findings, the modeling team conducted two additional analyses. First, it modeled the effects of preventing blood lead levels from rising above 0 µg/dL as a bounding exercise to provide an upper limit on the potential impacts of the intervention policies. Second, to address uncertainties that could not be tested by that method, the team performed quantitative sensitivity analyses to clarify how changes in the assumptions, coefficients, and data points could affect the overall results. (See the appendix for details.)

Qualitative methods

Through qualitative approaches, researchers can identify stakeholder concerns, explain why and how phenomena occur, and gauge the range of effects. These methods also provide context for quantifiable information and enable an examination of processes and experiences along with outcomes.

In addition to the research literature gathered for the quantitative models, the study team identified and reviewed other studies across a range of methods and topics that could help with screening policies and formulating recommendations. Across the two literature searches, the team identified roughly 700 peer-reviewed articles.

Through 16 focus groups held in Baltimore; Chicago; Flint; Indianapolis; Los Angeles; New Orleans; Philadelphia; and Warren, Arkansas, the team collected feedback from at least 129 community members, including landlords (16 participants), parents of children with high blood lead levels, and other concerned citizens (113 participants). The team gathered basic demographic information from participants in the parents and concerned citizens groups using a brief survey. (See Table A.3 for complete results.) The team also held two conference calls with eight parents of lead-poisoned children to capture their experiences navigating the medical and education systems.

The research team developed a list of themes from the discussion guides for the focus groups. The team analyzed the field notes and transcriptions from each focus group to identify additional common themes and keywords to add to the list and then summarized the findings and linked those to the quantitative results to provide context for the economic information. Perhaps more importantly, the qualitative analysis allowed the team to identify barriers to implementing the recommendations as well as steps to mitigate those challenges and support effective remediation of lead exposure risks.

In addition, the research team gathered more insight into the effects of childhood lead exposure and potential policy interventions through five national online listening sessions. (See the appendix for details on participants and methodologies for these events.) Unstructured conversations with experts provided additional input for the report.

Finally, the Trust for America's Health and the National Center for Healthy Housing developed case studies to highlight examples of policies in action and lessons learned from across the country. The team selected the case studies based on their relevance to the policies analyzed and their applicability to other jurisdictions. (See the "Policy in Action" listings in the Table of Contents.)

Study limitations

Qualitative data limitations

Obtaining input from all stakeholder groups that could be affected by the recommendations was beyond the scope of the study. Efforts were made to broadly advertise the national listening sessions to ensure that the study included diverse stakeholder perspectives, but in general, school administrators, the aviation industry, and owners of secondary smelters did not respond and so are not as well represented as the public health community. Further, although the team solicited feedback through the advisory committee and focus groups from several representatives of water utilities, property management firms, renovation contractors, child care operators, and rental property owners, fewer of these groups' perspectives were included than of public health professionals and community-based organizations. Finally, the focus group locations and project advisers were subject to selection bias, because existing relationships and networks were leveraged during the selection process. When possible, the team controlled for this by seeking input from a broad array of partners.

Quantitative model limitations

Blood lead data for the 2018 birth cohort

The team relied on the two most recent NHANES surveys (2011-14) to establish children's baseline blood lead, which, based on historical trends, may be higher than what will be seen among the 2018 birth cohort. However, data from the CDC lead surveillance program indicate a leveling-off between 2009 and 2015 of the number of children with blood lead levels above 10 µg/dL,[33] suggesting that using the NHANES data is appropriate to predict 2018 blood lead levels.

Current exposure levels

Recent epidemiologic data on the relative contribution to blood lead levels of different environmental sources are scarce. Therefore, the study team could not determine whether the proportion of exposure coming from different sources has changed or what adjustments would be necessary to reflect such shifts.

Data on the impact of interventions

In light of today's lower blood lead levels and the decreased amount of lead in the environment, the team took several precautions to avoid overestimating the benefits of exposure prevention, including using multistep processes to estimate the relationship between lead in the environment and in blood and the most recent data available on the effectiveness of the interventions, relying on studies of children with lower mean blood lead levels, and modeling different baseline levels of lead in the environment.

For the lead paint hazard control and drinking water interventions, instead of relying on older epidemiologic studies of environmental and blood lead levels, the team used a two-part process to establish first the relationship between the interventions and levels of lead in the environment and, second, the association between those environmental levels and the amount of lead in a child's blood. The team used an estimate from a large national evaluation of the effect of lead paint hazard control on dust lead levels in the home and then used corresponding blood lead level reductions from a 2009 study. In addition, the team modeled the benefits of the intervention based on two starting levels of lead in dust on floors; 20 and 10 µg/sq ft.

The team used a similar process for determining the relationship between removing lead drinking water lines, levels of lead in water, and lead in a child's blood. The team also modeled two baseline water lead level scenarios, 11.4 ppb and 5 ppb, to show a range of effects of replacing lead service lines depending on baseline water lead levels.

For renovation, repair, and painting, the team relied on a 2008 EPA model that estimated the effects of preventing acute exposure from unsafe practices.

For aviation gas, the team relied on a study of Michigan children from 2001 to 2009 with a relatively low mean blood lead level of 2.98 µg/dL.

The relationship between current blood lead levels and cognitive and behavioral outcomes

The models rely on estimates of the relationship between blood lead levels and outcomes such as IQ, cognition, and behavior from older studies that were conducted when mean blood lead levels were higher. Although few studies capture the relationship between IQ and blood lead levels below 2 µg/dL, several have found a relationship at mean levels of 3 to 5 µg/dL.[34] Not only do low blood lead levels result in IQ changes, but evidence suggests that IQ losses from lead exposure may be greater at lower blood levels.[35] An increase in blood lead from less than 1 to 10 µg/dL is associated with a loss of 6 IQ points, compared with 2 points lost from a rise from 10 µg/dL to 20.[36] (See appendix for further discussion of the impacts of low-level lead exposure on IQ.)

To avoid potentially overstating the blood lead-to-IQ impact for today's population of children, the team modeled different effect sizes depending on the predicted blood lead level of a child. For the lowest blood lead category of less than 5 µg/dL, the team relied only on studies with a mean level below 5 µg/dL. Although limited data exist on the relative effect sizes on IQ of blood levels below 2 µg/dL, the team assumed that the linear relationship established in the literature for levels between 5 and 2 µg/dL continued below 2 µg/dL. These strategies—using studies with the closest possible mean to today's blood lead levels and assuming a linear trend down to 0 µg/dL—are identical to those used by the EPA for its 2008 clean air regulations.[37]

Similarly, the team considered 14 estimates of the relationship between blood lead and reading and math scores, all but two of which were based on samples of children with mean blood lead levels of 5 µg/dL or lower.[38] Among the studies, two found that the rate of decline in reading scores increased at lower blood lead levels, while the others found a linear relationship, even in children with low blood lead levels. The team also reviewed eight estimates of the effect size of blood lead on behavioral outcomes: five from study samples with mean blood levels below 6 µg/dL, and three based on samples with higher mean levels.[39]

Other limitations

Data for the numbers of children at risk from leaded aviation gas and living in homes with leaded drinking water pipes as well as for those children's blood lead levels were incomplete. The benefits only account for the child residing in a treated home; they exclude children who might visit, except where otherwise noted. Further, the NHANES, which was used to establish the baseline blood lead levels for children in the quantitative models, estimates levels nationally rather than by smaller geographic areas such as neighborhoods, and the SGM is based on a population with fewer immigrants than the current U.S. population. These differences may mean that predictions in this study may understate or overstate effects for certain communities.

In addition, the cost-benefit ratios exclude the cost of government administration for the studied interventions because they could be operated by many levels of government or the private sector at widely varying costs. Where available, information about program administration expenses is included in the discussion of each intervention.

Further, outcome predictions assume complete implementation of each intervention, but, in reality, a portion of targeted homes would probably not receive a given remediation because of refusal, financial barriers, or other factors. As a result, total benefits, total costs, and net benefits would be lower, while cost-benefit ratios and per-child benefits would remain the same.

Total prevention of lead poisoning

> "I guess there must have been some public health campaigning at one point where they said paint chips are it! Because everybody got that message. It was like Smokey the Bear. But they don't understand that it's so much broader than that. ... It's in the soil. It's [in] the air. It's in your pipes."
>
> —New Orleans resident

The team, with guidance from advisers and key stakeholders, selected policies for analysis that promised the greatest public health and equity benefits and that could be adopted, though not necessarily fully implemented, in 18 to 36 months, given the urgent need for action.

Lead is ubiquitous; past and present uses challenge eradication efforts

Many sources and pathways add to the amount of lead in a child's blood, including releases from previous exposure stored in a child's bones. In addition, individual children's exposures vary based on several factors, including location, age, intake of food and water, mouthing behavior, and nutritional status. Evidence also suggests that for children with blood lead levels below 10 µg/dL, "no single exposure source predominates,"[40] underscoring the need for a comprehensive response.

Lead in Everyday Items

To the surprise of many people, lead continues to be used in a variety of everyday consumer and commercial goods. Although the team found no data to characterize the extent to which these sources present a population-level health risk, dozens of case studies have documented acute instances of child lead poisoning and even death from a range of products, including candies, health remedies, cosmetics, and spices.* For example, one national survey found that imported candy contributed 10 percent of dietary lead for 2- to 6-year-old children.[‡] In addition, Greta, a health remedy used in some Hispanic cultures to treat upset stomach, contains high levels of lead and has accounted for several cases of lead poisoning;[§] Tiro, an African eye cosmetic, has been found to contain 82 percent lead and has sickened at least one child in the U.S.;[§] and Litargirio (also known as litharge or lead monoxide), a Central American antiperspirant and deodorant, poisoned two siblings in Rhode Island in 2003. Further, between 2010 and 2014, six poisoning cases were attributed to lead-contaminated spices, including turmeric.[‖]

Lead compounds, such as lead oxide, also are sometimes used in pottery glazes because they allow for a broader range of firing temperatures. However, when fired at inadequate or uncontrolled temperatures, the lead may not be not fully incorporated into the glaze and can leach into food.[#] Also, many commercially available food products contain small amounts of lead, including some marketed for infants and toddlers.[**] The allowable amount of lead for many foods is based on consultation with other countries and on what is achievable for members of an international committee called the Codex Alimentarius General Standard for Contaminants and Toxins in Food and Feed.[††]

In focus groups, participants worried about lead contamination of food, including imported spices, breast milk, toys, jewelry, and other products, wanted improved labeling, and expressed concerns for refugees and a desire to ban lead from health remedies. They also identified a need for culturally and linguistically appropriate education efforts to reach recent immigrants and refugee families with information about sources of lead in consumer goods. According to one Spanish-speaking participant from Flint, Michigan, "There isn't any information about lead in Spanish here." In general, participants wanted increased testing and labeling of food products containing lead and improved health communication about related risks.

California has led U.S. efforts to ban lead from a range of products beginning with a 1986 law, known as Proposition 65, which requires manufacturers, retailers, and other businesses to notify consumers when they are being exposed to toxic chemicals, including lead. More recently, the state has enacted additional policies:

- The 2006 Lead-Containing Jewelry Law requires jewelry and components, such as dyes and crystal, that is sold, shipped, or manufactured for sale in California to meet limits set by the state under a 2004 consent judgment that applied to a number of manufacturers, retailers, and distributors.[††]

Continued on next page

- A 2010 law restricted the use of heavy metals including lead in motor vehicle brake pads to no more than 0.1 percent by weight. In January 2015, brake manufacturers agreed that all brake pads sold in the United States will meet California standards.[§§]
- The 2003 Toxics in Packaging Prevention Act, which limited harmful substances in packaging, originally exempted lead in paint or applied ceramic decoration on glass bottles, but a 2008 amendment banned such uses in excess of 600 ppm.[||||]
- To protect wildlife, a 2013 law required that only lead-free ammunition be used for hunting with a firearm.[##]

* Centers for Disease Control and Prevention, "Childhood Lead Poisoning Associated With Tamarind Candy and Folk Remedies—California, 1999–2000", Whitney Cowell et al., "Ground Turmeric as a Source of Lead Exposure in the United States," *Public Health Reports* 132, no. 3 (2017): 289–93, http://dx.doi.org/10.1177/0033354917700109.

† S.K. Egan et al., "U.S. Food and Drug Administration's Total Diet Study: Intake of Nutritional and Toxic Elements," *Food Additives and Contaminants* 19, no. 2 (2002): 103–25.

‡ Centers for Disease Control and Prevention, "Lead Poisoning Associated With Ayurvedic Medications—Five States, 2000–2003."

§ Centers for Disease Control and Prevention, "Infant Lead Poisoning Associated With Use of Tiro, an Eye Cosmetic From Nigeria—Boston, Massachusetts, 2011," Aug. 3, 2012, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6130a3.htm.

|| Centers for Disease Control and Prevention, "Lead Poisoning Associated With Use of Litargirio—Rhode Island, 2003," *Morbidity and Mortality Weekly Report*, March 11, 2005, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5409a5.htm, Whitney Cowell et al., "Ground Turmeric as a Source of Lead Exposure in the United States."

U.S. Food and Drug Administration, "Guidance for Industry: The Safety of Imported Traditional Pottery Intended for Use With Food and the Use of the Term 'Lead Free' in the Labeling of Pottery, and Proper Identification of Ornamental and Decorative Ceramicware," accessed Feb. 6, 2017, http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm214740.htm.

** U.S. Food and Drug Administration, "Total Diet Study, Elements Results Statistics, Market Baskets 2006 through 2011" (College Park, MD: U.S. Food and Drug Administration, 2014), https://www.fda.gov/downloads/food/totaldietstudy/ucm184301.pdf.

†† Codex Alimentarius Commission, "Report of the Ninth Session of the Codex Committee on Contaminants in Foods" (New Delhi, India, March 16–20, 2015), ftp://ftp.fao.org/codex/reports/reports_2015/REP15_CFe.pdf.

‡‡ California Department of Toxic Substances Control, "History of the Law," accessed Jan. 12, 2017, http://www.dtsc.ca.gov/PollutionPrevention/ToxicsInProducts/upload/History-of-the-Law1.pdf.

§§ California Department of Toxic Substances Control, "Brake Pad Legislation," accessed Jan. 12, 2017, http://www.dtsc.ca.gov/SCP/BrakePadLegislation.cfm; U.S. Environmental Protection Agency, "Copper Mitigation in Watersheds and Waterways," accessed Jan. 12, 2017, https://www.epa.gov/sites/production/files/2015-11/documents/copper_brakepads_mou.pdf.

|||| California Department of Toxic Substances Control, "Senate Bill (SB) 774 and Changes to the Toxics in Packaging Prevention Act," accessed Jan. 12, 2017, https://www.dtsc.ca.gov/ToxicsInPackaging/upload/TIP_FS_SB-774_Changes.pdf.

California Fish and Game Commission, "Prohibition on the Use of Lead Projectiles and Ammunition Using Lead Projectiles for the Take of Wildlife," accessed Jan. 12, 2017, http://www.fgc.ca.gov/regulations/current/mammalregs.aspx#250_1.

Modeling total prevention

The research team modeled interventions to prevent children's blood lead levels from exceeding zero. Notably, given the diverse sources of lead in the environment and the widely varied exposure risks across populations, a zero blood lead level is aspirational. However, the team chose to model a zero level to establish the maximum possible benefits that could be realized under a total prevention scenario. Using the VP Tool, the team determined that the discounted future societal benefits of such hypothetical total prevention would be $84 billion for the 2018 birth cohort. (See Table 1.)

Table 1

Keeping Blood Lead Levels of Children Born in 2018 at Zero Would Generate $84 Billion in Benefits

Future savings and increased earnings by source and recipient

Benefit	Value (in billions)
Increased lifetime earnings for entire 2018 cohort	$77.2
Health savings	$1.7
Education savings	$1.9
Quality-adjusted life years benefits	$31
Total future benefits	$84.0
Share to the federal government	$18.5
Share to state and local governments	$9.6
Share to households, private sector, and other nongovernmental entities	$55.9

Notes: Analysis is based on the 2018 birth cohort, estimated at approximately 4 million children. Future benefits are discounted at 3 percent per year to account for the changing value of money over time. Quality-adjusted life years is the number of additional healthy years of life resulting from an intervention, which the research team conservatively valued at $50,000 for each additional year of healthy life. Total future benefits include small changes in incarceration costs, which are not itemized in the table.

Source: Altarum Institute Value of Prevention Tool calculation. See the appendix for details on the model methodology and underlying data sources.

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The benefits include earnings associated with greater employment and higher-paying jobs and lower public spending on short- and long-term health care costs, such as for testing and treating lead-exposed children, doctor visits, and hypertension and cardiovascular disease later in life. The benefits also include savings to the education system, specifically, reduced spending on special education and grade repetition. The calculations also capture benefits from quality-adjusted life years (QALYs)—the number of additional healthy years of life resulting from an intervention—which the research team conservatively valued at $50,000 each.[41] Finally, the estimated future benefits also include $13 million in savings from decreased incarceration based on a longitudinal study

that linked blood lead levels to arrest rates.[42] However, that study only documented effects for blood lead above 6 µg/dL, a level that few children experience today, so the predicted benefits associated with reduced criminal involvement are relatively small. The model did not account for other potential cost reductions associated with crime and criminal justice, such as from fewer arrests, so the benefit estimates may be conservative.

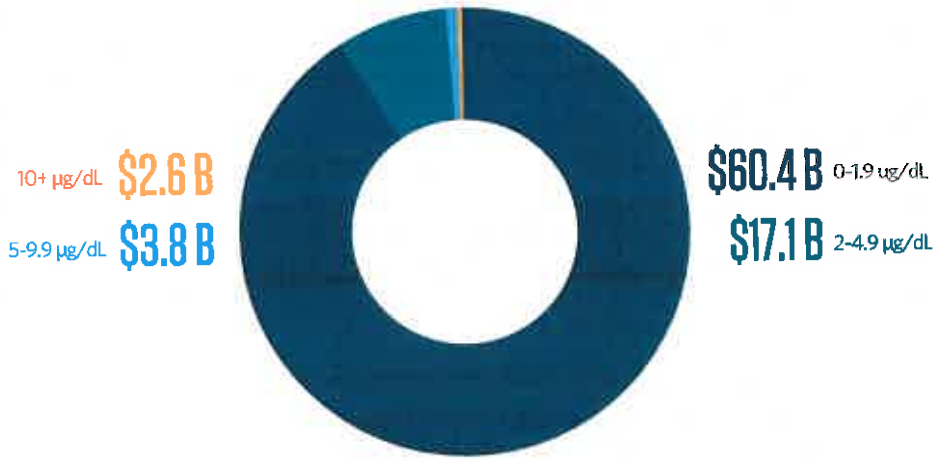
Of the $84 billion in future benefits for the 2018 birth cohort, about $77 billion comes from increased earnings, most of which accrues to families and the private sector, with a portion also going to federal, state, and local governments as increased tax revenue. Of the $19 billion federal share, nearly $15 billion is in the form of increased tax collections, with the remaining $4 billion coming from reduced spending on education, health care, and social support programs. The $10 billion for state and local governments includes about $4 billion from increased tax revenue and roughly $6 billion in decreases in government expenditures. This analysis predicts that increased employment and wages would reduce demand for government assistance, leading to lower spending on social support programs, which is counted as a benefit for federal, state, and local governments. However, because the savings result in a loss to the citizens who would receive payments, the reduced government spending is not included in the $84 billion benefit total.

Further, assuming no changes to current programs and policies, NHANES data predict that without the intervention, from ages 1-5, 90.8 percent of the cohort would have blood lead levels below 2 µg/dL; 8.0 percent would be between 2 and 5; 0.9 percent between 5 and 10; and 0.3 percent above 10. (See Figure 3.)

Figure 3

Most Benefits of Exposure Prevention Accrue for Children Whose Blood Lead Would Otherwise Be Below 2 µg/dL

Economic gains by avoided blood lead levels and number of children



Notes: Without intervention, the blood lead level distribution at ages 1-5 for the 2018 birth cohort would be 14,000 children with blood lead levels greater than 10 µg/dL, 34,000 between 5 and 9.9 µg/dL, 318,000 between 2 and 4.9, and 3,612,000 between 0 and 1.9.

Source: Altarum Institute Value of Prevention Tool calculation

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If federal investment of $80 billion was sufficient to prevent the 2018 cohort's blood lead from exceeding zero, estimated societal benefits would be $1.05 per $1 invested; if the necessary investment proved smaller, the cost-benefit ratio would be greater. Additionally, permanent removal of lead hazards would affect future cohorts, and those benefits would be in addition to the estimates provided in this analysis.

Additionally, the research team used the SGM to explore the effects of full prevention on children's educational attainment and likelihood of risky behaviors, such as criminal activity. The model indicated that holding blood lead levels at zero would improve high school and college graduation rates, and decrease rates of teen parenthood and criminal conviction. (See Table 2.)

Table 2

Keeping Blood Lead Levels at Zero Among Children Born in 2018 Would Improve Educational and Social Outcomes

Effects on education, teen parenthood, and crime

Outcome		All children born in 2018			Children born in 2018 whose blood lead levels would be expected to rise above 2 µg/dL in early childhood		
		Baseline conditions	Total prevention	Children benefiting	Baseline conditions	Total prevention	Children benefiting
Average high school GPA		2.93	2.94	N/A	2.74	2.78	N/A
Percentage and number of children	Earn high school diplomas	83.7%	84.0%	14,600	74.4%	75.6%	4,500
	Become teen parents	13.5%	13.3%	6,000	20.1%	19.6%	1,900
	Be convicted of crimes	17.2%	16.9%	15,500	22.0%	20.7%	4,700
	Complete 4-year college degrees	26.7%	27.1%	15,200	17.0%	18.3%	4,700

Notes: Analysis is based on the SGM's sample of about 8,000 children, drawn from the Children of the National Longitudinal Survey of Youth dataset. To arrive at the number of children positively affected, the research team applied the percentage point differences between baseline conditions and total prevention to the roughly 4 million children expected to be born in 2018 and to the roughly 365,000 of them whose blood lead levels would probably exceed 2 µg/dL. See the appendix for information on the model and methodology.

Source: Social Genome Model analysis by Child Trends and the Urban Institute

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The modeling team examined the impact of the total prevention scenario on the IQs of children born between 2018 and 2023 using a similar methodology to that presented by Gilbert and Weiss and found that, on average, preventing exposure would avoid the loss of 1.27 IQ points per child.[43] A 1.27-point difference would be difficult to discern between two children, but preventing lead exposure would reduce the number of intellectually challenged children, those with IQs below 70, by about 101,000 or 18.5 percent and would increase the number of children in the gifted category, above 130 IQ points, by about 119,000 or 22 percent across six birth cohorts. Findings from a recent study suggest that the impact of childhood lead exposure on IQ persists into adulthood, which lends support to the findings of these models that preventing exposure and mitigating the effects of lead for young children would improve their outcomes later in life.[44]

Drinking water

> "[Before the Flint, Michigan, case], I never thought we could get lead poisoning from water. I was totally ignorant about that."
>
> —Flint focus group participant

Sources of contamination in drinking water include corrosion of lead service lines (LSLs), brass plumbing fixtures, and lead solder installed before Congress limited the use of lead in plumbing and pipes in 1986.[45] Although indoor plumbing fixtures and lead solder can also contribute to elevated lead levels in water, the research indicates that LSLs account for the largest share of lead in water.[46] Importantly, observational studies show that U.S. residences with LSLs are at even greater risk if the techniques used to manage the corrosivity of water are not effective.

A robust body of academic literature from the U.S. and Canada links lead in drinking water to increases in blood lead levels.[47] For example, one cross-sectional study[48] of 183 children randomly selected from urban areas found that an increase in water lead concentrations from background levels to 15 ppb was associated with a nearly 14 percent jump in the share of children with estimated blood lead over 10 µg/dL.[49] Participants in all 16 focus groups said lead in drinking water at homes, schools, and child care facilities was a primary concern, and several parents of lead-exposed children said water was the source of their children's exposure.

Lead in Water and Infant Health

Infants can ingest lead through breast milk and water used to reconstitute powdered formula. Lead stored in bones can release into a mother's blood, and a fraction (up to 3 percent) of that lead can transfer to breast milk.* Breastfeeding provides infants and mothers with many health benefits, and weighing those against the adverse effects of lead exposure, the CDC recommends mothers with blood lead levels below 40 µg/dL continue to breastfeed.† In situations where breast milk is supplemented with or replaced by formula, caregivers should take steps to avoid using water contaminated by lead to reconstitute formula, such as flushing the tap or using bottled or filtered water, and never using water from the hot tap.‡

* Centers for Disease Control and Prevention, "Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women" (Atlanta: U.S. Department of Health and Human Services, 2010), https://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf.

† Ibid.

‡ Ibid.

The EPA began requiring water utilities to manage lead under its 1991 Lead and Copper Rule.[50] The rule set forth "corrosion control" as the primary method for reducing lead in water in the United States. This technique involves treating water with chemicals, such as orthophosphates, that create a barrier between the pipes and the water in them or adjusting the pH or hardness of water. Since the rule's inception, corrosion control has dramatically decreased water lead levels in the U.S., but the various methods can differ substantially in effectiveness, so the EPA requires utilities to monitor selected water quality parameters, such as pH.[51]

The rule also mandated that water utilities periodically test lead concentrations across a sample of customer taps that are deemed more likely to have elevated levels based on the presence of LSLs, other lead pipes, or any pipes with lead solder and to report the results to consumers. However, the rule does not require that all customer taps be tested. Instead, systems are only obligated to sample 10 percent of their taps. The crisis in Flint shed light on the shortcomings of the current approach to managing lead in water. The EPA acknowledged challenges in a document concerning possible revisions to the Lead and Copper Rule, which cited issues including complexity, sampling protocols, a lack of attention to specific areas such as schools, and too much flexibility regarding corrosion control implementation and monitoring.[52]

Water fountains in many public schools have not been tested for lead risks.

Drinking Water in Schools and Child Care Facilities

Millions of children spend significant time in school and child care facilities each day, making these places important potential sources of exposure.

- About 50.4 million children attend public school and nearly 4.3 million children under 5 are served annually by center- and home-based child care providers.
- Case studies of school drinking water have found dramatic variation: A 2015 study of 3,100 taps across 63 Seattle schools found lead levels from less than 1 ppb to 1,600 ppb; an analysis of first-draw samples—those taken after water sat in the pipes overnight—from the Los Angeles Unified School District revealed a range of 0.2 to 13,000 ppb; a 2004 study of Philadelphia schools found that about 57 percent of buildings had water lead above the EPA action level of 20 ppb, and 29 percent had water with mean levels over 50 ppb; and a report determined that a third of Chicago schools tested (30 percent of taps) had at least one sample above 15 ppb.[†]
- The average age of U.S. public schools is 44 years, but many have undergone major renovations, putting their "functional" age closer to 19 years on average. Despite the upgrades, the American Society of Civil Engineers in 2017 rated school infrastructure and drinking water quality as poor.[‡]

Continued on next page

- About 10 percent (roughly 8,000) of the nation's schools and child care facilities maintain their own water supplies and are regulated under the Lead and Copper Rule, but because the rule only requires a sampling of taps across the community, many schools may never have been tested. Approximately 98,000 public schools and 500,000 child care facilities are excluded from the federal Safe Drinking Water Act,[§] but in its 3Ts (training, testing, telling) guidance, the EPA recommends testing and a standard of 20 ppb.[‖]
- The CDC School Health Policies and Practices Survey's 2014 data show that nationwide, fewer than half (46 percent) of schools test their drinking water for lead and other contaminants.[#]

In the absence of an overarching law or regulation governing drinking water in public schools and licensed child care facilities, the 2010 Healthy, Hunger-Free Kids Act provides a possible avenue to address lead risks. The act requires schools and child care programs that participate in the National School Lunch (NSLP) and Child and Adult Care Food (CACFP) programs, respectively, to provide children with free potable water.[**] The NSLP operates in more than 100,000 public and nonprofit private schools and residential child care institutions, and in 2012, it provided low- or no-cost lunches to more than 31 million children each school day. CACFP supplied meals and snacks for more than 4.1 million children in child care settings each day in 2015.[††]

The U.S. Department of Agriculture (USDA), which oversees both programs, provides guidance related to drinking water and has encouraged schools and child care facilities to follow the EPA's testing recommendations, but it has not defined the term "potable" to include safety from the risks of lead above the EPA's guidance of 20 ppb.[‡‡] The American Academy of Pediatrics recommends a standard of 1 ppb lead in water from school drinking fountains, and in March 2017, Health Canada published for public comment a maximum allowable concentration of lead in water for schools and child care providers of 5 ppb,[§§] either of which could serve as an updated standard for the U.S.

Providing drinking water that meets such a health-based action level could help protect low-income children served by these programs who are at increased risk of lead exposure.

Many focus group participants raised concerns that school drinking fountains were a potential source of lead, but they also cited drawbacks to efforts to provide alternative sources of drinking water, such as bottled water. For example, schools may need to provide cups, and in some cases parents had to shoulder additional costs. Participants suggested adding filters to fountains or installing filtered-water stations that allow students to refill personal water bottles.

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Concern over contaminated water in schools led to the introduction of 82 bills in 12 states and the District of Columbia in 2016,[‖‖] and several school districts began testing tap water and replacing or shutting down fountains with high lead levels:

- At least nine states and the district took action to test school drinking water at the tap, including the Oregon Health Authority, which posted its results online.[##]
- Governor Jerry Brown (D) of California issued an executive order requiring all public water systems to offer free testing to schools in their service areas and included $9.5 million for remediation in the state budget.
- Massachusetts appropriated $2 million for voluntary school testing.
- Illinois is developing rules for mandatory testing, notification, and mitigation in all licensed child care homes and centers.
- New York, which requires testing and remediation of taps in schools and school-based child care, has included funds for the effort in its state budget, and posts results online.
- Rhode Island's General Assembly passed the Lead and Copper Drinking Water Protection Act in June 2016, requiring schools, day care providers, public playgrounds, shelters and foster homes with children under 6, and other state facilities to certify that drinking water conduits are lead-safe. The act also directs state inspectors to conduct annual lead and copper tests at these locations.[***]

* National Center for Education Statistics, "Digest of Education Statistics" (2016), Table 105.20, https://nces.ed.gov/programs/digest/d15/tables/dt15_105.20.asp?current=yes; U.S. Census Bureau, "Who's Minding the Kids? Child Care Arrangements: Spring 2011" (April 2013), https://www.census.gov/prod/2013pubs/p70-135.pdf.

‖ U.S. Environmental Protection Agency, "Seattle, WA: Arsenic in Public Schools" (Washington: U.S. Environmental Protection Agency, September 2015), https://www.epa.gov/sites/production/files/2015-09/documents/casestudy_seattle.pdf; Joel Grover and Matt Goldberg, "School Water Investigation—Part 2," NBC Los Angeles, Oct. 30, 2008, http://www.nbclosangeles.com/news/School_Water_Investigation_-_Part_2.html; S. Bryant, "Lead-Contaminated Drinking Waters in the Public Schools of Philadelphia," *Journal of Toxicology: Clinical Toxicology* 42, no. 3 (2004): 287–94; Juan Perez Jr., "CPS Is Testing Schools for High Lead Levels in Water: What You Should Know," *Chicago Tribune*, June 19, 2016, http://www.chicagotribune.com/news/local/breaking/ct-chicago-schools-lead-explainer-met-20160619-story.html.

‡ Debbie Alexander and Laurie Lewis, "Condition of America's Public School Facilities: 2012-2013 (NCES 2014-0222)," U.S. Department of Education (Washington: National Center for Education Statistics, 2014), https://nces.ed.gov/pubs2014/2014022.pdf; American Society of Civil Engineers, "2017 Infrastructure Report Card," accessed May 19, 2017, https://www.infrastructurereportcard.org/americas-grades.

§ U.S. Environmental Protection Agency, "Controlling for Lead in Schools: A Summary of State Programs" (Washington: EPA, Office of Water, 2004), EPA-810-R-04-00, accessed Jan. 22, 2017, https://www.epa.gov/sites/production/files/2015-09/documents/report_lcmr_schoolssummary.pdf; U.S. Environmental Protection Agency, "Lead in Drinking Water in Schools and Childcare Facilities," accessed June 5, 2017, https://www.epa.gov/dwreginfo/lead-drinking-water-schools-and-childcare-facilities.

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|| U.S. Environmental Protection Agency, "3Ts for Reducing Lead in Drinking Water in Schools" (Washington: EPA, 2006). https://www.epa.gov/sites/production/files/2015-09/documents/toolkit_leadschools_guide_3ts_leadschools.pdf

Centers for Disease Control and Prevention, "School Health Policies and Practice Study: Results From the School Health Policies and Practices Study, 2014" (Atlanta: Centers for Disease Control and Prevention, 2015): 119, http://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf

** Healthy, Hunger-Free Kids Act of 2010, Pub. L. No. 111-296, 124 Stat. 3183 (2010), Section 221 (u) 2

†† U.S. Department of Agriculture, "Program Information Report (Key Data)" (Washington: USDA, 2016), http://www.fns.usda.gov/sites/default/files/datastatistics/keydata-january-2016.pdf; U.S. Department of Agriculture, "Child and Adult Care Food Program: Why CACFP Is Important," accessed Feb. 4, 2017, http://www.fns.usda.gov/cacfp/why-cacfp-important

‡‡ U.S. Department of Agriculture, "Resources for Making Potable Water Available in Schools and Child Care Facilities," Memo Code SP 49—2016, CACFP 18—2016 (Alexandria, VA: USDA, Food and Nutrition Service, July 20, 2016), http://media.wix.com/ugd/9c073b_31708a4607294627a28777bc30668936.pdf

§§ Health Canada, "Lead in Drinking Water" (October 2016), http://www.healthycanadians.gc.ca/health-system-systeme-sante/consultations/lead-drinking-water-plomb-eau-potable/alt/lead-drinking-water-plomb-eau-potable-03-01-2017-eng.pdf

|| || National Conference of State Legislatures, "State Legislation on Lead, Lead in Water, Lead in Schools 2016-2017," February 2017.

"Drinking Water Test Results: Oregon Schools," Oregon Health Authority (2016), http://geo.maps.arcgis.com/apps/MapSeries/index.html?appid=6a4f2b6001bd474ca7d0a7f0c2552f57

*** State of Rhode Island, "An Act Relating to Waters and Navigation—Lead and Copper Drinking Water Protection Act," accessed Jan. 13, 2017; State of Rhode Island General Assembly, "Assembly Passes Rep. Naughton Bill to Test Public Drinking Water for Lead, Copper Contamination," accessed Jan. 13, 2017, http://webserver.rilin.state.ri.us/BillText16/HouseText16/H8127.pdf

Residential lead service line replacement

Under the Lead and Copper Rule, when testing finds lead concentrations that exceed the 15 ppb action level in more than 10 percent of the samples, the utility must evaluate its corrosion control practices, conduct public education, and initiate LSL replacement. Water systems removing LSLs must offer property owners the opportunity to replace their portion of the line at the same time. But because owners cannot be compelled to pay for replacement of their lines, the public portion is often all that gets updated.

However, research showing that lead concentrations increase during and after such partial remediation has raised concerns about safety.[53] For example, one analysis based on an event in Washington, DC, found that children living in homes with lead in at least some part of their service lines were twice as likely as those living in homes without LSLs to have blood lead of 5 to 9 µg/dL and three times as likely to have levels at or above 10 µg/dL. The same study did not find a statistically significant difference between blood lead levels of children from homes with partial versus full LSLs,[54] indicating that partial replacements—in which only one portion of a line is updated—are inadequate to protect children from exposure.

In 2011, an expert panel advising the EPA reviewed pilot studies and anecdotal reports from utilities and concluded that partial LSL replacement does not reliably reduce water lead levels, at least in the short term, and may result in more harm than benefit.[55] A recent field study monitoring partial replacement over 18 months found a short-term increase immediately following replacement and then slightly lower water lead thereafter.[56] A Canadian study also showed a short-term (less than one month) increase but found no improvement compared with no replacement after six months. These analyses confirm the limited benefits of partial replacement for reducing water lead levels and conclude that full replacement is preferable.

The number of LSLs in use across the country is unknown, but estimates suggest that between 5.5 and 10 million LSLs provide water to an estimated 15 to 22 million people. Similarly, no national data characterize the levels of lead in U.S. drinking water, so as communities work to more clearly identify the number of LSLs in operation, the estimates could prove low.[57]

Policy in Action: Strategies to Promote Lead Service Line Replacement

Milwaukee requires full replacement of lead service lines with copper pipe if a leak or failure is discovered or if the utility-owned portion is replaced on a planned or emergency basis. The city is using $2.6 million in state grants to replace lines at 300 day care centers and 300 residences as well as $3.6 million of its own funds to cover replacement of the city-owned portion of 600 other residential lines. The city's total $3.9 million budget for the program also includes funds to help pay for replacement of privately owned LSLs at the same time that the city updates the public portions and to provide water filters and bottled water to property owners during the work. Under the program, property owners are responsible for no more than one-third of the cost of replacement up to $1,600 if the work is done by a city contractor, and they can pay their share over 10 years. Previously, a property owner was responsible for the full cost, which could be as much as $7,000.

Milwaukee Water Works will use customer water payments to cover the balance of the cost to replace the city-owned portions, and property taxes will cover the difference for the private portion. The program is expected to take several decades to complete, reaching about 600 properties a year until all 68,300 known residential LSL are replaced.*

In 1986, **Woonsocket, Rhode Island**, adopted a policy requiring builders to replace the entire lead service line when a structure is sold, demolished, or replaced.† The property owner is responsible for the cost of the private side, and the city pays for its part at the same time, if it has not already been replaced.

In November 2016, the Centers for Medicare & Medicaid Services (CMS) authorized an amendment to allow **Michigan**'s Children's Health Insurance Program (CHIP) to pay for the replacement of water pipes and fixtures from the homes of low-income families with children, marking the first such approval.

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The amendment was developed under a provision that allows a state to access special federal CHIP matching funds for certain noncoverage-related expenditures that have a value of no more than 10 percent of the state's total amount paid for program benefits. Eligible activities include initiatives targeted at improving the health of children, outreach, translation or interpretation services, payments for other child health assistance such as specialty care not included in the benefit package, and other reasonable administrative costs.[‡]

Properties in Flint with contaminated water receive first priority, and any property in the state with a resident under 19 who qualifies for Medicaid or CHIP is eligible. Under the initiative, Michigan will spend $333,000 on the effort in fiscal year 2017, which will be matched by $23.5 million in federal funds. Over five years, the state plans to spend $119 million. Lead paint hazard control for eligible statewide residences is also an allowable expense under the initiative.[§]

* Don Behm, "Milwaukee Aldermen Approve Lead Pipe Replacement Plan," *Milwaukee Journal Sentinel*, Dec. 13, 2016, http://www.jsonline.com/story/news/local/milwaukee/2016/12/13/milwaukee-aldermen-approve-lead-pipe-replacement-plan/95342526

† Lead Service Line Replacement Collaborative, "State and Local Examples," *Requiring LSL Replacement When Opportunities Arise*, accessed May 25, 2017, http://www.lslr-collaborative.org/requiring-lsl-replacement.html

‡ Cindy Mann, Kinda Serafi, and Arielle Traub, "Leveraging CHIP to Protect Low-Income Children From Lead" (January 2017), https://www.manatt.com/getattachment/235604fe-5700-4ec1-a25e-7d51c4e347af/attachment.aspx, U.S. Centers for Medicare & Medicaid Services, "Michigan Health Services Initiative," *2016 Fact Sheets*, Nov. 14, 2016, https://www.cms.gov/newsroom/mediareleasedatabase/fact-sheets/2016-fact-sheets-items/2016-11-14-3.html

§ David Eggert for Associated Press, "Michigan Gets Federal OK to Spend $119 Million on Lead Abatement," *Crain's Detroit Business*, Nov. 14, 2016, http://www.crainsdetroit.com/article/20161114/NEWS01/161119887/michigan-gets-federal-ok-to-spend-119-million-on-lead-abatement, Kaiser Family Foundation, "Michigan's Medicaid Section 1115 Waiver to Address Effects of Lead Exposure in Flint," accessed Jan. 26, 2017, http://kff.org/medicaid/fact-sheet/michigans-medicaid-section-1115-waiver-to-address-effects-of-lead-exposure-in-flint

Stakeholder input

Participants in the focus groups recognized that lead in water from fixtures, solder, and pipes is a potential source of childhood exposure. Many community residents knew about steps they could take to reduce the risk, such as flushing taps and using bottled or filtered water, but some expressed concerns that bottled water could also be contaminated with lead or other chemicals. A few participants across multiple groups did indicate some misperceptions about lead in drinking water, primarily that it would be visible as a brown tint or particulate matter. A few believed that boiling water could protect against lead when, in fact, it can actually increase the concentration.[58]

Focus group participants in Flint emphasized the burden the city's crisis has placed on small-business owners and residents. For example, a woman who prepared and sold tamales from her home was forced to terminate her business because of water contamination. Others described stress and strain on social relationships resulting from worry and embarrassment over the quality of water in homes and said fear of unsafe water even led a

church to discontinue baptisms. One nursing mother explained that she had asked to have her blood tested for lead to ensure that she could safely breastfeed her child. The discussions also highlighted the importance of tailoring LSL replacement policies to local contexts; for example, a policy to replace pipes in Lansing, Michigan, may not be successfully replicated in Flint because as participants explained, Flint's water pipes are intricately bent rather than straight as in Lansing. Community members also noted that Flint's water system is underused due to significant population declines after the closure of General Motors' manufacturing plants.

Participants identified potential unintended effects of LSL removal, including traffic issues and closed streets. Others expressed concern about the cost of replacing private lines. Some also worried that the expense associated with replacing public lines would present a barrier to decision-makers in their communities. One Flint focus group participant said he "simply didn't trust the water and couldn't bear to drink it" despite having received LSL replacement and filters.

Participants in the national listening sessions said policies aimed at eliminating lead in water should address the risks of partial LSL replacement, consider the need for better sample collection and testing and reporting methods, include remediation as part of federal infrastructure investments, and ensure that grant assistance is available if abatement becomes a requirement of real estate transactions. They also pointed out that most federal, state, and local laws regarding lead hazards in housing do not address drinking water. For example, replacement of leaded pipes or plumbing is not an eligible expense under HUD's lead paint hazard control grant program because the relevant statute specified only paint, dust, and soil hazards.

These participants and expert advisers also expressed concern that consumers incorrectly interpret the EPA's action level of 15 ppb as addressing their individual tap, rather than the water system as a whole. Stakeholders recommended that the EPA issue a separate tap action level to help customers know when they should take steps to reduce the amount of lead in their water. The experts also pointed to a recent assessment by Health Canada that proposed a maximum allowable concentration of 5 ppb, and they suggested the same level could serve as an interim standard toward the goal of getting to 1 ppb over time.

Experts further expressed concern about the water sampling protocol used by utilities, specifically that too few samples are drawn within each home and that the samples are not consistently taken after the water has sat in the pipe (stagnated), so they may underestimate the risk to consumers. Many factors, including the materials used to collect samples, water flow rates, and components at the tap also influence results, so typical testing may not always be reliable. However, identifying a revised sampling protocol was beyond the scope of this study.

Experts recommended that the EPA develop a new protocol and partner with state agencies to assure that utilities inform homeowners about appropriate test procedures. They also thought that the EPA should require more widespread monitoring of lead in customers' tap water rather than the current practice of sampling only a percentage of taps.

Proposed solution

Full lead service line replacement (from street to structure) in the U.S. could take 20 to 30 years to complete, and a large number of homes still have lead plumbing fixtures. The research suggests a multipronged approach is the best option for reducing children's exposure to lead in drinking water. First, the EPA should improve corrosion control efforts by strengthening its Lead and Copper Rule to increase compliance monitoring, the use of corrosion control, and the adoption of optimized corrosion control, a practice that can involve adjusting the pH of water and

adding chemicals to inhibit corrosion. Second, rather than treating LSL replacement as a last resort, municipalities should proactively replace lead service lines. Finally, in light of the evidence of public health risks associated with partial replacement, municipalities should replace the entire line during routine repairs that disturb LSLs.

Although corrosion control will remain an important component of lead management, particularly for addressing risks associated with leaded plumbing fixtures and solder, because of concerns about the consistent effectiveness of corrosion control practices, and to permanently remediate a key source of exposure, the research team modeled the costs and benefits of removing LSLs from homes built before 1986 where children in the 2018 birth cohort would reside.

Although the benefit of the intervention is broad—affecting hundreds of thousands of children, as discussed earlier—children residing in low-income communities and localities with aging infrastructure would reap the greatest benefits from the replacement of lead service lines.

Literature summary

Evidentiary support: Scientifically supported. Strategies have been tested in multiple robust studies with consistently favorable results.[59]

Population affected: Regional or national.[60]

Modeling assumptions

- The number of LSLs used in this analysis relied in part on self-reported survey data collected from water utilities and on input from industry representatives.[61] No data source was found to document how many children are served by LSLs or their blood lead levels, so the team used a national survey of water systems to first estimate that 6.84 percent of the U.S. population is served by a lead service line and then applied that percentage to the roughly 4 million children estimated by the Current Population Survey to be in the 2018 cohort.[62] This calculation determined that the number of children born in 2018 who would be served by a lead service line is 272,285.[63]
- In the absence of national data to characterize the level of lead in drinking water in homes served by LSLs, the research team used two water lead levels for reference. A mean concentration of 11.4 ppb was derived from unpublished profiling samples from five Midwest utilities that were compliant with the Lead and Copper Rule but were not considered to have optimized corrosion control, and a lower level of 5 ppb was taken from profiling samples of an eastern U.S. utility viewed as using optimized corrosion control and from unpublished data from the city of Ottawa.[64] These levels were selected to be indicative of systems in compliance with the Lead and Copper Rule and to reflect the likely mean concentration of lead in water after stagnation. The team, in consultation with members of the advisory committee, assumed that LSL replacement could reduce drinking water lead levels to 2 ppb, rather than zero, because of remaining lead plumbing fixtures and solder in homes.
- To estimate baseline levels for children living in homes built before 1986 (the year the EPA banned lead in drinking water pipes), the team used NHANES blood lead level data for children residing in homes built before 1990—the closest available year.
- Although two well-designed studies from the literature review provided an effect size for the relationship between lead in water and children's blood lead levels, both had limitations that made them inappropriate for use in this study. Therefore the research team used the EPA's Integrated Exposure Uptake and Biokinetic (IEUBK) model estimates of 0.042 µg/dL change in blood lead per 1 ppb difference water lead.[65] Applying this estimate to the expected water lead changes, the team estimated that full residential LSL replacement would

prevent a 0.40 µg/dL and a 0.13 µg/dL increase in blood lead, for the 11.4 ppb and 5 ppb baseline water lead levels, respectively, and then applied these estimates to children's starting blood lead levels from NHANES. (See the appendix for more details.)

- In the absence of national pricing data for full LSL replacement, the research team estimated a per-unit cost of $6,000. A 2008 national survey of utilities found that typical replacement costs ranged widely from $250 for the utility portion and $600 for the customer portion to $3,000 and $4,000, respectively.[66] A recent informal survey of all systems known to be pursuing full LSL replacement suggested average costs of roughly $7,500.[67] Given the cost variations across localities, the research team combined these estimates to calculate the per-unit cost.
- The benefits include one child per home from the 2018 birth cohort as well as 80,000 additional children born into the remediated homes in the subsequent 10 years. They do not account for children who visit but do not reside in those homes.

Findings

The analysis, including the calculations of blood lead, cost, and children affected as well as the modeling, found that full LSL replacement across all homes built before 1986 with resident children would:

- Protect 352,000 children, including 272,000 born in 2018 and 80,000 born into the same homes over the next 10 years.
- Cost an estimated $2.0 billion for the 2018 cohort.

For homes with baseline water lead levels around 11.4 ppb, the intervention would:

- Prevent an increase of 0.40 µg/dL lead in the blood of children in the 2018 birth cohort.
- Produce total future benefits of $2.7 billion, including $480 million for the federal government and $250 million for states and municipalities.
- Generate roughly $1.33 per $1.00 invested.

If, alternatively, baseline water lead levels were 5 ppb, replacing LSLs would:

- Prevent an increase of 0.13 µg/dl lead in the blood of children in the 2018 birth cohort.
- Yield future benefits of $860 million, including $150 million for the federal government and $80 million for states and municipalities.
- Result in $0.42 in benefits for each $1 invested. (See Table 3.)

Table 3

Every Dollar Invested in Full Lead Service Line Replacement Would Generate $.42 to $1.33 in Benefits

Cost-benefit analysis, for two initial water lead levels

Baseline estimates	Number and percentage of children born in 2018 into homes built before 1986 (1 child per unit)		2,352,000 (59%)	
	Percentage of those children in homes with potential lead service lines (LSLs)		6.84%	
	Average blood lead level for children without intervention		1.19 µg/dL	
	Starting level of lead in water (ppb)		11.4	5
Predicted impacts	Homes receiving lead service line replacement		272,000	
	Children affected (including future cohorts)		352,000	
	Expected decrease in water lead (ppb)		**9.4**	**3**
	Prevented blood lead level increase per child (µg/dL)		**0.40**	**0.13**
Gross future benefits	Initial cohort	Earnings	$2.0 billion	$640 million
		Health savings	$40 million	$10 million
		Education savings	$50 million	$20 million
		Quality-adjusted life years benefits	$80 million	$30 million
	Future cohorts (through year 10)		$550 million	$170 million
	Total gross future benefits		$2.7 billion	$860 million
	Share to federal government		$480 million	$150 million
	Share to state and local governments		$250 million	$90 million
	Share to households, the private sector, and other nongovernmental entities		$2.0 billion	$630 million

Continued on next page

Costs	Testing cost per potential lead service line	$175	
	Total testing cost	$410 million	
	Full lead service line replacement cost per home	$6,000	
	Full lead service line replacement cost for all homes	$1.6 billion	
	Total costs	**$2.0 billion**	
Net	Net future benefits	$680 million	-$1.2 billion
	Cost-benefit ratio	1.33	0.42

Notes: Analysis is based on the 2018 birth cohort, estimated at approximately 4 million children. Analysis includes benefits for future cohorts. Total future benefits include small changes in incarceration costs not itemized in the table. Values may not add up to totals because of rounding.

Source: Altarum Institute Value of Prevention Tool calculation

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Policy in Action: Replacing Lead Service Lines

From 2004 through 2016, **Lansing, Michigan**, replaced 12,150 LSLs with copper lines at a cost of $44.5 million through a program of the Lansing Board of Water and Light (BWL), a municipally owned utility.* In 2004, then-Michigan State Senator Virg Bernero encouraged local officials to advocate with BWL Commissioners to accelerate the removal of Lansing's LSLs. The BWL funded the program as an infrastructure investment and utility customers shared the cost through an increase in water rates.† BWL prioritized lines serving schools and licensed day care centers, areas where testing showed that children had high blood lead levels, households with pregnant women or children under 6, and other places with large concentrations of LSLs.‡

BWL has developed a faster, more efficient method for replacing pipes: What had been a nearly eight-hour, $9,000 job requiring a trench to be dug from the main to the foundation of the house was streamlined to four hours and $3,600. Now, rather than trenching, BWL digs a hole in the street and another at the shut-off valve and pulls a new pipe in behind the old one.§ Where possible, the program has followed planned street, sewer, and other infrastructure projects to minimize street closures and reduce street reconstruction costs.||

BWL water quality reports indicate a decrease in lead levels in the water over 10 years, with 90 percent of homes falling from 11.3 ppb in 2005 to no more than 7.8 in 2015.# Although BWL has completed its LSL replacement program, it plans to continue corrosion control processes.

* Lansing Board of Water and Light, "Lead Service Advisory Information," accessed Jan. 12, 2017, https://lbwl.com/Community-Impact/Water-Quality/Lead-Service-Information, Lansing Board of Water and Light, "BWL 2015 Annual Water Quality Report," accessed Jan. 12, 2017, http://lbwl.com/WaterQualityReport, Lorna Benson, "In Battle to Keep Lead From Water, St. Paul Digs Deep," MPR News, May 25, 2016, https://www.mprnews.org/story/2016/05/25/water-stpaul-lead-pipes

† Trent Gillies, "Flint Crisis Can Be Fixed With $55M in New Pipes: Lansing Mayor," CNBC, April 24, 2016, http://www.cnbc.com/2016/04/22/flints-crisis-can-be-fixed-with-55m-in-new-pipes-lansing-mayor.html

‡ Lansing Board of Water and Light, "Lead Service Advisory Information."

§ Faith Miller, "Lansing BWL Helping Flint Figure Out How to Replace Lead Pipes," WILX 10, Feb. 9, 2016, http://www.wilx.com/home/headlines/Lansing-BWL--368260751.html

|| Lansing Board of Water and Light, "Lead Service Advisory Information."

\# Lansing Board of Water and Light, "BWL 2015 Annual Water Quality Report", Lorna Benson, "In Battle to Keep Lead From Water, St. Paul Digs Deep."

Lansing Board of Water and Light employees replace the last lead service line with copper pipes in Lansing, Michigan, on Dec. 14, 2016.

Potential challenges

Although specifics vary across communities, service lines are typically jointly owned: The utility generally owns the portion running from the water main at the street to the property line, while the section from the property line into the home, as well as the household plumbing, belongs to the property owner. Also, some cities assess substantial permitting fees; for example, Chicago reportedly charges $3,500 for city permits to perform the work.[68]

The concerns discussed above about partial LSL replacement risks have prompted some municipalities, such as Lansing, Madison, and Milwaukee, to prohibit the practice and have driven others to authorize public water utilities to replace the privately owned lines.[69] Promptly replacing LSLs would improve children's health and produce economic benefits, but it also would be costly and has the potential for unintended consequences. In particular, avoiding excessive costs to taxpayers, utilities, and ratepayers; proactively planning for the safe disposal of removed leaded lines; and minimizing traffic issues, street closures, and disruption to residents would all require significant planning, budgeting, and organizational capacity. In addition, investing in LSL removal could constrain resources and limit expenditures for other drinking water-related priorities.

The EPA's Drinking Water State Revolving Loan Fund (DWSRF) offers one potential means of offsetting these expenses. The fund was created in 1996 as an amendment of the Safe Drinking Water Act and is appropriated annually by Congress.[70] The program provides infrastructure grants to the states, the District of Columbia, and Puerto Rico for eligible projects, such as facility upgrades to improve drinking water quality and installation of water storage tanks. Grant awards are based on the most recent Drinking Water Infrastructure Needs Survey and Assessment, and states must provide 20 percent in matching funds. As water systems repay loans, the principal and interest are directed back into the fund. In total, the DWSRF has provided over $32 billion to water systems through nearly 13,000 grants.

Lead paint hazards

> "I didn't think about it. ... We had repainted every surface of the house. It looked clean. It looked neat. It looked ready. But there was still lead."
>
> —Baltimore resident

Lead-based paint and the contaminated dust it generates in homes and soil represent one of the most dangerous and widespread sources of exposure afflicting children.[71] The relationship between lead paint and blood lead has been extensively studied.[72] More than half of homes built before 1978 have some lead-based paint, and the share increases to 76 percent and 86 percent for homes built before 1960 and 1940, respectively.[73] The 2006 American Healthy Homes Survey found that more than a third of the nation's housing stock (an estimated 37 million residences) contain lead paint, and more than 1 in 5 homes (roughly 23 million) have deteriorating lead paint or dust or soil lead levels that exceed federal standards. Approximately 3.6 million homes with lead paint hazards house young children, including those from roughly 1.1 million low-income households.[74]

Residential remediation

Reducing lead paint hazards in homes involves testing paint, dust, and soil to determine whether levels are above federal standards. Once a lead paint problem is identified, property owners typically choose from one of two methods for dealing with it: Long-term "abatement" can last at least 20 years and involves either permanently covering or removing lead paint,[75] while shorter-term "interim controls" include repairing flaking and peeling paint and covering contaminated soil with mulch or grass. Windows have the highest levels of lead paint and dust compared with other building components, and replacing windows with lead paint has been shown to deliver large, sustained reductions in dust lead levels, including on floors that children are likely to contact more frequently.[76] One barrier to replacing old windows coated with lead paint is provisions of the National Historic Preservation Act, which along with state and local rules restricts replacement of features such as windows in historic homes.[77]

The preponderance of research evidence, including from multiple randomized-control trials and systematic reviews, demonstrates the effectiveness of lead paint hazard control,[78] but a small body of research has contradicted those findings. A few studies from the late 1980s and early 1990s found increased blood lead levels after abatement, but those discordant findings were the result of unsafe practices such as using high heat to remove paint, which created dangerous fumes and dust,[79] and which the federal government banned more than 20 years ago. In addition, some systematic reviews have found limited evidence to support lead paint abatement. However, those studies focused on the efficacy of treatment measures in reducing elevated blood lead levels in children,[80] which is an imperfect metric because blood lead can remain elevated for months or years after exposure as lead is exchanged between blood and bone.[81] In children, bone lead represents about 70 percent of total body lead,[82] so blood levels of lead-exposed children would not be expected to be statistically different one year after their homes were treated. Therefore, not only do those findings not suggest that the intervention is ineffective, they in fact underscore the importance of actions, such as abatement, that can prevent exposure.

The primary federal law concerning lead paint hazards in housing is the Residential Lead-Based Paint Hazard Reduction Act, also called Title X, to reflect the section of the Housing and Community Development Act of 1992 in which it was enacted.[83] Key features of the act include:

- **Authorizing the HUD lead hazard control grant program**, which is the federal government's primary means of assisting homeowners with control efforts. The program makes up less than 0.3 percent of the department's budget.
- **Creating a certification system for individuals and businesses** performing lead control activities.
- **Requiring either interim controls or lead abatement for federally owned and assisted housing**, such as public and military housing.
- **Establishing the federal lead disclosure rule**, which requires property owners to reveal any known lead paint hazards to prospective buyers or tenants before a property is sold or rented.
- **Defining existing lead-based paint in housing as containing 5,000 ppm of lead** or 1 mg/cm^2.
- **Requiring EPA to publish standards** for lead in dust and bare soil at residential properties.

Title X led to a significant reduction in the number of homes with lead paint hazards. Specifically, more than 190,000 homes have been made lead-safe with HUD lead hazard control grants since the program's inception in 1993. The program has a budget of about $90 million that supports lead-hazard reduction in roughly 7,000 units each year, but the funding amount falls far short of the $230 million recommended by a federal lead poisoning prevention task force in 2000.[84] About 12,000 low-income homes undergo lead paint hazard control annually under HUD regulations authorized by Title X that apply to federally assisted housing. Additionally, HUD, the EPA, and the Department of Justice enforce the federal lead disclosure rule which to date has yielded $31 million in settlement funds from property owners, and under landlords' agreements with HUD, the remediation of lead paint hazards in more than 188,000 homes of low-income families.

Rental housing built before 1960 that is in poor condition and is occupied by low-income families carries the greatest lead risks. States and local agencies can use available data to identify the neighborhoods and even blocks or streets that have these characteristics and target resources to those areas.[85] One study found that children from low-income families residing in federally assisted rental properties had lower blood lead levels than comparable children living in housing without federal subsidies.[86] These results suggest that the former group's rental units may be in better condition because of federal requirements and that unsubsidized low-income housing should be the primary focus for action in many states and localities. However, in communities that have strong policies in place to prevent children from being exposed to lead in rental housing, low-income owner-occupied homes, such as those handed down through generations, pose the more serious threat. Such variation in risk profiles within and across communities underscores the need for neighborhood-level data to support decision-making.

Forty-four states have adopted laws addressing lead paint hazards, and 38 require certification for contractors that conduct lead inspections and abatement. EPA handles such licensing for the remaining states.[87] Several municipalities also have taken action to address lead hazards in housing through code enforcement or public health laws. Such local government action has the advantage of being targeted to communities' immediate situations. For example, the city of Rochester, New York, used neighborhood-level blood lead data to prioritize enforcement of its local law. Municipal laws also are often more easily amendable than federal or state laws.[88]

Frequently, a small number of rental units is responsible for poisoning many children in a given community. For example, in Chicago, 67 high-risk buildings contributed to 994 cases of high lead levels, and in Jefferson County, Kentucky (home to Louisville), 79 houses were home to 35 percent of the children with blood lead levels at or above 20 µg/dl.[89] This is largely because most state and local laws permit property owners to re-rent units where a child has been exposed to lead even if the hazards persist. Laws requiring inspection and treatment of units with identified lead hazards can prevent multiple cases of lead poisoning at the same address. A study found that Massachusetts and Ohio, which mandate inspection and treatment of units with hazards, were 79 percent less likely than Mississippi, which lacks such a requirement, to have residential addresses that repeatedly contributed to high lead levels in children.[90]

Policy in Action: Local Lead Paint Laws

In **Rochester, New York**, 87 percent of homes were built before 1950, and 60 percent of housing is tenant-occupied.[*] In December 2005, the City Council passed an ordinance requiring regular inspections of most pre-1978 rental housing for lead paint hazards as part of the city's certificate of occupancy process for rental properties.[†]

Housing inspections may be triggered by a new certificate of occupancy, renewal of an existing certificate, a neighborhood survey, a referral by an outside agency, or a complaint. Single-family and duplex rental units are inspected every six years with some exceptions, and buildings with three or more units as well as mixed-use properties are inspected every three years.

To receive a certificate, property owners must correct identified lead hazard violations. The city maintains an online database of all lead-safe units and properties granted a certificate.[‡]

Experts describe Rochester's law as one of the smartest in the nation.[§] In the decade since the ordinance's passage, the city has inspected more than 141,000 homes and the number and proportion of children with high blood lead levels has decreased countywide. In 2004, 900 children tested for lead in Monroe County had levels above the CDC's action level at the time of 10 µg/dL compared with 206 children in 2015.[‖] Between 1997 and 2011, the number of children with blood lead over 10 µg/dL decreased roughly twice as fast in Monroe County as it did in New York state as a whole and nationwide.[#] Despite this significant progress in 2015, 988 of 14,283 children tested—enough to fill more than 40 kindergarten classrooms—had blood lead levels at or above CDC's current reference value of 5 µg/dL, indicating that additional efforts are needed in Rochester.[**]

The District of Columbia's Lead Hazard Prevention and Elimination Act of 2008, amended in 2011, prohibits the presence of lead-based paint hazards in dwelling units, common areas of multifamily properties, and day care and prekindergarten facilities constructed before 1978.[††] Before a purchaser or tenant is obligated under contract to buy or lease a unit, the property owner must prove no lead-based paint hazards were present within the previous 12 months.[‡‡]

Continued on next page

A related provision extends this requirement to units occupied or visited by a child or pregnant woman. In addition, if owners discover lead-based paint in their properties, they must disclose it to their tenants within 10 days.

* National Institutes of Health, "Rochester's Lead Law: Evaluation of a Local Environmental Health Policy Innovation," accessed Jan. 13, 2017, http://www.cityofrochester.gov/article.aspx?id=8589936091

† City of Rochester, "Article III: Lead-Based Paint Poisoning Prevention," accessed Jan. 13, 2017, http://ecode360.com/8677707; City of Rochester, "Lead Paint—Get Prepared," accessed Jan. 13, 2017, http://www.cityofrochester.gov/article.aspx?id=8589936091

‡ Dan Telvock, "Rochester Leads on Lead While Buffalo Dallies," *Investigative Post*, accessed June 9, 2017, http://www.investigativepost.org/2014/11/12/buffalo-lacks-leadership-lead-poisoning-problem

§ Rachel Dissell and Brie Zeltner, "How Rochester Responded to Its Lead Poisoning Problem: Toxic Neglect," *Cleveland Plain Dealer*, Oct. 23, 2015, http://www.cleveland.com/healthfit/index.ssf/2015/10/how_rochester_stopped_using_ch.html

‖ Meaghan M. McDermott, "Lead Levels on the Rise in Monroe County," *Democrat & Chronicle*, June 28, 2016, http://www.democratandchronicle.com/story/news/2016/06/28/children-lead-levels-monroe-county/86471002

\# Byron Kennedy et al., "Declines in Elevated Blood Lead Levels Among Children, 1997-2011," *American Journal of Preventive Medicine* 46, no. 3 (2014): 259–64, http://dx.doi.org/10.1016/j.amepre.2013.11.007

** McDermott, "Lead Levels on the Rise."

†† D.C. Official Code § 8-231.01 et seq.

‡‡ D.C. Municipal Regulations and D.C. Register, "Regulation of Lead-Based Paint Activities."

Stakeholder input

Regardless of race, ethnicity, and socioeconomic status, focus group participants worried about children coming into contact with lead paint at home. Nearly all parents said they wished they had more information about lead hazards in their homes before their children were exposed. Many also said that lead disclosure forms did not sufficiently communicate the dangers, and that they would prefer to have access to property inspection documents. Two homeowners admitted disregarding the lead disclosure information when they purchased their homes to avoid seeming fussy or losing the sale. Renters suggested that fear of eviction might prevent them from raising concerns about lead hazards with their landlords. Similarly, concerns about property devaluation keep many property owners from testing for lead.

Community residents largely agreed that fining noncompliant landlords is inadequate because it does not necessarily compel property owners to address the lead hazards. Families that moved to avoid continued exposure worried that future renters could be in danger because of the landlord's failure to comply or inability to afford abatement or remodeling. Landlords, in turn, worried about lawsuits, even when the rental unit was not confirmed as the primary source of exposure.

Not surprisingly, residents and landlords had different views on requiring inspections to identify lead hazards. Some renters had experienced conflicts with landlords over lead hazards, while property owners worried that the costs of addressing lead could cause financial strain and difficulty selling homes that still required abatement. Funding for abatement could mitigate some of these unintended harms. The cost of remediation and restrictions on the type of modifications allowed to historic properties, such as window replacements, could make it difficult for landlords meet lead requirements.

To reduce these burdens, some participants proposed prioritizing inspections for homes with young children or units rented using housing vouchers, but targeting units with young children could mean lead paint hazards in the homes of grandparents or other caregivers go undetected and could discourage landlords from renting to families. Another suggestion was offsetting the cost of window replacement and lead abatement through tax credits and financing to minimize burdens and encourage landlords and homeowners to have properties inspected. Some participants, however, identified citizenship requirements to receive financing and credits as a barrier for some property owners to access such funding.

In interviews, stakeholders recommended that jobs generated to address lead paint hazards in housing, such as inspectors and lead paint hazard control workers, be offered first to community members in lead-affected areas.

Policy in Action: State Lead Paint Hazard Control Laws

Maryland's Reduction of Lead Risk in Housing Act, enacted in 1994 and amended in 2012, requires owners of rental residences built before 1978 to annually register their properties with the Maryland Department of the Environment indicating that they are free of chipping, peeling paint, and lead-contaminated dust. To qualify for registration, owners must hire a certified contractor to address any defective paint and have an accredited inspector verify compliance before any change in occupancy. The department files between 500 and 800 violation notices annually, and a team from the state's attorney general's office is responsible for enforcing actions against noncompliant owners. Since the law's enactment, the rate of high blood lead levels in Maryland children has declined by 98 percent: In 1993, 14,546 (23.9 percent) of the 60,912 children under 6 tested had blood lead levels of 10 µg/dl or higher, and by 2015, that figure had declined to 377 children of 110,217 (0.3 percent).*

Since 1993, **New York state** regulations have included a Notice and Demand component that requires property owners to address lead hazards to prevent exposure. After inspecting a unit for lead paint hazards, including deteriorated paint and contaminated dust and bare soil, the local health department can issue a written notice, which outlines the hazards present and requires owners to submit a corrective work plan within a fixed number of days.†

Continued on next page

* Maryland Department of the Environment, "Lead Poisoning Cases Drop in Baltimore and in Maryland, Department of the Environment Moves to Reduce Potential Exposures in More Homes," accessed Jan.12, 2017, http://news maryland.gov/mde/2015/09/03/lead-poisoning-cases-drop-in-baltimore-and-in-maryland-department-of-the-environment-moves-to-reduce-potential-exposures-in-more-homes, Maryland Department of the Environment, "Childhood Blood Lead Surveillance, Statewide 1993-2014," accessed June 14, 2017, http://www.mde.state md.us/programs/PressRoom/Documents/Childhood_Lead_Surveillance_Statewide_1993-2014.pdf, Maryland Department of the Environment Lead Poisoning Prevention Program, "Childhood Blood Lead Surveillance in Maryland Annual Report 2015," accessed May 25, 2017, http://www.mde.state.md.us/programs/land/documents/leadreports/leadreportsannualchildhoodleadregistry/leadreportclr2015.pdf

† New York State Department of Health, "NYS Regulations for Lead Poisoning Prevention and Control—NYCRR Title X, Part 67," accessed Jan. 13, 2017, https://www.health.ny.gov/regulations/nycrr/title_10/part_67/#sec67-2-6.

Proposed solution

According to HUD, roughly 23 million residences have lead hazards such as peeling paint, contaminated dust, or toxic soil, and 3.6 million of these are home to young children.[91] Substantial evidence including from randomized control trials indicates that remediating lead paint hazards reduces blood lead levels, and many states and localities have undertaken successful lead hazard control efforts.[92] Given this diverse body of evidence, the research team chose to analyze the impacts of testing and treating paint, dust, and soil, and replacing old windows.

Literature summary

Evidentiary support: Scientifically supported. Strategies have been tested in multiple robust studies with consistently favorable results.[93]

Population affected: Regional or national.[94]

Modeling assumptions

- Using published literature on the effects of lead paint hazard control on dust lead levels and studies of the relationship between lead in dust and in blood, the team undertook a two-step process to estimate that removing lead paint hazards from homes before those children are born would prevent a 40 percent increase in their blood lead.

  To establish the reduction in dust lead levels resulting from lead paint hazard control, the team used data from a long-term follow-up of interventions in 189 nonrandomly selected homes from multiple regions of the country that found an 89 percent decline in dust lead 12 years after treatment.[95] The study did not include a control group for ethical reasons, but it is, nevertheless, the largest and longest national evaluation of lead hazard control efforts, and its findings align with many smaller studies of lead paint hazard control effects.[96] Second, the team used a national cross-sectional survey conducted from 1999 through 2004 to predict the effect of decreased dust lead on child blood lead levels.[97] The data indicated that the above-referenced 89 percent reduction in dust lead would prevent a 39.5 percent increase in children's blood lead levels.

- The study team used the American Healthy Homes Survey to estimate that about 75 percent of pre-1960 homes and 50 percent of pre-1978 homes have lead-based paint and would require remediation.[98]
- The per unit cost of remediation is estimated based on data from HUD's Lead Hazard Control program which includes costs for replacing some windows, treating deteriorated paint, remediating toxic soil, and repairing other high-risk areas, such as doors. In addition, the cost estimates include $1,000 for testing of paint, dust, and soil to identify hazards before work is initiated and to ensure the safety of the home before residents return. The costs do not include expenses necessary to administer lead-hazard control programs, for which HUD spends about $2.7 million. HUD also caps administrative costs for grantee states and municipalities at 10 percent, typically less than $300,000 for a three-year program.
- The benefits include one child per home from the 2018 birth cohort as well as 67,000 additional children likely to be born into the remediated homes in the subsequent 10 years.[99] They do not account for children who visit but do not reside in those homes.[100]

The team modeled the implementation of lead paint hazard control under four scenarios. Specifically, the models examined impacts for those living in homes built before 1978, the year that the CPSC restricted the use of lead-based paint for residential use, and those built before 1960, because data suggest that the use of lead paint tapered off after that date. Additionally, the team examined the effects of lead paint hazard control for the entire population of children and for the population from families with incomes at or below 120 percent of the federal poverty threshold. (See Table 4.)

Findings

The analysis determined that comprehensive lead paint hazard remediation for the children born in 2018, would, on average:

- Protect 311,000 low-income children who live in homes built before 1960.[101] This includes 244,000 children born in the initial 2018 cohort, with an additional 67,000 births estimated born into the same homes in the following 10 years.
- Cost approximately $2.5 billion.

For homes with floor dust lead levels around 20 µg/sq. ft., the intervention would:

- Yield $3.5 billion in total discounted future benefits, including:
  - $630 million for the federal government.
  - $320 million for state and local governments.
- Generate $1.39 per $1 invested.

If, alternatively, baseline floor dust lead levels are 10 µg/sq. ft., the intervention would:

- Yield $2.8 billion in total discounted future benefits, including:
  - $490 million for the federal government.
  - $250 million for state and local governments.
- Produce $1.09 for every $1 invested. (See Table 4.)

The research found that targeting this intervention only to more at-risk populations—pre-1960 homes, and low-income residents—generates a greater return and higher net benefits.

Table 4

Targeting Lead Paint Hazard Control to Older Low-Income Housing Offers the Greatest Per-Dollar Benefits

Cost-benefit analysis by income, age of housing, and floor dust lead level

			Pre-1960 homes				Pre-1978 homes			
			All		Low-income		All		Low-income	
Baseline estimates	Number and percentage of children expected to live in older housing (1 child per unit)		1,068,000 (26.8%)		321,000 (8.1%)		1,934,000 (48.6%)		600,000 (15.1%)	
	Percentage of those children whose homes need lead hazard control (LHC)		75.8%				52.4%			
	Average blood lead level for children if no intervention (µg/dL)		1.34		1.63		1.25		1.53	
	Starting level of lead in floor dust (µg/sq. ft.)		10	20	10	20	10	20	10	20
Predicted impacts	Homes remediated		809,000		244,000		1,014,000		315,000	
	Children affected (including future cohorts)		1,033,000		311,000		1,295,000		402,000	
	Expected decrease in levels of lead in house dust		76%	89%	76%	89%	76%	89%	76%	89%
	Prevented increase in blood lead levels per child		32%	40%	32%	40%	32%	40%	32%	40%
Gross future benefits	Initial cohort	Earnings	$6.1 billion	$7.7 billion	$2.0 billion	$2.6 billion	$7.2 billion	$9.0 billion	$2.5 billion	$3.2 billion
		Health savings	$140 million	$170 million	$50 million	$60 million	$160 million	$200 million	$60 million	$80 million
		Education savings	$140 million	$170 million	$50 million	$60 million	$170 million	$210 million	$60 million	$70 million
		Quality-adjusted life years benefits	$250 million	$310 million	$90 million	$110 million	$290 million	$360 million	$110 million	$140 million
	Future cohorts (through year 10)		$1.6 billion	$2.0 billion	$530 million	$670 million	$1.8 billion	$2.3 billion	$650 million	$830 million
	Total gross future benefits		$8.2 billion	$10.3 billion	$2.8 billion	$3.5 billion	$9.6 billion	$12.1 billion	$3.4 billion	$4.3 billion
	Share to the federal government		$1.5 billion	$1.8 billion	$490 million	$630 million	$1.7 billion	$2.2 billion	$600 million	$770 million
	Share to state and local governments		$740 million	$940 million	$250 million	$320 million	$880 million	$1.1 billion	$310 million	$390 million
	Share to households, the private sector, and other nongovernmental entities		$6.0 billion	$7.5 billion	$2.0 billion	$2.6 billion	$7.0 billion	$8.9 billion	$2.5 billion	$3.2 billion

Continued on next page

		Pre-1960 homes				Pre-1978 homes			
		All		Low-income		All		Low-income	
Costs	Cost of inspection per home	$1,000							
	Total inspection costs	$1.1 billion		$320 million		$1.9 billion		$600 million	
	Cost of LHC per home	$9,043				$8,269			
	Total LHC costs	$7.3 billion		$2.2 billion		$8.4 billion		$2.6 billion	
	Total costs	$8.4 billion		$2.5 billion		$10.3 billion		$3.2 billion	
Net*	Net future benefits	-$210 million	$1.9 billion	$230 million	$990 million	-$690 million	$1.8 billion	$200 million	$1.1 billion
	Cost-benefit ratio	0.97	1.23	1.09	1.39	0.93	1.17	1.06	1.35

* Results are based on dust lead levels of 10 or 20 as shown on the previous page.

Notes: Analysis is based on the 2018 birth cohort, estimated at approximately 4 million children, and includes benefits for future cohorts. Total future benefits include small changes in incarceration costs not itemized in the table. Values may not add up to totals because of rounding.

Source: Altarum Institute Value of Prevention Tool calculation

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Policy in Action: Financing Lead Paint Hazard Control

Massachusetts' lead law, enacted in 1971, is one of the oldest in the country and requires that any property built before 1978 and occupied by a child under 6 be "deleaded" by removing or covering lead paint hazards.* The state also prohibits property owners from discriminating against families with young children when renting or selling. To help homeowners pay for abating lead hazards, including replacement of windows, Massachusetts offers income tax credits of $500 and $1,500, depending on a property's needs, and administers a series of loan programs to support compliance with the law.†

Massachusetts imposes surcharges of $25 to $100 on the annual fees of certain professional licenses, including for real estate brokers, property and casualty insurance agents, mortgage brokers and lenders, small loan agencies, and individuals who perform lead inspections.‡ The collected revenue, roughly $2.5 million annually, is deposited into the Lead Paint Education and Training Trust Account for use by the state's Department of Public Health.§ In 2016, testing found that of more than 175,000 Massachusetts children tested, just 686 under age 6 had blood lead levels of 10 µg/dL or greater, compared with 3,095 of about 194,000 children tested in 2001, the earliest date for which data are available online.‖

Continued on next page

* "What Does the Massachusetts Lead Law Require," Massachusetts Executive Office of Health and Human Services, accessed Jan. 13, 2017, http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/lead/lead/massachusetts-lead-law-requirement.html.

† Ibid

‡ National Center for Healthy Housing, "Lead Education Trust Fund," 2017, accessed June 14, 2017, http://www.nchh.org/Portals/0/Contents/Alternative-Financing-Mechanism_Massachusetts_LETF.pdf.

§ National Center for Healthy Housing, "Lead Education Trust Fund", Centers for Disease Control and Prevention, "Building Blocks for Primary Prevention," accessed Feb. 14, 2017, https://www.cdc.gov/nceh/lead/publications/building_blocks_for_primary_prevention.pdf.

|| Massachusetts Department of Public Health Bureau of Environmental Health, Environmental Public Health Tracking, accessed May 24, 2017, http://www.mass.gov/eohhs/docs/dph/environmental/lead/stats/screening-and-prevalence-statistics-by-community-cy-2016.pdf, Massachusetts Department of Public Health Bureau of Environmental Health, "Prevalence of Males and Females With Confirmed Elevated BLLs >= 10 µg/dL, Screened in 2001 That Were Between 0 - <72 Months of Age," *Environmental Public Health Tracking*, accessed June 6, 2017, table generated from https://matracking.ehs.state.ma.us/Health-Data/Childhood_Blood_Lead_Levels.html.

Potential challenges

Stakeholders pointed to cost as the single biggest barrier to widespread implementation of lead paint hazard control and suggested several financing options, many of which are included in the recommendations. (See Page 79.) At nearly $10,000 per unit, lead paint hazard control is unaffordable for many low- and middle-income Americans. Higher housing costs can have severe consequences for low-income residents if the cost of replacement or abatement is passed on to them. Typical lower-income households spend 40 percent of their income on housing,[102] suggesting many people are vulnerable to even small increases in rents or mortgages. Unaffordable housing can lead to evictions, foreclosures, and homelessness, which can have devastating effects on the health of the family.

Stakeholders also highlighted many missed opportunities to inform renters and owners about potential risks. The federal lead disclosure rule requires only that owners document known hazards before selling or renting a home, not that they determine if lead is in fact present, and lead in water is not covered by the law. However, because most homes in the country have not been inspected, most owners have nothing to disclose. States can expand upon this federal law by requiring inspections during real estate transactions.

Remediating more than a million older low-income homes with children in the country will take time. Meanwhile, preventive housing inspections can help identify hazards and compel action before a child becomes sick. Although prevention is the most urgent and effective policy approach, when a child has already been poisoned, environmental inspections are vital to identify the source and compel property owners to promptly fix hazards. States could prevent the proliferation of repeat-offender units by requiring landlords to fix lead hazards before re-renting a unit and could mandate inspections for all units in a building where one is found to have lead hazards. This requirement would also create jobs because of increased demand for inspection and abatement, and those jobs could be prioritized for low-income residents of the high-risk communities. According to one estimate, addressing lead hazards in the highest-risk homes would create 50,000 to 75,000 jobs.[103]

Luis Benitez (left) and Jose Diaz remove lead paint in a contaminated building in Providence, Rhode Island, in 2006.

Stakeholders highlighted the lack of incentives and policies to encourage replacement of old windows as another missed opportunity. For example, federal programs such as the Department of Energy's (DOE) Weatherization Assistance Program (WAP) uses a "savings to investment ratio" to prioritize possible upgrades, but guidance regarding the calculation of this ratio does not typically rank window replacement high among WAP priorities. States and the DOE could adjust their approaches to this ratio to promote lead paint hazard controls within the WAP.

Another potential barrier to hazard-reduction efforts is that lead-based paint is not part of property value calculations for mortgage and appraisal purposes. For example, the Federal Housing Administration (FHA) states that, for single-family properties it insures, the "[m]ortgagee must confirm that the Property is free of lead paint hazards."[134] However, this determination is typically made based on a visual inspection, not a determination by a licensed lead professional. Without mandatory inspections for lead paint and dust in pre-1978 units, appraisers cannot adjust the market price, provide buyers with important information, or encourage owners to correct hazards, but state and federal home financing programs could update their requirements to include lead inspections.

Lead Paint Hazards and Contaminated Soil at Schools and Child Care Facilities

The most common sources of lead exposure in and around schools and child care settings are lead-based paint, dust, and contaminated soil. (See "Air emissions and soil contamination" on Page 57 for additional information about lead in soil.) This is a particular concern for young children, because of their frequent and extensive contact with soil outside and with floors, carpets, windows, and other indoor areas where dust gathers, as well as their frequent hand-to-mouth activity.

- Approximately 65 percent of school facilities were constructed before 1980.[†] A 2014 national survey of schools and classrooms found that only about a third (34 percent) had been inspected for lead in cracked or peeling paint in the preceding 12 months, and another 29 percent had already been identified as having lead paint hazards and remediated.[‡]
- Further, a 2003 study based on data from a nationally representative sample of licensed U.S. child care facilities showed that 14 percent have one or more lead-based paint hazards, including 26 percent of those located in buildings built before 1960 compared with 4 percent in newer buildings.[§]
- Painted metal or wood playground equipment may also contain high levels of lead, which becomes a risk as it ages.[‖] A 1996 Consumer Product Safety Commission (CPSC) investigation of 26 older playgrounds in 13 cities across 11 states found that 20 had equipment with lead paint levels above 600 ppm, the CPSC's standard at the time. In addition, nine states and 19 cities tested 223 additional playgrounds and reported that 125 exceeded the CPSC standard.[#] Many of these playgrounds have probably been replaced in the intervening 30 years, so these data should be interpreted with caution.
- One cross-sectional study of four inner-city child care facilities in New Orleans, which involved testing the hands of 40 children before and after they played outside, found that greater outdoor lead dust levels were correlated with higher levels on the children's hands.[**]

Remediating lead hazards in schools and child care facilities is subject to barriers similar to those identified for home environments. Older buildings tend to have more problems and to be in poorer communities with fewer resources; public schools in these places often have many competing priorities for limited dollars. Without new funding, the cost of removing lead paint, dust, and soil hazards may be a hardship for some school districts, as well as state and local governments.[††] Grants for capital improvements and maintenance, particularly for schools in high-risk communities and that serve low-income children, could help offset this burden and improve health equity for these disadvantaged populations.

Continued on next page

One possible model for addressing lead hazards in schools would be the USDA's Equipment Assistance Grants program, which provides federal funds to state child nutrition agencies that then competitively award grants to individual schools for the purchase of kitchen equipment necessary to meet National School Lunch Program (NSLP) nutrition standards.[‡‡] The program also prioritizes high-need schools where at least half of enrolled students are eligible for free or reduced-price meals.[§§]

In addition, the 2014 reauthorization of the Child Care and Development Block Grant Act included several changes to improve the health and safety of children in early care and education settings that could provide a springboard for action on lead hazards. Specifically it requires states to have health and safety regulations in place for providers serving children funded by the grant and to include "building and physical premises safety" in provider training.[‖‖]

Focus group participants cited lead paint in child care facilities, especially those in historic buildings, as a concern, reported difficulty in finding information about lead risks in these facilities, and recommended increased testing. In addition to citing cost as a potential burden for child care providers, stakeholders pointed out that some people care for multiple children but don't have a license and so might not feel safe seeking help with identifying and abating lead hazards.

According to a participant who worked at a child care center in a church, unlicensed providers and facilities operated by religious institutions may also not be covered under existing regulations, which could allow lead hazards to go unaddressed. Such unlicensed and "family and friends" child care accounts for about half of all care provided to children under 5.[##]

Stakeholders in the national listening sessions suggested using local data to target information to parents in high-risk areas. Schools also could be a good forum for reaching parents, including expectant parents. Because of the legacy of lead paint, stakeholders also suggested engaging a lead professional during the planning phase of school renovations.

- U.S. Environmental Protection Agency, "America's Children and the Environment, Third Edition," EPA 240-R-13-001 (Washington: U.S. Environmental Protection Agency, January 2013): 289, https://www.epa.gov/sites/production/files/2015-06/documents/ace3_2013.pdf; Ronnie Levin et al., "Lead Exposures in U.S. Children, 2008: Implications for Prevention," *Environmental Health Perspectives* 116, no. 10 (2008): 1285–93, https://dx.doi.org/10.1289%2Fehp.11241; Howard W. Mielke et al., "The Urban Environment and Children's Health: Soils as an Integrator of Lead, Zinc, and Cadmium in New Orleans Louisiana, USA," *Environmental Research* 81, no. 2 (1999): 117–29, https://doi.org/10.1006/enrs.1999.3966.

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† National Center for Education Statistics, "Public-Use Data Files and Documentation (FRSS 105): Condition of Public School Facilities: 2012-13," accessed April 6, 2017, https://nces.ed.gov/surveys/frss/downloads.asp.

‡ Centers for Disease Control and Prevention, "School Health Policies and Practice Study: Physical School Environment," accessed June 6, 2017, https://www.cdc.gov/healthyyouth/data/shpps/pdf/2014factsheets/phy_sch_env_shpps2014.pdf

§ David Marker et al., "First National Environmental Health Survey of Child Care Centers: Final Report" (Rockville, MD: Westat Inc., 2003), http://www.nmic.org/nyccelp/documents/HUD_NEHSCCC.pdf

‖ "Protect Your Family from Exposures to Lead," U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics, accessed June 6, 2017, https://www.epa.gov/lead/protect-your-family-exposures-lead

Consumer Product Safety Commission, "CPSC Staff Recommendations for Identifying and Controlling Lead Paint on Public Playground Equipment" (Washington: U.S. Consumer Product Safety Commission, October 1996), http://www.state.nj.us/dca/divisions/dhcr/rec/pdf/recleadpaint.pdf.

** Latonia Viverette et al., "Environmental Health in Minority and Other Underserved Populations: Benign Methods for Identifying Lead Hazards at Day Care Centres of New Orleans," *Environmental Geochemistry and Health* 18 no. 1 (1996): 41–45, https://dx.doi.org/10.1007/BF01757218; Howard W. Mielke et al., "The Urban Environment and Children's Health: Soils as an Integrator of Lead, Zinc, and Cadmium in New Orleans Louisiana, USA."

†† Rafael Guerrero, "Local Schools Have Mixed Reactions to Bill That Would Require Lead Testing," Chicago Tribune, Jan. 13, 2017, http://www.chicagotribune.com/suburbs/elgin-courier-news/news/ct-ecn-schools-lead-testing-st-0115-20170113-story.html

‡‡ The Pew Charitable Trusts, "U.S. Department of Agriculture Equipment Grants Improve School Kitchens," Kids' Safe and Healthful Foods Project (June 2016), http://www.pewtrusts.org/en/multimedia/data-visualizations/2016/usda-school-kitchen-equipment-grants

§§ U.S. Department of Agriculture, "2016 NSLP Equipment Assistance Grants," Food and Nutrition Service (February 2016), https://www.fns.usda.gov/2016-nslp-equipment-assistance-grants

‖‖ President's Task Force on Environmental Health Risks and Safety Risks to Children, "Key Federal Programs to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts" (November 2016), https://ptfceh.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf

U.S. Census Bureau, "Who's Minding the Kids? Child Care Arrangements: Spring 2011" (2013), http://www.census.gov/prod/2013pubs/p70-135.pdf

Safe renovation, repair, and painting enforcement

> "We bought the house in March of this year, and after buying the house we found out that it had been painted last year, and when the house was painted they took no precautions when they were scraping off the lead paint."
>
> —Indianapolis resident

As discussed above, residential remediation is the primary strategy for preventing chronic exposure to lead dust. However, renovation, repair, and painting activities in older homes are also a major source of lead exposure. The use of safe work practices is critical for avoiding acute exposures from highly toxic dust, debris, and fumes that can be created when homes undergo routine maintenance and repair, including dry scraping, power sanding, and the use of torches and heat guns to remove paint, which in older homes is often lead-based.[105] Children can be exposed to these hazards if the family is not relocated during the work, if dust hazards remain when the family returns to the home, and if a parent is a contractor who brings home dust-contaminated clothes or shoes.

Unsafe and unregulated remodeling and renovation of older housing that contains lead-based paint pose significant hazards that can increase children's blood lead levels by as much as 69 percent.[106] In a 2013 study, 276 children ranging in age from 6 months to 2 years whose housing underwent interior renovation had mean blood lead levels at 2 years of age that were 12 percent higher than children whose homes were not renovated. The study also found that the higher the lead paint content in the home, the more elevated the blood lead.[107] Studies have found that work done by parents and other do-it-yourselfers has been a factor in children's high blood lead levels.[108] For example, in 2006-07, a review of case records of children in New York state revealed that 14 percent of children with blood lead levels at or above 20 µg/dL lived in homes that had undergone recent renovations. Notably, residents performed 66 percent of these renovations, suggesting that while preventing unsafe work by contractors is important, educating homeowners and renters about proper renovation practices is also vital.[109]

Although the 1992 Title X law directed EPA to require safe work practices similar to those for lead paint abatement the agency did not finalize its rule for renovation activities until 2008.[110] The updated regulation went into effect in April 2010 and set training requirements, standards, and enforcement mechanisms for renovations that disturb paint in pre-1978 buildings.

The EPA supervises compliance with the rule through its 10 regional offices. The EPA is responsible for enforcement in 36 states and has delegated this responsibility to 14 states. However, federal oversight is severely underfunded. In its regulatory impact assessment, the EPA estimated that 11.4 million projects in pre-1978 homes and child care facilities would potentially fall under the scope of the rule each year, with about 4.4 million required to follow its safe practices after subtracting minor maintenance projects and structures found not to have lead.[111]

Unfortunately, model codes which serve as the basis for many state and local housing regulations only require any peeling paint in housing to be repaired. However, the codes do not explain how to perform the repairs safely, nor do they reference the EPA's requirements. Multiple efforts to fix the codes have been rejected by the governing International Code Council because of unfunded mandates and concerns about code officials being responsible for enforcement that the EPA should handle. Several state and local governments have found ways to encourage compliance:

- **New York City** has a system to identify potentially unsafe renovations and intervene to prevent lead exposure. Health department inspectors who observe uncontained paint dust or debris must take samples and stop the work. Owners or contractors must then post a "conspicuous" sign with a phone number to access additional information, including inspection results, until they have completed cleanup and undergone additional inspections to confirm that the source of potential lead exposure has been addressed.[112] When contractors resume work, they must follow safe work practices that contain and minimize dust.[113]
- In the **District of Columbia**, where an estimated 75 percent of housing was built before 1978, contractors seeking permits for renovation must show proof of EPA-required training.[114]
- **Rhode Island** requires contractors working in homes and child care facilities built before 1978 to hold a Lead-Safe Remodeler/Renovator or higher certification.[115] To ensure compliance, the cities of **Providence** and **Pawtucket** will not issue permits for construction work at properties covered by the law without proof of such licensure.[116]

Stakeholder input

In stakeholder conversations, parents of children with a history of lead exposure frequently cited renovation as the culprit. One mother explained that she rented a historic home after the owners completed a do-it-yourself remodel. Flaking paint on the windows and doors contributed to her child's high lead levels. A few other parents related similar stories of their children coming into contact with lead during home remodeling, including renovations completed by the parents themselves as well as contractors who lacked proper certification.

One landlord pointed out that property owners who inherit buildings from family members may not know about renovation, repair, and painting requirements and might attempt renovations without taking required precautions, although most participants knew that they should seek out certified contractors. In some cases, tenants distrusted the contractors hired by their landlords or felt that landlords hired the lowest bidder without confirming proper certification. Residents and landlords alike suggested offering free certification classes for contractors and encouraging the hiring of local builders. Landlords recommended providing and encouraging training for property managers and smaller renovators on lead-safe practices and requirements.

Proposed solution

According to the EPA, an estimated 4.4 million older homes need repairs and updates that could generate lead-contaminated dust, debris, and fumes of the sort that many robust studies show could cause sharp spikes in children's blood lead levels.[117] Several localities have successfully implemented programs and policies to increase the use of these safe practices. Yet focus group participants identified home repairs as an ongoing concern.

Drawing upon findings from the literature, expert input, the experience of community members, and state and local examples, the research team modeled enforcement of the EPA's policy requiring that renovations, repair, and painting in homes with children and child care facilities built before 1978 use lead-safe work practices.

Literature summary

Evidentiary support: Scientifically supported. Strategies have been tested in multiple robust studies with consistently favorable results.[118]

Population affected: Regional or national.[119]

Modeling assumptions

- Using an EPA model which suggests that following lead-safe renovation practices would prevent a 1.08 µg/dL increase in blood lead levels of children, the team modeled the effect of compliance with the renovation rule enforcement on a single birth cohort, in terms of lifetime earnings, health and education expenditures, and QALYs.[120] (See Table 5.)
- The costs and the number of renovation events are based on the EPA's regulatory impact analysis for the rule. The impact analysis included the costs of testing, increased training and education for renovators, government certification and enforcement, and additional necessary supplies, such as plastic sheeting.[121] The study team added costs associated with conducting full dust clearance testing after a renovation to ensure a home is completely safe. The EPA analysis suggested that approximately 1.27 million children age 6 and younger would be protected by the rule and assumed an achievable compliance rate of 75 percent.[122]

The research team assumed, therefore, that a cohort of children born in the same year would be equal to that figure divided by six, or approximately 211,000. The cost calculations also include clearance dust testing following renovations, which the EPA does not require, because evidence indicates that it is necessary to confirm the safety of a structure.[123] The team included the annual cost of compliance for all homes and child care facilities built before 1978, but only counted benefits for children from the 2018 cohort living in those homes or visiting those facilities. The calculations exclude benefits for children who may visit during a renovation activity or may move into a remediated house in the future.

The federal estimates, and thus the models used in this study, exclude do-it-yourself renovations, which are not regulated by the EPA. However, one analysis found that these projects accounted for most renovation-related lead poisoning.[124]

Findings

The analysis found that, for children born in 2018, rigorous enforcement of the EPA's rule would:

- Protect 211,000 children from lead exposure in those settings.
- Cost about $1.4 billion.
- Provide positive net benefits of approximately $3 billion, including:
  - $990 million for the federal government.
  - $500 million for state and local governments.
- Return $3.10 for every dollar invested. (See Table 5.)

Table 5

Lead-Safe Renovation Could Yield $3.10 Per $1 Invested

Benefits of EPA rule enforcement

Baseline estimates	Average blood lead level for children if no intervention	1.25 µg/dL
	Number of children in homes with covered events	211,000
	Total number of renovation events	11.4 million
	Number of renovations requiring safe work practices	4.4 million
Predicted impacts	Prevented increase in blood lead per child	1.08 µg/dL
Gross future benefits	Earnings	$4.1 billion
	Health savings	$90 million
	Education savings	$90 million
	Quality-adjusted life years benefits	$160 million
	Total gross future benefits	$4.5 billion
	Share to the federal government	$990 million
	Share to state and local governments	$500 million
	Share to households, the private sector, and other nongovernmental entities	$3.0 billion
Costs	Testing cost per renovation event	$10
	Total testing cost	$110 million
	Lead-safe work practices per renovation event	$302
	Total lead-safe work practices	$1.3 billion
	Total costs	**$1.4 billion**
Net	Net future benefits	$3.0 billion
	Cost-benefit ratio	3.10

Notes: Analysis is based on the 2018 birth cohort, estimated at approximately 4 million children. Total future benefits include small changes in incarceration costs not itemized in the table. Values may not add up to totals because of rounding.

Source: Altarum Institute Value of Prevention Tool calculation

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Jana Curtis and her children walk past a construction site next to their Philadelphia neighborhood park in April 2017. Curtis's 3-year-old daughter was poisoned by lead in the soil in their backyard and from construction dust in the neighborhood.

Potential challenges

The modeled policy is unique among those studied in its simplicity and low cost, which is a primary driver of its high cost-benefit ratio. Training for renovators in the EPA's required protocol is widely available. However, the lack of enforcement undercuts the rule's protectiveness because contractors can avoid compliance without penalty. Based on stakeholder feedback, consumer knowledge of the rule remains low. State and local governments have the opportunity to codify EPA's requirements or adopt their own laws and to conduct aggressive public outreach about lead-safe renovation practices, but only a few have done so. Although all 4.4 million renovation events undertaken each year in the U.S. probably do not require direct EPA or state oversight and supervising every jobsite would be impractical, the large number of renovations that go unchecked are a missed opportunity for protecting children. The EPA has only authorized 14 states to enforce the rule, but it could encourage more states to apply for delegated authority. Additionally, the EPA could increase high-profile enforcement to promote contractors' awareness of the rule and adherence to its requirements.

Air emissions and soil contamination

> "I grew up in the country digging in the dirt and gardening and stuff, and that's not a reality for my kid."
>
> —Baltimore resident

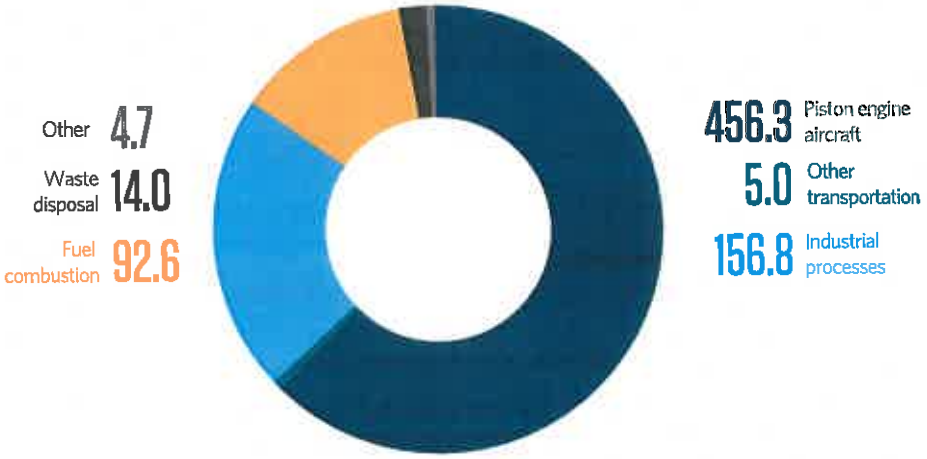
Even as the nation struggles to address the legacy of lead in homes, yards, and drinking water, more lead is being introduced into the environment every day. Most emissions result from mobile sources such as the use of leaded fuels in smaller piston-engine aircraft, followed by mining and smelting, factories that use lead, and electric power plants that burn coal and other contaminated fuels.[125] (See Figure 4.)

In 2008, the EPA decreased the acceptable level of lead concentration in air—the primary National Ambient Air Quality Standard (NAAQS)—from 1.5 to 0.15 μg/m³ to better protect children and other at-risk populations. The Children's Health Protection Advisory Committee recommended a more significant reduction to 0.02 μg/m³ because of the unique effects on children, particularly children of color.[126] Under current regulation, state and environmental agencies that track lead in the air must place monitors at non-airport facilities that reported lead emissions of a half-ton or more per year and at airports with documented emissions of 1 ton or more per year.[127]

Figure 4

Piston Engine Aircraft and Industrial Processes Make Up the Majority of Lead Emissions

Lead emissions by source in tons, 2014



Notes: Other transportation includes locomotives, commercial marine vessels, diesel heavy-duty vehicles. Industrial processes include activities involving ferrous (iron-containing) and nonferrous metals, mining, oil and gas production, pulp and paper production, cement manufacturing, and petroleum refining. Fuel combustion includes electricity generation, the use of industrial boilers/internal combustion engines, and the burning of residential oil, commercial natural gas, and coal. Waste disposal includes livestock waste and field burning. Other includes dust, agriculture, gas stations, and solvents, comprising industrial surface coatings and degreasing agents.

Source: EPA, "2014 National Emissions Inventory Data" (2014), https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data

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Lead in the air eventually makes its way into the top layer of soil, which children may ingest directly or be exposed to if it contaminates toys or is tracked into homes.[128] The most recent nationally representative survey of residential yards documented a mean soil lead level of 169 ppm, which is less than the EPA's standard of 400 ppm for areas where children play, but this average can obscure significant site-specific contamination. For example, a property near the East Chicago public housing development had levels of 54,900 ppm.[129]

Importantly, the risks of lead in soil are not equally distributed. Two observational studies from New Orleans suggest that children exposed to higher levels of lead in soil are more likely to be black, have low socioeconomic status, and live in inner cities without safe outdoor play areas that are free from harmful lead.[130]

The relationship between soil lead and children's blood lead has been the subject of several analyses with findings showing increases in blood lead of 0.12 to 1.4 µg/dL per 100 ppm lead in soil.[131] One study found that at lower levels of lead in soil (i.e., below 100 ppm) the relationship between lead in soil and in blood is steeper than at higher levels (i.e., above 300 ppm).[132]

Despite the need for a cost-effective approach to soil lead remediation, the peer-reviewed studies evaluating soil interventions are limited.[133] One randomized control trial study published in 1993 evaluated the difference in children's blood lead levels before remediation and again 11 months after and found that among the group whose homes received treatment, average blood lead was 1.28 µg/dL lower than the comparison group. The blood lead decline associated with soil remediation ranged from 0.8 to 1.6 µg/dL after adjusting for other factors.[134] Conversely, one study found no reduction in blood lead after soil remediation, despite an average reduction in soil lead from 501 to 34 ppm.[135]

More recently, a case study review article assessed changes in blood lead and identified 13 relevant studies.[136] Twelve of those demonstrated decreases in blood lead or in the proportion of children with high levels after treatment. The authors found that most soil remediation efforts have focused on Superfund sites or individual neighborhoods with lead smelters that have affected nearby residences. They noted that low-cost solutions are needed in cases where no "responsible party" is available to pay for cleanup, such as large residential communities contaminated by past industry or gasoline emissions. Some options proposed by the authors include the use of biosolid and compost-based soil products to build raised bed gardens; the use of biochar—charcoal produced from plant or animal waste matter—which immobilizes lead in soil; and watering of lawns to prevent soil resuspension in warm, dry months.[137]

Lead smelting and battery recycling facilities

The production of lead, from mining and primary smelting—a process that uses high temperatures and chemical oxidation to produce lead from ore—as well as from recycling of lead-containing products, such as car batteries and electronic devices, referred to as secondary smelting, can cause widespread contamination of air and soil in surrounding communities. According to the EPA, more than 80,000 people experienced elevated health threats from 15 secondary lead smelters located in 10 states and Puerto Rico.[138] These communities typically have a higher proportion of people of color (41 percent nonwhite) and more Latino and Hispanic residents (52 percent) than the population as a whole (25 percent and 14 percent, respectively).[139] More recently, Exide plants in Vernon, California (described later in this report); Frisco, Texas; and Baton Rouge, Louisiana, permanently closed, and one was constructed in Florence, South Carolina, bringing the total number of active facilities at the time of this report to 13.[140]

Secondary smelting has increased as the value of lead has risen on international markets,[141] and no complete account of current and historical secondary lead smelting sites in the U.S. exists. A 2001 study found that the EPA's centralized index of regulated facilities listed only 32 percent of existing sites.[142] Research indicates that many are located in or near residential areas, suggesting that they have produced or are causing widespread contamination of nearby neighborhood soil.[143] For example, between 2001 and 2009, 22 lead-emitting facilities operated in Detroit.[144] These data highlight the need to monitor secondary smelter sites and identify and measure lead concentrations in residential soils close to legacy sites.

A sign warns residents of the West Calumet Housing Complex in East Chicago, Indiana, to avoid playing in the dirt where high levels of lead and arsenic were discovered in 2016.

Superfund sites

In 1992, the Agency for Toxic Substances and Disease Registry (ATSDR) ranked lead as the number one priority hazardous substance at sites included on the EPA's national priorities list (NPL), an inventory of the most contaminated places in the country, known as Superfund sites. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which is the Superfund law, typically requires identification of a "principal responsible party" (e.g., smelter, mine, manufacturing plant, or other facility) that caused the contamination and outlines steps to reduce hazards such as excavating and replacing contaminated soil, cleaning up interior dust, and, in limited circumstances, stabilizing exterior paint to preserve soil treatment.

The EPA has documented lead contamination at 66 percent of the 1,300 Superfund sites across the country. CERCLA does not apply to the many other facilities and communities with lead contaminated soil that do not appear on the NPL, including more than 450 EPA-identified sites where lead was produced or used.[145] Lead dust from industrial facilities can contaminate surrounding soil, creating a hidden source of exposure for communities.

In 2016, the EPA found that 800,000 children under 18 reside within roughly one mile of active Superfund sites.[146] A small but consistent set of local studies demonstrates an association between elevated blood lead in children and residing near a Superfund site. One study of shuttered industrial facilities and the long-term risks they pose determined that children living near one such abandoned factory in Philadelphia were more than four times as likely as the general population to have elevated blood lead levels, but the investigators were not able to verify that the facility was the source of the lead from the tested homes.[147]

Similarly, children living near the Bunker Hill Superfund Site in northern Idaho were exposed to high levels of lead in the mid-1970s; in 1974 more than 95 percent of children within 3 miles of the smelter had blood lead levels over 40 µg/dL.[148] The Bunker Hill cleanup strategy included remediating nearby homes and soil. In 2001, only 3 percent of children in neighboring residential areas had blood lead levels over 10 µg/dL.[149]

A 1999 observational study of four Superfund sites examined whether soil lead could be a predictor of blood lead in children. Researchers evaluated blood lead measurements and environmental samples from soil, house dust, interior paint, and tap water collected for the 1,015 children in the ATSDR's multisite lead and cadmium study. After adjusting for income, education of the parents, presence of a smoker in the household, gender, and dust lead, the authors found a statistically significant association between lead in soil and in blood independent of home dust lead levels; however, the model also had high levels of uncertainty and variability.[150]

Policy in Action: Superfund Cleanup

In 1998, the **Omaha, Nebraska**, City Council requested assistance from the EPA after blood tests conducted by the Douglas County Health Department revealed that nearly 10 percent of tested children in the county had blood lead levels higher than 10 µg/dL.[*] The EPA began investigating contamination from historic smelting and refining operations under its Superfund authority, and in 2003, approximately 14 square miles of property in East Omaha was deemed at high risk and added to the national priorities list.[†]

Cleanup included soil testing at child care facilities, schools, playgrounds, parks, and homes; removal and replacement of contaminated soil; and planting of new sod and grass seed. The EPA funded an interior dust program to provide residents who had their soil remediated with education and a free vacuum.[‡] To date, the EPA has tested nearly 40,000 properties, cleaned up more than 12,000 that were polluted, and awarded $40 million to the city of Omaha through a cooperative agreement to address the final phases of the work, including continued attempts to collect soil samples and clean up remaining contaminated properties.[§]

A lead-acid battery recycling plant in **Vernon, California**, which opened in 1922, contributed to air pollution in the nearby Los Angeles neighborhood of Boyle Heights, for more than 90 years. The plant logged at least 88 violations of emissions standards between 1996 and 2015.[‖] The facility, which was purchased by Exide Technologies in 2000, ran seven days a week, processing 25,000 batteries a day and emitting lead, arsenic, and other pollutants into the air.[#]

Continued on next page

In 2013, after the South Coast Air Quality Management District found the plant "posed a higher cancer risk to more people than any of 450 operations the agency has regulated in the last 25 years," the state temporarily shut it down.** Exide was able to get the closure overturned quickly, driving advocates to take further action. In 2014, the EPA found that Exide had violated the Clean Air Act emissions standards more than 30 times and was subject to fines of up to $37,500 a day for each violation. The ruling resulted in the plant's second temporary closure.††

At the same time, Exide was under criminal investigation and entered into an agreement with the U.S. attorney's office to avoid prosecution in exchange for permanently closing the plant and paying $50 million to tear it down and clean the site, including $9 million for removing lead from nearby homes.## In April 2016, California appropriated an additional $177 million to clean up about a 2-mile radius surrounding the plant and intends to seek reimbursement from the company.§§

* Agency for Toxic Substances and Disease Registry , "ATSDR Releases Public Health Assessment Concerning Lead for the Omaha Lead Site, Omaha, Neb.," accessed Jan 13, 2017, https://www.atsdr.cdc.gov/news/displaynews.asp?PRid=1979

† United States Environmental Protection Agency, "Site Information for Omaha Lead," accessed Jan.13, 2017, https://archive.epa.gov/region07/cleanup/npl-archive/web/pdf/record_of_decision.pdf.

‡ Environmental Protection Agency, "Site Information for Omaha Lead."

§ The Chicago Tribune, "Violent Crime Part of Lead's Toxic Legacy," *Omaha World-Herald*, June 14, 2016, http://www.omaha.com/eedition/sunrise/articles/violent-crime-part-of-lead-s-toxic-legacy/article_b4865302-fa82-5e76-84a6-c1fe9b80e154.html; Brandon McDermott, "Where Does Omaha Stand After 15 Years of EPA Cleanup?," KNVO News, May 16, 2014, http://www.kvnonews.com/2014/05/omaha-stand-15-years-epa-cleanup; Steve Kemp, "Going Home to Manage the Final Steps of Omaha's Historic Lead Cleanup," *The EPA Blog*, May 25, 2016, http://blog.epa.gov/blog/2016/05/going-home-to-manage-the-final-steps-of-omahas-historic-lead-cleanup

|| Molly Peterson, "State Toxic Regulators Give Exide 30 Days to Correct Permit Problems," Southern California Public Radio, June 17, 2014, http://www.scpr.org/news/2014/06/17/44788/state-toxics-regulators-give-exide-30-days-to-corr/, Tony Barboza, "Exide's Troubled History: Years of Pollution Violations but Few Penalties," *Los Angeles Times*, March 14, 2015, http://graphics.latimes.com/exide-battery-plant.

\# Tony Barboza, "How a Battery Recycler Contaminated L.A.-Area Homes for Decades," *Los Angeles Times*, Dec. 21, 2015, http://www.latimes.com/local/lanow/la-me-exide-cleanup-story-so-far-20151121-story.html

** Jessica Garrison and Kim Christensen, "Vernon Plant Closed Over Toxics," *Los Angeles Times*, April 25, 2013, http://articles.latimes.com/2013/apr/25/local/la-me-exide-arsenic-20130425.

†† Ibid.; Tony Barboza, "How a Battery Recycler Contaminated L.A.-Area Homes for Decades."

‡‡ Haley Branson-Potts, "Vernon Battery Recycler Cited by EPA for Excessive Lead Emissions," *Los Angeles Times*, May 23, 2014, http://www.latimes.com/local/la-me-0524-epa-exide-20140524-story.html; Environmental Protection Agency, "Annual Air Quality Monitoring Network Plan," July 2015, https://www3.epa.gov/ttn/amtic/files/networkplans/CASCAQMDPlan2015.pdf.

§§ "$177 Million for Exide Cleanup Signed Into Law," Southern California Public Radio, April 20, 2016, http://www.scpr.org/news/2016/04/20/59806/177-million-for-exide-cleanup-signed-into-law.

Increasing the number of sites placed on the NPL and financing cleanup when no responsible industry party can be identified are critical needs for scaling cleanup efforts. CERCLA initially gave the EPA authority to tax crude oil, imported petroleum products, and hazardous chemicals and to use those funds for Superfund-related activities. However, that provision of the law expired in 1996, severely reducing the resources available for cleaning up contaminated sites.

Policy in Action: Imposing a Fee on Emitters to Fund Public Lead Remediation Programs

In the mid-1980s, the **California** Legislature declared childhood lead poisoning to be the state's most significant environmental health problem and subsequently established a prevention program within the Department of Public Health.* To help pay for the program, in 1993, California adopted an annual fee on manufacturers and other entities involved with the production or sale of lead and lead-based products collected from businesses in the petroleum and architectural coatings industries and from facilities reporting releases of lead into the air. The department employs a "historical market share attributions" concept to estimate each payer's long-term contribution to environmental lead contamination and allocate fees. It then deploys collected funds to support health care referrals, assessments of homes for hazards, and educational activities. The fee generated $20.6 million in fiscal 2015.[1]

* Californians for a Healthy and Green Economy, "California: The Leader in Lead Regulation," accessed Jan. 12, 2017, http://www.changecalifornia.org/2010/08/lead.html

† California State Board of Equalization, "Supporting Our Communities: Funding a Better Quality of Life," accessed Jan. 12, 2017, http://www.boe.ca.gov/pdf/pub306.pdf

Stakeholder input

Several focus group participants identified lead in soil as a concern, and a few parents said it was the source of exposure for their children's elevated blood lead. Los Angeles focus group participants expressed concerns about children in a community near a smelter coming into contact with lead through soil at bus stops or while playing in sprinklers. Community members in Baltimore said they kept their children from playing outside in the dirt, digging, planting, climbing trees, or picking up worms. Other focus group participants reported gardening in raised beds to avoid exposing their children to produce contaminated by lead, and in Chicago, one person described a program where farmers brought fruits and vegetables to a school to give residents access to local produce grown in safe soil.

Many participants wanted more transparency and better communications about lead hazards in their neighborhoods. Residents in Philadelphia related how when the EPA came to their community to test soil and children's blood lead levels many people distrusted the researchers and didn't answer their doors or participate in the tests, suggesting a need for improved communication in the future. Others worried that residents who participated in inspections would be unintentionally penalized and experience financial strain or difficulty selling their homes because of disclosure requirements. Participants also were concerned about lingering contamination in their neighborhoods even after industrial sites had been cleaned up, and some called for safer handling of

industrial lead waste and disclosure of information about its location. A few individuals also worried about exposure resulting from parents' unintentionally carrying home lead from their workplaces on their clothing or shoes. Participants discussed job loss as a potential disadvantage to increasing regulations on industry.

Proposed solution

Several policy interventions are available that could address industry-related lead soil contamination, such as reducing emissions from secondary lead smelters, increasing public funding, and prioritization of cleanup, particularly at sites where no responsible industry party exists to finance the work. To protect against lead risks for food grown at home, the EPA has recommended practices for gardeners working in soil containing more than 100 ppm lead (soil lead levels can be tested by private or university labs[151]), including building raised beds, planting in containers, wearing gloves, using tools, restricting gardening by and for children, and selecting plants with shallow roots.[152] Quantitatively modeling these strategies on a national basis was both beyond the scope of this study and deemed by the team to present a significant chance of inaccuracy because soil exposure is highly dependent on community context.

Lead levels in the ground and in the air can be higher near airports that serve piston engine aircraft, such as this one.

Literature summary

Evidentiary support: Some evidence. Strategies with this rating are likely to work, but further research is needed to confirm effects. These strategies have been tested more than once and results trend favorable overall.[153]

Population affected: Community.[154]

Leaded aviation gas

Leaded fuel used by piston engine aircraft is the nation's largest source of lead emissions into the air, with approximately 167,000 aircraft emitting about 450 tons a year.[155] These planes constitute 71 percent of the U.S. air fleet, and many of them require high-octane gasoline to avoid dangerous engine knocking. Lead is one of the best known ingredients for raising octane, and eliminating its use would require modifications to a

significant share of existing planes.[156] However, research suggests that most planes could safely make the transition to unleaded fuel at little cost if airports provided appropriate alternatives to leaded gas, and most new aircraft are certified to run on ethanol-free automobile gasoline.[157]

In 2010, the EPA estimated that about half of lead emissions from aircraft remains in the vicinity of the airport, and that approximately 16 million people live near the roughly 20,000 U.S. airports that serve aircraft running on leaded fuel and 3 million children attend school near these airports.[158] Most of these are small, general aviation facilities serving civilian, noncommercial flights, such as private or corporate planes, flying schools, and sightseeing tours.[159] In one study, children who lived within 0.6 miles of an airport were found to have blood lead levels that are 5.7 percent higher than those of children residing more than 2.5 miles from airports.[160]

Stakeholder input

Community members in Los Angeles mentioned lead in aviation gas as a concern, and experts identified it as an important contributor to air emissions. Additionally, the experts suggested that removing lead from the fuel would decrease pilots' and aircraft fuelers' contact with lead, potentially reducing take-home exposure.

Proposed solution

The team modeled the effect on blood lead in children residing within about 0.6 mile of airports serving piston engine aircraft of prohibiting the use of lead in aircraft fuel.

Literature summary

Evidentiary support: Some evidence. These strategies have been tested more than once and results trend favorable overall.[161]

Population affected: Community.[162]

Assumptions

- The team used data from a cross-sectional study to determine that children living closer than 0.6 miles from airports using leaded gas have blood lead levels that are 5.7 percent higher than those of children living farther away.[163]
- EPA data show that about 5.7 percent of the U.S. population resides within 0.6 miles of an airport that serves piston engine aircraft, so the study team applied this percentage to the 2018 birth cohort to predict that 226,000 children would live within that radius of such airports.[164]
- Baseline blood lead levels for children living in close proximity to airports serving piston engine aircraft were based on NHANES 2011-14 data and mirror the national average.

Findings

Removing lead from aviation gas would:

- Prevent an increase in blood lead levels of 5.7 percent.
- Protect 226,000 children born in 2018.
- Provide positive benefits of approximately $262 million, including:
  - $60 million for the federal government.
  - $30 million for state and local governments. (See Table 6.)

In the absence of cost data, the team did not compute a cost-benefit ratio for this intervention.

Table 6

Removing Lead From Aviation Fuel Could Prevent a 5.7% Increase in Children's Blood Lead

Benefits, assuming about 230,000 children

Baseline estimates	Number and percentage of children expected to live within 0.6 miles of airports serving piston engine aircraft	226,000 (5.7%)
	Average blood lead levels for children if no intervention	1.11 µg/dL
Predicted impacts	Prevented increases in blood lead levels per child	5.7%
	Children affected	226,000
Gross future benefits	Earnings	$240 million
	Health savings	$6 million
	Education savings	$6 million
	Quality-adjusted life years benefits	$10 million
	Total gross future benefits	$262 million
	Share to the federal government	$60 million
	Share to state and local governments	$30 million
	Share to households, the private sector, and other nongovernmental entities	$170 million

Notes: Analysis is based on the 2018 birth cohort, estimated at approximately 4 million children total. Total future benefits include small changes in incarceration costs not itemized in the table. Values may not add up to totals because of rounding.

Source: Altarum Institute Value of Prevention Tool calculation

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Potential challenges

In 2012, the FAA estimated that phasing out leaded fuel would take 11 years.[165] According to a recent federal task force report, the FAA is working to identify unleaded alternative fuels for most piston engine aircraft by 2018, and under section 231 of the Clean Air Act, the EPA is evaluating whether lead emissions from aviation fuel "cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare."[166] Based on the results of its investigation, the EPA could help to expedite the elimination of lead in aviation fuel by using its authority under the act to issue an "endangerment finding," indicating that leaded aircraft fuel emissions are polluting and harmful to public health. Such a ruling would trigger the FAA to issue standards.

Given the protracted timelines for federal action, however, states may wish to take steps to address the problem by, for example, requiring all general aviation airports to provide unleaded gas or establishing fees or taxes on airports serving piston engine aircraft to support the cleanup of the soil in parks and near homes, schools, and child care facilities.

Policy in Action: Safe Soil for Schools and Child Care

In **New Orleans**, the use of leaded gasoline contributed significantly to elevated soil lead levels, particularly in transit-heavy areas downtown. Research estimates that vehicles deposited more than 10,000 metric tons of lead dust in New Orleans soil between 1950 and 1985.[*]

In 2004, more than 40 percent of New Orleans soils exceeded the EPA's cleanup standard.[†] But a year later, storm surges and flooding from Hurricane Katrina deposited cleaner, less hazardous surface soil over the high-lead topsoil, which, combined with citywide cleanup and remediation efforts, reduced lead dust in homes and surrounding soil.[‡] Lead assessments conducted in Katrina's immediate aftermath found a 46 percent reduction in median soil lead levels.[§] And the declines continued. Before the storm, 15 of the city's 46 census tract neighborhoods exceeded the EPA's regulatory soil lead standards; by 2010, only six neighborhoods exceeded standards.[||]

Inspired by the city's unique natural experiment, researchers used a similar approach to clean up soil at 10 child care centers in New Orleans, covering lead-contaminated surface soils with a water-permeable barrier and 6-inch layer of low-lead soil.[#] Since 2005, nine of 10 federal public housing projects in the city also were rebuilt using this process.[**] New Orleans expanded this practice to all public parks and playgrounds that tested high for lead.[††] These efforts, combined with the potential reduction of lead in soil from fresh topsoil deposited by the storm surge during Hurricane Katrina, led to a decrease in the percentage of children from high-lead, largely inner-city areas with blood lead of at least 5 µg/dL from 64 percent in 2005 to 19 percent in 2015.[‡‡]

* Howard W. Mielke et al., "Environmental and Health Disparities in Residential Communities of New Orleans: The Need for Soil Lead Intervention to Advance Primary Prevention," *Environment International* 51 (2013): 73–81, https://doi.org/10.1016/j.envint.2012.10.013.

† Janet Pelley, "Lead a Hazard in Post-Katrina Sludge," *Environmental Science & Technology* 40, no. 2 (2006): 414–15, https://www.ncbi.nlm.nih.gov/pubmed/16468382.

‡ Howard W. Mielke et al., "Spatiotemporal Dynamic Transformations of Soil Lead and Children's Blood Lead Ten Years After Hurricane Katrina: New Grounds for Primary Prevention," *Environment International* 94 (2016): 567–75, https://doi.org/10.1016/j.envint.2016.06.017.

§ Sammy Zahran et al., "New Orleans Before and After Hurricanes Katrina/Rita: A Quasi-Experiment of the Association Between Soil Lead and Children's Blood Lead," *Environmental Science & Technology* 44, no. 12 (2010): 4433–40, https://doi.org/10.1021/es100572s.

|| Ibid.

\# Howard Mielke et al., "Soil Intervention as a Strategy for Lead Exposure Prevention: the New Orleans Lead-Safe Childcare Playground Project," *Environmental Pollution* 159 (2011): 2071–77, https://doi.org/10.1016/j.envpol.2010.11.008.

** Mielke et al., "Spatiotemporal Dynamic Transformations of Soil Lead and Children's Blood Lead Ten Years After Hurricane Katrina."

†† Ibid.

‡‡ Ibid.

Addressing data gaps

> "We need some data. We need to get children tested. Once we have that data, we will have a game plan. If 80 percent of our kids have lead, then we have an epidemic. We can raise our voices and perhaps get something done."
>
> —New Orleans resident

Data play an important role in the nation's ability to prevent and respond to childhood lead exposure by helping to identify high-risk locations, assessing testing rates among high-risk groups, evaluating the impact of remediation efforts, and detecting housing units responsible for multiple exposures over time. However, inadequate investment in state and local technology and limited capacity for timely data collection, processing, and sharing impede the ability of agencies at all levels of government to provide the public with transparent data on the highest-risk areas and to protect privacy.

But even if these data were collected, no federal agency curates or integrates national blood lead and environmental information into a single database. For example, the National Health and Nutrition Examination Survey provides the best available blood lead data, and the American Healthy Housing Survey is the best estimate of lead paint hazards, but because these are two separate databases, research on the issue is needlessly complicated. Further, data are rarely available at a census tract level or finer, and county-level data obscure neighborhood risks because exposure can vary block by block depending, for example, on the location of industrial sources or the age of buildings and water infrastructure.

In addition to the need for better community-level information about lead, the research team identified several significant research gaps during the course of this study. The questions include epidemiologic research to establish the dose-response relationships between levels of lead in the environment and lower blood lead levels; research on the effectiveness of prevention and response interventions; data on the geographic location of certain lead risks and any populations that are at high risk of exposure; and information about valid testing methods.

Community members and landlords wanted more sharing of information about issues affecting their neighborhoods. Spanish-speaking residents in Flint, for example, explained that the Latino community didn't learn about the water crisis until Univision reported on the issue four months after the story first broke. This oversight speaks to the importance of cultural competency, that is the "ability to address [people's] diverse values, beliefs and behaviors," in response programs to ensure that they promote equity by meeting the needs of the populations at risk.[167]

Some parents noted that messages about lead dangers tend to focus on specific populations, for example, Medicaid-eligible children, at the risk of overlooking others, such as children from middle-income families exposed to lead through home renovations.

Many community members expressed distrust in industries, inspectors, and the agencies that they feel should be tracking information and protecting citizens. In Los Angeles, participants suspected that industry-hired researchers manipulated data about blood lead levels in children from different neighborhoods to make the case that a nearby battery facility hadn't exposed children to harmful levels of lead.

Focus group participants suggested making neighborhood-level data publicly available to help community members, policymakers, and the medical community detect possible sources of exposure and address high lead levels in children. They felt that sharing these data by census tract or ZIP code could help pediatricians and obstetricians identify patients at a high risk of lead exposure in their homes or yards. Participants also supported community-based science and research, in which community members could be trained to collect samples from their homes and neighborhoods and help with sharing data.

Some state laws may make it difficult to share data publicly or between responding agencies such as schools and public health departments. Further, although cooperative agreements require states and cities to submit blood lead surveillance data to the CDC, many states do not receive CDC funding and so are under no obligation to submit data. Similarly, states and localities do not categorize lead as a reportable disease, which means that laboratories across the country do not consistently convey all results of blood lead tests to health departments, and even when those data are shared, considerable time typically elapses before the public is made aware of neighborhood or other trends.

Future research could address the most pressing knowledge gaps, such as:

Water: Several municipalities, including Cincinnati, the District of Columbia, and Boston, have inventoried their LSLs and made the information publicly available, and California and Ohio have passed laws requiring the creation of such records.[168] However, no recent and rigorous national surveys have estimated the number of LSLs in operation nationwide. Similarly, information on the extent of lead-leaching internal plumbing in homes across the country is scarce. Finally, protocols for sampling water from homes and schools should be updated and validated.

Housing: The evaluation of HUD's lead hazard control program is the largest study of strategies to address lead paint hazards in housing. Limitations of the study include that the units were not randomly selected, the omission of a control or comparison group for ethical reasons, and that it was conducted when blood lead levels and the amount of lead in the environment were higher. As a result, new assessments of this program are needed, as are other studies to rigorously investigate the extent of lead paint hazards and resultant child exposures.

Epidemiology of blood and environmental lead levels: Declining blood lead levels and the technology to detect lower amounts of lead in the environment create new research opportunities. New studies should include epidemiologic research on the relationship between lead exposure and various sources such as food, water, soil, air, dust, and paint, as well as better national and community-level data on risks by geography and population. Future studies could examine the effect of blood lead levels below 2 µg/dL on IQ. Additionally, a longitudinal study tracking IQ and lead exposure through childhood and adulthood could strengthen the evidence of the link between lead exposure and lifetime earnings.

Educational interventions: No studies have measured the effectiveness of educational, social, or behavioral interventions for children with a history of lead poisoning. Research is needed to identify practices and pedagogies that can help children with elevated blood lead levels avoid or overcome cognitive and behavioral challenges.

Supporting children with a history of lead exposure

> "Children affected by lead who can't focus in class get separated from the other students and labeled a trouble child."
>
> —Los Angeles resident

Prevention is the most critical and first approach to addressing childhood lead exposure, but those efforts have come too late for many children. Children exposed to lead may demonstrate delays in development of language skills, problems focusing, poor impulse control, and disruptive behavior. They are more likely to be diagnosed with a learning disability, to struggle to pass achievement tests, and to have lower IQs and worse academic achievement than other children.[169] Recent research has found that among young adults exposed to lead as children, the areas of the brain important for language can reorganize to facilitate language; however this reorganization does not necessarily compensate for the effects of lead on language function.[170] Research suggests that exposure to lead has particularly detrimental effects on children's executive functioning, such as working memory, mental flexibility, and self-control. These skills help children retain and manipulate information over short periods; sustain or shift attention in response to different demands; set priorities; and resist impulsive actions, responses, or judgments.[171] If children do not receive appropriate early interventions, lead-related deficits can ripple through their lives. For example, attention deficit hyperactivity disorder, which is common among lead-poisoned children, is a strong predictor of social isolation, which in turn can decrease school success and increase risky behaviors.[172] All of these problems become risk factors for delinquency, criminal behavior, substance use, and pregnancy in adolescence and young adulthood.[173]

Fortunately, cognitive and behavioral developmental skills are malleable and can be built through high-quality interventions, staffed by engaged and skilled personnel who are supported by practice-based professional development and provided in a safe setting with small child-to-adult ratios.[174] Research consistently finds that strategic investments in children's development can yield benefits for children and families.[175] However, the ability to intervene early and effectively with at-risk children before problems compound begins with testing to ascertain the extent of the exposure and then, through neuropsychological and developmental assessments, to determine if developmental delay or cognitive or functional deficits have resulted.

Blood lead testing

A necessary precursor to getting children the interventions and care they need is determining the level of lead in their bodies. Some state health departments encourage health care providers to use risk factor screening questionnaires to identify children at a high risk of lead exposure based on housing and other conditions, but one study found that many of these questionnaires do a poor job of predicting risk.[176] Providers often incorrectly assume that if patients do not live in a poor neighborhood or a community of color then they are not at risk, and clinicians are not always up to date on the latest CDC guidelines regarding harmful levels of lead in blood. For example, some providers and laboratories still tell parents that blood lead test results are normal if levels are below 10 µg/dL. Further, low blood lead levels can have lasting effects without any visible symptoms. For all of these reasons, a blood test is the preferred way to determine if a child has been exposed to lead.

The CMS requires states to comply with the Early Periodic Screening Diagnostic and Testing (EPSDT) program, a comprehensive preventive child health initiative that emphasizes early assessment of children's health care needs and requires that all children receiving Medicaid be tested for various health indicators, including receiving a blood lead test, at 12 and 24 months of age, unless the state has been granted a waiver by the CMS. However, despite these and other long-standing requirements, about 40 percent of Medicaid-enrolled children do not receive tests.[177]

State guidelines for children not covered by Medicaid range from universal testing to screening only high-risk children.[178] Ten states plus the District of Columbia require testing of all children, eight mandate targeted testing, and the rest either provide only recommendations or have no policy. Most of the states with universal testing require it at ages 1 and 2 or at 3 years of age if no previous test was conducted, but even in these states, not all children actually receive tests.[179]

The CDC's 2009 report on testing of Medicaid-eligible children recommends offering blood lead testing at sites operated by the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) to increase the percentage of children tested.[180] The report notes that collaboration with WIC has been effective for blood lead testing of Native American children. Additionally, the CDC created lead poisoning prevention recommendations for newly arrived refugee children, including testing within 90 days of entry to the U.S. for children ages 6 months to 16 years, and six months after resettlement for children 6 years of age and younger.[181]

Under EPSDT, Medicaid agencies are also required to cover diagnostic services and treatment to correct and ameliorate defects, physical and mental illnesses, and other conditions for individuals up to age 21. To qualify for coverage, school-based health programs must be primarily medical rather than educational in nature, medically necessary for the child, and delivered by a qualified Medicaid provider to income-eligible families. Services can include diagnosis and treatment of acute uncomplicated problems, monitoring and treatment of chronic medical conditions, and provision of medical services to children with disabilities that are required by the Individuals with Disabilities Education Act (IDEA). States and schools have flexibility in how they implement these services. (See Special Education below.)

Academic and behavioral interventions

Many lead-poisoned children's developmental and learning deficits are similar to those in children affected by trauma and poverty. Within that broader population of at-risk children, certain high-quality, evidence-based programs have demonstrated positive effects, for example on executive functioning.[182] In fact, research studies consistently find that investments in high-quality child development interventions reap positive benefits for children, families, and society.[183] Although no formal evaluations have measured the effectiveness of academic and behavioral interventions for children with a history of lead exposure, robust evidence nevertheless shows that various childhood interventions reduce deficits in the very same skills and behaviors most commonly affected by lead exposure through injuries it causes to the brain. Further, although no high-quality programs were designed or implemented specifically for children exposed to lead, they generally focus on children at similar developmental risks from trauma, poverty, stress, and other adverse childhood experiences and therefore may provide benefits for children affected by lead.

One such intervention is the federal Head Start and Early Head Start program for which the Administration for Children and Families provides grants to states and communities to deliver high-quality early learning opportunities to low-income infants, toddlers, and young children. Recipients then use the funding to provide services for children from low-income families. Given the federal support and focus on high-risk populations, Head Start could be a valuable entry point for reaching children who have been exposed to lead and could have positive impacts on their academic and behavioral outcomes and executive functioning.

Early Head Start provides a range of comprehensive services for parents, including family support and coaching offered in and outside the home. Such parent-focused interventions can build on the positive impacts of early childhood education programs if they include regular, voluntary in-home family support and coaching—commonly known as home visiting—to provide parents with opportunities to practice responsive interactions and other activities that offer their children age-appropriate encouragement. A recent analysis of parent education programs found that combining monthly in-home family support and coaching visits with parent education resulted in the highest improvements in children's cognitive and pre-academic skills, such as vocabulary development, task persistence, reading, and counting.[184] If regularly provided, intensive, and focused on improving the quality of interactions with young children, these programs might also represent a promising intervention for lead-exposed children.

Still further, high-quality targeted academic and behavioral school-based, community-based, and caregiver and parent training programs can provide children in elementary and middle school with opportunities and tools to manage anger, aggression, and negative thoughts, which in turn can improve social and academic performance. Some programs rely on cognitive therapy approaches, a type of talk therapy that builds awareness of negative thinking and helps manage stress.[185] Behavioral interventions can engage parents to promote healthy emotional management, improve attention, and reduce impulsiveness through meditation and computer trainings.

Rigorous research has demonstrated the positive effects of many high-quality early and middle childhood interventions for children with some of the same deficits faced by lead-exposed children. For example:

- **Nurse-Family Partnership** (NFP) connects young, low-income, first-time expectant mothers with a public health nurse, who meets with the woman in her home, starting during pregnancy and continuing until the baby turns 2. The model has been shown to have a 54 percent return to the federal government on its investment, lower enrollment in Medicaid, a 9 percent reduction in Medicaid costs, a decrease in emergency room visits for poisonings, and fewer behavior and intellectual problems among children. A 2012 study found long-term benefits of the program of almost $23,000 per participant.[186] At age 12, children who had received nurse visits in early childhood out-performed their counterparts on standardized reading and math tests and were 70 percent less likely than children who did not participate to have used harmful substances, including cigarettes and alcohol.[187] By age 15, participating children were half as likely to have behavioral problems and had half as many arrests as those without visits.[188]
- **The Incredible Years** training program consists of a range of activities that promote positive parenting and teaching practices, interpersonal skills, academic competence, and general social skills and has been shown, overall, to decrease harsh discipline practices, improve proactive parenting skills and the parent-child relationship, enhance children's academic and social competence, and decrease aggression.[189] In a randomized controlled trial, researchers found reductions in antisocial behavior of up to 59 percent among children who received training or whose parents or teachers were trained.[190]

- **Promoting Alternative Thinking Strategies** (PATHS) fosters emotional and social competencies through the development and strengthening of skills in emotional literacy, positive peer relations, and problem solving and was found in an evaluation involving children in grades one to three to improve cognitive concentration and reduce aggressive and antisocial behavior.[191] PATHS has also been found to improve academic skills. In a 2015 randomized evaluation of children from 24 elementary schools, those who participated in PATHS were 1.7 and 1.6 times more likely to attain proficiency in reading and math, respectively.[192]
- **Steps to Respect** is a school-based bullying-prevention program that focuses on prosocial beliefs and social-emotional learning. Students participate in a 12- to 14-week-long curriculum that uses literature-based lessons, and parents receive information and updates about the program. Participating students demonstrated fewer antisocial characteristics, such as aggression and bossiness, and by the end of the intervention, schools saw a nearly 25 percent reduction in bullying behavior.[193]

Only rigorously tested, culturally competent high-quality interventions have the potential to deliver benefits for any children, including those exposed to lead. Policymakers and other stakeholders will need to investigate the options with the needs of their communities in mind. The programs described above are illustrative of the many high-quality interventions available. The resources below provide detailed descriptions of and information on supporting research and evidence for these and many other interventions and can provide a starting point for policymakers' exploratory efforts:

- Blueprints for Healthy Youth Development, available at http://www.blueprintsprograms.com.
- Child Trends—What Works, available at https://www.childtrends.org/what-works.
- Home Visiting Evidence of Effectiveness, available at https://homvee.acf.hhs.gov.
- The Institute of Education Sciences' What Works Clearinghouse, available at https://ies.ed.gov/ncee/WWC.
- The National Institute of Justice's Crime Solutions, available at https://www.crimesolutions.gov/default.aspx.
- Pew-MacArthur Results First Clearinghouse Database, available at http://www.pewtrusts.org/en/multimedia/data-visualizations/2015/results-first-clearinghouse-database.

Special education

The deficits associated with lead often do not become apparent until a child is older, such as in first grade when children begin to acquire basic academic skills, and in sixth or seventh grade when executive functions such as planning and organization skills are needed. For this reason, it is best not to wait until the effects of lead exposure become a problem for the child, but rather begin intervention as early as possible once a child is identified as having an elevated blood lead level.

The IDEA ensures that all children with disabilities receive a free appropriate public education. Part C of the law serves infants and toddlers through age 2 with developmental delays or physical or mental conditions likely to result in delays. Part B provides grants to states to partially fund special education and related services for children and youth ages 3-21. Only eight states specify lead exposure as a condition that qualifies for IDEA, 12 others mention blood lead levels ranging from more than 10 to over 45 µg/dL as a criterion for eligibility, and 13 reference "toxic" exposures generally.[194] IDEA requires states to identify children with disabilities, determine their eligibility, and make referrals to services via the comprehensive Child Find system.[195]

All states participate in IDEA, but state and local implementation and quality varies, resulting in some differences in policies, services, processes, and outcomes. One promising, but not yet rigorously evaluated, strategy to accomplish this is Universal Design for Learning, an educational framework based on scientific insight for improving teaching and learning for all students.

Policy in Action: Serving Children With a History of Lead Exposure

Connecticut has a unique approach to providing educational interventions for lead-exposed children. Under the Child Find program, the State Department of Education collaborates with local school districts and the Connecticut Parent Advocacy Center to identify children with a history of lead exposure or blood lead levels of 5 µg/dL or above, then notify the parent, refer the family to medical providers and housing assistance, and obtain a health history from the school nurse.* Based on a subsequent assessment, children then receive one of three interventions:

- *If the child has no noted or suspected developmental delays or other risk factors*, the school team develops a monitoring plan with annual review and refers the family to Head Start or a school readiness or other enrichment program.†
- *If the child has a suspected or actual developmental delay or disability*, the team determines IDEA eligibility, conducts an evaluation, develops an individualized education program identifying necessary services and supports, and places the child in district pre-kindergarten or another enrichment program. For children with disabilities who do not qualify for IDEA, the team completes evaluations as appropriate and investigates eligibility under Section 504 of the federal Rehabilitation Act of 1973, which requires schools to meet the needs of such children.‡
- *If the child has other risk factors (e.g., poor housing condition, anemia, lack of enrichment) but no noted or suspected delay*, the team still assesses for services under Section 504 and, if the child is eligible, develops an accommodation and monitoring plan and considers placement in district or other enrichment programs in accordance with the federal provision. If the child is not eligible, the team proceeds with an annual monitoring plan and referral to Head Start, school readiness, or other enrichment programs. If the child does not qualify for Section 504, the team proceeds with an annual monitoring plan and referral to Head Start or a school readiness or other enrichment program.

* Connecticut Parent Advocacy Center, "Child Find," accessed March 9, 2017, http://www.cpacinc.org/hot-topics/child-find; U.S. Centers for Disease Control and Prevention, "Educational Interventions for Children Affected by Lead" (Atlanta: U.S. Department of Health and Human Services, 2015), https://www.cdc.gov/nceh/lead/publications/educational_interventions_children_affected_by_lead.pdf.

† U.S. Centers for Disease Control and Prevention, "Educational Interventions for Children Affected by Lead."

‡ Ibid.

Nutrition

Nutritional measures have not yet been proven to have a clinically important impact on the blood lead levels of children who have already been exposed.[196] However, nutritional interventions can support children's development in areas that lead exposure is known to cause impairment—particularly reading, math, and social-emotional skills—and so may serve as a buffer against lead's deleterious effects. Multiple studies, including randomized control trials, have found that healthy diets high in iron may improve children's developmental outcomes, including motor control, social interaction, and IQ later in life.[197]

In a recent experiment in North Carolina, children with high blood lead levels received various health- and nutrition-related services, such as WIC, and their parents were given advice about reducing lead in the home.[198] Children in the treated group had improved educational achievement and reduced adolescent antisocial behavior, compared with the control group, which included children who did not have high blood lead levels and did not receive interventions. The researchers observed and controlled for some differences between the two groups, such as children in the control group had more days absent from school and were suspended more than the intervention group.

The USDA's food programs, such as the Supplemental Nutrition Assistance Program (SNAP, previously known as food stamps) and the National School Lunch Program (NSLP), must meet strong nutrition standards, including providing meals that are high in iron, calcium, and other vital nutrients, but the research team did not find any studies of the impact of these programs on children with elevated blood lead levels.[199] A few small studies, however, have explored how these programs affect outcomes such as reading, math, and social-emotional skills, which are areas that lead exposure tends to undermine. Specifically, these analyses found slight but not statistically significant increases in reading and math scores and social-emotional outcomes among children participating in WIC, while another study identified a positive relationship between participation in SNAP and reading and math scores among elementary grade girls.[200]

Policy in Action: Healthy Diets for Better Long-Term Outcomes

Michigan State University (MSU) and Hurley Children's Hospital created the Pediatric Public Health Initiative in January 2016 in response to Flint's lead crisis. As part of the initiative, university and hospital staff provide nutrition education.[a] Additionally, the Fair Food Network, an organization committed to connecting families with healthy food, expanded its "Double-Up Food Bucks" program to increase participants' access to fruits and vegetables. This initiative matches the value of federal food assistance that enrollees spend on produce at participating farmers markets and grocery stores. For example, residents who buy $10 worth of fruit and vegetables get another $10 in produce. Similarly, WIC beneficiaries can receive coupons to buy locally grown fruit and vegetables through a program called WIC Project Fresh.[b]

a. Michigan State University, "About MSU-Hurley Children's Hospital Pediatric Public Health Initiative," accessed Jan. 25, 2017, http://humanmedicine.msu.edu/pphi/About.htm

b. Michigan State University, "Fight Lead With Nutrition," accessed Feb. 18, 2017, http://msue.anr.msu.edu/uploads/resources/pdfs/MSUE_Fight_Lead_With_Nutrition_WEB-4-22-16.pdf

Stakeholder input

Parents of children with a history of exposure or who may be at risk strongly and consistently urged universal blood lead testing.[201] Further, they advocated for blood tests to start early (e.g., 9 months) and be conducted often, with some recommending annual tests. Parents of lead-exposed children thought having this information sooner could have enabled them to seek appropriate follow-up treatment.

Some focus group participants explained that their children had blood lead tests as part of regular pediatric checkups, but others said they had to ask their pediatricians for the tests. Participants in Flint noted that parents without health insurance, especially immigrant families, might not have access to blood tests. Many participants supported universal testing, though some said that positive tests set off a chain of negative events, including visits from the health department, home inspections, doctor appointments, and requirements to abate or remediate lead. Some participants reported receiving threats that Child Protective Services would remove their children if they did not comply with health department requirements to remediate hazards.

Community members and parents emphasized the importance of prevention and improved awareness among adult caregivers before children come into contact with lead, but many also commended the early interventions their children received. Recommendations to improve these programs included professional development for teachers, specialized curricula, and extension of certain services to older children.

Participants recommended employing community health and social workers to implement parent-focused interventions and reinforced the need for neuropsychological assessments to ensure that interventions address each child's specific challenges. Other concerns included the cost of assessments and insurance coverage of related expenses.

A small number of focus group participants mentioned healthy, nutritious food as a way to help protect children from the effects of lead exposure. In Baltimore, a parent attributed her son's decreasing lead levels to the diet high in vegetables and fruits he received at school. Other participants in the same group referred to a connection between diets rich in iron and low blood lead levels. In Chicago, a focus group participant explained that the farm-to-school program described earlier in this report expanded to accept SNAP benefits, which allowed more children to take advantage of the health benefits of fresh fruits and vegetables. In Indiana, the NAACP started produce giveaways at two churches.

Experts from the national listening sessions and the advisory committee recommended including nutrition as a policy to combat the effects of lead exposure. Listening session participants also considered whether special education eligibility regulations should cite specific blood lead levels and inquired whether the Health Insurance Portability and Accountability Act prohibits health care providers and health agencies from disclosing children's blood lead levels to schools; it does not in most cases.[202]

Proposed solution

Although all children benefit from healthy diets, nutritional interventions cannot completely prevent the harms associated with lead exposure.[203] However, based on the literature, expanding the services and outreach provided by programs such as WIC, SNAP, Child and Adult Care Food Program (CACFP), and the NSLP helps improve children's academic and social outcomes.

Additionally, a vast and robust body of literature demonstrates positive outcomes for children with deficits similar to those that result from lead exposure who receive high-quality educational interventions. Experts in pediatrics and project advisers agreed that providing access to developmental assessments and culturally appropriate evidence-based programs is critical to responding to lead poisoning in children. Parents of lead-poisoned children who participated in focus groups universally agreed that their children benefited from educational supports.

Giving children with elevated blood lead the best opportunity for success begins with ensuring that clinicians follow blood lead testing guidelines; recommendations to improve blood lead testing for high-risk children are included later in this report. Once a child is identified as having elevated levels of lead in his or her blood, any ongoing source of exposure must be removed and neuropsychological assessments should be conducted to identify the specific parts of the brain that have been affected. From there, caregivers need help navigating the complicated system of potential educational and care interventions. Child Find is one program that can help parents identify and enroll their children in appropriate programs. These are the ideal steps for children who have been exposed to lead, but they are not in place in most communities in the U.S.

In the absence of this protocol, children with a history of elevated blood lead levels should be offered entry into early and middle childhood development programs that are available in their communities. To quantify the potential of doing so, the study team modeled the benefits of providing high-quality, culturally appropriate early and middle childhood education and care programs for children known to have been exposed to lead.

Assumptions

- The team modeled the effect of high-quality interventions on later-life outcomes for children with blood lead levels above 2 µg/dL. This blood lead level was selected because too few children in NHANES had blood lead levels above other potential cut-points such as 3.5 or 5 µg/dl, which would lead to instability in the modeling, and because, given that any lead in blood is harmful, it is the lowest practical level for which remediation might be offered.
- The team drew effect sizes from a review of experimental evaluations and meta-analyses of programs for children in early and middle childhood and then took the median effect size across the studies for each outcome.
- Child Trends identified evidence-based interventions and determined their effect sizes for children with other disadvantages, such as poverty and trauma. The relevant outcomes in the SGM include improved reading and math scores and reduced antisocial behavior and hyperactivity, which are all areas of potential deficit in lead-exposed children. To be included, interventions must have been rigorously evaluated, served children in early or middle childhood, and reported on one or more of the outcome categories in the SGM: academic, behavioral, or both. Assuming comparable benefits for children with lead-related deficits, those effect sizes were used to predict impacts on children's educational attainment, rates of teen parenthood and criminal convictions, and family income later in life.

Findings

The Social Genome Model found possible benefits of high-quality early and middle education programs for children with blood lead levels above 2 µg/dL (see Table 7), compared with having no such intervention, including:

- Increases of roughly 4 and 3 percentage points, respectively, in the likelihood of earning a high school diploma and a four-year college degree. Among the 2018 birth cohort, this would result in more than 13,000 additional high school graduates.

- Decreases of 1.1 and 1.7 percentage points, respectively, in the likelihood of becoming a teen parent or being convicted of a crime. This translates into 4,300 fewer teen parents and 6,200 fewer convictions among the 2018 birth cohort alone.
- Increased estimated lifetime family earnings of:
  - $33,000 for children who receive only early interventions.
  - $69,000 for children enrolled only in middle childhood interventions.
  - $102,000 for children who receive both.

Table 7

Providing Both Early and Middle Childhood Interventions Could Yield the Greatest Benefits

Effects on education, crime, and income

Outcome		Baseline	Early childhood programs		Middle childhood programs		Both	
			With intervention	Children affected	With intervention	Children affected	With intervention	Children affected
At age 19								
Average high school GPA		2.74	2.77	N/A	2.79	N/A	2.82	N/A
Percentage of children	Earn a high school diploma	74.4%	75.6%	4,100	76.9%	9,200	78.0%	13,300
	Become a teen parent	20.1%	19.9%	900	19.2%	3,500	19.0%	4,300
	Be convicted of a crime	22.0%	21.4%	2,500	21.0%	3,700	20.3%	6,200
At age 29								
Earn a 4-year college degree		17.0%	18.1%	3,800	18.9%	6,800	19.9%	10,700
Income (in 2015 constant dollars)								
Mean family at age 40		$62,300	$65,500	N/A	$68,800	N/A	$72,000	N/A
Estimated lifetime family		$753,500	$786,700	N/A	$822,000	N/A	$855,300	N/A

Notes: Analysis is based on the SGM's sample of about 8,000 children drawn from the Children of the National Longitudinal Survey of Youth dataset. To arrive at the number of children positively affected, the research team applied the percentage point differences between baseline conditions and total prevention to the roughly 365,000 children in the 2018 birth cohort whose blood lead levels would probably exceed 2 µg/dL.

Source: Social Genome Model analysis by Child Trends and the Urban Institute

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Potential challenges

Differences in guidelines for and implementation of blood lead testing and parents' concerns about safety and cost may pose barriers to identifying children exposed to lead. Requiring universal testing in communities at high risk would push local clinicians to recognize the urgency of blood lead tests and ensure that lead-exposed children receive needed follow-up services. Increasing environmental testing and public disclosure of results could help parents make more informed choices about having their children tested.

The lack of studies investigating the effectiveness of educational interventions for children with a history of elevated blood lead levels may present an obstacle to increasing availability of these programs. The unique biological mechanisms by which lead contributes to behavior and attention deficits in children may mean that interventions that support non-exposed children with similar deficits will not yield comparable benefits for lead-exposed children. More research is needed to determine which specific types of interventions, if any, could effectively help to mitigate the various impacts of lead on children's brains.

Further, the cost of neuropsychological and developmental assessments may be a barrier to children being evaluated and receiving needed services. States and the CMS could improve access by providing adequate reimbursement for comprehensive follow-up services for children affected by lead, such as inspection and reduction of hazards, family support and coaching programs, and remediation and developmental assessments.

In addition, school systems may not be in compliance with legal requirements to provide services such as special education to children with a history of elevated blood lead levels because they have not allocated enough funding or for other reasons. Without additional financial resources to increase access for these children, schools may shift funding from one child in need to another. Similarly, schools and districts also may not have the capacity for needed training and staffing, and programs that require complete fidelity to a specific model may not be flexible enough to adapt to local circumstances.

Finally, stakeholders worried about stigma associated with labeling children as having a disability, so care would need to be taken to address the potential unintended harms of increasing enrollment in these programs. Specifically, trauma-informed care, an approach now being used in schools that involves understanding, recognizing, and responding to the effects of trauma, could be a useful model for lead-exposed children to minimize stigma and enhance understanding among providers, caregivers, and children. To address stakeholders' concerns about lack of support after children age out of programs, mental health and other services should be made available to young people over the age of 18 with a history of childhood exposure to help reduce interactions with the criminal justice system, difficulties with job performance, and risky behaviors.

Recommendations

Children poisoned by lead may suffer from impaired brain development and behavior problems, making them more likely to struggle and drop out of school, get into trouble with the law, and underperform in the workplace. It is not possible to quantify the emotional and psychological trauma these children and their families experience.

Eliminating lead exposure would avoid health and financial harms to families and future generations and could yield $84 billion in discounted future benefits per birth cohort. The federal government would realize about $19 billion, and states would gain approximately $10 billion, in the form of increased tax collections and lower health care, education, and safety net expenditures for the children born in 2018 alone. In the absence of lead, these children will have higher GPAs, a better chance of earning their high school diplomas and of graduating from college, and they will be less likely to become teen parents or be convicted of a crime. Among children for whom prevention efforts have come too late, comprehensive academic and behavioral interventions may help overcome the challenges they will encounter and could help prevent the toxic effects of lead from diminishing their lifelong health and potential for achievement.

Federal, state, and local organizations should coordinate to effectively align and target resources. In light of the overwhelming evidence about the effects of lead at very low levels and the urgency of sending our next generation of children to school ready and able to learn, the team developed the following 10 policy recommendations and implementation tactics for various sources of lead exposure, such as housing and water.

At the national level, the success of these strategies depends on a comprehensive approach, rather than focusing discretely on individual sources of lead, and demands collaboration across agencies and levels of government to achieve full implementation within the next 36 months. At the state and local levels, data on community risk factors can inform prioritization of the recommendations.

Priority sources

Based on the quantitative and qualitative findings the study team recommends prioritizing policies that address sources of lead with which children are most likely to come into contact and in the places that they spend most of their time.

Reduce lead in drinking water in homes built before 1986 and other places children frequent

- By 2019, the EPA and states should require water utilities to submit plans for full lead service line replacement across their systems, including specific efforts by utilities to reduce the financial burden on low-income customers. The plans should include strategies for ensuring customer safety following LSL replacement, such as flushing, monitoring, and provision of water filters. For example, Lansing, Michigan; St. Paul, Minnesota; and Madison, Wisconsin, have nearly completed replacement of their LSLs. (See Policy in Action on Page 36.)
- State or local governments should require all properties to be inspected for drinking water lead risks before sale or lease.
- The EPA should develop an action level for lead in a home's drinking water. Health Canada's proposed maximum allowable concentration of 5 ppb could serve as an interim level with the goal of getting to 1 ppb over time.[204]

- The EPA should increase the number of household drinking water taps that are tested for lead under its Lead and Copper Rule requirements.
- HUD and the EPA should require drinking water sampling as part of lead risk assessment procedures.
- The EPA and HUD should coordinate funding for addressing lead in low-income housing so it includes the replacement of LSLs and plumbing as well as removal of paint hazards.
- Municipalities should require developers to conduct full LSL replacement when a structure is sold, demolished, or rebuilt. Woonsocket, Rhode Island, has pursued this policy. (See Policy in Action on Page 29.)
- The EPA and states should require utilities to take immediate protective steps when partial LSL replacements occur, including optimized corrosion control, flushing, monitoring, sampling, and clear and timely communication to affected residents.
- The EPA should provide funding to train water system personnel to improve the consistency and effectiveness of corrosion control across systems of different sizes and water chemistries.
- State Medicaid agencies should seek approval from the CMS to use CHIP funding for testing and remediation of lead in water in children's homes and child care facilities. (See Policy in Action on Page 30.)
- The USDA should provide supplemental benefits for SNAP and WIC participants whose home tap water contains harmful levels of lead to purchase bottled water.
- The USDA should work with the EPA to define water quality for the National School Lunch Program (NSLP) and the Child and Adult Care Food Program (CACFP).
- For schools and child care sites participating in NSLP and CACFP, respectively, the USDA should establish a fund for testing and remediation costs. Such a program could be modeled after the NSLP Equipment Assistance Grants program.
- The USDA should ensure that schools and child care facilities meet water quality standards through its NSLP Administrative Reviews and CACFP Monitoring.
- Schools and licensed child care facilities should implement the EPA's 3Ts recommendation to test water for lead.
- States should require that schools and licensed child care providers test for lead in drinking water and release the results publicly. California, New York, and Rhode Island already require testing at the tap in these facilities. (See Policy in Action on Page 27.)
- To increase the number of water samples drawn from places where vulnerable children spend time, the EPA's Lead and Copper Rule should require utilities to collect and test water from schools and licensed child care facilities in their service districts.

Remove lead paint hazards from low-income housing built before 1960 and other places children spend time

- HUD should increase funding for replacement of windows coated with lead paint, fix peeling paint, clean up contaminated dust, and treat toxic soil outside homes of low-income families built before 1960, while ensuring that the homes remain affordable.

- The U.S. Department of Energy and states should encourage the replacement of lead-painted windows with new energy-efficient ones by including the benefits of preventing lead exposure and government dollars spent in the savings-to-investment ratio used to determine the cost effectiveness of energy upgrades.
- State and local governments should make lead paint hazard control financially accessible for property owners by offering low-interest loans, tax credits and other incentives.
- States or localities should require housing inspections and remediation of lead paint hazards, including peeling or chipped paint and contaminated soil and dust, before a home is sold, rented, or financed. Agencies should seek to reduce costs for compliant rental property owners by, for example, requiring recertification only at intervals that are demonstrated to protect health. Rental registries, such as those in Maryland and Rhode Island, and systematic code enforcement, as in Rochester, New York, demonstrate various ways this can be accomplished. (See Policy in Action on Page 40.)
- States and localities should prevent displacement of tenants in homes with lead hazards by freezing any eviction proceeding initiated without just cause and within six months of a finding of a high blood lead level or lead hazard in the home and should prohibit landlords from re-renting units that poisoned a child or where lead has been found until hazards are addressed.
- States should mandate inspections of all apartments in buildings where one unit is found with hazards to prevent other children from coming into contact with lead paint hazards. New York state's notice and demand authority provides a model for this approach. (See Policy in Action on Page 42.)
- State Medicaid agencies should pay for state and local health department testing of homes in high-risk neighborhoods for environmental hazards, and states should establish additional permanent sources of funding, other than Medicaid, for such investigations when affected children do not qualify for other state or federal funds.
- The CMS and Title V Maternal and Child Health Services Block Grant Program should provide training to enable home health care workers and other home-based aides to identify potential lead hazards in homes with children.
- The EPA should update its standards for lead dust, soil, and paint based on evidence, and states should adopt standards for lead in dust and on porches that are comparable to those covering HUD lead hazard control grantees.
- The EPA and state and local governments should offer funding to schools and child care providers to support lead paint hazard identification and mitigation.

Increase enforcement of the EPA's renovation, repair, and painting rule

- The EPA should develop and implement a strategy for ensuring compliance with its renovation, repair, and painting rule with an emphasis on older homes with children and child care facilities.
- Local governments should require proof of appropriate EPA-compliant lead-remediation training before issuing a permit for work that is likely to disturb paint in housing built before 1978 and more broadly disseminate information about the rule's requirements. Providence, Rhode Island, and the District of Columbia and have enacted such policies. (See Page 53.)
- The EPA should provide state and local agencies with funding to support compliance with the rule, including educating businesses and consumers about the hazards of unsafe renovation and federal requirements.
- The EPA should require that contractors perform dust testing after completing renovation, repair, and painting work to ensure that the home is safe for reoccupancy.

- The Occupational Safety and Health Administration should protect construction and renovation workers and their children by updating its standards for occupational lead exposure to reduce both on-the-job risks and the likelihood of dust and other hazards transferring from the jobsite to workers' homes.

Additional sources

Although the top policy priority should be addressing sources of lead with which children are most likely to come into contact, achieving total prevention also requires focusing on other sources that contribute to the overall amount of lead in the environment and may cause individual serious cases of lead poisoning but account for a smaller proportion of lead in children's blood overall.

Reduce lead in food and consumer products

- The federal government, through participation in the Codex committee, should encourage expedited reduction of international limits on lead in foods, particularly those that young children and babies are likely to consume. Where local surveillance data indicate that children are being exposed to lead from sources such as candy, health remedies, or cosmetics, state and local agencies should target education and outreach to at-risk neighborhoods; support cultural awareness among physicians; and increase investigation and enforcement of small retailers.

Reduce air lead emissions

- The EPA should implement the Children's Health Protection Advisory Committee's recommendation to reduce the National Ambient Air Quality Standard for lead to 0.02 $\mu g/m^3$ and prioritize regulation of concentrations around lead smelting and battery recycling facilities.
- The FAA should eliminate lead from aviation gas and identify alternative formulas that can minimize the cost to airport and plane operators, and the EPA should issue an endangerment finding that lead emissions from aircraft threaten public health and promulgate emissions limits, which would then require the FAA to adopt regulations to ensure compliance with those standards.
- State and local governments should impose fees on airports serving piston engine aircraft that rely on leaded gas and use the revenue to finance the cleanup of soil in surrounding residential neighborhoods, parks, and school districts. California levies a fee on paint and petroleum. (See Policy in Action on Page 62.)

Clean up contaminated soil

- Congress should provide adequate funding for Superfund cleanup at lead-contaminated sites.
- The EPA and states should investigate lead levels in neighborhoods near former lead smelter sites and other industrial and hazardous waste facilities and convey the information resulting from those studies in a culturally competent manner and in partnership with organizations trusted by local communities.
- The EPA and HUD should coordinate Superfund efforts and lead hazard control activities so that when a residence is treated for contaminated soil, the interior and exterior of homes are also made lead-safe. The Omaha Superfund site provides an example of this approach. (See Policy in Action on Page 60.)
- State agencies should develop and fund a coordinated cleanup effort for contaminated neighborhoods.
- The EPA should adopt a health-based standard for lead in dust and soil and eliminate the distinction between areas where children do and do not play in the soil.

Poisoning response

Prevention is the most critical and first approach to addressing childhood lead exposure, but those efforts have come too late for many children. Policymakers should take concrete steps to ensure that children with elevated blood lead levels are identified and receive the supportive services they need to minimize negative outcomes and succeed later in life. Although no studies have specifically assessed the effect of education and care interventions among children exposed to lead, high-quality programs have shown benefits for children at similar developmental risk and might improve certain cognitive and behavioral outcomes among lead-exposed children.

Improve blood lead testing among children at high risk of exposure and find and remediate the sources of their exposure

- The CDC should collaborate with the American Academy of Pediatrics and other professional organizations, with input from concerned parents, to determine the factors that contribute to the persistent lack of appropriate testing of high-risk children and should develop and implement strategies to address identified barriers.
- HHS and the CDC should provide funding to upgrade and improve blood lead surveillance at the state and local levels and to ensure that health agencies have the necessary resources to provide follow-up care for children with elevated blood lead, including for finding the sources of exposures and connecting families to remediation services and developmental and neuropsychological assessments.
- The CMS should work with state Medicaid agencies to increase the number of states that include blood lead testing of Medicaid-enrolled children as one of its performance measures and should make publicly available its annual estimates of Medicaid-enrolled children tested for lead by age 2, broken out by state and health provider.
- State and local health departments should offer blood lead testing at clinics and schools and through mobile health units to improve access for at-risk families; these sites can use simple, portable devices to check blood lead levels at the point of care.[205] The results from blood lead tests should be shared with children's pediatricians and state agencies responsible for surveillance.
- The USDA should develop mechanisms to reimburse blood lead testing conducted at WIC sites in concert with hemoglobin testing.
- State Medicaid agencies should only allow health care providers to receive an increased reimbursement rate for Early and Periodic Screening, Diagnostic and Treatment services if required blood lead testing is also conducted.
- State Medicaid agencies should use CHIP funding to increase inspections of the homes of lead-exposed children and to remediate identified paint, dust, soil, and water hazards.

Ensure access to developmental and neuropsychological assessments and appropriate high-quality programs for lead-exposed children

- The U.S. Departments of Health and Human Services and Education and state and local health and education agencies should invest in high-quality early and middle childhood education programs for children with a history of elevated blood lead levels.
- State education departments, through their Child Find programs, should collaborate with local health departments to identify children with elevated blood lead levels and ensure that they receive needed supports and services. Connecticut provides a model approach. (See Policy in Action on Page 73.)

- The CMS should provide adequate reimbursement for comprehensive follow-up services for children affected by lead, including lead hazard remediation and developmental and neuropsychological assessments.
- State education agencies should modify their IDEA Part C programs so neurocognitive and developmental deficits of lead exposure qualify for services and should presume that children with elevated blood lead levels are eligible for services. States also should modify IDEA Part B programs to help local education agencies identify and provide interventions and accommodations for children affected by lead.
- The USDA should increase funding for programs such as WIC and SNAP to expand their ability to improve children's nutrition.

Data and research

Decades of research have documented the extent of lead exposure and its impacts on children, but as policy actions have helped curb exposures, research has not kept pace. As a result, more study of the effectiveness of interventions on today's lower blood lead and exposure levels is needed. In addition, local data, which play an important role in helping public health officials and community organizations identify and target treatment and response efforts, are often not readily available to the agencies and groups that need them.

Improve public access to local data

- The CDC should, in partnership with community-based organizations, local health agencies, and private philanthropy, collect census tract level data on blood lead level results; the presence of leaded drinking water pipes; and lead in the water, dust, paint, and soil of homes, schools, child care facilities, and other places children spend time.
- The CDC should use gathered data to produce culturally competent and accessible community lead reports and broadly disseminate them to health care providers, school administrators, and child care operators. New York City's Environment & Health Data Portal is a good example.
- States should require laboratories to electronically submit all blood lead test results to local and state health departments within a week of the result so the information can be aggregated to assist with prevention and response efforts.
- States should be required to report blood lead surveillance data to the CDC.
- States should, in partnership with local health agencies and their municipalities, make property-specific information on leaded drinking water pipes and lead in water, dust, paint, and soil of homes, schools, child care facilities, and other places where children spend time easily available to the public.

Fill gaps in research to better target state and local prevention and response efforts

- The federal government should support an integrated national survey of children's blood lead levels and multiple sources of exposure, including food, water, soil, paint, house dust, and consumer products.
- HUD and the EPA should design and implement a study of water from a representative sample of U.S. housing to collect data that can be used to estimate how much lead different sections of the house plumbing system add to water. Samples should be drawn over time during cold and warm weather, from different parts of the service lines, and under varying corrosion control and water source conditions. The study design should produce exposure estimates for susceptible populations such as formula-fed babies and expectant mothers.
- The EPA should develop and validate a standardized method for sampling water for homes, schools, and child care facilities that can be implemented in the field by environmental health professionals.

- The EPA should support an evaluation of the efficacy and efficiency of water pipe liners and point-of-entry water filters for prevention of lead leaching.
- The EPA should identify barriers to optimal corrosion control and methods to overcome them, including widespread education of the public and water utilities.
- The EPA should develop field tools to identify LSLs.
- The EPA should evaluate the effectiveness of different periods of flushing in reducing dissolved and particulate lead concentrations at household taps.
- HUD should research the effectiveness of various lead hazard control treatments in preventing blood lead level increases.
- HUD and the EPA should undertake large-scale studies to test the effect of soil treatments over time to inform cleanup programs.
- Federal, state, and local agencies and philanthropy should conduct small-area population-based studies to identify relative risks among communities and subpopulations compared with the general population.
- The National Institute for Environmental Health Sciences should fund studies on the impacts of prenatal and early childhood lead on high-prevalence adult conditions such as hypertension, cardiac disease, and stroke.
- The EPA and other agencies should conduct studies to understand the primary sources of children's lead intake, including dietary, residential, and neighborhood sources among the general population and newly arrived immigrant groups.

Conclusion

Childhood lead poisoning is preventable. U.S. children's blood lead levels have declined dramatically over the past few decades as a result of successful policy interventions that have removed large amounts of lead from the environment and reduced potential sources of exposure. However, current crises in Flint, East Chicago, and other communities across the country demonstrate the need for continued attention and action to protect children from the harmful effects of lead.

Eliminating lead hazards from the places where children live, learn, and play will pay dividends in terms of social and educational outcomes, and this analysis found that it also could yield $84 billion in long-term benefits per birth cohort. The federal government would reap about $19 billion, and states would gain approximately $10 billion for children born in 2018 alone. In the absence of lead, hundreds of thousands of children would be more likely to realize their full potential thanks to higher GPAs, a better chance of earning high school diplomas and graduating from college, and a reduced likelihood of becoming teen parents or being convicted of crimes.

Children spend dozens of hours each week in school and child care facilities, and dozens of case reports show elevated levels of lead in the tap water of these facilities. Yet only scarce national data are available to indicate how much lead children are coming into contact with in classrooms, from drinking fountains, or on playgrounds. Uncovering and remediating the current sources of childhood exposure to lead both nationally and at the community level, given the importance of contextual factors, should be a high priority.

And while prevention is the priority, addressing sources of lead does little to meet the needs of children once they have been exposed. Children with a history of lead exposure can suffer from impaired brain development and behavior problems, making them more likely to struggle and drop out of school, get into trouble with the law, and underperform in the workplace. And recent research confirms that the effects of early childhood exposure to lead persist, undermining cognition and socioeconomic status well into adulthood.[206]

Giving these children the best opportunity for success begins with ensuring that clinicians follow blood lead testing guidelines. Although no studies have evaluated the effectiveness of childhood interventions for lead-exposed children, the absence of these data should not prevent children from receiving evidence-based, high-quality childhood interventions shown to reduce the same cognitive and behavioral deficits common among lead-exposed children.

By taking steps to both address sources of lead affecting children and implement interventions to help lead-exposed kids overcome the obstacles they face, federal, state, and local governments together with business leaders can save billions of taxpayer dollars, generate thousands of good jobs, and improve the quality of life for children and families across the nation.

Glossary

Abatement: Measures to permanently control (i.e., 20 years or more) lead-based paint or paint hazards, including contaminated soil, dust, and deteriorated lead-based paint. EPA regulations exclude from the definition "renovation, remodeling, landscaping or other activities, when such activities are not designed to permanently eliminate lead-based paint hazards, but instead are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of lead-based paint hazards."[207]

Action level: Measurements used to express a health or physical hazard. They indicate the level of a harmful or toxic substance or activity requiring medical surveillance, increased industrial hygiene monitoring, or biological monitoring.

Blood lead test: Any draw of blood (capillary, venous, or unknown sample type) from a child that produces a quantifiable lead level result and is analyzed by a certified facility or an approved portable device. A blood lead test may be collected for use in screening, confirmation, or follow-up.

Community Development Block Grant (CDBG) program: A HUD program that issues grants to local government and state entities to promote community development. Lead-based paint activities are an eligible expense under the program.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): A federal law enacted in 1980, also known as Superfund, that granted federal agencies the authority to respond to public health and environmental threats posed by the release of hazardous substances and levied a tax on the chemical and petroleum industries to fund cleanup of waste sites. The funding provision has since expired, and the program is now funded through regular appropriations.

Corrosion control: Treatment to minimize the dissolution of lead and/or copper in drinking water.

Cultural competency: The ability to address people's diverse values, beliefs, and behaviors in public programs to ensure they promote equity by meeting the particular needs of the population being served.

Early Periodic Screening Diagnostic and Testing (EPSDT) program: A comprehensive preventive child health initiative that emphasizes early assessment of children's health care needs and requires that all children receiving Medicaid be tested for various health indicators, including blood lead at 12 and 24 months of age, unless the state has been granted a waiver by the CMS.

Effect size: A quantitative measure of the magnitude of a difference between or within groups over time. Effect size is particularly useful in comparing the effects of interventions.

Elevated blood lead level (EBL): The CDC uses this term to refer to a blood lead level greater than or equal to 5 µg/dL, which it defines as high and requiring public health intervention. (See also "reference value" and "lead poisoning.")

FIND: Filming Interactions to Nurture Development.

Healthy, Hunger-Free Kids Act (HHFKA): An update to the Child Nutrition Act passed in 2010 to improve child nutrition through oversight of the USDA's child nutrition programs, including the National School Lunch Program, the School Breakfast Program, the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), the Summer Food Service Program, and the Child and Adult Care Food Program.

Integrated Exposure Uptake and Biokinetic model (IEUBK): Estimates lead in children using four interrelated modules (exposure, uptake, biokinetic, and probability distribution) for children exposed to lead from water, food, dust and soil, and through inhalation. The model allows the user to estimate, for a hypothetical child or population of children at different ages, a distribution of blood lead concentrations based on information about different sources of exposure to lead.

Individuals with Disabilities Education Act (IDEA): A law that was first enacted in 1975 to protect the rights of children with disabilities to receive free appropriate education.

Interim controls: Set of measures to temporarily control lead-based paint hazards. Interim control methods must be completed by qualified workers using safe work practices and followed by clearance testing. Follow-up monitoring is needed.

Lead and Copper Rule (LCR): A regulation introduced by the EPA in 1991 to control lead and copper in the drinking water distribution system. The EPA is currently considering new modifications to the rule, which has been revised several times.

Lead-based paint: Defined by HUD and the EPA as existing paint or other surface coatings that contain lead equal to or exceeding 5,000 parts ppm. In 1978, the CPSC banned residential use of new lead-based paint that contained greater than or equal to 600 ppm of lead, which was later reduced by Congress to 90 ppm.

Lead-based paint hazards: Any condition that causes exposure to lead from dust-lead hazards, soil-lead hazards, or lead-based paint that is deteriorated or present in chewable surfaces, friction surfaces, or impact surfaces, and that would result in adverse human health effects.

Lead-Based Paint Hazard Control Grant Program (LBPHC): A HUD-administered program that assists elements of local government in establishing programs to address lead-based paint hazards in privately owned residences.

Lead exposure: In toxicology, exposure is defined as any detectable level in blood; thus, lead exposure in this document means any detectable level of lead in blood.

Lead poisoning: For the purposes of this report, a child is considered to have been poisoned by lead if he or she has a single blood lead test (capillary or venous) at or above the Centers for Disease Control and Prevention's 2012 reference value of 5 µg/dL even though some experts use the term to refer to a child who is at risk of a blood lead concentration greater than 5 µg/dL.

Lead service line (LSL): The pipe that connects a home or other structure to the water main. Use of lead pipes in all drinking water plumbing, including service lines, was banned by Congress effective 1986.

Microgram (µg): 1/1000th of a milligram (or 1 millionth of a gram). To put this unit into perspective, a penny weighs 2 grams, so a microgram would be one of 2 million equal pieces of that penny.

National Health and Nutrition Examination Survey (NHANES): A set of representative national surveys that measures the health and nutrition of adults and children in the United States using interviews, physical examinations, and blood specimens. NHANES is the main government data source for estimating mean blood lead levels for the U.S. population and the number of children with high blood lead levels.

National Ambient Air Quality Standards (NAAQS): EPA rules for concentrations of various pollutants in outdoor air intended to minimize human health risks.

National Priorities List (NPL): The EPA's list of locations with hazardous wastes eligible for cleanup under CERCLA.

Parts per billion (ppb): Equivalent to µg/kilogram by weight, a part per billion is equal to the value of one penny compared with $10 million. This unit is used to measure lead in water.

Parts per million (ppm): Equivalent to µg/gram (10,000 ppm = 1 percent) by weight, this unit is used to measure lead in paint and soil.

Quality-adjusted life year (QALY): A generic measure of disease burden, including the quality and the quantity of life lived that is used in economic evaluations to assess the monetary value of medical interventions. One QALY is equal to one year of perfect health.

Reference value/level: A value used to identify children with blood lead levels that indicate an elevated source of exposure in their environment. The value is based on the 97.5th percentile of blood lead concentrations from the National Health and Nutrition Examination Survey. In 2011 this value was 5 µg/dL, and the CDC recommended implementing interventions for individual children at this or higher blood lead concentrations. The CDC has not made a recommendation for blood lead levels at the 2014 reference value of 3.5 µg/dL. The reference value is calculated every four years based on the two latest years of NHANES data.

Risk assessment: A comprehensive evaluation, conducted by a certified assessor, to identify lead-based paint hazards using paint testing, dust and soil sampling, and visual examination, and to recommend appropriate reduction methods.

Savings to investment ratio (SIR): A measure that expresses the ratio of savings to costs.

Smelter: An industrial facility that extracts metals from ore (usually mixed with purifying and/or heat-generating substances such as limestone and coke) at high temperature in an enclosed furnace. The process results in lighter ore components (impurities called slag or tailing) rising to the top and floating on the molten metal.

Social Genome Model (SGM): A quantitative tool that combines two national longitudinal datasets to simulate the effects of childhood interventions on outcomes at five life stages, from birth to age 40.

Soil remediation: The purification, covering, or removal of contaminated soil.

Value of Prevention (VP) Tool: A quantitative modeling system that synthesizes data from literature and national datasets to characterize the financial and health impacts of investment in prevention from the perspectives of different stakeholders.

Appendix: Methodology

Study methods included policy screening, literature review, case studies, interviews, national listening sessions, focus groups, and quantitative modeling. (See Table A.1.) The models required several inputs, including the number of children likely to be affected by a proposed policy, their baseline blood lead levels, and the expected change in those levels as a result of each policy intervention.

To determine the number of children affected by a policy, the researchers sought information about the scope of sources of exposure. For example, to determine the effect of replacing lead service lines, researchers needed to know how many children live in homes with those lines, the level of lead in the water of their homes, their current blood lead levels, and what the evidence suggests would happen to their blood lead levels with the replacement of the lead lines. In the case of policy proposals for which those data were lacking, the team did not attempt quantitative modeling and instead relied on qualitative research. Similarly, the team conducted cost-benefit analyses only for policy solutions for which cost information was available. Details of the various methods are included below.

Table A.1

Summary of Research Methods

Method	Purpose	Source
Policy screening	• Narrow the list of policies to be included in the assessment • Identify potential policy interventions • Document the relationship between blood lead levels and parameters in the quantitative models including IQ, earnings, and math and reading scores	
Literature review	• Identify the effect sizes of potential policy interventions on environmental lead levels, blood lead levels, and educational and behavioral outcomes for use in quantitative modeling • Determine the populations affected by the prospective policies • Document known sources of exposure for affected populations and vulnerable subpopulations	Articles in medical, public health, education, and child development publications, including original papers, meta-analyses, syntheses, and literature reviews
Case studies	• Illustrate if and how recommended policies have been implemented at the state and local levels to provide pragmatic information	
Informant interviews	• Capture the perspectives of stakeholders, such as parents of children with a history of lead exposure, businesses that could be affected by the policies, and environmental health and early childhood experts and advocates	

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Method	Purpose	Source
National listening sessions	• Identify possible unintended benefits and consequences of policy interventions • Prioritize recommendations	Federal, state, and local officials, industry representatives, academics, and advocacy organizations
Focus groups	• Prioritize recommendations • Document community concerns and priorities • Identify possible unintended benefits and consequences of policy interventions	Landlords and property managers Parents of children with a history of lead exposure People at high risk of exposure, and other concerned community members
Quantitative models	• Quantify potential effects of policy interventions on early childhood and adult outcomes, including cognitive and social/emotional development, academic achievement, and earnings • Predict policies' long-term economic impacts in terms of potential cost and future savings	Social Genome Model and Value of Prevention Tool

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Policy screening process

The Health Impact Project conducted policy screening between August and December 2016 using the following criteria:

- Will Congress or a federal, state, or municipal agency likely consider the policy within the next 18-36 months?
- Does an authoritative document (i.e., a produced by a multidisciplinary task force, advisory committee, professional organization, or government body) cite the policy as a recommendation?
- Is the policy a high priority for affected populations?
- What is the expected result of the policy intervention in terms of the number of children affected and effect size of the intervention?

The timeframe criteria reflect the team's desire to identify policies that can reasonably be advanced in time to protect the next generation of children. The 18-36 month window assumes policy adoption, but not full implementation. The team relied on authoritative documents to identify recommendations that addressed stakeholder priorities and that experts and advocates had previously vetted. To avoid potential conflicts between recommendations promoted by agencies and experts and those endorsed by community members, the team specifically sought input from affected populations during the policy screening process.

The screening process began with an Aug. 5 meeting of advocates and experts from the fields of water, housing, soil, consumer products, and early childhood to identify "best policy bets." The research team used the findings from the meeting, combined with recommendations developed by a wide range of organizations and agencies, to generate a list of more than 100 policy options for consideration. (The full list is available upon request.)

The team then refined the list to include policies that would result in either reduced environmental sources of lead (prevention) or the provision of a service for children at risk or with a history of exposure (response). This screening led the team to initially exclude financing strategies, operational policies (e.g., task forces, job training), and approaches to blood lead testing.

After the initial screening, about 50 policies remained for consideration. In October 2016, subject matter experts helped the team further narrow the list to 28 for potential study. The experts subsequently identified several underrepresented policy areas on the list, including schools, plumbing fixtures, wells, lead paint hazards created through demolition, exposures associated with Superfund sites, lead in ambient air, occupational hazards, blood lead testing, state and municipal policies, and early interventions for children exposed to lead. The team conducted informant interviews and additional literature reviews to fill many of these gaps. For example, at the recommendation of stakeholders, the team included several financing policies deemed critical to implementing the prevention policies, as well as options related to blood lead testing, Superfund, early interventions, and schools and child care facilities. In total, the team studied 10 high-level policy options and analyzed 70 tactics for implementing those 10.

In November 2016, the Health Impact Project conducted a series of national virtual conversations to collect stakeholder feedback on the interventions and tactics. Between December 2016 and January 2017, the team held focus groups to document the concerns of communities across the country. Feedback from these events also helped refine the list of policies considered for analysis.

Literature review

Researchers from Pew, with support from Child Trends and other experts, led the literature search to answer a set of research questions on the effects of lead on young children and interventions to prevent and respond to exposure. The initial research questions were:

1. To what extent do blood lead levels above 5 µg/dL affect cognition and academic achievement (i.e., IQ, reading scores, math scores, high school drop-out/graduation rates, cognition, attention disorder, memory impairment)?
2. To what extent do elevated blood lead levels affect lifetime earnings (i.e., lifetime earnings, employment, income)?
3. To what extent do elevated blood lead levels affect criminal behavior (i.e., delinquency, violent crime)?
4. To what extent do elevated blood lead levels affect health (i.e., hypertension, cardiovascular health, immunological health, endocrine health, child growth rates, hearing)?
5. To what extent does the replacement of lead service lines decrease or prevent elevated blood lead levels?
6. To what extent does lead hazard control prevent elevated blood lead levels?
7. How do nutritional interventions impact cognition and educational achievement for children exposed to lead (i.e., IQ, reading scores, math scores, high school drop-out/graduation rates, cognition, attention disorder, memory impairment)?
8. How do nutritional interventions impact cognition and educational achievement for children with blood lead levels less than 5 µg/dL (i.e., IQ, reading scores, math scores, high school drop-out/graduation rates, cognition, attention disorder, memory impairment)?
9. How do early childhood education interventions impact cognition and educational achievement for children with blood lead levels greater than 5 µg/dL (i.e., IQ, reading scores, math scores, high school drop-out/graduation rates, cognition, attention disorder, memory impairment)?
10. How do early childhood interventions impact cognition and educational achievement for children with blood lead levels less than 5 µg/dL (i.e., IQ, reading scores, math scores, high school drop-out/graduation rates, cognition, attention disorder, memory impairment)?

11. To what extent do detectable levels of lead in a pregnant woman's blood affect her newborn's health?
12. To what extent do the impacts of lead poisoning increase societal or taxpayer costs?

Pew searched PubMed, Cochrane, Campbell, ERIC, EBSCO, Google Scholar, and Google databases for systematic reviews, experimental studies, and quasi-experimental studies conducted over the past 30 years. For searches that yielded a large number of results, the team screened a minimum of 50 abstracts to determine relevance to the research questions, and for those that produced fewer than five articles, the team employed a "snowball" method to identify relevant peer-reviewed studies and gray literature from citations and bibliographies. The search excluded articles published in languages other than English or that studied populations outside the United States, except when no U.S. studies addressed a particular research question, in which cases the team expanded the search to international articles published in English. For each study, the team documented the target population, source name, article title, year of publication, authors, source type (e.g., peer-reviewed or gray literature), analysis type (i.e., systematic review, experimental study, quasi-experimental), data sources and measures, and key findings. The initial search included 100 articles in medical, public health, education, and child development publications, including original papers, meta-analyses, syntheses, and literature reviews.

Concurrent with the literature search, the Health Impact Project commissioned five sector-specific white papers to summarize the literature related to the prospective policies. Experts prepared papers on housing, water, consumer products, early interventions, and schools and child care facilities and contributed additional references to be included in the Pew literature review. Child Trends reviewed the sector-specific white papers to compare the studies cited in those with other identified articles to ensure that no major research was omitted. Experts recommended several international studies to fill gaps where U.S. data were lacking and the team eventually included those in the search results. Pew, with assistance from Child Trends, the Urban Institute, and Altarum Institute, conducted additional literature searches throughout the project based on input from key informants, subject matter experts, and advisory committee members. The team ultimately reviewed well over 700 articles.

Of those, Child Trends reviewed 176 studies that provided information necessary to inform the inputs in the two quantitative models. Child Trends, the Urban Institute, and Altarum Institute performed a third-party review of these selected studies to establish effect sizes for interventions that would be included in the models. Using a five category scale, Child Trends evaluated the strength of each study used to estimate effect sizes based on design, sample size, attrition rate, intent-to-treat analysis, clarity of variable definitions, and whether or not the studies adjusted for socio-economic status. (See Table A.2.)

Table A.2

Strength of Evidence Criteria for Literature Review Used in Quantitative Models

Study type	Lower quality	Higher quality
Level 1: Meta-analysis		
Design	Quasi Experimental Designs (QEDs) or mix of randomized control trials and QEDs	Randomized control trials
Number of included studies	Fewer than 10	10 or more
Inclusion/exclusion criteria	Unclearly defined, or inconsistently applied across studies	Clearly defined, and consistently applied across studies
Attrition	Attrition rate of included studies is 50% or more and/or varies between treatment and control group	Attrition rate of included studies is 49% or lower
Control variables	Included studies don't control for socioeconomic status	Included studies that control for at least one measure of socioeconomic status, such as mother's education or free and reduced-price meal eligibility
Intent-to-treat analysis	Not used by included studies	Used by included studies
Outcome measures	Unclearly defined, not valid and reliable, or inconsistently applied across study participants	Clearly defined, valid, reliable, and implemented consistently across study participants
Level 2: Randomized controlled trial		
Sample size	No power analysis conducted, or, sample size insufficient to conduct all analyses as required	Sample size is sufficient to conduct all analyses as required. If sufficiency of sample size is not clear, then a power analysis was conducted
Attrition	Attrition rate is 50% or more, and/or attrition rate varies between treatment and control group	Attrition rate is 49% or lower
Control variables	Doesn't include SES	Includes at least one measure of SES such as mother's education or free and reduced price meal eligibility
Intent-to-treat analysis	Not used	Used
Outcome measures	Unclearly defined, or not valid and reliable, or inconsistently applied across study participants	Clearly defined, valid, reliable, and implemented consistently across all study participants
Level 3: Controlled trial without randomization (Quasi-experimental design)		
Sample size	No power analysis conducted, or, sample size insufficient to conduct all analyses as required	Sample size is sufficient to conduct all analyses as required. If sufficiency of sample size is not clear, then a power analysis was conducted
Attrition	Attrition rate is 50% or more, and/or attrition rate varies between treatment and control group	Attrition rate is 49% or lower
Control variables	Doesn't include SES	Includes at least one measure of SES such as mother's education or free and reduced price meal eligibility
Intent-to-treat analysis	ITT analyses not used	ITT analyses used
Outcome measures	Unclearly defined, or not valid and reliable, or inconsistently applied across study participants	Clearly defined, valid, reliable, and implemented consistently across all study participants

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Study type	Lower quality	Higher quality
Level 4: Cohort study or case-control study		
Sample size	Insufficient to conduct all analyses as intended	Sufficient to conduct all analyses as intended
Control variables	Doesn't include SES	Includes at least one measure of SES such as mother's education or free and reduced price meal eligibility
Outcome measures	Unclearly defined, or not valid and reliable, or inconsistently applied across study participants	Clearly defined, valid, reliable, and implemented consistently across all study participants
Additional criteria for prospective cohort studies only		
Attrition	Attrition rate is 50% or more	Attrition rate is 49% or lower
Additional criteria for retrospective cohort studies and case control studies		
Potential for recall bias	Data subject to bias (e.g., subjects asked to recall)	Data from administrative source or recorded prior to start of study
Missing data	33% or more of cases are missing data	Less than 33% of cases are missing data
Additional criteria for case control studies only		
Sample selection	Convenience sample	Sample selection method accounts for bias (e.g., matching, two or more control groups, random sampling of cases and controls)
Level 5: Cross sectional study		
Representativeness	Representative at state or local level; not representative; representativeness unknown; or, nationally representative but response rate below 80%	Nationally representative, with a response rate of 80% or higher
Sample size	Insufficient to conduct all analyses as intended	Sufficient to conduct all analyses as intended
Control variables	Doesn't include a measure of SES	Includes at least one measure of SES such as mother's education or free and reduced price meal eligibility
Outcome measures	Unclearly defined, or not valid and reliable, or inconsistently applied across study participants	Clearly defined, valid, reliable, and implemented consistently across all study participants

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Case studies

Trust for America's Health (TFAH) and the National Center for Healthy Housing (NCHH) received grants from the Health Impact Project to create case studies (see the "Policy in Action" listings in the Table of Contents) detailing successful prevention and response strategies at the state and local levels. To select the case study subjects, NCHH reviewed literature and developed three criteria for policies and programs under consideration: diversity of lead hazard exposures addressed (water, housing, consumer products, etc.), geographic diversity, and impact (based on published evaluations or summaries of the policies and programs). NCHH contacted members of the National Safe and Healthy Housing Coalition, a broad voluntary coalition of over 300 organizations, for recommendations on possible case study locations. Based on the literature review and the responses from coalition members, NCHH recommended 20 communities as models to include in the case studies. The Health Impact Project made additions to the list using the same criteria. Ultimately, TFAH developed 22 case studies, and the study team selected 15 for inclusion in the final report based on the above criteria and a determination of relevance to the policies analyzed.

Listening sessions

The Health Impact Project held five national listening webinars to collect additional stakeholder feedback. The topics of the web-based conversations included housing, schools and childcare, early childhood development, and consumer products; one general session was also held. In total, more than 200 people registered for the listening sessions and approximately 195 attended, including individuals from federal, state, and local environmental, health, housing, water, and utilities agencies and tribal health departments as well as nonprofit and advocacy organizations who work with policymakers. Stakeholders unable to participate through the webinars had the opportunity to provide feedback through an online form. The team collected and stored under password protection registrants' names, email addresses, and organizations and summarized all feedback provided in the session thematically.

Parent conversations

The Health Impact Project led two conference calls with a total of eight parents of lead-poisoned children and guided the participants in open-ended discussions. The conversations focused primarily on interventions for children with a history of lead exposure and parents' experiences with various programs. The team summarized parent feedback thematically and identified relevant quotes for inclusion in the report. The Health Impact Project collected and stored under password protection participants' names, cities and states of residence, and email addresses.

Focus groups

The Health Impact Project held a total of 16 focus groups between December 2016 and January 2017 in Baltimore; Chicago; Flint, Michigan; Indianapolis; Los Angeles; New Orleans; Philadelphia; and Warren, Arkansas, with a diverse group of participants, including property owners and landlords, residents of communities affected by lead exposure, parents of lead exposed children, and representatives from organizations supporting these populations. (See Table A.3.) The team led the semi-structured, open-ended discussions to identify which lead sources raised the greatest concern, obtain feedback on potential policies to prevent and respond to lead exposure, and provide stakeholders with an opportunity to inform the policy development process.

The team sought Institutional Review Board (IRB) approval for the focus group methodology and the Chesapeake board deemed the project exempt from IRB oversight on Dec. 7. Two to 15 individuals attended each focus group, and participation was entirely voluntary. Focus group settings included a library, a church, and several facilities operated by community organizations. Host site contacts chose the locations based on their convenience and accessibility. Focus group participants received prepaid Visas in the amount of $25 as thank-you gifts. The team recorded each participant's city and state of residence. No other identifying information was collected. The team summarized the findings, and identified key themes.

Table A.3

Focus Group Participant Demographics and Other Characteristics

Participant demographics	n	%
Race and ethnicity		
American Indian and Alaska Native	7	7%
Asian and Pacific Islander	2	2%
Black, non-Hispanic	44	42%
Hispanic, any race	17	16%
White, non-Hispanic	25	24%
Other, including two or more races	7	7%
No response	2	2%
Educational attainment		
Some high school	8	8%
High school/GED	25	24%
Associate's degree	4	4%
Some college, no degree	16	15%
College graduate or above	47	45%
Other	2	2%
No response	2	2%
Annual household income		
$19,999 or less	24	23%
$20,000 to $24,999	11	11%
$25,000 to $34,999	14	13%
$35,000 to $44,999	18	17%
$45,000 to $54,999	7	7%
$55,000 to $64,999	4	4%
$65,000 to $74,999	4	4%
$75,000 and over	16	15%
No response	6	6%

Housing characteristics	n	%
Type		
Single-family	65	63%
Duplex	10	10%
Multiunit	17	16%
No response	12	12%
Age		
Built before 1940	22	21%
Built between 1940 and 1959	20	19%
Built between 1960 and 1978	17	16%
Built after 1978	10	10%
Don't know	23	22%
No response	12	12%
Ownership		
Own	59	57%
Rent	33	32%
No response	12	12%
History of lead testing		
Paint/dust	13	13%
Water	15	14%
Paint/dust and water	18	17%
Neither	40	38%
Don't know	7	7%
No response	11	11%

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Quantitative methods

Social Genome Model

The Social Genome Model (SGM) is a lifecycle microsimulation model starting at birth and moving through five subsequent life stages—early childhood, middle childhood, adolescence, transition to adulthood, adulthood—through age 40. The version of the SGM used for this research (the SGM79) is constructed using two data sets from the Bureau of Labor Statistics' National Longitudinal Surveys: the Children of the National Longitudinal Survey of Youth (CNLSY) and the National Longitudinal Survey of Youth 1979 (NLSY79). The CNLSY follows from birth through age 19 a sample of children born to the women of the National Longitudinal Survey of Youth 1979 (NLSY79). Most of the children in the CNLSY were born in the 1980s or early 1990s. The second survey is the NLSY79 itself, which follows a sample of people in the United States born between 1957 and 1964 from their first interview (ages 14-22 in 1979) into mid-adulthood. Data are available for 25 rounds of data collection, through 2012 when respondents were 47-55 years of age.

To combine the two sources of information, SGM uses information about the children in the CNLSY from birth through age 19 and then statistically matches them to comparable individuals in the NLSY79 sample based on variables measuring circumstances at birth and adolescence common in the two data sets. The NLSY79 data are then used to estimate outcomes at age 29 and age 40 for the children in the CNLSY. The overall model is based on data on 8,056 children. Lifetime income estimates are based on data from the 1998-2015 Current Population Survey, which is the primary source of labor force statistics for the population of the United States.[208]

The SGM uses CNLSY and NLSY data to track children's development from birth onward and employs regression models to assess the relationships between children's early life circumstances and subsequent outcomes such as educational attainment, grade point average, teen parenthood, criminal conviction, and lifetime family income. The model enables researchers to assess how actions at developmentally significant life stages reverberate through a person's life. For example, circumstances at birth influence early childhood outcomes, which in turn affect middle childhood. Those middle and early childhood conditions influence adolescent outcomes, and so on through middle age. Using data on children to assess these effects over time allows the SGM to explore how early changes may ripple through outcomes later in life. Thus, if lead reduction improves a child's reading ability in early childhood, the SGM can be used to see how that improvement in reading leads, for instance, to greater educational attainment and higher income later in life.

Because lead is not a variable included in the surveys that underpin the model's dataset, the Urban Institute and Child Trends had to estimate the blood lead levels for the children in the sample by using blood lead data from the 2011-12 and 2013-14 NHANES to predict the age 1-5 blood lead level of each child. In other words, they created in the dataset a cohort of children with blood lead levels consistent with those of the national child population based on regression models of the logarithm of blood lead as a function of race, ethnicity, gender, family income, maternal education, and maternal marital status, using children age 1-5 in the combined NHANES samples. The average blood lead level in the combined two surveys for children ages 1-5 was 1.1 µg/dL, which may be higher than what will be seen among the 2018 birth cohort. One option to address this possibility was to extrapolate the trend line from earlier years to predict 2018 levels, but this strategy would underestimate 2018 levels if the rate of decline is slower between 2014 and 2018. Data from the CDC lead surveillance program indicate that the number of children with blood lead above 10 µg/dL leveled off between 2009 and 2015.[209] The potential for similar settling at lower levels in subsequent years makes the 2011-14 NHANES data the most accurate approach to predicting 2018 blood lead levels.

The modeling team assigned a blood lead value to every person in the SGM cohort to identify whether that person was part of the target population for a policy intervention. This blood lead variable was not used in the SGM regression equations to predict later life outcomes, so the results cannot be biased by misclassifying a person's blood lead level. The team modeled the policy effects by directly altering the values of the early and middle childhood outcome scores (reading, math, and behavior) to the degree that the literature suggests given the change in blood lead levels resulting from a given policy intervention. For example, if a child in the SGM has a blood lead level of 1.5 µg/dL and is in the target population to receive a policy intervention that prevents a 50 percent increase in blood lead, his or her blood lead should be 0.75 µg/dL lower than without the intervention. Using the expected reading score effect size, estimated from the literature, of a 0.0405 standard deviation increase in reading score for every 1 µg/dL decrease in blood lead, this child's reading score would improve by 0.0304 (i.e., 0.75 x 0.0405) standard deviations. This change in reading score, in turn, affects the person's later outcomes, such as high school graduation and family income at age 40.

The modeling team identified the effect of blood lead levels on variables in the model's dataset that the literature review indicated are affected by blood lead levels. The model contains the following outcomes for which Child Trends and the Urban Institute gathered effect sizes for children ages 5 and 11 from the literature:

- Peabody Individual Achievement Test (PIAT) reading scores.
- PIAT math scores.
- Behavior Problems Index (BPI) hyperactivity subscale.
- BPI antisocial behavior subscale.

No studies estimated an association between blood lead levels and the specific variables in the SGM, so the modeling team relied on estimates from other similar standardized reading and math assessments and on indices of antisocial and hyperactive behavior. For reading and math scores, Child Trends used the median effect size for all the included studies. For hyperactivity and antisocial behavior, most studies included multiple measures of behavior, so the team first calculated a mean effect size for each study, then used the median value of the study means. For example, if a study examined parent and teacher reports of hyperactivity on one scale, Child Trends took the mean of those two measures and then used the median of those means across all the studies. Significant and insignificant effect sizes were included in the calculations. A summary of the basis for the effect size calculations is available upon request and includes a list of the research used as well as effect sizes and average blood lead levels reported in each study.

Table A.4 provides the results of the SGM modeling of the prevention interventions: lead service line replacements, lead paint hazard control, lead-safe renovation practices, and the elimination of leaded aviation fuel. Although the differences in outcomes for children with and without interventions appear small, it is important to bear in mind that these are the changes for the entire population of children targeted for an intervention (for example, all those who live in a house built before 1960), not just those who are at greatest risk or have the highest blood lead levels. The effects for subpopulations with higher blood lead levels would be larger. Additionally, improving outcomes such as high school graduation and the attainment of a college degree are difficult to achieve with any one intervention since many factors play a role. Finally, the fact that blood lead levels have declined rapidly as a result of the reduction of lead in the environment is evidence that policy interventions make a difference for the population—and the fact that disparities in exposure have shrunk over the last two decades suggests that policies have been appropriately targeted. Intervening on lower levels of lead in blood result in more modest improvements in later-in-life outcomes than in the recent past when blood lead levels were much higher. But even modest outcomes when applied across a population of newborn children are meaningful, both for individual children and for the entire cohort of school aged children.

Table A.4

Summary of Effects of Selected Lead-Exposure Prevention Policies

Impacts on education, income, teen parenthood, and crime

	Children living in pre-1978 homes who experience a renovation, repair, and painting (RRP) event (N=211,167)			Lead paint hazard control (LHC) for children living in pre-1960 low-income housing (N=321,182)		
	Unsafe RRP	Safe RRP	Children benefiting	Without LHC	With LHC	Children benefiting
Outcomes at age 19						
Average high school GPAs	2.86	2.87	N/A	2.79	2.80	N/A
Earn high school diplomas	81.6%	82.0%	900	72.1%	72.4%	1,000
Become teen parents	15.4%	15.2%	500	28.0%	28.0%	100
Be convicted of crimes	18.0%	17.7%	700	23.8%	23.6%	600
Outcomes at age 29						
Complete 4-year degrees	23.5%	23.8%	800	15.0%	15.1%	400
Income						
Mean family income at age 40 (2015$)	$69,100	$70,000	N/A	$58,300	$58,900	N/A
Estimated lifetime family income (2015$)	$838,300	$848,700	N/A	$701,300	$707,200	N/A

Notes: Analysis is based on the SGM's sample of about 8,000 children drawn from the Children of the National Longitudinal Survey of Youth dataset. To arrive at the number of children positively affected, the research team applied the percentage point differences between the baseline conditions and total prevention to the estimated number of children in the 2018 birth cohort who would receive the intervention.

Source: Social Genome Model analysis by Child Trends and the Urban Institute

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Full lead service line (LSL) replacement for children living in homes built before 1986 with baseline water lead levels of 11.4 ppb (N=272,285)			Full lead service line replacement for children living in homes built before 1986 with baseline water lead levels of 5 ppb (N=272,285)			Children ages 1-5 living within 0.6 miles of an airport serving planes using leaded aviation gas (N=226,530)		
With an LSL	Without an LSL	Children benefiting	With an LSL	Without an LSL	Children benefiting	Without removing lead from aviation gas	Removing lead from aviation gas	Children benefiting
2.90	2.90	N/A	2.90	2.90	N/A	2.83	2.83	N/A
82.8%	82.9%	300	82.8%	82.9%	0	80.8%	80.9%	0
14.0%	13.9%	200	14.0%	13.9%	100	15.9%	15.9%	0
17.7%	17.6%	100	17.7%	17.7%	100	17.8%	17.8%	0
24.6%	24.8%	600	24.7%	24.8%	200	23.0%	23.0%	100
$70,700	$71,100	N/A	$70,700	$70,800	N/A	$67,500	$67,600	N/A
$855,400	$859,500	N/A	$855,400	$857,000	N/A	$823,700	$824,400	N/A

Value of Prevention Tool

Using data from the literature and national datasets, the Value of Prevention Tool predicts the financial and health effects of investments in social determinants of health, such as access to early education. The tool can assess the potential cost and future savings associated with various policies that would accrue to the federal government, states, and society at large based on the intervention's predicted impact on mortality, morbidity, future earnings and health care and incarceration costs, and noneconomic impacts such as educational attainment.

The tool tracks impacts on the federal government, specifically those related to spending on Medicaid, CHIP, Medicare, and other medical costs, such as exchange subsidies and care for veterans and military families; safety net expenditures; Social Security spending; incarceration costs; and tax revenue. State effects may include Medicaid and other medical spending, safety net expenditures, and incarceration costs. The tool also tracks impacts on the federal, state, and local governments in the form of changes in tax receipts resulting from differences in lifetime earnings.

The tool provides an assessment of the QALYs that could be gained by the affected population as well as the predicted impact of each intervention on health-adjusted life expectancy, both of which account for the amount of time lived in less than perfect health. QALYs are the number of additional healthy years of life resulting from an intervention measured on a scale of 0 to 1, where 0 and 1 correspond to the worst and best possible health outcomes.

For this project, Altarum used the tool to estimate the benefits of policies that reduce exposure to lead for an annual cohort of children (about four million births) over their lifetimes. These benefits consist of increased lifetime earnings, reduced health expenditures, decreased education spending, and a lower risk of mortality; are measured in 2015 constant dollars; and are discounted at 3 percent. When cost estimates of a policy were available, the tool reported the cost-benefit ratio of an investment.

Reductions in incarceration costs were estimated but not depicted in the tables because they were very small compared with the other outcomes measured. The benefits of decreased incarceration are based on a longitudinal study that linked blood lead levels to arrest rates. However, that study only documented effects for blood lead above 6 μg/dL,[210] a level that few children experience today, so the predicted benefits associated with reduced criminal involvement are relatively small. The Value of Prevention Tool is designed to measure incarceration costs so the team converted arrests to incarceration using FBI data to predict both the probability and length of incarceration given an arrest for a nonviolent and violent crime. The model did not account for other potential criminal justice-related cost reductions, such as those associated with arrests.

Importantly, the costs and benefits Altarum calculated are for a single annual cohort of children. Many of these policies could and probably would be implemented over a longer period, but the results are reported only for a single cohort to ensure consistency across policies and so readers can compare these simulations to previous work.[211] Further, estimating benefits beyond the first cohort introduces greater uncertainty because it requires the prediction of cohorts' blood lead levels and other characteristics further into the future. The tool models lifetime earnings benefits by estimating changes in IQ from lead exposure and their downstream impact on earnings potential, health savings by approximating lead exposure's short-term health costs (testing, office and emergency room visits) and long-term impacts (increased risk of cardiovascular disease, hypertension, and associated costs), and education savings by estimating the decreased need for special education and repeated grades associated with avoided IQ losses.

The QALY benefits are estimated through reductions in mortality risk associated with lifetime cardiovascular disease, which puts a dollar value on increased healthy years of life and is included in many regulatory analyses of environmental hazards. In this report the value of a gained QALY unit is $50,000, a conservative estimate when compared with similar analyses.[212] The team's estimates were restricted to benefits associated with reduced cardiovascular disease because it is the only increased risk of mortality shown to occur down to blood lead levels of zero, an important consideration given the lower levels of lead in children's blood today.

The tool modeled the impacts of lead paint hazard control and lead service line replacement in homes for the estimated 3,978,038 children who will be born in 2018. However, lead paint hazard control has been shown to make changes in home dust lead levels that persist for at least 12 years, and lead service line replacement should make permanent improvements to home water lead levels. Therefore, future children born into remediated homes would see benefits. The modeling team approximated the number of such children using data on the housing stock and the size of future birth cohorts from the American Community Survey. This analysis showed that in the next 10 years, about 0.25 future children on average will be born into an already remediated home.

When possible, conservative assumptions were used and only some benefits were included as quantifiable in the Value of Prevention Tool results. Therefore, interventions with a positive cost-benefit ratio have a beneficial impact, but may have even greater positive effects not included in the results.

The tool tracks and distinguishes among benefits that accrue to different stakeholders, including the federal government, state and local governments, and the remainder of society, including households and businesses. Therefore, the future benefits reported are societal and include discounted benefits to all entities, not a particular stakeholder or investor. When possible, Altarum breaks out individual benefits by the level of government to which they would accrue. Many of these benefits occur far in the future, so the results are highly sensitive to the 3 percent discount rate and 1 percent real-earnings growth assumptions.[213]

Altarum models evaluated changes in health care costs in two pieces. The first is short-term costs associated with increased use of medical services, such as lead testing, office visits, environmental investigations, and chelation therapies. The medical procedures recommended for various blood lead levels were taken from the American Academy of Pediatrics recommendations for children above the 5 µg/dL cutoff,[214] which, in turn, were revised from the previous guidance which recommended care beginning at 10 µg/dL.[215] Cost estimates for medical procedures were derived from Gould's 2009 study and inflated to 2015 dollars using Altarum's health care prices index.[216]

The second piece of health outcomes are long-term risks associated with lead exposure, which has a large research base. In addition to the cognitive impacts discussed above, evidence has found harmful effects of lead exposure on hypertension; cardiovascular, immunological, and endocrine health; child growth rates; and hearing. However, much of this research has been done in children and adults at blood lead levels much higher than 5 µg/dL, and the strongest evidence of impacts on individuals with levels at or below 5 µg/dL is for hypertension and cardiovascular disease. The model, therefore, included only increased mortality risk and long-term health care expenditures associated with cardiovascular disease and hypertension.

Further, to simplify the process of estimating long-term health impacts of childhood exposure and avoid the need for engineering models to approximate changes in blood and bone lead over time, the analysis assumes that children's blood lead levels persist throughout their lives. This approach is reasonable because, although blood lead levels are likely to fluctuate during a lifetime as a result of changing exposures, childhood levels are one of the best predictors of lifetime average blood lead levels, particularly given the relationships between blood lead and lead stored in bones.

The first long-term health outcome measured was increased mortality risk through likelihood of fatal cardiovascular disease. Initial, nonexposed mortality risks were drawn from the Underlying Cause of Death data from the CDC.[217] The model then used research on hazard ratios to represent the increased mortality risk.[218] To calculate increased mortality rates, the team identified cardiovascular and noncardiovascular mortality from the CDC Underlying Cause of Death data and then used a linearized hazard ratio to find the increased annual risk of cardiovascular mortality associated with a 1 µg/dL increase in blood lead.[219]

Additionally, for hypertension the model uses American Heart Association data from 2015 on hypertension risks for baseline nonexposed risks,[220] and then other published data to calculate the increased risk of hypertension associated with a 1 µg/dL increase in blood lead.[221] The higher prevalence of hypertension is then used as a predictor for increased cardiovascular and health care costs through published data showing that people with hypertension spend $5,755 in 2007 dollars more on average each year for medical expenditures.[222] Altarum then inflated these costs to 2015 dollars using its health care prices index and aggregated to produce the cohort-level estimates.

IQ

The effect size of early childhood blood lead levels on IQ has been well studied, although researchers have produced a wide range of estimates. The emphasis for this analysis was on the IQ impacts for young children with blood lead levels less than 10 µg/dL because this is the range for most U.S. children. Strong evidence in the recent literature suggests that the relative impacts of blood lead on IQ are much larger at lower levels.[223] Therefore, the team estimated the impact of lead on IQ for three separate categories: children in the <5 µg/dL range, the 5-9.9 µg/dL range, and the 10+ µg/dL range.

The team identified four distinct studies of IQ in U.S.-based cohorts of young children with blood lead levels in the <5µg/dL range[224] and standardized their estimated impacts to a 1 µg/dL increase in blood lead, measured in IQ points.

When studies produced multiple estimates from subsamples of different blood lead level ranges, the research team included all those estimates. The IQ estimates for the <5 µg/dL group ranged from a 0.19 to 2.53 decrease in IQ points per 1 µg/dL increase in blood lead depending on study and methodology. Of the five estimates included, the median result for the <5 µg/dL category was 0.77 IQ points lost per 1 µg/dL of additional blood lead and the mean was 1.15 points. Altarum used the mean result of -1.15 in IQ per 1 µg/dL increase in blood level for the <5 µg/dL analysis. The estimate is slightly more conservative than the effect size used by the EPA in its 2008 NAAQS final rule, which was based on four studies with a median result of -1.75,[225] but is slightly more aggressive than the -0.83 estimate found by the European Food Safety Authority in its literature review.[226] For the 5-10 µg/dL category, the mean result was 0.51 IQ points lost, and for the 10+ µg/dL category, the mean result was 0.18 points. A summary of the basis for the effect size calculations is available upon request and includes a list of the research used as well as effect sizes and average blood lead levels reported in each study.

Lifetime earnings

The team used a similar methodology to determine the effect of IQ changes on lifetime earnings. The team performed a literature search of relevant studies and supplemented the results using a survey article[227] because the universe of available data on lifetime earnings is smaller than the data on IQ and blood lead levels. The team found no literature directly connecting blood lead levels to lifetime earnings and therefore employed a two-step approach commonly used in the field, first linking blood lead levels to IQ as described above and then linking IQ to earnings.

Altarum further restricted the estimates of IQ effects on earnings to studies that analyzed males and females together because the evidence suggests that IQ impacts on earnings for women are larger than those for men, so studies that only report the effect size for males would underestimate the total. Additionally, Altarum focused on studies that included in lifetime earnings not only hourly or annual wages but also likelihood of labor force participation, because studies that consider just wage effects underestimate the impact of IQ on lifetime earnings.

In addition, the team excluded studies that analyzed the impacts of IQ on lifetime earnings while controlling for educational attainment because increased education is a probable pathway through which higher IQ increases earnings, and controlling for education creates a "blocking variable" that results in an underestimate of the impact of IQ on earnings.[228] Further, some studies attempted to approximate the lifetime value of blood lead reduction through willingness-to-pay analyses for certain lead remediation and treatment,[229] but Altarum deemed them inappropriate and excluded them because of the probable information asymmetries related to the effectiveness of lead-related treatment.

The result of the above work is three estimates. Two focus on the NLSY79 cohort and a third incorporates some evidence from literature that drew on the NLSY's 1997 cohort, a nationally representative sample of approximately 9,000 youths who were 12 to 16 years old as of Dec. 31, 1996. One finds an overall impact of a single IQ point on lifetime earnings of 1.43 percent in the NLSY79 sample and similar effects in the NLSY97 data. The second estimates an earnings impact of 2.56 percent, and the third estimates a 2.82 percent effect.[230] Taking the mean of these three estimates, Altarum used an effect size of a 2.27 percent increase in earnings per IQ point for this analysis.

Some researchers in this field view these estimates of IQ impacts on earnings as aggressive because of the inability to control for other noncognitive variables, such as self-control and conscientiousness.[231] Others suppose that 1.1 percent may be more appropriate, but the team found only one study that included noncognitive controls in a lifetime earnings regression analysis.[232] Furthermore, because the Value of Prevention Tool does not include noncognitive effects, the estimated effect size of 2.27 percent best aligns with the data incorporated into the tool.

Economic benefits

The quantifiable benefits of reducing child lead exposure are dominated by the expected increases in future lifetime incomes as a result of improved cognitive and noncognitive ability, increased educational attainment, and greater labor force participation. However, the Value of Prevention Tool also includes benefits associated with reductions in special education and lifetime health spending and increases in expected lifespans as a result of lower blood lead levels. Although the Value of Prevention and Social Genome models are structured differently and draw on different types of information, when considering a common outcome, such as the discounted present value of lifetime income, they would reach conclusions within the same order of magnitude.

Education

Education impacts are estimated through expected changes in IQ as described above. Previous lead modeling literature approximated the additional educational costs associated with children with blood lead levels above 20 µg/dL. One study estimated that 20 percent of those children would require an additional three years of special education.[233] Altarum instead modeled possible increases in special education spending for all children exposed to lead. This was done by approximating the number of children whose IQs would decline below the 70 point threshold as a result of lead exposure and assuming that all those children would require special education interventions. The analysis also assumed a standard normal IQ distribution and used the IQ-to-blood

lead level effect sizes described above to estimate the number of children affected. For example, children in the 5 to 10 µg/dL blood lead category were predicted to lose 6.2 IQ pts as a result of their full lead exposure, so the model estimated that any child within this blood lead level range and the post-intervention distribution between 76 and 70 IQ points (3.6 percent of children) would fall below the 70 point threshold absent elimination of blood lead and would require additional special education. The analysis then assumed that special education spending for these children would persist throughout their primary school years.

The expected additional cost of a year of special education was estimated for the 1999-2000 school year to be $8,040 per student.[234] This number was inflated using the CPI to 2015 dollars. Total educational spending was estimated by multiplying the number of affected children by the per-year per-student cost and then by the number of primary education years.

Assumptions for modeled policies

Lead service line replacement

- Because of a lack of data for most of the inputs, the models had to rely on a range of available information sources. For the number of LSLs in the country, this analysis relied in part on self-reported survey data collected from water utilities and on input from industry representatives.[235] No data source was found that could document how many children are served by those lines or their blood lead levels. The team used a 2016 study to estimate that 6.84 percent of the population is served by a lead service line and then applied that percentage to the roughly 4 million children in the 2018 cohort to determine the number of children who would be served by a lead service line (272,285).[236]
- Limited data connect lead levels in water to blood lead levels in children so the research team assumed that replacing an LSL prevents a 0.40 µg/dL increase in blood lead. This estimate is derived from proposed IEUBK model coefficients.[237] An alternative to the IEUBK estimate would have been to use findings from one study that found a 20 percent reduction in blood lead levels for children exposed to less than 5 ppb of lead in water compared with those exposed to greater than 5 ppb.[238] However, that report used data from a 2005 pooled analysis, which drew water samples in such a way that they may not have accurately depicted the exposure risk. Alternatively, a Canadian study showed a 35 percent decrease in blood lead for every 1 ppb decline in water lead levels.[239] Assuming that LSL replacement reduces water lead levels from 11.4 to 2.0 ppb, the Canadian findings suggest a resulting 98 percent decrease in blood lead levels, which seems implausible given that children are also at risk from other sources of exposure. Ultimately, the research team used recently proposed parameters for the IEUBK model that suggest a 0.5 µg/dL change in mean blood lead level is caused by a 11.8 ppb increase in water lead. The team converted this to a 0.04 µg/dL increase in blood lead for every 1 ppb increase in water lead.[240]
- In the absence of national data to characterize the level of lead in drinking water in homes served by LSLs, the research team used two water lead levels for reference: 11.4 ppb lead based on unpublished sampling data from five utilities in the Midwest and 5 ppb from unpublished Canadian data.[241] These levels were selected to represent a system in compliance with the Lead and Copper Rule, and to reflect the upper bound amount of lead in water for a system using optimized corrosion control, respectively.
- About 59 percent of the U.S. population lives in pre-1986 homes according to the American Community Survey, so this analysis assumed the same percentage for the approximately 4 million children in the 2018 birth cohort to arrive at 2,351,498 children residing in homes built before 1986.

- The team assumed that children served by LSLs would have starting blood lead levels similar to the average across children living in all homes built before 1990, specifically 1.16 µg/dL, with 9.2 percent of the cohort having levels of at least 2 µg/dL.
- The team assumed that replacing the LSL in one home would affect one child in the initial cohort (i.e., that one child, rather than multiple children, per cohort will be born into each home).
- The number of children born into homes with replaced LSLs in the next 10 years was estimated separately from the initial cohort. First the percent of the housing stock that each intervention would remediate was calculated by dividing the number of remediated homes by the total housing stock using data from the American Community Survey.[242] This percentage was then used as the likelihood a future child will be born into a remediated home. For example, in the LSL replacement intervention for pre-1986 housing, an estimated 0.3 percent of the housing stock would be remediated. Therefore each future child has a 0.3 percent chance of living in a remediated home. This is likely a conservative estimate because it assumes births are evenly distributed across the housing stock and ignores that children cluster in families and certain styles of homes. The team also conservatively assumed that the impacts would persist for only the next 10 birth cohorts.
- In the absence of national pricing data for full LSL replacement, the research team estimated a per-unit cost of $6,000. A 2008 national survey of utilities found that typical replacement costs ranged widely from $250 for the utility portion and $600 for the customer portion to $3,000 and $4,000, respectively.[243] A recent informal survey of all systems known to be pursuing full LSL replacement suggested that current costs averaged roughly $7,500. The real cost varies greatly across regions, states, and even local providers and by the length of the line, so the research team combined these estimates to calculate a rough $6,000 per unit cost.[244]

Lead paint hazard control

- Using published literature on the effects of lead paint hazard control on dust lead levels and studies of the relationship between levels in dust and those in blood, the team assumed that removing lead paint hazards from homes before children are born would cut their expected blood lead levels by 39.5 percent. This involved a two-step process. First, the team used data from a long-term follow up of lead hazard control interventions, which found an 89 percent decline in dust lead levels 12 years after treatment.[245] The study was conducted in 189 nonrandomly selected homes from multiple regions of the country and did not include a control group for ethical reasons. It is, nevertheless, the largest national evaluation of lead hazard control efforts and its findings align with many smaller studies of lead paint hazard control effects.[246]
- Second, the team used a an analysis of a national cross-sectional survey to predict the effect of decreased dust lead on child blood lead levels.[247] The study was based on blood lead levels from 1999 to 2004. (See "Uncertainty in modeling lead impacts and remediation policies" below.) The data indicated that the above-referenced 89 percent reduction in dust lead would prevent a 39.5 percent increase in children's blood lead levels.
- The team provided an alternative baseline of 10 µg/sq. ft. to illustrate the benefits of the intervention at lower floor dust lead levels.
- The analysis used the American Healthy Homes Survey to estimate that about 75 percent of pre-1960 homes and 50 percent of pre-1978 homes have lead-based paint and would require remediation.[248]
- The team calculated children's baseline blood lead levels based on NHANES data from 2011-14.

- The benefits include one child per home from the 2018 birth cohort as well as additional children likely to be born into the remediated homes in the subsequent 10 years. To calculate the number of children born into a remediated home the team used the same methodology described under "Lead service line replacement" above.

Renovation, repair, and painting

- The team consulted an EPA study which used the Leggett model to determine that following lead-safe renovation practices would prevent a 1.08 µg/dL increase in blood lead levels of children and then used that estimate to model the impact of compliance with the renovation rule enforcement on a single birth cohort, in terms of lifetime earnings, health and education expenditures, and QALYs.[249] The Leggett model enables estimates of blood lead levels and the probability of a child's concentration exceeding levels of concern based on different exposure scenarios.
- Although the EPA does not require clearance dust testing following renovations, these tests were included in this study's cost calculations because they are necessary to confirm the safety of a home or child care facility before children are allowed to re-enter.
- The team included the annual cost of compliance for all homes and child care facilities built before 1978 so that it could use cost information from the EPA's regulatory impact assessment. However, to be consistent with all of the interventions modeled in this report, the team only counted benefits for children from the 2018 cohort living in those homes or visiting those facilities. As discussed, some limited benefits would also accrue to homes without children, but those impacts were excluded from the modeling.

Aviation gas

- The team used published research to determine that children living closer than 0.6 miles from airports using leaded gas have blood lead levels that are 5.7 percent higher than those living further away.[250]
- The team used EPA's estimated number of people living within 0.6 miles from airports serving piston engine aircraft and assumed based on the NHANES 2011-14 blood lead distribution that the children living within that proximity had baseline blood lead levels similar to the national average.
- Other researchers have found larger benefits than those shown in this report or studied the effects of aviation emissions to the population of children living farther (up to 2.5 miles) from an airport serving piston engine aircraft.[251] However, the research team found no published data on the number of such children nationwide and so only modeled the distance for which data were available: 0.6 miles.

Early and middle childhood education and care

To estimate the potential impact of early and middle childhood care and education interventions on children who have high blood lead levels, Child Trends identified evidence-based interventions and determined their effect size on outcomes for children with other disadvantages, such as poverty and trauma, in the SGM, specifically, reading and math scores, antisocial behavior, and hyperactivity, which are all areas of potential deficit in lead-exposed children. Child Trends evaluated the early childhood literature to identify specific programs that have been rigorously evaluated and demonstrated to improve outcomes for children at risk for or displaying cognitive and behavioral deficits. Programs selected for the modeling effort have been the subject of previous meta-analyses (reviews that compared multiple studies to determine typical effects), randomized controlled trials, and quasi-experimental evaluations. In addition, research shows that addressing such disadvantages has strong economic benefits, which are not included in this analysis.[252]

To develop the list of programs to be considered, Child Trends reviewed high-quality interventions recommended by subject matter experts, meta-analyses, and the following additional resources:

- Blueprints for Healthy Youth Development's compendium of evidence-based program evaluations of interventions for children and youth.[253]
- *The Nurture Effect: How the Science of Human Behavior Can Improve Our Lives and Our World.* Oakland, CA: New Harbinger.[254]
- Child Trends' LINKS Compendium of random assignment intent-to-treat evaluations of social interventions for children. [255]
- *Early Childhood Roots of Bullying: Early Childhood Investigations Webinar.* Child Trends.[256]

To be included, interventions must have been subject to a randomized evaluation and an intent-to-treat analysis. In addition, the program had to have served children in either early or middle childhood and reported on one or more outcome categories included in the SGM, academic, behavioral, or both.

To determine the effect size of the interventions on academic and behavioral outcomes, Child Trends initially categorized programs into either early childhood (0-5 years old) or middle childhood (6-11 years old). Because some were implemented over a period of time, which resulted in data being collected in waves, Child Trends only included the final outcome measures for those interventions. In cases when a program evaluation measured multiple aspects of a behavioral or academic outcome, Child Trends calculated the mean effect size for each outcome in that evaluation. Finally, to determine the overall effect size of early childhood and middle childhood interventions, the research team used the median value across all of the program evaluations for reading, math, and behavior, including significant and insignificant findings. A summary of the basis for the effect size calculations is available upon request and includes a list of the research used as well as effect sizes and average blood lead levels reported in each study.

Uncertainty in modeling lead impacts and remediation policies

Modeling the long-term impacts, costs, and benefits of early childhood focused lead remediation and prevention policies is complex and involves high levels of uncertainty. Given available data, an analysis cannot generate wholly accurate estimates of the effects of specific policies in reducing future blood lead levels in children and mitigating the various effects of lead exposure, but rather is most useful to provide more insight into which policies would most likely be effective and cost-beneficial and how policies might best be structured to help ensure their usefulness. The long-term nature of the harms resulting from lead exposure and data limitations in quantifying these harms necessitates a multistage modeling process that can compound the effects of uncertainties from different sources.

Strong evidence indicates that early childhood lead exposure is statistically correlated with intermediate outcomes, such as IQ, reading, math, and behavior, and that they, in turn, are statistically related to lifetime outcomes, particularly earnings and educational attainment.

However, the modeling team has found neither data that directly links primary prevention interventions or blood lead exposure to lifetime earnings outcomes nor studies designed to prove causality in an early childhood lead exposure and earnings relationship. Therefore, for this project the modeling team used studies that measured the impact of lead exposure on IQ (Value of Prevention Tool) and reading scores, math scores, and behavioral outcomes (Social Genome Model) as intermediate outcomes to predict lifetime outcomes. As a result, defining traditional statistical levels of uncertainty or "confidence intervals" in the results is not possible. Statistical

measurements of uncertainty are driven by standard errors and are designed to measure the relationship of multiple variables taken from data analyzing a single sample of participants.

As a substitute, the modeling team performed three separate analyses to address concerns about the uncertainty of the estimates of the lifetime benefits of reducing childhood lead exposure via policy interventions. The first was a qualitative exploration and the second was a set of "bounding exercises" to frame possible upper and lower limits on the impact of certain model results. Assuming appropriate data were used in other modeling steps, these exercises show the maximum possible benefit (the prevention of any lead exposure, and therefore the complete elimination of lead in children's blood) that might be achieved through various policy interventions. Finally, the modeling team used the VP Tool to perform sensitivity analyses on key areas of uncertainty.

Sensitivity analyses do not estimate statistical uncertainty, but they do provide descriptive, quantitative evidence on how the dependent outcomes of a modeling process change depending on the inputs. The analyses chosen to run were prioritized because either the parameter values were believed to be particularly uncertain (e.g., there are a wide range of values in the literature) or parameter values for which even small changes in input values result in large changes in the final results.

Qualitative description of uncertainty

The estimation of lifetime benefits of lead abatement policies is a multistage process, with uncertainties at each step. To address these, the team developed a brief qualitative description of the modeling details relevant to each step and of how each effect size might be larger or smaller in the real world.

Step 1: Impact of a policy intervention on lead in the environment and in children's blood

The ability to quantify the magnitude of the effect of intervention policies on environmental and childhood blood lead levels varies depending on the data available for each intervention. Whenever possible, the modeling team used real-world risk and effect-size data from controlled evaluations of lead interventions; other types of studies were also employed as needed. In some cases, no one clear effect size was evident, and the modeling team relied on subject matter experts' guidance to select an input for the model.

For example, for the first intervention examined, the replacement of residential LSLs, as discussed previously, because of a lack of data the modeling team estimated water lead levels before and after a lead service line replacement intervention. To address the uncertainty, the team modeled two starting water levels: 11.4 µg/dL and 5 µg/dL.

The second intervention, residential lead hazard control, has been more extensively studied, and the data have shown robust effects over long periods. The study used in this analysis to generate the effect size for lead paint hazard control was conducted between 2008 and 2009.[257] If lead hazard control abatement and interim control techniques and standards have improved since then, the data may underestimate the impact of lead hazard control implemented today. Whether dust lead levels are higher or lower than those in the underlying study is unknown, and as pre-1960 housing continues to age, dust lead levels attributed to deteriorated paint may increase. The modeling team presented two baseline floor dust lead scenarios to examine the impact of varying dust lead levels on the predicted benefits.

Modeling lead paint hazard control required a second step of predicting the effect of lower dust lead levels on childhood blood lead. The modeling team considered a mix of evidence for this effect size. Although the range was much tighter than the lead service line effect sizes, the team similarly relied on bounding assumptions

that the intervention could prevent some but not all lead exposure. However, whether the assumed effect size accurately states, overstates, or understates the impact is unclear.

As with lead service line replacement, the third intervention, improved renovation and repair standards, has a limited evidence base regarding impact. Some previous work explored the effect of a renovation on raising child blood lead levels when compared to no renovation, but the modeling team could not find any analyses that specifically compared the effects of safe versus unsafe practices on blood lead levels. However, one study looked at the impact of following the EPA rule requirements on dust lead levels,[258] and strong anecdotal evidence and expert opinion indicate that renovations pose some of the most acute risks because they disturb and spread lead dust.

As a result, the modeling team relied heavily on previous work by the EPA for this intervention. Because this model is looking at the prevention of a spike in blood lead levels, it is not as well bounded as the previous interventions. Additionally, renovation activities are likely to cause short-term spikes in blood lead rather than prolonged exposure as from lead in soil or water, and because the comparative effects of short- vs. long-term exposure are not well studied, the model may overstate the impacts of the improved standards.

The final intervention, removal of lead from aviation gas, was modeled differently. No data are available on the prohibition of leaded aviation fuel because it has not been done. So the modeling team attempted to estimate the effect of childhood exposure to aviation gas through the differential of blood lead between children living near airports (within 0.6 miles) compared with those living farther away (more than 2.5 miles). Then, using that figure, the modeling team was able to predict the amount of blood lead that might be prevented by eliminating leaded aviation gas. This approach may understate the impacts because it assumes that children living more than 2.5 miles from an airport are not exposed to lead from aviation emissions, which is probably untrue and leads to a conservative estimate.

Step 2: Impact of childhood blood lead levels on intermediate outcomes

After predicting the impact on childhood blood lead levels of the four policy interventions, the modeling team used a more comprehensive set of literature to estimate the impact on intermediate childhood outcomes. These analyses primarily rely on regression modeling, which derives the relationship between blood lead levels and childhood IQ, reading, math, and behavioral outcomes from data for a sample of children. These regression-based approaches bring specific uncertainties into the modeling process. First, they are not designed to demonstrate causal links between exposure and outcomes—that is, they are not random-assignment studies—which could result in effect sizes that overstate the relationship. Because these are not random-assignment studies, they instead must use control variables to account for other characteristics, such as socioeconomic status, related to lead exposure and outcomes. These models could be missing key variables, which could also result in overstated effect sizes. Alternatively, these models might over-control for certain variables and therefore understate the relationship between lead and later outcomes.

Extrapolating results from this literature also includes some level of uncertainty. These studies may include sampling errors, although many, such as those that explore the relationship between blood lead and reading and math scores, have large sample sizes and probably low error levels. Nevertheless, sampling errors could understate or overstate the true impacts. More concerning is the ability to apply the findings to children with very low blood lead levels because most of these studies do not address that population and instead looked at children with levels between 2 and 10 µg/dL. However, the majority of children today in the U.S. fall well below these levels. The modeling team therefore extrapolated results for blood lead levels greater than 2 µg/dL to children

below that level and assumed linear relationships, which may over- or understate the effect sizes at lower levels. If lead exposure below a certain threshold does no biological harm, then the linear extrapolations would overstate the true relationship, but if, as suggested by some experts, a supralinear relationship continues at very low levels, this analysis could be understating the effect. (Note that the VP tool used different effect sizes for blood lead levels below 5 µg/dl, 5-10 µg/dl, and above 10 µg/dl to reflect the nonlinear relationship found in the literature). Finally, uncertainty persists about the cumulative impacts of lead exposure, and the studies used for this analysis, which look only at point-in-time relationships, may understate the true relationship between blood lead and IQ, reading, math, and behavioral outcomes.

Step 3: Effect of intermediate outcomes on lifetime outcomes

Similar to the above steps connecting blood lead levels to intermediate outcomes, the relationships between those intermediate outcomes and lifetime earnings and educational attainment are based on previous regression models and literature. The SGM's and VP Tool's approaches to estimating earnings diverge somewhat in this step, with the former relying on its well-tested and established microsimulation model, and the latter using previous literature on the relationship between IQ and lifetime earnings.

The SGM is a regression-based model which raises concerns similar to those outlined in Step 2 above, in that it might overstate the relationship if it misses important control variables or because it cannot show a causal link between the regression-generated results. Additionally, the SGM process does not produce a direct calculation of standard errors; hence, it does not provide a range around the estimated effects into which the true effect will fall. Nevertheless, the effects shown represent the model's best estimates.

The final uncertainty concern in the SGM results from the use of data on past children to predict effects for future children. The cohorts from which the samples were drawn entered adulthood as long ago as the early 1980s and grew up with much higher levels of childhood lead exposure than exist today, which could be reflected in their outcome measures. Therefore, applying their childhood and adult experiences to children born in 2018 and later could cause the modeling to understate or overstate the relationship between intermediate and lifetime outcomes, but given the increasing importance of cognitive skills for life success, they are more likely to understate the effect sizes.

In contrast, the VP Tool uses academic literature to connect intermediate childhood IQ to lifetime earnings. The greatest amount of uncertainty in this relationship involves IQ measurements collected at different points in time. In particular, the IQ that is connected to childhood blood lead comes from tests of children at younger ages (5-10), but the IQ measurements used to estimate impacts on lifetime earnings are from older children (around age 18). If childhood IQ is not perfectly predictive of adolescent IQ, this process may understate or overstate the effect of childhood blood lead on lifetime earnings. Further, these relationships are estimated through regression models, which are subject to the same concerns listed above regarding the use of regression in the SGM process, except for those related to older samples and to direct standard error calculations.

Bounding exercises to measure uncertainty in effect sizes

A useful process to measure and constrain uncertainty in the estimation of effect sizes is to run the models assuming a complete elimination of blood lead. Although this process still contains uncertainty surrounding the blood lead-to-lifetime outcome effect sizes described in Steps 2 and 3 above, it provides a useful upper bound on the potential impacts of a given policy. In this analysis, the modeling teams ran the models measuring the impacts of preventing blood lead levels from rising above 0 µg/dL. Although this is an impossible real-life scenario, it represents a maximum bound on achievable benefits for all policies.

The results of the bounding runs are available in Tables 1 and 2 of the report.

Quantitative sensitivity analyses

To address uncertainties that could not be tested in the bounding exercises, particularly those described in Steps 2 and 3 above, the modeling team performed quantitative sensitivity analyses using the VP Tool on the "Prevent all Lead Exposure" hypothetical modeling scenario. (See Table 1.) These analyses help to better understand and describe the sensitivity of the findings to changes in the input assumptions, coefficients, and data points.

Inputs and coefficients were selected for sensitivity analyses based on their likelihood of having substantial impacts on the final results or if the published values in the literature varied substantially. Alternative values for each coefficient were chosen through literature reviews and typically had been used in previous analyses by other authors. Details on how each alternative value was selected can be found below in the detailed discussion of each result.

Although the sensitivity analyses were run on the hypothetical "total prevention" scenario, the results are relevant to all four interventions modeled in the report. In general, the relative change in benefits would be similar in the other modeling results. For example, an alternative input that reduced the total benefits in this sensitivity analysis by 50 percent would probably have close to the same effect on any of the four policy cost-benefit analyses. (See Table A.5.)

Table A.5

Value of Prevention Tool Sensitivity Analysis Results

			Total discounted benefits	Benefit per child
Results using original inputs			$84 billion	$21,000
Input tested	Original value	Alternative value	Alternative total discounted benefits	Alternative benefit per child
Blood lead level (BLL) to IQ effect size (<5 µg/dL)	1.15	2.53	$174 billion	$44,000
BLL to IQ effect size (<5 µg/dL)	1.15	0.51	$42 billion	$11,000
IQ to lifetime earnings effect size	2.27%	1.10%	$45 billion	$11,000
Population BLL distribution	1.11	0.95	$74 billion	$16,000
Real wage growth	1%	0%	$57 billion	$14,000
Gross domestic product multiplier	1.00	1.92	$155 billion	$39,000
Valuation of QALYs	$50k	$0k	$81 billion	$20,000
Discount rates	3%	1%	$208 billion	$52,000
		5%	$38 billion	$9,000
		7%	$19 billion	$5,000

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Blood lead level-to-IQ effect size

The modeling team reviewed the available research to ensure that its estimates of the effect size on IQ of lead in blood were appropriate. The literature included several prospective and cross-sectional epidemiologic studies conducted in diverse populations with adjustment for socioeconomic variables as well as parental intelligence, education, and caregiving quality and stimulation. The studies provide strong support of the loss of neurocognition among young children with blood lead concentrations.[259] The research literature also included a pooled analysis of children ages 4.8-10 who participated in seven prospective studies conducted in Boston, Cincinnati, Cleveland, and Rochester, New York, in the U.S. as well as Mexico City; Port Pirie, Australia; and Kosovo, Yugoslavia, which found associations between blood lead levels and deficits in full-scale intelligence quotient (FSIQ), infant mental development, memory, learning, and executive function in children ages 2-17 with mean blood levels (measured at various life stages and time periods) of 5 to 10 µg/dL. As discussed above, when using this pooled analysis only study estimates of children with the lowest peak blood lead (<7.5 µg/dL and <10 µg/dL) were included for the <5µg/dL effect size. The range of concurrent blood lead levels from these categories was 0.9 to 7.4 µg/dL and 0.1 to 9.8 µg/dL.

The team was particularly interested in whether the relationship between blood lead and IQ persisted at blood levels less than 5 µg/dL. Although few studies extend this relationship below 2 µg/dL, several found IQ deficits in children ages 2-10 with lower mean blood lead levels of 3 to 5 µg/dL.[260] Specifically, in analyses of the Boston and Rochester cohorts and of data pooled across all seven cohorts but restricted to children in the lower blood lead range (e.g., up to 10 µg/dL), associations were observed in children with mean levels of 3 to 4 µg/dL.[261] The mean blood lead levels in these subsets of children were 3.3 µg/dL (Rochester) and 3.8 µg/dL (Boston), which are closer to those of current U.S. children compared with other prospective studies. Further, the Rochester cohort study considered the effects of several variables, including gender, family income, maternal education, race, prenatal maternal smoking, birth weight, and maternal IQ.[262]

The modeling team, with input from members of the advisory committee, made separate estimates for the blood lead-to-IQ effect size depending on starting blood level (<5 µg/dL, 5-10 µg/dL, and 10+ µg/dL), as described above. The estimate for levels below 5 µg/dL had by far the greatest impact on the final results because based on data from NHANES 2011-14, more than 90 percent of children in the U.S. fall into this group.

For the <5 µg/dL category, five estimates from the literature produced an average effect size of 1.15 IQ points per 1 µg/dL blood lead, which was used in the original analyses for this report. This result is somewhat smaller than previous EPA estimates used in regulatory studies (1.75 in the NAAQS final rule and 2.94 in the 2015 cost-benefit analysis on the Steam Electric Power Standards) but somewhat larger than the 0.51 coefficient used in previous research.[263] The 2.94 and 0.51 values are both based on a 2005 pooled analysis, which also was among the studies used to derive the original assumptions for this report.[264] The 2.94 is based on the linear relationship of children below 7.5 µg/dL, and the 0.51 is from the log-linear relationship of children between 2.4 and 10 µg/dL.

The team performed two sensitivity analyses on the blood lead-to-IQ effect size using alternate estimates of 2.53 and 0.51. The team selected these values because 2.53 is corrected from a re-analysis of the 2005 study's <7.5 µg/dL subsample (previously 2.94) and 0.51 is commonly used in other lead remediation studies.[265] As seen in Table A.5, both alternate values had a substantial impact on the final results, changing the total discounted benefits from $84 billion to $174 billion and $42 billion, respectively.

Lifetime earnings-to-IQ effect size

As previously discussed, the modeling team used an average of studies on the relationship between IQ and earnings, while excluding studies that over-controlled for educational attainment or failed to calculate effect sizes for both males and females. The 2.27 percent increase in earnings per IQ point was calculated from the mean of three studies. Some additional literature, which the team excluded for the reasons stated above, favors a value closer to 1.1 percent.[266] The team therefore selected 1.1 percent for the sensitivity analysis, and similar to the IQ-to-blood lead effect size, this change had a large impact on the results, reducing total discounted benefits to $45 billion.

Starting blood lead levels

The modeling team defined population blood lead levels using the two most recent samples from NHANES data (2011-12 and 2013-14), as explained above. The team used a combined sample to provide demographic breakouts of lead exposure as well as a larger dataset, which reduces uncertainty. However, given the persistent downward trend in child blood lead levels since the start of NHANES data collection, the mixture of the two samples could overestimate population blood lead concentrations. To account for this possibility, the team ran a sensitivity analysis using only the 2013-14 distribution, which has a slightly lower mean (0.95 µg/dL vs. 1.1 µg/dL) and a smaller percentage of children above important thresholds (2 µg/dL and 5 µg/dL). The sensitivity analysis revealed relatively small impacts of the alternate data set on the results.

Real wage growth

The benefit calculations were particularly sensitive to assumptions about the labor market and future earnings. Real wage growth was estimated to be 1 percent, which has been used in previous work on childhood lead exposure and is similar to estimates used in other economic projections.[267] An alternative assumption of 0 percent real wage growth had a significant impact on the results, reducing the benefits from $84 billion to $57 billion.

Gross domestic product

The team did not include in the original model gross domestic product (GDP) multiplier effects of the increased income resulting from reduced childhood lead exposure. Some previous work in this area does include such impacts, which result from the assumption that an individual who gains $1 in income will spend some of that dollar, increasing GDP by more than $1.[268] This concept is debated among economists, though most generally agree that the real-world multiplier is greater than 1.0 and that the effect is larger when the economy is not at full employment. The modeling team made a conservative assumption by not including a multiplier effect for this work. Not using a GDP multiplier makes the results more consistent with previous work that also did not include this effect.[269]

An alternative multiplier value of 1.92 was derived using data from the Bureau of Economic Analysis and the ratio of GDP to earned income,[270] which have been relatively consistent over the past 10 years, ranging from about 1.86 to 1.92. Altering this assumption to 1.92 had a significant impact on the results, increasing the total benefits from $84 to $155 billion.

Valuation of QALYs

Another impact of reducing childhood lead exposure is greater longevity resulting from reduced risk of disease, the benefits of which are captured in the model in multiple ways: reductions in health spending, increases in lifetime earnings, and QALYs, a calculation of the "implicit value" of added years of life. QALYs is a somewhat intangible benefit but one that is commonly included in regulatory analyses.[271] The modeling team used a conservative valuation of $50,000 per QALY, and a sensitivity analysis to omit this variable (e.g., valuing a QALY at zero) produced a very similar final result of $81 billion.

Discount rate

In an economic analysis, the rate at which the value of future benefits decreases relative to present-day dollars has a substantial impact on the results. Because many of the benefits from reducing childhood lead exposure come from earnings many years in the future, the discount rate has a very large impact on the findings in this study. A discount rate of 3 percent has become relatively standard in regulatory analyses, though, in the past, the Office of Management and Budget and the Congressional Budget Office have advocated for using both 7 percent and 3 percent. To address this variation in the field, the modeling team conducted a sensitivity analysis at the 7 percent discount rate. The results were a substantially smaller present value, $19 billion rather than $84 billion.

Although government cost-benefit analyses tend to use 3 percent and 7 percent, some economists suggest that discount rates over longer time horizons should be much lower. In particular, they have argued that when analyzing intergenerational transfers (interventions paid for today that benefit future generations), discount rates closer to zero percent are more appropriate.[272] Conducting the sensitivity analysis using a smaller discount rate of 1 percent yielded far greater total discounted benefits of $208 billion.

Endnotes

1 Ronnie Levin et al., "Lead Exposures in U.S. Children, 2008: Implications for Prevention," *Environmental Health Perspectives* 116, no. 10 (2008): 1285–93, http://dx.doi.org/10.1289/ehp.11241; Susan M. Bernard and Michael A. McGeehin, "Prevalence of Blood Lead Levels >5 µg/dL Among U.S. Children 1 to 5 Years of Age and Socioeconomic and Demographic Factors Associated With Blood of Lead Levels 5 to 10 µg/dL, Third National Health and Nutrition Examination Survey, 1988–1994," *Pediatrics* 112, no. 6 (2003): 1308–13, http://pediatrics.aappublications.org/content/112/6/1308.

2 Richard Rabin, "The Lead Industry and Lead Water Pipes: A Modest Campaign," *American Journal of Public Health* 98, no. 9 (2008): 1584–92, http://dx.doi.org/10.2105/AJPH.2007.113555.

3 U.S. Environmental Protection Agency, "Phasing Down Lead in Gasoline," *Environmental Protection Agency Journal* 11, no. 4 (1985), https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=93000E80.txt.

4 Gerald Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children*, 2013 (Berkeley, CA: University of California Press, 2013).

5 National Research Council Committee on Measuring Lead in Critical Populations, *Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations*; International Labour Organisation, "White (Painting) Convention," 1921 (No. 13), accessed March 20, 2017, http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312158.

6 International Labour Organisation, "White (Painting) Convention"; David E. Jacobs, "Lead Poisoning: Focusing on the Fix," *Journal of Public Health Management & Practice* 22, no. 4 (2016): 326, http://dx.doi.org/10.1097/PHH.0000000000000430; Gerald E. Markowitz and David Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution* (Berkeley: University of California Press, 2002).

7 David E. Jacobs, "Lead Poisoning: Focusing on the Fix"; Richard Rabin, "The Lead Industry and Lead Water Pipes: A Modest Campaign."

8 Lead-Soldered Food Cans. 60 Fed. Reg. 33106 (June 27, 1995), https://www.gpo.gov/fdsys/granule/FR-1995-06-27/95-15593.

9 David E. Jacobs, "Lead Poisoning: Focusing on the Fix"; Gerald E. Markowitz and David Rosner, *Deceit and Denial*.

10 David E. Jacobs, "Lead Poisoning: Focusing on the Fix"; Gerald E. Markowitz and David Rosner, *Deceit and Denial*, 58.

11 U.S. Environmental Protection Agency, "Phasing Down Lead in Gasoline."

12 U.S. Food and Drug Administration, "Lead-Based Paint Poisoning Prevention Act," accessed April 14, 2017, https://www.fda.gov/RegulatoryInformation/LawsEnforcedbyFDA/ucm148755.htm; Randolph K. Byers and Elizabeth E. Lord, "Late Effects of Lead Poisoning on Mental Development," *American Journal of Diseases of Children* 66, no. 5 (1943): 471–94, http://rachel.org/files/document/Late_Effects_of_Lead_Poisoning_on_Mental_devel.pdf; Gerald E. Markowitz and David Rosner, *Deceit and Denial*, 58.

13 U.S. Environmental Protection Agency, "EPA History: Lead," accessed April 12, 2017, https://www.epa.gov/history/epa-history-lead; U.S. Energy Information Administration, "Gasoline Explained: Gasoline and the Environment," accessed Feb. 7, 2017, http://www.eia.gov/energyexplained/?page=gasoline_environment.

14 Man-Fung Tsoi et al., "Continual Decrease in Blood Lead Level in Americans: United States National Health Nutrition and Examination Survey 1999-2014," *American Journal of Medicine* 129, no. 11 (2016): 1213–18, http://dx.doi.org/10.1016/j.amjmed.2016.05.042; William Wheeler and Mary Jean Brown, "Blood Lead Levels in Children Aged 1-5 Years—United States, 1999-2010," *Morbidity and Mortality Weekly Report* 62, no. 13 (2013): 245–48, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6213a3.htm.

15 Centers for Disease Control and Prevention, "What Do Parents Need to Know to Protect Their Children?" accessed Jan. 27, 2017, https://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm.

16 National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (meeting of the Lead Poisoning Prevention Subcommittee of the NCEH/ATSDR Board of Scientific Advisors, record of the proceedings, Atlanta, Sept. 19, 2016), https://www.atsdr.cdc.gov/science/lpp/docs/lead_subcommittee_minutes_9_19_2016_508.pdf.

17 Ibid.

18 Centers for Disease Control and Prevention, "Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women" (Atlanta: U.S. Department of Health and Human Services, Nov. 2010), https://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf. During pregnancy and lactation, lead stored in bones can release into a mother's blood.

19 U.S. Environmental Protection Agency, "Review of the National Ambient Air Quality Standards for Lead," Fed. Reg. 81, no. 201, Oct. 18, 2016, https://www.gpo.gov/fdsys/pkg/FR-2016-10-18/pdf/2016-23153.pdf; U.S. Environmental Protection Agency, "Lead; Identification of Dangerous Levels of Lead; Final Rule," 40 CFR Part 745, Fed. Reg. 66, no. 4 (2001): 1206–40, https://www.gpo.gov/fdsys/pkg/FR-2001-01-05/pdf/01-84.pdf; Code of Federal Regulations, Protection of Environment, Title 40, Part 141 (1991), http://www.ecfr.gov/cgi-bin/text-idx?SID=531617f923c3de2cbf5d12ae4663f56d&mc=true&node=sp40.23.141.i&rgn=div6; Department of Health and Human Services, National Institute for Occupational Safety and Health, "Occupational Safety and Health Guideline for Inorganic Lead," accessed April 17, 2017, https://www.cdc.gov/niosh/docs/81-123/pdfs/0368.pdf; "Citizen Petition to EPA Regarding the Paint and Dust Lead Standards" (Aug. 10, 2009): http://www.nchh.org/Portals/0/Contents/EPA_Lead_Standards_Petition_Final.pdf.

20 U.S. Environmental Protection Agency, "What Are the Health Effects of Lead?" *Learn About Lead* (March 2017), https://www.epa.gov/lead/learn-about-lead#effects.

21 Ibid.; Bruce Lanphear et al., "Low Level Environmental Lead Exposure and Children's Intellectual Function: An International Pooled Analysis," *Environmental Health Perspectives* 113, no. 7 (2005): 894–99, https://dx.doi.org/10.1289/ehp.7688; email from David Bellinger, Harvard Medical School, to Jee-Young Kim, EPA (2008)—subject: request for additional information on Bellinger and Needleman (2003) (EPA-HQ-OAR-2006-0735-5156), U.S. Environmental Protection Agency, http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2006-0735-5156; email from Dr. Richard Canfield, Cornell University, to Jee-Young Kim, USEPA (2008)—subject: request for additional information on Canfield et al. (2003) (EPA-HQ-OAR-2006-0735- 5811), U.S. Environmental Protection Agency, http://www.regulations.gov/#!documentDetail;D=EPAHQ-OAR-2006-0735-5811; email from Richard Hornung, Cincinnati Children's Hospital Medical Center (CCHMC), to Jee-Young Kim, USEPA (2008)—subject: request for additional information on Lanphear et al. (2005) (EPA-HQ-OAR-2006-0735-5814), U.S. Environmental Protection Agency, http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2006-0735-5814; email from Martha Tellez-Rojo, Center of Investigation in Evaluation and Polls, National Institute of Public Health, to Jee-Young Kim, USEPA (2008)—subject: questions on the Tellez-Rojo et al. (2006) paper (EPAHQ-OAR-2006-0735-5123).

22 U.S. Environmental Protection Agency, "Integrated Science Assessment for Lead" (2013), https://www.epa.gov/isa/integrated-science-assessment-isa-lead.

23 U.S. Environmental Protection Agency, "Integrated Science Assessment for Lead."

24 Atmaram Yarlagadda et al., "Blood-Brain Barrier: The Role of Calcium Homeostasis," *Psychiatry (Edgmont)* 4, no. 12 (2007): 55–59, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2861516; Elizabeth Prado and Kathryn Dewey, "Nutrition and Brain Development in Early Life," *Nutrition Reviews* 72, no. 4 (2014): 267–84, https://doi.org/10.1111/nure.12102.

25 U.S. Environmental Protection Agency, "Air Quality Criteria for Lead—Volume I" (October 2006), http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=459555; Talia Sanders et al., "Neurotoxic Effects and Biomarkers of Lead Exposure: A Review," *Environmental Health* 24, no. 1 (2009): 14, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2858639/pdf/nihms190515.pdf.

26 U.S. Environmental Protection Agency, "West Calumet Housing Complex—East Chicago, Ind.," accessed Jan. 27, 2017, https://www.epa.gov/uss-lead-superfund-site/west-calumet-housing-complex-east-chicago-ind; Agency for Toxic Substances and Disease Registry, "Public Health Assessment for U.S. Smelter and Lead Refinery Inc. (USS Lead) East Chicago, Indiana" accessed Feb. 14, 2017, https://www.atsdr.cdc.gov/HAC/pha/USSmelterandLeadRefinery/USSLeadPHABlue01272011.pdf.

27 U.S. Environmental Protection Agency, "West Calumet Housing Complex—East Chicago, Ind."

28 Council on Environmental Health, "Prevention of Childhood Lead Toxicity," *Pediatrics* 138, no. 1 (2016), http://dx.doi.org/10.1542/peds.2016-1493; National Center for Healthy Housing, "Find It, Fix It, Fund It: A Lead Elimination Action Drive," accessed Jan. 27, 2017, http://www.nchh.org/Portals/0/Contents/Find-It-Fix-It-Fund-It.pdf; Ruth Ann Norton, "Strategic Plan to End Childhood Lead Poisoning," Green & Healthy Homes Initiative Blog, accessed Jan. 27, 2017, http://www.greenandhealthyhomes.org/StrategicPlanforEndingLeadPoisoning; Earthjustice, "Health, Environment & Children's Groups Call for National Strategy to End Lead Poisoning and Lead Exposure," Oct. 24, 2016, http://earthjustice.org/news/press/2016/health-environment-children-s-groups-call-for-national-strategy-to-end-lead-poisoning-and-lead-exposure; President's Task Force, "Federal Strategy"; Centers for Disease Control and Prevention, "Preventing Lead Poisoning in Young Children" (August 2005), https://www.cdc.gov/nceh/lead/publications/prevleadpoisoning.pdf; Nick Farr and Cushing N. Dolbeare, "Childhood Lead Poisoning: Solving a Health and Housing Problem" *Cityscape* 2, no. 3 (1996): 167–81, https://www.huduser.gov/periodicals/cityscpe/vol2num3/farr.pdf; Centers for Disease Control and Prevention, "Preventing Lead Exposure in Young Children: A Housing-Based Approach to Primary Prevention of Lead Poisoning" (Atlanta: CDC, 2004), https://www.cdc.gov/nceh/lead/publications/primarypreventiondocument.pdf; U.S. Environmental Protection Agency, "Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council" (2015), https://www.epa.gov/sites/production/files/2016-01/documents/ndwaclcrwgfinalreportaug2015.pdf; Educational Services for Children Affected by Lead Expert Panel, "Educational Interventions for Children Affected by Lead" (2015), https://www.cdc.gov/nceh/lead/publications/educational_interventions_children_affected_by_lead.pdf; Centers for Disease Control and Prevention, "Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women" (Atlanta: U.S. Department of Health and Human Services, November 2010), https://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf.

29 The models include impacts for the 2018 birth cohort up to age 100 and estimate the number of children alive at each age using CDC Underlying Cause of Death data. A decreasing percentage of the cohort is predicted to be alive and receiving the benefits of lead reduction at older ages. For example, at age 100 approximately 4 percent of individuals are projected to still be alive.

30 A.C. Klassen et al., "Best Practices for Mixed Methods for Quality of Life Research," *Quality of Life Research* 21, no. 3 (2012): 377–80, https://doi.org/10.1007/s11136-012-0122-x; Sachiko Ozawa and Krit Pongpirul, "10 Best Resources on ... Mixed Methods Research in Health Systems," *Health Policy and Planning* 29 (2014): 323–27, https://doi.org/10.1093/heapol/czt019.

31 Isabel V. Sawhill and Richard V. Reeves, "Modeling Equal Opportunity," *The Russell Sage Foundation Journal of the Social Sciences* 2, no. 2 (2016): 60–97; Gregory Acs et al., "The Social Genome Model: Estimating How Policies Affect Outcomes, Mobility and Inequality Across the Life Course," *Journal of Social Issues* 72 (2016): 656–75, http://dx.doi.org/10.1111/josi.12188.

32 Lisa Chiodo et al., "Blood Lead Levels and Specific Attention Effects in Young Children," *Neurotoxicology and Teratology* 29, no. 5 (2007): 538–46, https://doi.org/10.1016/j.ntt.2007.04.001; Marie Lynn Miranda et al., "The Relationship Between Early Childhood Blood Lead Levels and Performance on End-of-Grade Tests," *Environmental Health Perspectives* 115, no. 8 (2007): 1242–47, https://doi.org/10.1289/ehp.9994; Michael J. Blackowicz et al., "The Impact of Low-Level Lead Toxicity on School Performance Among Hispanic Subgroups in the Chicago Public Schools," *International Journal of Environmental Research and Public Health* 13, no. 8 (2016): 774, https://dx.doi.org/10.3390%2Fijerph13080774; Anne Evens et al., "The Impact of Low-Level Lead Toxicity on School Performance Among Children in the Chicago Public Schools: A Population-Based Retrospective Cohort Study," *Environmental Health* 14, no. 24 (2015): 21, https://doi.org/10.1186/s12940-015-0008-9; Katarzyna Kordas et al., "Deficits in Cognitive Function and Achievement in Mexican First-Graders With Low Blood Lead Concentrations," *Environmental Research* 110, no. 3 (2006): 371–86, https://doi.org/10.1016/j.envres.2005.07.007; Bruce Lanphear et al., "Cognitive Deficits Associated With Blood Lead Concentrations <10 microg/dL in U.S. Children and Adolescents," *Public Health Reports* 115, no. 6 (2000): 521–29, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1308622; David Bellinger, Karen Stiles, and Herbert Needleman, "Low-Level Lead Exposure, Intelligence and Academic Achievement: A Long-Term Follow-Up Study," *Pediatrics* 90, no. 6 (1992): 855–61, https://www.ncbi.nlm.nih.gov/pubmed/1437425.

33 U.S. Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Emergency and Environmental Health Services, "National Surveillance Data (1997–2015)," last updated Oct. 28, 2016. https://www.cdc.gov/nceh/lead/data/national.htm.

34 Bruce Lanphear et al., "Low Level Environmental Lead Exposure and Children's intellectual Function: An International Pooled Analysis," *Environmental Health Perspectives* 113, no. 7 (2005): 894–99, https://dx.doi.org/10.1289/ehp.7688; email from David Bellinger, Harvard Medical School, to Jee-Young Kim, EPA (2008)—subject: request for additional information on Bellinger and Needleman (2003) (EPA-HQ-OAR-2006-0735-5156), U.S. Environmental Protection Agency, http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2006-0735-5156; email from Dr. Richard Canfield, Cornell University, to Jee-Young Kim, USEPA (2008)—subject: request for additional information on Canfield et al. (2003) (EPA-HQ-OAR-2006-0735-5811), U.S. Environmental Protection Agency, http://www.regulations.gov/#!documentDetail;D=EPAHQ-OAR-2006-0735-5811; email from Richard Hornung, Cincinnati Children's Hospital Medical Center (CCHMC), to Jee-Young Kim, USEPA (2008)—subject: request for additional information on Lanphear et al. (2005) (EPA-HQ-OAR-2006-0735-5814), U.S. Environmental Protection Agency, http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2006-0735-5814; email from Martha Tellez-Rojo, Center of Investigation in Evaluation and Polls, National Institute of Public Health, to Jee-Young Kim, USEPA (2008)—subject: questions on the Tellez-Rojo et al. (2006) paper (EPAHQ-OAR-2006-0735-5123).

35 Bruce Lanphear et al., "Cognitive Deficits"; Lisa Chiodo et al., "Blood Lead Levels and Specific Attention Effects in Young Children," *Neurotoxicology and Teratology* 29, no. 5 (2007): 538–46, https://doi.org/10.1016/j.ntt.2007.04.001; Pameia Surkan et al., "Neuropsychological Function in Children With Blood Lead Levels < 10μg/dL," *Neurotoxicology* 28, no. 6 (2007): 1170–77, https://dx.doi.org/10.1016/j.neuro.2007.07.007; Meeyoung Min et al., "Cognitive Development and Low-Level Lead Exposure in Poly-Drug Exposed Children," *Neurotoxicology and Teratology* 31 no. 4 (2009): 225–31, https://dx.doi.org/10.1016/j.ntt.2009.03.002.

36 Richard L. Canfield et al., "Intellectual Impairment in Children With Blood Lead Concentrations Below 10 μg per Deciliter," *New England Journal of Medicine* 348 (2003): 1517–26, http:/dx.doi.org/10.1056/NEJMoa022848.

37 U.S. Environmental Protection Agency, "Benefit and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category" (October 2015), https://www.epa.gov/sites/production/files/2015-10/documents/steam-electric_benefit-cost-analysis_09-29-2015.pdf.

38 Marie Lynn Miranda et al., "The Relationship Between Early Childhood Blood Lead Levels and Performance on End-of-Grade Tests," *Environmental Health Perspectives* 115 (2007): 1242–47, http://www.jstor.org/stable/4626860?seq=1#page_scan_tab_contents; Michael J. Blackowicz et al., "The Impact of Low-Level Lead Toxicity on School Performance Among Hispanic Subgroups in the Chicago Public Schools," *International Journal of Environmental Research and Public Health* 13, no. 8 (2016): 774, doi: 10.3390/ijerph13080774; Chiodo et al., "Blood Lead Levels and Specific Attention Effects in Young Children," *Neurotoxicology and Teratology* 29, no. 5 (2007): 538–46, https://doi.org/10.1016/j.ntt.2007.04.001; David C. Bellinger, Karen M. Stiles, and Herbert L. Needleman, "Low-Level Lead Exposure, Intelligence and Academic Achievement: a Long-Term Follow-Up Study," *Pediatrics* 90, no. 6 (1992): 855–61, http://pediatrics.aappublications.org/content/90/6/855.short; Evans et al., "The Impact of Low-Level Lead Toxicity on School Performance Among Children in the Chicago Public Schools: a Population-Based Retrospective Cohort Study," *Environmental Health* 14, no. 21 (2015), https://doi.org/10.1186/s12940-015-0008-9; Kordas et al., "Deficits in Cognitive Function and Achievement in Mexican First-Graders With Low Blood Lead Concentrations," *Environmental Research* 100, no. 3 (2006): 371–86, https://doi.org/10.1016/j.envres.2005.07.007; Lanphear et al., "Cognitive Deficits Associated With Blood Lead Concentrations< 10 microg/dL in U.S. Children and Adolescents," *Public Health Reports* 115, no. 6 (2000): 521–29, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1308622.

39 J.M. Burns et al., "Lifetime Low-Level Exposure to Environmental Lead and Children's Emotional and Behavioral Development at Ages 11-13 Years: The Port Pirie Cohort Study," *American Journal of Epidemiology* 149, no. 8 (1999): 740–49, https://www.academia.edu/25223826/Lifetime_Low-Level_Exposure_to_Environmental_Lead_and_Childrens_Emotional_and_Behavioral_Development_at_Ages_11-13_Years_The_Port_Pirie_Cohort_Study; Aimin Chen et al., "Lead Exposure, IQ, and Behavior in Urban 5- to 7-Year-Olds: Does Lead Affect Behavior Only by Lowering IQ?" *Pediatrics* 119, no. 3 (2007): e650–58, http://pediatrics.aappublications.org/content/119/3/e650.short; Lisa M. Chiodo, Sandra W. Jacobson, and Joseph L. Jacobson, "Neurodevelopmental Effects of Postnatal Lead Exposure at Very Low Levels," *Neurotoxicology and Teratology* 26, no. 3 (2004): 359–71, doi: 10.1016/j.ntt.2004.01.010; Lisa M. Chiodo et al., "Blood Lead Levels and Specific Attention Effects in Young Children," *Neurotoxicology and Teratology* 29, no. 5 (2007): 538–46, doi: 10.1016/j.ntt.2007.04.001; Joel T. Nigg et al., "Low Blood Levels Associated With Clinically Diagnosed Attention-Deficit/Hyperactivity Disorder and Mediated by Weak Cognitive Control," *Biological Psychiatry* 63, no. 3 (2008): 325–31, doi: 10.1016/j.biopsych.2007.07.013.

40 S.M. Bernard and M.A. McGeehin, "Prevalence of Blood Lead Levels ≥5 µg/dL Among U.S. Children 1 to 5 Years of Age and Socioeconomic and Demographic Factors Associated With Blood Lead Level 5 to 10 µg/dL, Third National Health and Nutrition Examination Survey, 1988–1994," *Pediatrics* 112, no. 6 (2003): 1308–13.

41 Peter J. Neumann, Joshua T. Cohen, and Milton C. Weinstein, "Updating Cost-Effectiveness—The Curious Resilience of the $50,000-per-QALY Threshold," *New England Journal of Medicine* 371, no. 9 (2014): 796–97, http://dx.doi.org/10.1056/NEJMp1405158.

42 John Paul Wright et al., "Association of Prenatal and Childhood Blood Lead Concentrations With Criminal Arrests in Early Adulthood," *PLoS Medicine* 5, no. 5 (2008): e101, https://doi.org/10.1371/journal.pmed.0050101.

43 Steven G. Gilbert and Bernard Weiss, "A Rationale for Lowering the Blood Lead Action Level from 10 to 2 µg/dL," *Neurotoxicology* 27, no. 5 (2006): 693–701, https://dx.doi.org/10.1016%2Fj.neuro.2006.06.008; Tanya E. Froelich et al., "Association of Tobacco and Lead Exposures With Attention-Deficit/Hyperactivity Disorder," *Pediatrics* 124, no. 6 (2009): e1054–63, https://doi.org/10.1542/peds.2009-0738.

44 Aaron Reuben et al., "Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood," *The Journal of the American Medical Association* 317, no. 12 (2017): 1244–51, http://dx.doi.org/10.1001/jama.2017.1712.

45 U.S. Environmental Protection Agency, "Basic Information About Lead in Drinking Water," accessed Dec. 12, 2016, https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water; "Safety of Public Water Systems," The Public Health and Welfare, U.S. Code 42 § 300f, accessed May 24, 2017, https://www.gpo.gov/fdsys/pkg/USCODE-2010-title42/pdf/USCODE-2010-title42-chap6A-subchapXII.pdf. A later amendment to the SDWA that went into effect in 2014 banned lead plumbing fixtures in homes and redefined the term "lead free."

46 Anne Sandvig et al., "Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues" (Denver: AWWA and EPA, 2008), https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf.

47 Simoni Triantafyllidou and Marc Edwards, "Lead (Pb) in Tap Water and in Blood: Implications for Lead Exposure in the United States," *Critical Reviews in Environmental Science and Technology* 42, no. 13 (2012): 1297–1352, http://dx.doi.org/10.1080/10643389.2011.556556; Mary Jean Brown and Stephen Margolis, "Lead in Drinking Water and Human Blood Lead Levels in the United States," *Morbidity and Mortality Weekly Report* 61 (2012), https://www.cdc.gov/mmwr/pdf/other/su6104.pdf; Marc Edwards, Simoni Triantafyllidou, and Dana Best, "Elevated Blood Lead in Young Children Due to Lead-Contaminated Drinking Water," *Environmental Science and Technology* 43, no. 5 (2009), http://dx.doi.org/10.1021/es802789w; G. Ngueta et al., "Use of a Cumulative Exposure Index to Estimate the Impact of Tap Water Lead Concentration on Blood Lead Levels in 1- to 5-Year-Old Children (Montreal, Canada)," *Environmental Health Perspectives* 124 (2016): 388–95; http://dx.doi.org/10.1289/ehp.1409144.

48 A cross-sectional study is an analysis of observed data collected from a population at a specific point in time.

49 Bruce P. Lanphear et al., "Environmental Exposures to Lead and Urban Children's Blood Lead Levels," *Environmental Research* 76, no. 2 (1998): 120–30, https://doi.org/10.1006/enrs.1997.3801.

50 "National Primary Drinking Water Regulations," Code of Federal Regulations, title 40, part 141 (June 7, 1991), http://www.ecfr.gov/cgi-bin/text-idx?SID=531617f923c3de2cbf5d12ae4663f56d&mc=true&node=sp40.23.141.i&rgn=div6.

51 U.S. Environmental Protection Agency, "Lead and Copper Rule Revisions White Paper" (Washington: U.S. Environmental Protection Agency, 2016), https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf.

52 Ibid.

53 An observational study is an analysis in which individuals are monitored or certain outcomes are measured. No attempt is made to affect the outcome (for example, no treatment is given). Well-designed observational studies have been shown to provide results similar to randomized controlled trials. Cohort and case-control studies are two primary types of observational studies that aid in evaluating associations between diseases and exposures.

54 Mary Jean Brown et al., "Association Between Children's Blood Lead Levels, Lead Service Lines, and Water Disinfection, Washington, DC, 1998–2006," *Environmental Research* 111 (2011): 67–74, https://doi.org/10.1016/j.envres.2010.10.003.

55 U.S. Environmental Protection Agency, "SAB Evaluation of the Effectiveness of Partial Lead Service Line Replacements" (2011), https://www.epa.gov/sites/production/files/201509/documents/sab_evaluation_partial_lead_service_lines_epa-sab-11-015.pdf.

56 Élise Deshommes et al., "Monitoring-Based Framework to Detect and Manage Lead Water Service Lines," *Journal of the American Waterworks Association* 108, no. 11 (2016): 555–70, http://dx.doi.org/10.5942/jawwa.2016.108.0167.

57 David A. Cornwell, Richard A. Brown, and Steve H. Via, "National Survey of Lead Service Line Occurrence," *Journal of the American Water Works Association* 108, no. 4 (2016): E187–92, http://dx.doi.org/10.5942/jawwa.2016.108.0086; U.S. Environmental Protection Agency, "Drinking Water Action Plan" (Washington: U.S. Environmental Protection Agency, November 2016), https://www.epa.gov/sites/production/files/2016-11/documents/508.final_.usepa_.drinking.water_.action.plan_11.30.16.v0.pdf.

58 Michael W. Shannon and John W. Graef, "Lead Intoxication in Infancy," *Pediatrics* 89, no. 1 (1992): 87–90, http://pediatrics.aappublications.org/content/89/1/87?sso=1&sso_redirect_count=1&nfstatus=401&nftoken=00000000-0000-0000-0000-000000000000&nfstatusdescription=ERROR%3a+No+local+token.

59 County Health Rankings, "Our Ratings," accessed May 5, 2017, http://www.countyhealthrankings.org/roadmaps/what-works-for-health/our-ratings. Scientifically supported is defined by County Health Rankings as interventions for which there are 1 or more systematic review(s), or at least three experimental studies, or three quasi-experimental studies with matched concurrent comparisons. Studies have strong designs and statistically significant favorable findings, see http://www.countyhealthrankings.org/roadmaps/what-works-for-health/our-methods.

60 Alaska Department of Health and Social Services, "Technical Guidance for Health Impact Assessment In Alaska," accessed May 12, 2017, http://dhss.alaska.gov/dph/Epi/hia/Documents/AlaskaHIAToolkit.pdf.

61 Cornwell et al., "National Survey of Lead Service Line Occurrence."

62 U.S. Census Bureau, Population Division, "Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States: April 1, 2010 to July 1, 2015" (Washington: U.S. Census Bureau, June 2016), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk.

63 Ibid.

64 Michèle Prévost and Élise Deshommes, "Calculation of Reference Water Levels for Lead Service Line Replacement Intervention," http://altarum.org/our-work/lead-exposure-mitigation; S. Triantafyllidou et al., "Low Contribution of PbO2-Coated Lead Service Lines to Water Lead Contamination at the Tap," *Environmental Science & Technology* 49, no. 6 (2015): 3746–54, doi: 10.1021/es505886h.

65 U.S. Environmental Protection Agency, "Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water" (Washington: U.S. Environmental Protection Agency, 2017), https://www.epa.gov/sites/production/files/2017-01/documents/report_proposed_modeling_approaches_for_a_health_based_benchmark_for_lead_in_drinking_water_final_0.pdf; U.S. Environmental Protection Agency, Integrated Exposure Uptake Biokinetic Model for Lead in Children, EPA 9285.7-42540-K-01-005, IEUBK win 32Lead Model Version 1.1 Build 11 (May 2007) https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals. IEUBK uses site-specific data and biokinetic modeling.

66 Anne Sandvig et al., "Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues" (Denver: AWWA and EPA, 2008), https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf.

67 Personal communication with Steve Via, "Informal Survey of Estimated Lead Service Line Replacement Costs," unpublished dataset, cited with permission, March 2017.

68 Pam Zekman, "2 Investigators: Cost of Replacing Lead Service Lines Is on Chicago Home Owners," CBS Chicago, Dec. 8, 2016, http://chicago.cbslocal.com/2016/12/08/2-investigators-cost-of-replacing-lead-service-lines-is-on-chicago-home-owners.

69 Michael Hawthorne and Peter Matuszak, "As Other Cities Dig Up Pipes Made of Toxic Lead, Chicago Resists," *Chicago Tribune*, Sept. 21, 2016, http://www.chicagotribune.com/news/watchdog/ct-lead-water-pipes-funding-20160921-story.html; Environmental Protection Agency Science Advisory Board, "SAB Evaluation of the Effectiveness of Partial Lead Service Line Replacements."

70 U.S. Environmental Protection Agency, "How the Drinking Water State Revolving Fund Works," accessed March 21, 2017, https://www.epa.gov/drinkingwatersrf/how-drinking-water-state-revolving-fund-works.

71 Ronnie Levin et al., "Lead Exposures in U.S. Children, 2008: Implications for Prevention."

72 David E. Jacobs, "Lead-Based Paint as a Major Source of Childhood Lead Poisoning: A Review of the Evidence," in *Lead in Paint, Soil and Dust: Health Risks, Exposure Studies, Control Measures and Quality Assurance*, ed. Michael E. Beard and S.D. Allen Iske (Philadelphia: American Society for Testing and Materials, 1995), 175–87.

73 U.S. Department of Housing and Urban Development, "American Healthy Homes Survey: Lead and Arsenic Findings" (2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf.

74 Ibid.

75 40 CFR 745.223.

76 HUD, "American Healthy Homes Survey" (2011); David E. Jacobs et al., "Replacing Windows Reduces Childhood Lead Exposure: Results From a State-Funded Program," *Journal of Public Health Management and Practice* 22, no. 5 (2016): 482–91, https://doi.org/10.1097/PHH.0000000000000389.

77 Caroline Alderson, "Technical Preservation Guidelines: Upgrading Historic Building Windows" (Washington: U.S. General Services Administration, April 2009), https://www.gsa.gov/graphics/pbs/Windows.pdf; Advisory Council on Historic Preservation, "The National Historic Preservation Program: Overview," accessed Feb. 17, 2017, http://www.achp.gov/overview.html.

78 David E. Jacobs, "Lead-Based Paint as a Major Source of Childhood Lead Poisoning"; Sherry Dixon et al., "Window Replacement and Residential Lead Paint Hazard Control 12 Years Later," *Environmental Research* 113 (2012): 14–20, https://doi.org/10.1016/j.envres.2012.01.005; David E. Jacobs et al., "Replacing Windows Reduces Childhood Lead Exposure"; Rick Nevin et al., "Monetary Benefits of Preventing Childhood Lead Poisoning With Lead-Safe Window Replacement," *Environmental Research* 106, no. 3 (2008): 410–19, http://doi.org/10.1016/j.envres.2007.09.003; Lead Safe Illinois, "CLEAR-WIN Comprehensive Lead Elimination and Reduction—Through Window Replacement" (2010), http://www.leadsafeillinois.org/uploads/documents/CLEARWINfactsheet62010.pdf; Illinois Department of Public Health, "Clear-Win Program: Pilot Phase Evaluation" (December 2014), http://www.dph.illinois.gov/sites/default/files/publications/publications-ohp-clear-winreport-042016.pdf.

79 Yona Amitai et al., "Residential Deleading: Effects on the Blood Lead Levels of Lead-Poisoned Children," *Pediatrics* 88, no. 5 (1991): 893–97, http://pediatrics.aappublications.org/content/88/5/893.

80 Walter J. Rogan et al., "The Effect of Chelation Therapy With Succimer on Neuropsychological Development in Children Exposed to Lead," *The New England Journal of Medicine* 344 (2001): 1421–26, http://dx.doi.org/10.1056/NEJM200105103441902; Hilary Thomson et al., "Housing Improvements for Health and Associated Socio-Economic Outcomes," *Cochrane Database of Systematic Reviews* 2 (Feb. 28, 2013), https://doi.org/10.1002/14651858.CD008657.pub2; Barbara Nussbaumer-Streit et al., "Household Interventions for Preventing Domestic Lead Exposure in Children (Review)," *Cochrane Database of Systematic Reviews* 10 (2016): 2–3, http://dx.doi.org/10.1002/14651858.CD006047.pub5

81 Roberto Gwiazda, Carla Campbell, and Donald Smith, "A Noninvasive Isotopic Approach to Estimate the Bone Lead Contribution to Blood in Children: Implications for Assessing the Efficacy of Lead Abatement," *Environmental Health Perspectives* 113, no. 1 (2005): 104–10, http://www.jstor.org/stable/3435755.

82 P.S. Barry, "A Comparison of Concentrations of Lead in Human Tissues," *British Journal of Industrial Medicine* 32, no. 2 (1975): 119–39, https://www.ncbi.nlm.nih.gov/pubmed/1131339; Michael B. Rabinowitz, "Toxicokinetics of Bone Lead," *Environmental Health Perspectives* 91 (1991): 33–37, http://dx.doi.org/10.2307/3430979; Howard Hu et al., "The Epidemiology of Lead Toxicity in Adults: Measuring Dose and Consideration of Other Methodologic Issues," *Environmental Health Perspectives* 115, no. 3 (2007): 455–62, https://dx.doi.org/10.1289%2Fehp.9783; Pam Factor-Litvak et al., "The Yugoslavia Prospective Study of Environmental Lead Exposure," *Environmental Health Perspectives* 107, no. 1 (1999): 9–15, http://dx.doi.org/10.2307/3434284; Mary Jean Brown et al., "Determinants of Bone and Blood Lead Concentrations in the Early Postpartum Period," *Occupational and Environmental Medicine* 57, no. 8 (2000): 535–41, https://dx.doi.org/10.1136%2Foem.57.8.535; Hung-Yi Chuang et al., "Interrelations of Lead Levels in Bone, Venous Blood, and Umbilical Cord Blood With Exogenous Lead Exposure Through Maternal Plasma Lead in Peripartum Women," *Environmental Health Perspectives* 109, no. 5 (2001): 527–32, http://dx.doi.org/10.2307/3454713; P.S. Barry, "Concentrations of Lead in the Tissues of Children," *British Journal of Industrial Medicine* 38, no. 1 (1981): 61–71, http://www.jstor.org/stable/27723491.

83 Residential Lead-Based Paint Hazard Reduction Act of 1992, Pub. L. No. 102-550 (as amended through April 21, 2005), https://www.hud.gov/offices/lead/library/lead/Title_X.pdf.

84 President's Task Force on Environmental Health Risks and Safety Risks to Children, "Key Federal Programs to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts" (November 2016), https://ptfceh.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf.

85 U.S. Department of Housing and Urban Development, "American Healthy Homes Survey: Lead and Arsenic Findings."

86 Katherine A. Ahrens et al., "Housing Assistance and Blood Lead Levels: Children in the United States, 2005–2012," *American Journal of Public Health* 106, no. 11 (2016): 2049–56, http://dx.doi.org/10.2105/AJPH.2016.303432.

87 National Conference of State Legislatures, "Lead Hazards Project" (Washington: NCSL, Aug. 3, 2016), http://www.ncsl.org/research/environment-and-natural-resources/lead-hazards-project.aspx.

88 Katrina S. Korfmacher and Michael L. Hanley, "Are Local Laws the Key to Ending Childhood Lead Poisoning?" *Journal of Health Politics, Policy and Law* 38, no. 4 (2013): 757–813, http://dx.doi.org/10.1215/03616878-2208603.

89 Nimia L. Reyes et al., "Identifying Housing That Poisons: A Critical Step in Eliminating Childhood Lead Poisoning," *Journal of Public Health Management and Practice* 12, no. 6 (2006): 563–69, http://journals.lww.com/jphmp/Abstract/2006/11000/Identifying_Housing_That_Poisons__A_Critical_Step.10.aspx; Dori B. Reissman et al., "Use of Geographic Information System Technology to Aid Health Department Decision Making About Childhood Lead Poisoning Prevention Activities," *Environmental Health Perspectives* 109, no. 1 (2001): 89–94, http://dx.doi.org/10.2307/3434926.

90 Chinaro Kennedy et al., "Primary Prevention of Lead Poisoning in Children: A Cross-Sectional Study to Evaluate State Specific Lead-Based Paint Risk Reduction Laws in Preventing Lead Poisoning in Children," *Environmental Health* 13 (2014): 93, http://dx.doi.org/10.1186/1476-069X-13-93.

91 U.S. Department of Housing and Urban Development, "American Healthy Homes Survey: Lead and Arsenic Findings" (2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf.

92 David E. Jacobs, "Lead-Based Paint as a Major Source of Childhood Lead Poisoning"; Sherry Dixon et al., "Window Replacement and Residential Lead Paint Hazard Control 12 Years Later," *Environmental Research* 113 (2012): 14–20, https://doi.org/10.1016/j.envres.2012.01.005; David E. Jacobs et al., "Replacing Windows Reduces Childhood Lead Exposure: Results From a State-Funded Program," *Journal of Public Health Management and Practice* 22, no. 5 (2016): 482–91, https://doi.org/10.1097/PHH.0000000000000389; Rick Nevin et al., "Monetary Benefits of Preventing Childhood Lead Poisoning With Lead-Safe Window Replacement," *Environmental Research* 106, no. 3 (2008): 410–19, http://doi.org/10.1016/j.envres.2007.09.003; Lead Safe Illinois, "CLEAR-WIN Comprehensive Lead Elimination and Reduction—Through Window Replacement" (2010), http://www.leadsafeillinois.org/uploads/documents/CLEARWINfactsheet62010.pdf; Illinois Department of Public Health, "Clear-Win Program: Pilot Phase Evaluation" (December 2014), http://www.dph.illinois.gov/sites/default/files/publications/publications-ohp-clear-winreport-042016.pdf.

93 County Health Rankings, "Our Ratings." Scientifically supported is defined by County Health Rankings as interventions for which there are one or more systematic review(s), or at least three experimental studies, or three quasi-experimental studies with matched concurrent comparisons. Studies have strong designs and statistically significant favorable findings.

94 Alaska Department of Health and Social Services, "Technical Guidance for Health Impact Assessment in Alaska."

95 Sherry Dixon et al., "Window Replacement and Residential Lead Paint Hazard Control 12 Years Later," *Environmental Research* 113 (2012): 14–20, https://doi.org/10.1016/j.envres.2012.01.005.

96 Mark Farfel et al., "An Extended Study of Interim Lead Hazard Reduction Measures Employed in the Baltimore Clinical Center of the Treatment of Lead-Exposed Children (TLC)—Clinical Trial" (Washington: U.S. Department of Housing and Urban Development, April 2000), http://www.nmic.org/nyccelp/medical-studies/Farfel-extended-study-interim-controls-4-00.pdf; Farfel et al. 1997, "Lead Based Paint Abatement and Repair and Maintenance Study" (Washington: U.S. Environmental Protection Agency, December 1997), EPA-747-R-97-005, https://www.epa.gov/sites/production/files/documents/24folup. pdf. Several variables would affect the applicability of this study to the prevention scenario. Techniques and standards may have improved since the study was conducted in 2008 and 2009, so its data may underestimate the impact of lead hazard control undertaken today. Because the prevalence of contaminated dust in older homes may have changed since these data were collected the team modeled two different baseline dust lead levels, 20 and 10 µg/sq. ft.

97 Sherry L. Dixon et al., "Exposure of U.S. Children to Residential Dust Lead, 1999–2004: II. The Contribution of Lead-Contaminated Dust to Children's Blood Lead Levels," *Environmental Health Perspectives* 117, no. 3 (2009): 468–74, https://dx.doi.org/10.1289/ehp.11918.

98 U.S. Department of Housing and Urban Development, "American Healthy Homes Survey: Lead and Arsenic Findings" (April 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf.

99 To determine the number of children born into a remediated home in the next 10 years, the team first calculated the percent of the housing stock that would receive the intervention by dividing the number of remediated homes by the total number of homes in the U.S. as shown in the American Community Survey. The team then used this percentage as the likelihood that a future child would be born into a remediated home. For example, for the pre-1960, lead hazard control intervention, the team estimated that 2.1 percent of the housing stock would receive the intervention and therefore each future child would have a 2.1 percent chance of living in a remediated home. The team then assumed conservatively that these effects would persist for the next 10 birth cohorts.

100 Mark Farfel et al., "An Extended Study of Interim Lead Hazard Reduction Measures Employed in the Baltimore Clinical Center of the Treatment of Lead-Exposed Children (TLC)—Clinical Trial" (Washington: U.S. Department of Housing and Urban Development, April 2000), http://www.nmic.org/nyccelp/medical-studies/Farfel-extended-study-interim-controls-4-00.pdf; Mark Farfel et al., "Lead Based Paint Abatement and Repair and Maintenance Study in Baltimore: Findings Based on Two Years of Follow-Up" (Washington: U.S. Environmental Protection Agency, December 1997), https://www.epa.gov/sites/production/files/documents/24folup.pdf.

101 The maximum number children born in 2018 from low-income families expected to reside in pre-1960 housing is 321,000. A subset of these children—311,000—are expected to reside in homes with lead-based paint.

102 The Pew Charitable Trusts, "Household Expenditures and Income: Balancing Family Finances in Today's Economy" (March 2016), http://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2016/03/household-expenditures-and-income.

103 National Center for Healthy Housing, "Find It, Fix It, Fund It."

104 Federal Housing Administration, "FHA Single Family Housing Policy Handbook" (Washington: U.S. Department of Housing and Urban Development, Aug. 27, 2014), https://portal.hud.gov/hudportal/documents/huddoc?id=sfh_poli_appr_prop.pdf.

105 U.S. Environmental Protection Agency, Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities, §402(c) (2008): 3 39–41, http://www.nchh.org/Portals/0/Contents/EPA-HQ-OPPT-2005-0049-0916_Final_Economic_Analysis_3-08.pdf.

106 Michael Rabinowitz, Alan Leviton, and David Bellinger, "Home Refinishing, Lead Paint and Infant Blood Lead Levels," *American Journal of Public Health* 75, no. 4 (1985): 403–04, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1646251/pdf/amjph00280-0093.pdf.

107 Adam J. Spanier et al., "The Contribution of Housing Renovation to Children's Blood Lead Levels: A Cohort Study," *Environmental Health* 12, no. 1 (2013): 72, http://dx.doi.org/10.1186/1476-069X-12-72.

108 E.M. Franko et al., "Children With Elevated Blood Lead Levels Related to Home Renovation, Repair, and Painting Activities—New York State, 2006-2007," *Morbidity and Mortality Weekly Report* 58, no. 3 (2009): 55–58, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5803a3.htm; Rabinowitz, Leviton, and Bellinger, "Home Refinishing, Lead Paint and Infant Blood Lead Levels."

109 E.M. Franko et al., "Children With Elevated Blood Lead Levels."

110 U.S. Environmental Protection Agency, Lead Renovation, Repair and Painting Rule, 40 CFR 745, Federal Register 73, no. 78 (2008): 21691–769, https://www.gpo.gov/fdsys/pkg/FR-2008-04-22/html/E8-8141.htm.

111 U.S. Environmental Protection Agency, Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities, 3 39–41.

112 National Center for Healthy Housing, "New York's Childhood Lead Poisoning Primary Prevention Program: Year 8 Grantee Impact Summaries (Draft)," accessed Feb. 3, 2017, http://www.nchh.org/Portals/0/Contents/NYSDOH_Yr8_Appendix_Final.pdf; City of New York, "Health Department Launches New Lead Dust Notification Procedures," accessed Feb. 3, 2017, https://www1.nyc.gov/site/doh/about/press/pr2015/pr021-15.page.

113 National Center for Healthy Housing, "New York's Childhood Lead Poisoning Primary Prevention Program: Year 8 Grantee Impact Summaries (draft)," accessed Feb. 3, 2017, http://www.nchh.org/Portals/0/Contents/NYSDOH_Yr8_Appendix_Final.pdf.

114 District of Columbia Department of Energy and Environment, "All About Lead," accessed Jan. 13, 2017, http://doee.dc.gov/lead.

115 Rhode Island Department of Health, "Lead Safe Renovation, Repair, and Painting," accessed Jan. 13, 2017, http://www.health.ri.gov/healthrisks/poisoning/lead/about/renovationrepairandpainting.

116 Lead Safe Kids, "Working Lead-Safe in Providence: What Does This Mean for Me?" accessed Jan. 13, 2017, http://www.leadsafekids.org/en/news/77-providence-rrp.

117 U.S. EPA, Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program, 3-39–41; Spanier et al., "The Contribution of Housing Renovation to Children's Blood Lead Levels: A Cohort Study"; Rabinowitz, Leviton and Bellinger, "Home Refinishing, Lead Paint and Infant Blood Lead Levels"; Franko et al., "Children With Elevated Blood Lead Levels."

118 County Health Rankings, "Our Ratings." Scientifically supported is defined by County Health Rankings as interventions for which there are one or more systematic review(s), or at least three experimental studies, or three quasi-experimental studies with matched concurrent comparisons. Studies have strong designs and statistically significant favorable findings.

119 Alaska Department of Health and Social Services, "Technical Guidance for Health Impact Assessment In Alaska."

120 U.S. Environmental Protection Agency, "The Approach Used for Estimating Changes in Children's IQ From Lead Dust Generated During Renovation, Repair and Painting in Residences and Child-Occupied Facilities" (Washington: EPA, March 28, 2008), https://www.regulations.gov/document?D=EPA-HQ-OPPT-2005-0049-0930; Richard W. Leggett, "An Age-Specific Kinetic Model of Lead Metabolism in Humans," *Environmental Health Perspectives* 101, no. 7 (1993): 598–616, http://dx.doi.org/10.1289/ehp.93101598; U.S. Environmental Protection Agency, "Revised Final Report on Characterization of Dust Lead Levels After Renovation, Repair, and Painting Activities" (Washington: U.S. Environmental Protection Agency, Nov. 13, 2016), https://www.regulations.gov/document?D=EPA-HQ-OPPT-2005-0049-0857.

121 U.S. EPA, Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program, ES-4.

122 U.S. EPA, Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program.

123 In its economic analysis, the EPA identified the cost of spot test kits as approximately $0.50 each, and assumed that testing four samples would require about 15 minutes of a certified renovator's time. Therefore, the estimated cost of using the kits would be $10 per renovation event.

124 Franko et al., "Children With Elevated Blood Lead Levels."

125 Environmental Protection Agency, "2014 National Emissions Inventory Data" (2014), https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data.

126 Children's Health Protection Advisory Committee, "National Ambient Air Quality Standards for Lead" (Jan. 8, 2015), https://www.epa.gov/sites/production/files/2015-01/documents/naaqs_for_lead_letter.pdf.

127 Environmental Protection Agency, "Review of the National Ambient Air Quality Standards for Lead."

128 Howard W. Mielke et al., "Environmental and Health Disparities in Residential Communities of New Orleans: The Need for Soil Lead Intervention to Advance Primary Prevention." *Environment International* 51 (2013) 73–81, http://dx.doi.org/10.1016/j.envint.2012.10.013; U.S. Environmental Protection Agency, "America's Children and the Environment, Third Edition," EPA 240-R-13-001 (Washington: U.S. Environmental Protection Agency, January 2013): 61, https://www.epa.gov/sites/production/files/2015-06/documents/ace3_2013.pdf.

129 Environmental Protection Agency, "Results of Lead and Arsenic Testing at West Calumet Housing Complex (Excel spreadsheet)," accessed May 10, 2017, https://www.epa.gov/sites/production/files/2016-08/uss-lead-zone-1-action-data-redacted.xlsx.

130 Michael D. Lewin, Sara Sarasua, and Paul A. Jones, "A Multivariate Linear Regression Model for Predicting Children's Blood Lead Levels Based on Soil Lead Levels: A Study at Four Superfund Sites," *Environmental Research* 81, no. 1 (1999): 52–61, https://dx.doi.org/10.1006/enrs.1998.3952; Sammy Zahran et al., "Linking Source and Effect: Resuspended Soil Lead, Air Lead, and Children's Blood Lead Levels in Detroit, Michigan," *Environmental Science and Technology* 47, no. 6 (2013), http://pubs.acs.org/doi/abs/10.1021/es303854c; Howard W. Mielke et al., "The Urban Environment and Children's Health: Soils as an Integrator of Lead, Zinc, and Cadmium in New Orleans, Louisiana, USA," *Environmental Research* 81, no. 2 (1999): 117–19, https://dx.doi.org/10.1006/enrs.1999.3966; Mielke et al., "Environmental and Health Disparities in Residential Communities of New Orleans."

131 Howard Mielke et al., "Nonlinear Association Between Soil Lead and Blood Lead of Children in Metropolitan New Orleans, Louisiana: 2000-2005," *Science of the Total Environment* 388, no. 1–3 (2007): 43–53, http://dx.doi.org/10.1016/j.scitotenv.2007.08.012; Jeffrey Shire and John Villanacci, "Analysis of Risk Factors for Childhood Blood Lead Levels El Paso, Texas, 1997–2002," prepared by the Texas Department of Health for the Agency for Toxic Substances and Disease Registry (April 20, 2004), https://www.dshs.texas.gov/epitox/consults/elppasblpbgisfinal4_23.pdf.

132 Howard Mielke et al., "Nonlinear Association Between Soil Lead and Blood Lead of Children in Metropolitan New Orleans, Louisiana: 2000–2005," *Science of the Total Environment* 388, no. 1–3 (2007): 43–53. http://dx.doi.org/10.1016/j.scitotenv.2007.08.012.

133 Mark Laidlaw et al., "Case Studies and Evidence-Based Approaches to Addressing Urban Soil Lead Contamination," *Applied Geochemistry* (2017), http://dx.doi.org/10.1016/j.apgeochem.2017.02.015.

134 Mielke et al., "Environmental and Health Disparities in New Orleans"; Michael Weitzman et al., "Lead-Contaminated Soil Abatement and Urban Children's Blood Lead Levels," *JAMA* 263, no. 13 (1993): 1647–54.

135 Katherine Farrell et al., "Soil Lead Abatement and Children's Blood Lead Levels in an Urban Setting," *American Journal of Public Health* 88, no. 12 (1998): 1837–39, http://dx.doi.org/10.2105/AJPH.88.12.1837.

136 Mark Laidlaw et al., "Case Studies and Evidence-Based Approaches to Addressing Urban Soil Lead Contamination."

137 Ibid.

138 U.S. Environmental Protection Agency, National Emissions Standards for Hazardous Air Pollutants From Secondary Lead Smelting, 77 Fed. Reg. 3 (Jan. 5, 2012), https://www.gpo.gov/fdsys/pkg/FR-2012-01-05/pdf/2011-32933.pdf#page=2.

139 EC/R Inc., memo prepared for EPA Office of Air Quality Planning and Standards, "Risk and Technology Review—Final Analysis of Socio-Economic Factors for Populations Living Near Secondary Lead Smelting Facilities," December 2011, http://earthjustice.org/sites/default/files/Leadsmeltersocioeconomicanalysis.pdf.

140 U.S. Environmental Protection Agency, National Emissions Standards for Hazardous Air Pollutants From Secondary Lead Smelting, 77 Fed. Reg. 3; Jessica Garrison and Kim Christensen, "Vernon Plant Closed Over Toxins," *Los Angeles Times*, April 25, 2013, http://articles.latimes.com/2013/apr/25/local/la-me-exide-arsenic-20130425; Texas Commission on Environmental Quality, "Exide Frisco Batter Recycling Center" (October 2014), https://www.tceq.texas.gov/remediation/sites/exide/exide; Amy Wold, "New Plan to Close Former Exide Site Expected to Be Complete in Early 2016," *The Advocate*, Jan. 5, 2016, http://www.theadvocate.com/baton_rouge/news/article_e0375310-ed91-578d-9f77-aa3019a2efdd.html.

141 U.S. Geological Survey, "Historical Statistics for Mineral and Material Commodities in the United States" (2011), https://minerals.usgs.gov/minerals/pubs/historical-statistics; International Lead Association, "Lead Industry Profile," accessed March 28, 2017, http://www.ila-lead.org/UserFiles/File/factbook/chapter4.pdf.

142 William P. Eckel, Michael B. Rabinowitz and Gregory D. Foster, "Discovering Unrecognized Lead-Smelting Sites by Historical Methods," *American Journal of Public Health* 91, no. 4 (2001), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1446633/pdf/11291377.pdf.

143 Ibid.

144 Sammy Zahran et al., "Linking Source and Effect: Resuspended Soil Lead, Air Lead, and Children's Blood Lead Levels in Detroit, Michigan," *Environmental Science and Technology* 47, no. 6 (2013): 2839–45, http://dx.doi.org/10.1021/es303854c .

145 United States Environmental Protection Agency, Office of Inspector General, "EPA Has Made Progress in Assessing Historical Lead Smelter Sites but Needs to Strengthen Procedures" (June 2014), https://www.epa.gov/sites/production/files/2015-09/documents/20140617-14-p-0302.pdf.

146 Environmental Protection Agency, "Superfund Remedial Annual Accomplishments: Fiscal Year 2016 Superfund Remedial Program Accomplishments Report," accessed May 10, 2017, https://www.epa.gov/superfund/superfund-remedial-annual-accomplishments#metrics.

147 Agency for Toxic Substances and Disease Registry, "John T. Lewis Community Childhood Blood Lead Study: Findings," accessed March 24, 2017, https://www.atsdr.cdc.gov/sites/jtlewis/findings.html.

148 Ian von Lindern et al., "Estimating Children's Soil/Dust Ingestion Rates Through Retrospective Analyses of Blood Lead Biomonitoring From the Bunker Hill Superfund Site in Idaho," *Environmental Health Perspectives* 124, no. 9 (2016): 1462–70, http://dx.doi.org/10.1289/ehp.1510144.

149 Ian von Lindern et al., "Assessing Remedial Effectiveness Through the Blood Lead: Soil/Dust Lead Relationship at the Bunker Hill Superfund Site in the Silver Valley of Idaho," *Science of the Total Environment* 303 no. 1–2 (2003): 139–70, http://doi.org/10.1016/S0048-9697(02)00352-2.

150 Michael D. Lewin, Sara Sarasua, and Paul A. Jones, "A Multivariate Linear Regression Model for Predicting Children's Blood Lead Levels Based on Soil Lead Levels."

151 University of Maryland, "Lead in Garden Soils," accessed June 7, 2017, https://extension.umd.edu/hgic/lead-garden-soils.

152 U.S. Environmental Protection Agency, "Technical Review Workgroup Recommendations Regarding Gardening and Reducing Exposure to Lead-Contaminated Soils" (Washington: U.S. Environmental Protection Agency, 2014), http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100JJS3.TXT.

153 County Health Rankings, "Our Ratings." Some evidence is defined by County Health Rankings and Roadmaps as: one or more systematic review(s), or at least two experimental studies, or two quasi-experimental studies with matched concurrent comparisons, or three studies with unmatched comparisons or pre-post measures. Studies have statistically significant favorable findings. Compared with "Scientifically Supported," studies have less rigorous designs or limited effect(s). Although the removal of lead from aviation fuel has not been tested, multiple studies have documented an association between blood lead levels and residence near an airport serving aircraft using leaded fuel.

154 Alaska Department of Health and Social Services, "Technical Guidance for Health Impact Assessment in Alaska."

155 Unleaded AVGAS Transition Aviation Rulemaking Committee, "FAA UAT ARC Final Report Part I: Unleaded AVGAS Findings & Recommendations" (Washington: Federal Aviation Administration, U.S. Department of Transportation, Feb. 17, 2012), https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Avgas.ARC.RR.2.17.12.pdf; Control of Air Pollution from Aircraft and Aircraft Engines, Code of Federal Regulations, title 40, part 87 (2013); Advance Notice of Proposed Rulemaking on Lead Emissions From Piston-Engine Aircraft Using Leaded Aviation Gasoline 75 Fed. Reg. 81 (April 28, 2010): 22439–68, https://www.federalregister.gov/documents/2010/04/28/2010-9603/advance-notice-of-proposed-rulemaking-on-lead-emissions-from-piston-engine-aircraft-using-leaded.

156 Sammy Zahran et al., "The Effect of Leaded Aviation Gasoline on Blood Lead in Children," *Journal of the Association of Environmental and Resource Economists* 4, no. 2 (2017): 575–610, http://dx.doi.org/10.1086/691686; "U.S. Product Supplied of Aviation Gasoline," U.S. Energy Information Administration, accessed Jan. 29, 2017, http://www.eia.gov/dnav/pet/hist/Leafhandler.ashx?n=PET&s=MGAUPUS1&f=A.

157 Ibid.

158 Proposed Rulemaking on Lead Emissions From Piston-Engine Aircraft, 75 Fed. Reg. 81 (April 28, 2010), https://www.gpo.gov/fdsys/pkg/FR-2010-04-28/pdf/2010-9603.pdf.

159 Rebecca Kessler, "Sunset for Leaded Aviation Gasoline?" *Environmental Health Perspectives* 121, no. 2 (2013): 54–57, http://dx.doi.org/10.1289/ehp.121-a54; Marie Lynn Miranda, Rebecca Anthopolos and Douglas Hastings, "A Geospatial Analysis of the Effects of Aviation Gasoline on Childhood Blood Lead Levels," *Environmental Health Perspectives* 119, no. 10 (2011): 1513–16, https://dx.doi.org/10.1289%2Fehp.1003231; Zahran et al., "The Effect of Leaded Aviation Gasoline."

160 Zahran et al., "The Effect of Leaded Aviation Gasoline."

161 County Health Rankings, "Our Ratings." Some evidence is defined by County Health Rankings and Roadmaps as: one or more systematic review(s), or at least two experimental studies, or two quasi-experimental studies with matched concurrent comparisons, or three studies with unmatched comparisons or pre-post measures. Studies have statistically significant favorable findings. Compared to "Scientifically Supported," studies have less rigorous designs or limited effect(s). Although the removal of lead from aviation fuel has not been tested, multiple studies have documented an association between blood lead levels and residence near an airport serving aircraft using leaded fuel.

162 Alaska Department of Health and Social Services, "Technical Guidance for Health Impact Assessment in Alaska," accessed May 12, 2017, http://dhss.alaska.gov/dph/Epi/hia/Documents/AlaskaHIAToolkit.pdf.

163 Alaska Department of Health and Social Services, "Technical Guidance for Health Impact Assessment in Alaska," accessed May 12, 2017, http://dhss.alaska.gov/dph/Epi/hia/Documents/AlaskaHIAToolkit.pdf.

164 Proposed Rulemaking on Lead Emissions From Piston-Engine Aircraft, 75 Fed. Reg. 81; Advance notice of proposed rulemaking on lead emissions from piston-engine aircraft using leaded aviation gasoline, 75 Fed. Reg. 22440: 22440–68 (April 28, 2010).

165 Unleaded AVGAS Transition Aviation Rulemaking Committee, "FAA UAT ARC Final Report Part I" (February 2012).

166 President's Task Force on Environmental Health Risks and Safety Risks to Children, "Key Federal Programs to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts," https://ptfceh.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf.

167 Substance Abuse and Mental Health Services Administration, "Cultural Competence," accessed April 20, 2017, https://www.samhsa.gov/capt/applying-strategic-prevention/cultural-competence

168 Greater Cincinnati Water Works, "Lead Awareness" (2007), http://cincinnati-oh.gov/water/lead-information/; DC Water, "Service Map, Lead" (2017), https://www.dcwater.com/servicemap; Boston Water and Sewer Commission, "Lead Service Map" (2017), http://www.bwsc.org/COMMUNITY/lead/leadmaps.asp#TOP_PAGE; Lead Materials, California Health and Safety Code 104 Part 12, Ch. 5 Art 4, http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=104.&title=&part=12.&chapter=5.&article=4.; Ohio House of Representatives Bill 512, 131st General Assembly (Sept. 9, 2016), http://search-prod.lis.state.oh.us/solarapi/v1/general_assembly_131/bills/hb512/EN/05?format=pdf.

169 U.S. Centers for Disease Control and Prevention, "Educational Interventions for Children Affected by Lead" (Atlanta: U.S. Department of Health and Human Services, 2015), https://www.cdc.gov/nceh/lead/publications/educational_interventions_children_affected_by_lead.pdf.

170 Weihong Yuan et al., "The Impact of Early Childhood Lead Exposure on Brain Organization: A Functional Magnetic Resonance Imaging Study of Language Function," *Pediatrics* 118, no. 3 (2006): 971–77, https://doi.org/10.1542/peds.2006-0467.

171 Center on the Developing Child at Harvard University, "Building the Brain's 'Air Traffic Control' System: How Early Experiences Shape the Development of Executive Function," Working Paper No. 11 (2011), http://developingchild.harvard.edu/resources/building-the-brains-air-traffic-control-system-how-early-experiences-shape-the-development-of-executive-function.

172 T. Matthews et al., "Social Isolation and Mental Health at Primary and Secondary School Entry: A Longitudinal Cohort Study," *Journal of the American Academy of Child and Adolescent Psychiatry* 54, no. 3 (2015): 225–32, http://doi.org/10.1016/j.jaac.2014.12.008.

173 Jessica Wolpaw Reyes, "Lead Exposure and Behavior: Effects on Antisocial and Risky Behavior Among Children and Adolescents," *Economic Inquiry* 53, no. 3 (2015): 1580–1605, http://dx.doi.org/10.1111/ecin.12202.

174 Adele Diamond and Kathleen Lee, "Interventions Shown to Aid Executive Function Development in Children 4 to 12 Years Old," *Science* 333, no. 6045 (2011): 959–64, https://dx.doi.org/10.1126%2Fscience.1204529.

175 Hirokazu Yoshikawa et al., "Investing in Our Future: The Evidence Base on Preschool Education" (Ann Arbor, MI: Society for Research in Child Development, 2013), http://www.srcd.org/sites/default/files/documents/washington/mb_2013_10_16_investing_in_children.pdf.

176 Eric M. Ossiander, "A Systematic Review of Screening Questionnaires for Childhood Lead Poisoning," *Journal of Public Health Management Practice* 19, no. 1 (2013): E21–29, http://dx.doi.org/10.1097/PHH.0b013e3182249523. This report uses the term "screening" to refer to questionnaires only, while "testing" includes any sampling of blood. Methods for analyzing blood tests range in price, accuracy, sample size, difficulty of use, and amount of time required to provide results. In the U.S., most laboratories cannot detect blood lead levels below 3 µg/dL. Factors such as the person performing the analysis and the care taken to ensure that the sample is not contaminated after collection can also affect the results.

177 The Centers for Medicare & Medicaid Services, "Early and Periodic Screening, Diagnostic, and Treatment," accessed June 7, 2017, https://www.medicaid.gov/medicaid/benefits/epsdt/index.html; Joshua Schneyer and M. B. Pell, "Unsafe At Any Level," *Reuters*, June 9, 2016, http://www.reuters.com/investigates/special-report/lead-poisoning-testing-gaps.

178 Anne M. Wengrovitz and Mary Jean Brown, "Recommendations for Blood Lead Screening of Medicaid-Eligible Children Aged 1-5 Years: An Updated Approach to Targeting a Group at High Risk," *Morbidity and Mortality Weekly Report* 58, no. RR-9 (2009): 1–11, https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5809a1.htm.

179 Jennifer Dickman, "Children at Risk: Gaps in State Lead Screening Policies" (Washington: Safer Chemicals, Healthy Families, January 2017), http://saferchemicals.org/sc/wp-content/uploads/2017/01/saferchemicals.org_children-at-risk-report.pdf.

180 Wengrovitz and Brown, "Recommendations for Blood Lead Screening of Medicaid-Eligible Children."

181 Centers for Disease Control and Prevention, "CDC Recommendations for Lead Poisoning Prevention in Newly Arrived Refugee Children," accessed Feb. 22, 2017, https://www.cdc.gov/nceh/lead/publications/refugeetoolkit/pdfs/cdcrecommendations.pdf

182 Diamond and Lee, "Interventions Shown to Aid Executive Function Development in Children 4 to 12 Years Old."

183 Hirokazu Yoshikawa et al., "Investing in Our Future: The Evidence Base on Preschool Education" (Ann Arbor, MI: Society for Research in Child Development, 2013), http://www.srcd.org/sites/default/files/documents/washington/mb_2013_10_16_investing_in_children.pdf.

184 Todd Grindal et al., "The Added Impact of Parenting Education in Early Childhood Education Programs: A Meta-Analysis," *Children and Youth Services Review* 70 (2016): 238–49, https://doi.org/10.1016/j.childyouth.2016.09.018.

185 Mayo Clinic, "Cognitive Behavioral Therapy," accessed March 9, 2017, http://www.mayoclinic.org/tests-procedures/cognitive-behavioral-therapy/home/ovc-20186868.

186 Nurse-Family Partnership, "A Rigorously Tested Program with Measureable Benefits," accessed Feb. 23, 2017, http://www.nursefamilypartnership.org/assets/PDF/Fact-sheets/NFP_Benefit_Cost.aspx.

187 Harriet J. Kitzman et al., "Enduring Effects of Prenatal and Infancy Home Visiting by Nurses on Children," *Archive Pediatric Adolescent Medicine* 164, no. 5 (2010): 412–18, https://dx.doi.org/10.1001/archpediatrics.2010.76.

188 David Olds et al., "Long-Term Effects of Nurse Home Visitation on Children's Criminal and Antisocial Behavior: 15-Year Follow-Up of a Randomized Controlled Trial," *Journal of American Medicine Association* 280, no. 14 (1996): 1238–44, https://dx.doi.org/ 10.1001/jama.280.14.1238.

189 Child Trends, "Incredible Years Series," accessed December 2016, https://www.childtrends.org/programs/incredible-years-series.

190 M. Jamila Reid, Carolyn Webster-Stratton, and Mary Hammond, "Follow-Up of Children Who Received the Incredible Years Intervention for Oppositional-Defiant Disorder: Maintenance and Prediction of 2-Year Outcome," *Behavior Therapy* 34 (2003): 471–91, https://dx.doi.org/ 10.1016/S0005-7894(03)80031-X.

191 Hugh F. Crean and Deborah B. Johnson, "Promoting Alternative Thinking Strategies (PATHS) and Elementary School Aged Children's Aggression: Results From a Cluster Randomized Trial," *American Journal of Community Psychology* 52, no. 1–2 (2013): 56–72, https://dx.doi.org/10.1007/s10464-013-9576-4.

192 David J. Schonfeld et al., "Cluster-Randomized Trial Demonstrating Impact on Academic Achievement of Elementary Social-Emotional Learning," *School Psychology Quarterly* 30, no. 3 (2015): 406–20, http://dx.doi.org/10.1037/spq0000099.

193 Karin S. Frey et al., "Reducing Playground Bullying and Supporting Beliefs: An Experimental Trial of the Steps to Respect Program," *Developmental Psychology* 41, no. 3 (2005): 479–90, https://dx.doi.org/10.1037/0012-1649.41.3.479.

194 U.S. Centers for Disease Control and Prevention, "Educational Interventions for Children Affected by Lead," 34.

195 Assistance to States for the Education of Children With Disabilities, "§ 300.111 Child Find," Cornell University Law School, accessed April 20, 2017, https://www.law.cornell.edu/cfr/text/34/300.111.

196 U.S. Centers for Disease Control and Prevention, "Managing Elevated Blood Lead Levels Among Young Children: Recommendations From the Advisory Committee on Childhood Lead Poisoning Prevention," accessed May 1, 2017, https://www.cdc.gov/nceh/lead/casemanagement/managingEBLLs.pdf.

197 Betsy Lozoff, "Iron Deficiency and Child Development," *Food and Nutrition Bulletin* 28 (2007): S560–71, http://journals.sagepub.com/doi/pdf/10.1177/15648265070284S409.

198 Stephen Billings and Kevin Schnepel, "Life Unleaded: Effects of Early Interventions for Children Exposed to Lead" (Working Paper No. 2015-18, Life Course Centre, Australian Research Council, August 2015), http://www.lifecoursecentre.org.au/wp-content/uploads/2015/08/2015-18-LCC-Working-Paper-Billings-and-Schnepel2.pdf.

199 U.S. Department of Agriculture Food and Nutrition Service, "Women, Infants and Children (WIC): WIC Food Package Regulatory Requirements," accessed April 18, 2017, https://www.fns.usda.gov/wic/wic-food-package-regulatory-requirements.

200 Margot I. Jackson, "Early Childhood WIC Participation, Cognitive Development and Academic Achievement," *Social Science & Medicine* 126 (2015): 145–53, https://dx.doi.org/10.1016/j.socscimed.2014.12.018; Abigail Arons et al., "Participation in the Special Supplemental Nutrition Program for Women, Infants, and Children Is Not Associated With Early Childhood Socioemotional Development: Results From a Longitudinal Cohort Study," *Preventive Medicine Reports* 4 (2016): 507–11, https://dx.doi.org/10.1016/j.pmedr.2016.09.004; Edward A. Frongillo, Diana F. Jyoti, and Sonya J. Jones, "Food Stamp Program Participation Is Associated With Better Academic Learning Among School Children," *The Journal of Nutrition* 136, no. 4 (2006): 1077–80, http://jn.nutrition.org/content/136/4/1077.full.pdf+html.

201 U.S. Preventive Services Task Force, "Final Recommendation Statement: Lead Levels in Childhood and Pregnancy: Screening" (2006), https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/lead-levels-in-childhood-and-pregnancy-screening. In 2006, the U.S. Preventive Services Task Force recommended against universal blood lead testing for children at average risk of exposure. This guidance was designed to avoid potential harms, including false-positive results, anxiety, inconvenience, absenteeism from work and school, and financial costs of repeated testing. However, the recommendations did not address testing for high-risk children.

202 Anne Guthrie Wengrovitz et al., "Overcoming Barriers to Data-Sharing Related to the HIPAA Privacy Rule" (Washington: Alliance for Healthy Homes, June 2004), https://www.cdc.gov/nceh/lead/policy/HIPAADoc.pdf.

203 Katarzyna Kordas, "The 'Lead Diet': Can Dietary Approaches Prevent or Treat Lead Exposure?" *Journal of Pediatrics*, in print (2017), http://dx.doi.org/10.1016/j.jpeds.2017.01.069.

204 Health Canada, "Lead in Drinking Water" (Health Canada, the Federal-Provincial-Territorial Committee on Drinking Water, October 2016), http://www.healthycanadians.gc.ca/health-system-systeme-sante/consultations/lead-drinking-water-plomb-eau-potable/alt/lead-drinking-water-plomb-eau-potable-03-01-2017-eng.pdf.

205 Dr. Pascal Haefliger, "Brief Guide to Analytical Methods for Measuring Lead in Blood," World Health Organization (2011), http://www.who.int/ipcs/assessment/public_health/lead_blood.pdf; The U.S. Centers for Disease Control and Prevention defines a blood lead test as "any blood lead draw (capillary, venous or unknown sample type) on a child that produces a quantifiable result and is analyzed by a Clinical Laboratory Improvement Amendments (CLIA)-certified facility or an approved portable device. A blood lead test may be collected for screening, confirmation, or follow-up."

206 Reuben et al., "Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood."

207 40 CFR 745.223.

208 Miriam King, Steven Ruggles, J. Trent Alexander, Sarah Flood, Katie Genadek, Matthew B. Schroeder, Brandon Trampe, and Rebecca Vick. Integrated Public Use Microdata Series, Current Population Survey: Version 3.0. [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2010.

209 U.S. Centers for Disease Control and Prevention, National Center for Environmental Health, "National Surveillance Data (1997–2015)" (Atlanta: U.S. Department of Health and Human Services, 2016), https://www.cdc.gov/nceh/lead/data/national.htm.

210 John Paul Wright et al., "Association of Prenatal and Childhood Blood Lead Concentrations With Criminal Arrests in Early Adulthood," *PLoS Medicine* 5, no. 5 (2008): e101, https://doi.org/10.1371/journal.pmed.0050101.

211 Leonardo Trasande and Yinghua Liu, "Reducing the Staggering Costs of Environmental Disease in Children, Estimated at $76.6 Billion in 2008," *Health Affairs* 30, no. 5 (2011): 863–70, http://content.healthaffairs.org/content/30/5/863.short.

212 P.J. Neumann, J.T. Cohen, and M.C. Weinstein, "Updating Cost-Effectiveness—The Curious Resilience of the $50,000-per-QALY Threshold," *New England Journal of Medicine* 371, no. 9 (2014): 796–97.

213 G.D. Sanders et al., "Recommendations for Conduct, Methodological Practices, and Reporting of Cost-Effectiveness Analyses," *JAMA* 316, no. 10 (2016): 1093–1103; W. Max, "Present Value of Lifetime Earnings, 2007," unpublished tables, Institute for Health and Aging, University of California, San Francisco (2010).

214 Council on Environmental Health, "Prevention of Childhood Lead Toxicity," *Pediatrics* (2016), http://dx.doi.org/10.1542/peds.2016-1493.

215 Elise Gould, "Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control," *Environmental Health Perspectives* 117, no. 7 (2009): 1162–67, http://dx.doi.org/10.1289/ehp.0800408.

216 Ibid.; Altarum Institute, "Health Sector Economic Indicators—Price Briefs," available at http://altarum.org/our-work/cshs-health-sector-economic-indicators-briefs.

217 U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, Underlying Cause of Death 1999-2015 on CDC WONDER Online Database, released 2016. Data are compiled from the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program, accessed at http://wonder.cdc.gov/ucd-icd10.html. Data for 2015 are compiled from the Multiple Cause of Death File 2015, Series 20, No. 2U, 2016.

218 Yutaka Aoki et al., "Blood Lead and Other Metal Biomarkers as Risk Factors for Cardiovascular Disease Mortality," *Medicine* 95, no. 1 (2016): e2223, http://dx.doi.org/10.1097/MD.0000000000002223.

219 Ibid.

220 Dariush Mozaffarian et al., "Heart Disease and Stroke Statistics—2015 Update: A Report From the American Heart Association," *Circulation* 131 (2015): e29–322, http://dx.doi.org/10.1161/CIR.0000000000000152.

221 Martin et al., "Association of Blood Lead and Tibia Lead With Blood Pressure and Hypertension in a Community Sample of Older Adults," *American Journal of Epidemiology* 163, no. 5 (2006): 467–78, https://doi.org/10.1093/aje/kwj060.

222 Guijing Wang et al., "Hypertension-Associated Expenditures for Medication Among U.S. Adults," *American Journal of Hypertension* 26, no. 11 (2013): 1295–1302, https://doi.org/10.1093/ajh/hpt079.

223 Bruce Lanphear et al., "Low-Level Environmental Lead Exposure and Children's Intellectual Function: an International Pooled Analysis," *Environmental Health Perspectives* 113, no. 7 (2005): 894–99, https://dx.doi.org/10.1056/NEJM200307313490515; Todd Jusko et al., "Blood Lead Concentrations < 10 µg/dL and Child Intelligence at 6 Years of Age," *Environmental Health Perspectives* 166 (2008): 243–48.

224 Jusko et al., "Blood Lead Concentrations"; Richard L. Canfield et al., "Intellectual Impairment in Children With Blood Lead Concentrations below 10 µg per Deciliter," *New England Journal of Medicine* 348 (2003): 1517–26, http:/dx.doi.org/10.1056/NEJMoa022848; David Bellinger and Herbert Needleman, "Intellectual Impairment And Blood Lead Levels," *New England Journal of Medicine* 349 (2003): 500–02, https://dx.doi.org/10.1056/NEJM200307313490515; Bruce Lanphear et al., "Low-Level Environmental Lead Exposure And Children's Intellectual Function: An International Pooled Analysis," *Environmental Health Perspectives* 113, no. 7 (2005): 894–99, https://dx.doi.org/10.1289%2Fehp.7688.

225 National Ambient Air Quality Standards for Lead, 73 Fed. Reg. 219 (Nov. 12, 2008): 66964.

226 European Food Safety Authority, "Scientific Opinion on Lead in Food: EFSA Panel on Contaminants in the Food Chain (CONTAM)," *EFSA Journal* 8, no. 4 (2010): 1570, http://dx.doi.org/10.2903/j.efsa.2010.1570

227 David S. Salkever, "Assessing the IQ-Earnings Link in Environmental Lead Impacts on Children: Have Hazard Effects Been Overstated?," *Environmental Research* 131 (2014): 219–30, http://dx.doi.org/10.1016/j.envres.2014.03.018.

228 Ibid.

229 Randall Lutter, "Valuing Children's Health: A Reassessment of the Benefits of Lower Lead Levels," Working Paper 00-02 (AEI-Brookings Joint Center for Regulatory Studies, 2000), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=243537.

230 Dajun Lin, Randall Lutter, and Christopher J. Ruhm, "Cognitive Performance and Labor Market Outcomes," Working Paper 22470 (NBER, 2016), http://www.nber.org/papers/w22470; David Salkever, "Updated Estimates of Earnings Benefits From Reduced Exposure of Children to Environmental Lead," *Environmental Research* 70, no. 1 (1995): 1–6, https://dx.doi.org/10.1006/enrs.1995.1038; Derek A. Neal and William R. Johnson, "The Role of Premarket Factors in Black-White Wage Differences," *Journal of Political Economy* 104, no. 5 (1996): 869–95, http://dx.doi.org/10.1086/262045.

231 Scott Grosse, "How Much Does IQ Raise Earnings? Implications for Regulatory Impact Analyses," Research Letter, Association of Environmental and Resource Economics, 27, no. 2 (2007). http://www.umsl.edu/~kosnikl/AERE%20Essay.pdf.

232 Ted Gayer and Robert W. Hahn, "Designing Environmental Policy: Lessons From the Regulation of Mercury Emissions," *Journal of Regulatory Economics* 30 (2006): 291–315, http://dx.doi.org/10.1007/s11149-006-9005-9; Lin, Lutter and Ruhm, "Cognitive Performance."

233 J. Schwartz, "Societal Benefits of Reducing Lead Exposure," *Environmental Research* 66 (1994): 105–24, https://dx.doi.org/10.1006/enrs.1994.1048.

234 Jay G. Chambers, Thomas B. Parish, and Jenifer J. Harr, "What Are We Spending on Special Education Services in the United States, 1999-2000?" (Washington: American Institutes for Research, 2004), http://www.csef-air.org/publications/seep/national/advrpt1.pdf.

235 David A. Cornwell, "National Survey of Lead Service Line Occurrence," *American Water Works Association* 108, no. 4 (2016), http://dx.doi.org/10.5942/jawwa.2016.108.0086.

236 David A. Cornwell, Richard A. Brown and Steven Via, "National Survey of Lead Service Line Occurrence," *Journal of the American Water Works Association* 13 (2016): E187–92, http://dx.doi.org/10.5942/jawwa.2016.108.0086.

237 U.S. Environmental Protection Agency, "Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water" (2017), https://www.epa.gov/sites/production/files/2017-01/documents/report_proposed_modeling_approaches_for_a_health_based_benchmark_for_lead_in_drinking_water_final_0.pdf.

238 Bruce P. Lanphear et al., "Environmental Exposures to Lead and Urban Children's Blood Lead Levels," *Environmental Research* 76 no. 2 (1998): 120–30, https://dx.doi.org/10.1006/enrs.1997.3801; Bruce P. Lanphear et al., "Environmental Lead Exposure During Early Childhood," *Journal of Pediatrics* 140, no. 1 (2002): 40–47, http://dx.doi.org/10.1067/mpd.2002.120513; Bruce P. Lanphear et al., "Low-Level Environmental Lead Exposure And Children's Intellectual Function: An International Pooled Analysis."

239 Gerard Ngueta et al., "Use of a Cumulative Exposure Index to Estimate the Impact of Tap Water Lead Concentration on Blood Lead Levels in 1- to 5-Year-Old Children (Montreal, Canada)," *Environmental Health Perspectives* 124 (2016): 388–95; http://dx.doi.org/10.1289/ehp.1409144.

240 U.S. Environmental Protection Agency, "Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water."

241 Michèle Prévost and Élise Deshommes, "Calculation of Reference Water Levels for Lead Service Line Replacement Intervention"; S. Triantafyllidou et al., "Low Contribution of PbO2-Coated Lead Service Lines to Water Lead Contamination at the Tap."

242 U.S. Census Bureau, "American Community Survey," U.S. Census Bureau's American Community Survey Office (2006), http://factfinder2.census.gov.

243 Anne Sandvig et al., "Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues" (Denver: AWWA and EPA, 2008), https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf.

244 Personal communication with Steve Via, "Informal Survey of Estimated Lead Service Line Replacement Costs," unpublished dataset, cited with permission, March 2017.

245 Sherry Dixon et al., "Window Replacement and Residential Lead Paint Hazard Control 12 Years Later," *Environmental Research* 113 (2012): 14–20, https://doi.org/10.1016/j.envres.2012.01.005.

246 Mark Farfel et al., "An Extended Study of Interim Lead Hazard Reduction Measures Employed in the Baltimore Clinical Center of the Treatment of Lead-Exposed Children (TLC)—Clinical Trial" (Washington: U.S. Department of Housing and Urban Development, April 2000), http://www.nmic.org/nyccelp/medical-studies/Farfel-extended-study-interim-controls-4-00.pdf; Farfel et al. 1997, "Lead Based Paint Abatement and Repair and Maintenance Study" (Washington: U.S. Environmental Protection Agency, December 1997) EPA-747-R-97-005, https://www.epa.gov/sites/production/files/documents/24folup.pdf.

247 Sherry L. Dixon et al., "Exposure of U.S. Children to Residential Dust Lead, 1999–2004: II. The Contribution of Lead-Contaminated Dust to Children's Blood Lead Levels," *Environmental Health Perspectives* 117, no. 3 (2009):468–74, https://dx.doi.org/10.1289/ehp.11918.

248 U.S. Department of Housing and Urban Development, "American Healthy Homes Survey: Lead and Arsenic Findings" (Washington: HUD, 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf; An alternative to this approach would have been to use the percent of homes with lead-based paint hazards, defined as significantly deteriorated lead-based paint, or dust or soil lead levels in excess of EPA standards, which is a subset of those with lead-based paint: The AHHS estimates that 52.5 percent of pre-1960 homes and 33.7 percent of pre-1978 homes have hazards. The study team chose to lead-based paint rather than hazards for several reasons. First, homes with lead paint could develop hazards at any time if the paint deteriorates or is damaged. Second, the AHHS definition of a lead-based paint hazard would exclude many units that by today's standards would be considered dangerous. For example, a home with a floor dust lead level under 40 µg/sq ft would not constitute a hazard under the survey, but would far exceed HUD's recently adopted floor dust standard of 10 µg/sq ft for grantees of the department's lead paint hazard control program. This variation in standards could result in an underestimation of high-risk units if only homes with hazards were considered. Finally, by focusing on low-income older housing, which evidence suggests is in poorer condition than other homes, the models and recommendations probably already isolated the units with the greatest likelihood of risk.

249 U.S. Environmental Protection Agency, "The Approach Used for Estimating Changes in Children's IQ From Lead Dust Generated During Renovation, Repair and Painting in Residences and Child-Occupied Facilities" (Washington: EPA, March 28, 2008), https://www.regulations.gov/document?D=EPA-HQ-OPPT-2005-0049-0930; Richard W. Leggett, "An Age-Specific Kinetic Model of Lead Metabolism in Humans," *Environmental Health Perspectives* 101, no. 7 (1993): 598–616, http://dx.doi.org/10.1289/ehp.93101598; U.S. Environmental Protection Agency, "Revised Final Report on Characterization of Dust Lead Levels After Renovation, Repair, and Painting Activities" (Washington: U.S. Environmental Protection Agency, Nov. 13, 2016), https://www.regulations.gov/document?D=EPA-HQ-OPPT-2005-0049-0857.

250 Sammy Zahran et al., "The Effect of Leaded Aviation Gasoline on Blood Lead in Children," *Journal of the Association of Environmental and Resource Economists* (In press).

251 Philip J. Wolfe et al., "Costs of IQ Loss From Leaded Aviation Gasoline Emissions," *Environmental Science and Technology* 50 (2016): 9026–33, http://dx.doi.org/10.1021/acs.est.6b02910; Sammy Zahran et al., "The Effect of Leaded Aviation Gasoline on Blood Lead in Children."

252 Lynn A. Karolyn, M. Rebecca Kilburn, and Jill Cannon, "Early Childhood Interventions: Proven Results, Future Promise" (Santa Monica, CA: RAND Corp., 2005), http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG341.pdf.

253 Blueprints for Healthy Youth Development, "Blueprints Programs," accessed November 2016, http://www.blueprintsprograms.com/programs.

254 A. Biglan, *The Nurture Effect: How the Science of Human Behavior Can Improve Our Lives & Our World* (Oakland, CA: New Harbinger Publications, 2015).

255 ChildTrends, *Youth Development Outcomes Compendium* (2001), https://www.childtrends.org/publications/youth-development-outcomes-compendium.

256 Kristen E. Darling-Churchill, Laura Lippman, "Early Childhood Social and Emotional Development: Advancing the Field of Measurement," *Journal of Applied Developmental Psychology* 45 (2016): 1–7, http://dx.doi.org/10.1016/j.appdev.2016.02.002.

257 Sherry Dixon et al., "Window Replacement and Residential Lead Paint Hazard Control 12 Years Later," *Environmental Research* 113 (2012): 14–20, https://doi.org/10.1016/j.envres.2012.01.005.

258 U.S. Environmental Protection Agency, "Revised Final Report on Characterization of Dust Lead Levels After Renovation, Repair, and Painting Activities" (Washington: U.S. Environmental Protection Agency, Nov. 13, 2016), https://www.regulations.gov/document?D=EPA-HQ-OPPT-2005-0049-0857.

259 U.S. Environmental Protection Agency, "Air Quality Criteria for Lead: Volume I of II [EPA Report, EPA/600/R-05/144aF]" (2006), http://cfpub.epa.gov/ncea/CFM/recordisplay.cfm?deid=158823.

260 Bruce Lanphear et al., "Low Level Environmental Lead Exposure and Children's Intellectual Function: an International Pooled Analysis," *Environmental Health Perspectives* 113, no. 7 (2005): 894–99, https://dx.doi.org/10.1289/ehp.7688; David Bellinger, email to Jee-Young Kim, Feb. 13, 2008; Richard Canfield, email to Jee-Young Kim, Aug. 12, 2008; Richard Hornung, email to Jee-Young Kim, Aug. 19, 2008; Martha Tellez-Rojo, email to Jee-Young Kim, Feb. 11, 2008.

261 David Bellinger, email to Jee-Young Kim, Feb. 13, 2008.

262 Ibid.; Richard Hornung, email to Jee-Young Kim, Aug. 19, 2008; Richard Canfield et al., "Intellectual Impairment in Children With Blood Lead Concentrations Below 10 µg per Decliter," *The New England Journal of Medicine* 348 (2003): 1517–26, http://dx.doi.org/10.1056/NEJMoa022848.

263 National Ambient Air Quality Standards for Lead, 73 Fed. Reg. 219 (Nov. 12, 2008): 66964; U.S. Environmental Protection Agency, "Benefit and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category" (2015), https://www.epa.gov/sites/production/files/2015-10/documents/steam-electric_benefit-cost-analysis_09-29-2015.pdf; Elise Gould, "Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control," *Environmental Health Perspectives* 117, no. 7 (2009): 1162–67, http://dx.doi.org/10.1289/ehp.0800408; Leonardo Trasande and Yinghua Liu, "Reducing the Staggering Costs of Environmental Disease in Children, Estimated at $76.6 Billion in 2008," *Health Affairs* 30, no. 5 (2011): 863–70, http://content.healthaffairs.org/content/30/5/863.short.

264 Bruce Lanphear et al., "Low-Level Environmental Lead Exposure and Children's Intellectual Function: an International Pooled Analysis," *Environmental Health Perspectives* 113, no. 7 (2005): 894–99, https://dx.doi.org/10.1056/NEJM200307313490515.

265 K.S. Crump et al., "A Statistical Reevaluation of the Data Used in the Lanphear et al. (2005) Pooled Analysis That Related Low Levels of Blood Lead to Intellectual Deficits In Children," *Critical Reviews in Toxicology* 43 (2013): 785–99.

266 Scott Grosse, "How Much Does IQ Raise Earnings? Implications for Regulatory Impact Analyses," Research Letter, *Association of Environmental and Resource Economics* 27, no. 2 (2007), http://www.umsl.edu/~kosnikl/AERE%20Essay.pdf; Ted Gayer and Robert W. Hahn, "Designing Environmental Policy: Lessons From the Regulation of Mercury Emissions," *Journal of Regulatory Economics* 30 (2006): 291–315, http://dx.doi.org/10.1007/s11149-006-9005-9; Lin, Lutter and Ruhm, "Cognitive Performance."

267 Leonardo Trasande and Yinghua Liu, "Reducing the Staggering Costs of Environmental Disease in Children, Estimated at $76.6 Billion in 2008," *Health Affairs* 30, no. 5 (2011): 863–70, http://content.healthaffairs.org/content/30/5/863.short; See economic assumptions and methods in Social Security Administration, "The 2016 Annual Report of the Board of Trustees of The Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds" (2016), https://www.ssa.gov/OACT/TR/2016/tr2016.pdf.

268 Philip J. Wolfe et al., "Costs of IQ Loss From Leaded Aviation Gasoline Emissions," *Environmental Science and Technology* 50 (2016): 9026–33, http://dx.doi.org/10.1021/acs.est.6b02910.

269 Elise Gould, "Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control," *Environmental Health Perspectives* 117, no. 7 (2009): 1162–67, http://dx.doi.org/10.1289/ehp.0800408; Leonardo Trasande and Yinghua Liu, "Reducing the Staggering Costs of Environmental Disease in Children, Estimated at $76.6 Billion in 2008," *Health Affairs* 30, no. 5 (2011): 863–70, http://content.healthaffairs.org/content/30/5/863.short.

270 U.S. Bureau of Economic Analysis, "Table 1.10. Gross Domestic Income by Type of Income," accessed April 13, 2017, https://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=3&isuri=1&903=51.

271 U.S. Environmental Protection Agency, "Mortality Risk Valuation," https://www.epa.gov/environmental-economics/mortality-risk-valuation.

272 See, for example, the discussion of discount rates in N.H. Stern & Great Britain, *The Economics of Climate Change: The Stern Review* (Cambridge, UK: Cambridge University Press, 2007).

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Windows of Opportunity: Lead Poisoning Prevention, Housing Affordability, and Energy Conservation

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Abstract

We used housing demolition and window replacement rates to forecast prevalence trends for childhood lead poisoning and lead paint hazards from 1990 to 2010 for the President's Task Force on Environmental Health Risks and Safety Risks to Children. The mid-point of that forecast has now been validated by national blood lead data and the 1998–2000 National Survey of Lead and Allergens in Housing.

The validation of the task force model and new analysis of these survey data indicate that window replacement explains a large part of the substantial reduction in lead poisoning that occurred from 1990 to 2000. A public-private effort to increase window replacement rates could help eliminate childhood lead poisoning by 2010. This effort would also improve home energy efficiency and affordability, in addition to reducing air pollution from power plants, and a broader initiative could reduce other housing-related health risks as well.

Keywords: Community development and revitalization; Energy conservation; Lead poisoning

Introduction

The U.S. Centers for Disease Control and Prevention (CDC) states that blood lead levels above 10 micrograms per deciliter (µg/dL) are associated with "harmful effects on children's learning and behavior" (CDC 1997b, 9). This article shows that a substantial reduction in the number of children with elevated blood lead (EBL) at or above 10 µg/dL from 1990 to 2000 can be largely explained by window replacement. An initiative to increase window replacement rates could help eliminate childhood lead poisoning by 2010 *and* improve home energy efficiency and affordability because old windows with lead paint on interior surfaces also have single panes. Replacing single-pane

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windows with ENERGY STAR windows can substantially reduce home energy use, associated air pollution from power plants, and fuel bills that adversely affect the affordability of low-income housing.

In February 2000, the President's Task Force on Environmental Health Risks and Safety Risks to Children published the first federal interagency strategy to eliminate childhood lead poisoning from exposure to lead paint hazards by 2010. The report forecast the prevalence of lead paint hazards and EBL prevalence from 1990 to 2010 based on a model constructed in 1999, when the most recent data came from the National Health and Nutrition Examination Survey (NHANES) III, phase 2 (1992 to 1994), and the 1989–90 National Lead Paint Survey (NLPS) (U.S. Department of Housing and Urban Development [HUD], Office of Policy Development and Research 1990). The task force model combined these data with housing demolition and window replacement rates derived from the 1989–97 (five biannual) American Housing Surveys (AHS) (U.S. Bureau of the Census and HUD 2001) and the 1993 Residential Energy Consumption Survey (RECS) (U.S. Department of Energy [DOE] 1995). For 1989 to 2000, the model forecast a 25 percent decline in the number of housing units with lead paint hazards, with window replacement accounting for 70 percent of that decline and demolition accounting for the remainder. On the basis of the estimated decline in lead paint hazards, the model also forecast a substantial decline in prevalence of EBL in children under six.

The task force anticipated that the demolition of older homes would reduce both lead paint hazards and the prevalence of EBL because lead paint was widely used on interior and exterior surfaces before 1940. In addition, NLPS and RECS data for pre-1940 units showed that window replacement is a good indicator of the kind of housing rehabilitation that is likely to remove lead paint and the most severe dust lead hazards. NLPS data showed that 17 percent of pre-1940 units had no interior lead paint in 1989, and RECS data showed that 13 percent of pre-1940 units had had all of their windows replaced before 1990. This suggests that most pre-1940 units with no interior lead paint in 1989 had probably had it removed through substantial rehabilitation, including window replacement.

In addition to serving as an indicator of extensive rehabilitation and ongoing property maintenance, window replacement was directly linked to reducing lead paint hazards. The NLPS showed that windows were where lead paint and the highest levels of dust lead were most likely to be found. Dust lead on horizontal window surfaces is also significantly correlated with the levels of lead in children's blood (Lanphear et al. 1995). Further, the national evaluation of the HUD lead hazard reduction grant program showed that window

replacement is a common hazard control strategy adopted by many local governments receiving HUD grants (National Center for Healthy Housing 2004).

An analysis of these national evaluation data demonstrated the short- and long-term effectiveness of window replacement with respect to controlling dust lead hazards (HUD, Office of Lead Hazard Control 1999a). This analysis found that pre-intervention median dust lead loadings in rooms treated with paint stabilization *and* window replacement were 60 percent higher than in rooms treated with paint stabilization and window repairs, and over three times higher than in rooms treated only with paint stabilization. These data indicate that window replacement was an especially common intervention strategy in rooms with severe dust lead hazards. But after six months, rooms that underwent window replacement, cleanup, and clearance had postintervention dust lead loadings that were significantly lower than they were in rooms with just window repair. Also, one year after the intervention, loadings were significantly lower in rooms that underwent window replacement than in rooms with just paint stabilization (HUD, Office of Lead Hazard Control 1999a). Moreover, evaluation data show that dust lead loadings were lower in units with window replacement three years after the intervention (National Center for Healthy Housing 2004).

In effect, the task force model assumed that units with interior lead paint in 1989 would follow one of three paths that would determine the risk of having lead paint hazards through 2010. Some would undergo window replacement and ongoing property maintenance, resulting in a low risk of lead paint hazards. Others would be demolished, and still others would remain occupied without window replacement, resulting in a high risk of lead paint hazards over the 20-year forecast horizon.

The term "high risk" as used here should not be confused with the regulatory definition of lead paint hazards. These are identified at a given housing unit at the time of risk assessment, whereas the task force model forecast the risk of such hazards over a 20-year horizon. From a regulatory standpoint, intact interior lead paint, by itself, does not constitute a lead paint hazard, but the model defined high-risk units in 1989 to include all units with interior lead paint, whether intact or deteriorated, because such homes had a higher risk of developing lead paint hazards (including dust lead hazards) over the 20-year horizon. Units that had dust lead hazards in 1989 but no interior lead paint were counted as low risk in the model because without a source of potential recontamination, these hazards would likely dissipate with routine housecleaning over the 20-year horizon. The NLPS showed that homes with interior lead paint were more likely to have lead paint hazards, so there was substan-

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tial overlap between 1989 units with lead paint hazards and units defined as high risk in the model.

The forecast was then combined with 1992–94 NHANES EBL data and AHS data on children under six per occupied unit to estimate the number of children with EBL through 2010 by family income, age of housing, and housing risk (high or low). The EBL forecast also reflected the 2000–10 impact of the HUD assisted-housing rule on lead paint (24 CFR Part 35), which took effect in 2000, protecting children in public housing and in project-based and tenant-based rental units. Assisted rehabilitation programs subject to the rule were expected to replace windows at about the same overall rate reflected in the housing risk forecast (which was based on AHS and RECS data that include these programs), so the model did not assume any further reduction in high-risk housing directly related to assisted rehabilitation.

Validation of the model

Overall, the model forecast a decline in high-risk housing from 44.2 million units in 1989 to 33.3 million in 2000. This forecast has been validated by lead paint hazard data from HUD's 1998–2000 National Survey of Lead and Allergens in Housing (NSLAH) and the 1999–2000 NHANES data.

The model's emphasis on window replacement is also validated by analysis of NSLAH, RECS, and AHS data on windows (Jacobs and Nevin 2006). The NSLAH data show that dust lead hazards (as defined in the next section) are especially common and severe in units with lead paint on interior window surfaces. Comparing the NSLAH data with RECS and AHS window data indicates that replacing single-pane windows in pre-1960 homes also effectively targets windows with lead paint on interior window surfaces. These data, and the validation of the model, indicate that single-pane window replacement can help eliminate childhood lead poisoning by 2010, while at the same time increasing home energy efficiency, reducing air pollution from power plants, and improving affordability through lower fuel bills.

The risk to children from exposure to lead

Children under six are especially vulnerable to lead exposure because their nervous systems are still developing (National Academy of Sciences 1993). Although childhood blood lead levels at or above 10 µg/dL are characterized as EBL, CDC warns that "there may be no lower threshold for some of the adverse effects of lead in children" (1997a). In addition to many other adverse health effects, recent research has shown that even blood lead levels below 10 µg/dL in early childhood may be associated with intellectual impairment

(Canfield et al. 2003). Other research has shown that exposure to lead in early childhood has a strong association with delinquent and criminal behavior among juveniles and young adults (Denno 1990; Dietrich et al. 2001; Needleman et al. 1996; Nevin 2000).

During the 20th century, the two main sources of childhood lead exposure were leaded gasoline emissions and lead paint (Agency for Toxic Substances and Disease Registry 1988; Clark et al. 1991; Jacobs 1995). Lead poisoning can be caused by inhalation of lead in the air, ingestion of lead paint chips, and occasionally other sources, but the main exposure pathway today is from lead-contaminated dust that settles on horizontal surfaces such as floors and window sills and is then ingested via normal hand-to-mouth contact in children (Bornschein et al. 1987; Duggan and Inskip 1985; Lanphear et al. 1995). Very young children are especially at risk because the brain undergoes critical development in the first few years of life, when children have regular hand-to-mouth activity as they crawl. Lead ingested via contaminated dust on children's hands is absorbed into the bloodstream and carried to the developing brain.

The amount of dust lead ingested by young children due to lead paint or exposure to the lead in gasoline emissions is several times greater than average lead ingestion via other pathways (U.S. Environmental Protection Agency [EPA] 1986). Before leaded gasoline was banned, urban children were exposed to dust lead from settling gasoline emissions. Homes with interior lead paint are especially likely to have dust lead hazards if the paint has deteriorated (Jacobs et al. 2002), but these hazards may also be created by lead paint on friction and impact surfaces, such as windows, and by home renovation that disturbs the paint without appropriate dust containment and cleanup (President's Task Force on Environmental Health Risks and Safety Risks to Children 2000).

Pursuant to the Residential Lead Hazard Reduction Act of 1992, otherwise known as Title X of the 1992 Housing and Community Development Act (Public Law 101–550; 42 USC 4851 *et seq.*), EPA and HUD now define housing units with lead paint hazards to include housing that exceeds any one of the following (EPA 2001b):

1. Deteriorated lead paint above *de minimus* levels[1]
2. Dust lead loadings above 250 micrograms of lead per square foot of surface area (μg/ft^2) on interior window sills (measured by wipe sampling)

[1] References in this article to lead paint refer to paint equal to or exceeding the regulated minimum of one milligram of lead per square centimeter of painted surface (1 mg/cm^2), and deteriorated lead paint refers to deterioration exceeding *de minimus* levels of 2 square feet on large interior surfaces, 10 percent of window sashes or other small interior surfaces, and/or 20 square feet of exterior surfaces.

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3. Dust lead loadings above 40 μg/ft² on floors (measured by wipe sampling)
4. Bare soil lead concentrations exceeding 1,200 parts per million (ppm) or 400 ppm in play areas

To put the dust standards into perspective, if a one-square-foot area of lead paint at the minimum regulated concentration (1 mg/cm²) is sanded and turned into dust that is distributed evenly over a 10- by 10-foot room and none of that dust is cleaned up, then the level of dust lead would be 9,300 μg/ft² (HUD 1995), more than 230 times the level regulated by EPA and HUD. Dust lead loadings above the standards can raise blood lead to levels that can impair cognitive development in a child (EPA 2001b; HUD, Office of Lead Hazard Control 1999a; Lanphear et al. 1998). Higher loadings are associated with higher levels of lead in the blood and more severe cognitive damage.

Trends in childhood lead poisoning

The percentage of children under six with blood lead levels at or above 10 μg/dL fell from 88 percent during NHANES II (1976 to 1980) to 9 percent during NHANES III, phase 1 (1988 to 1991) (Pirkle et al. 1994). This decline revealed the public health benefit of regulatory actions to remove lead from gasoline, new paint, and the solder used in food and beverage cans. But those same data showed that 1.7 million U.S. children under six still had EBL. The sale of lead paint for residential use was banned in 1978 (U.S. Consumer Product Safety Commission 1977), but a large body of research shows that lead paint hazards in older homes are the most important remaining source of childhood lead exposure today (CDC 1991, 1997b; National Academy of Sciences 1993; President's Task Force on Environmental Health Risks and Safety Risks to Children 2000). The NHANES report concluded with the following warning about residential lead paint hazards: "Without efforts to reduce these exposures, population blood lead levels are unlikely to continue to decline" (as cited in Pirkle et al. 1994, 291).

EBL prevalence in U.S. children under six then declined to 4.4 percent during NHANES III, phase 2 (1992 to 1994), but those data showed a prevalence of 16.4 percent among low-income children and 22 percent among black children living in homes built before 1946 (CDC 1997c). EBL prevalence for all children under six fell further to 2.2 percent during the 1999–2000 NHANES (Meyer et al. 2003).[2] The decline through 2001 is confirmed by

[2] The 95 percent confidence interval for the 1999–2000 NHANES is large due to sample size limitations, but the decline in the NHANES EBL prevalence point estimate is also consistent with the CDC surveillance data trend.

CDC surveillance data (CDC 2000; Meyer et al. 2003) that reflect blood lead tests for about 7 to 8 percent of children under six for each year from 1997 to 2001 and account for a larger share of children with EBL because surveillance programs target low-income areas with older housing and a higher prevalence of EBL. Even within this at-risk population, the prevalence of EBL (as a percentage of children tested) declined from 7.66 percent in 1997 to 3.01 percent in 2001, although the disparity between low-income minority children and other children was still large (Meyer et al. 2003).

The magnitude of the decline in the prevalence of childhood EBL reported by NHANES, from 9 percent in 1988 to 1991 to 2.2 percent in 1999 to 2000 clearly indicates a national trend, which is confirmed by 1997–2001 CDC surveillance data. But there were still 434,000 children with EBL in 1999 to 2000, and CDC noted that the 2000 national goal of eliminating blood lead levels above 25 µg/dL was not achieved. In short, despite significant progress, lead poisoning arising primarily from lead paint hazards in housing remains a major childhood environmental disease in the United States.

Policies and practices that reduce lead paint hazards and childhood lead poisoning

The dramatic decline in the prevalence of EBL over the 1990s is due in part to government efforts to reduce lead paint hazards, including efforts mandated by Congress with the passage of Title X, which authorized new programs that educated the public, required disclosure of known lead paint hazards in most pre-1978 housing, and provided HUD funding to eliminate lead paint hazards in privately owned low-income housing. HUD grant funding controlled lead paint hazards in many privately owned low-income units posing the greatest risks in the 1990s, but grant program units directly account for only a small percentage of the decline in units with lead paint hazards during that time. Regulatory efforts by some state and local governments also accounted directly for only a small portion of the decline. Title X prescribed activities to control lead paint hazards in federally assisted housing, but HUD did not issue new regulations for such housing until 1999, so the trend in childhood lead poisoning during the 1990s cannot be explained solely by regulatory changes.

The 1999 assisted-housing rule (24 CFR, Part 35) requires lead paint hazard evaluation and reduction in public housing, in project-based and tenant-based rental units, and in HUD-assisted rehabilitation and other programs (HUD, Office of Lead Hazard Control 1999b). For most assisted housing, the rule requires safe work practices, stabilization of deteriorated lead paint, cleanup, and clearance testing for dust lead hazards. For units receiving

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less than $25,000 of federal rehabilitation assistance (accounting for the vast majority of such units), the rule also requires friction and impact repair work on window surfaces with lead paint (as needed) to reduce friction as the sash is operated, thus reducing the generation of dust lead. The HUD rule does not generally require window replacement, but the economic analysis of the rule determined that replacement provides a longer-lasting reduction in dust lead hazards. Further, this analysis showed that the cost of window replacement could often be recovered by energy savings and increased home value resulting from energy-efficient windows (HUD, Office of Lead Hazard Control 1999a).

Recent trends in window replacement

The task force forecast through 2010 reflected window replacement rates based on RECS and AHS data through 1997 only. But AHS data (table 1) now show that the window replacement share of non-disaster-related assisted upgrades actually increased from 9.1 percent in 1997 to 13.3 percent in 2001, and the window replacement share of assisted-rehabilitation spending in pre-1960 homes rose from 7.2 percent to 15.3 percent. There was also a significant though somewhat smaller increase in the share of *unassisted* home upgrade spending in pre-1960 units devoted to window replacement, from 7.8 percent to 8.5 percent.

Higher window replacement rates are further evident in market research data showing that sales of residential replacement windows increased from 29.9 million window units in 1999 to 33.3 million in 2003, exceeding the 29.5 million sold for new construction in 2003 (Drucker Research Co. 2004). The increase in window replacement likely reflects a combination of increased awareness of how windows affect lead paint hazards and how replacement can reduce home energy costs. In 1997, window manufacturers formed the Effi-

Table 1. Percentage of Non-Disaster-Related Upgrade Expenditures Used for Window Replacement

	1997 (%)	2001 (%)
All assisted upgrades	9.1	13.3
Assisted upgrades in pre-1960 units	7.2	15.3
All unassisted upgrades	8.5	8.7
Unassisted upgrades in pre-1960 units	7.8	8.5

Source: U.S. Bureau of the Census and HUD 2001.

Note: The HUD rule on lead paint hazards in federally assisted housing, which took effect in 2000 and increased awareness of potential energy savings, appears to be shifting more upgrade expenditures to window replacement, especially in pre-1960 government-assisted projects.

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cient Windows Collaborative (EWC) to promote energy savings and other benefits of high-efficiency windows. In 1998, the ENERGY STAR program, jointly sponsored by EPA and DOE, established the ENERGY STAR windows standard. Replacing single-pane windows with clear-glass double-pane windows can reduce fuel bills by about 10 percent to 15 percent, whereas savings with ENERGY STAR windows can exceed 20 percent, increasing the financial incentive for replacement (Nevin, Gazan, and Bender 1999). Concerns about generating capacity have also led to some utility-sponsored incentive programs for ENERGY STAR windows, because the low solar gain of high-efficiency windows produces the greatest savings in electricity during the afternoon hours when peak demand strains system capacity (EWC 2004).

Rising energy prices

Moreover, rising fuel oil and natural gas prices since 2001 have increased the energy saving incentives for window replacement. In the case of assisted housing, these incentives converge with a memorandum of understanding signed by HUD, DOE, and EPA in 2003, agreeing to use more ENERGY STAR products in HUD housing programs. According to the memorandum, HUD spends more than $4 billion annually on utility bills—in excess of 10 percent of its total budget (HUD 2004). CDC and HUD also sponsored a windows symposium in 2004, bringing together lead hazard reduction, weatherization, and other assisted rehabilitation grantees, plus mortgage underwriters and health and housing policy experts, to discuss the multiple benefits of window replacement (National Center for Healthy Housing 2005).

Windows of opportunity: Simultaneously eliminating childhood lead poisoning, increasing energy efficiency, improving housing affordability, and reducing air pollution

These findings indicate that window replacement can help eliminate childhood lead poisoning by 2010, while increasing housing affordability through greater home energy efficiency; however, window replacement that disturbs lead paint without proper cleanup and clearance testing can actually increase dust lead hazards in the short term. To eliminate short- and long-term risks, public education about lead paint hazards, regulatory requirements, and assisted rehabilitation funding should be designed to complement and enhance market incentives for window replacement and increase replacement rates in low-income housing with lead paint hazards.

The task force model accurately forecasted the decline in lead paint hazards and children with EBL through 2000 based on housing demolition and

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window replacement rates, but market forces alone are unlikely to achieve the national goal of eliminating childhood lead poisoning by 2010. The 2000 NSLAH showed that dust lead hazards are still common in units with deteriorated interior lead paint (Jacobs et al. 2002), thus indicating a continuing need for better enforcement of housing and health codes that prohibit deteriorated paint conditions, as well as public education about lead paint hazards. AHS data also show a much lower rate of window replacement in low-income housing, demonstrating the need for lead hazard reduction and other housing rehabilitation in such units.

Window replacement and other rehabilitation work that disturbs lead paint without proper cleanup can increase exposure in the short run, and renovation without proper cleanup was a likely cause of dust lead hazards in some NSLAH homes with no interior lead paint. While the prevalence of dust lead hazards in such units was relatively low, homes without interior lead paint still accounted for a substantial number of all units with dust lead hazards. The median severity of those hazards (i.e., micrograms of lead per square foot) was relatively low, but any dust lead loading above regulatory standards can cause cognitive damage in young children. The HUD lead paint rule requires federally assisted housing programs to conduct cleanup and clearance testing to address the immediate risk of dust lead hazards, but further efforts are needed to encourage testing to verify proper cleanup after all rehabilitation and window replacement work that disturbs lead paint, including work done without federal assistance.

A simple home upgrade strategy for lead hazard reduction and energy efficiency

The task force strategy to eliminate childhood lead poisoning by 2010 focused on low-income children living in older housing and estimated the direct federal assistance needed to protect this most at-risk population. To protect middle- and upper-income children, the strategy also called for "education and training of painters, renovators, remodelers, maintenance workers, landlords, parents, and others, combined with tax or other financial incentives" (President's Task Force on Environmental Health Risks and Safety Risks to Children 2000, 13). About a third of children with EBL in the 2000–10 forecast actually come from families that have incomes above 130 percent of the poverty level and therefore are generally not eligible for government assistance.

The challenge of meeting the 2010 goal remains twofold: to provide the financial assistance needed to eliminate lead paint hazards in low-income households and to provide additional incentives for middle- and upper-income households to eliminate lead paint hazards in their homes. The validation of

the model, the NSLAH data on windows and dust lead hazards, and the comparison of single-pane window data with NSLAH data on interior window surfaces with lead paint all suggest that this challenge can be met by a coordinated effort to promote the following "lead-safe window replacement" home upgrade:

1. Replace single-pane windows with ENERGY STAR windows
2. Use safe work practices to stabilize any deteriorated paint (HUD 1995)
3. Remove dust lead hazards with specialized cleaning
4. Conduct clearance testing for dust lead hazards to ensure that units are safe for children after the work has been completed

Under the HUD rule for federally assisted housing, lead paint hazard controls can be completed without testing the lead content in paint if all deteriorated paint is presumed to be lead paint and is stabilized and if work is followed by cleanup and clearance testing. Replacing single-pane windows in older homes would also effectively target windows with lead paint on interior surfaces, without testing for lead in paint. Therefore, an upgrade strategy that combines the replacement of single-pane windows, the stabilization of deteriorated paint, cleanup, and clearance testing would simultaneously address the immediate risk of lead paint hazards and the long-term risk of dust lead related to lead paint on window surfaces. This lead-safe window replacement upgrade could be combined with other work, and cleanup and clearance testing would also prevent the risk of dust lead hazards created by rehabilitation.

HUD and EPA have already taken some actions that should help encourage lead-safe window replacement. For example, the only independent inspection required for this upgrade would be a postproject visual evaluation for deteriorated paint and dust wipe clearance testing. To lower the cost of testing, HUD and EPA have developed clearance technician training that does not require more highly trained risk assessors and lead paint inspectors. An initiative that combined lead-safe window replacement with low-income homeownership assistance could also train home inspectors to be clearance technicians, and those inspectors could then provide dust lead clearance services to middle- and upper-income home buyers.

Further, HUD could encourage lead-safe window replacement by stating that this upgrade strategy satisfies regulatory requirements for any work done in coordination with lead hazard reduction grantees. Coordinating lead hazard reduction with homeownership initiatives, weatherization, and other assisted rehabilitation programs could be facilitated by establishing a single set of income eligibility criteria for programs funding lead-safe window replacement.

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Federal aid

In fiscal year 2000, the federal government provided state and local governments with more than $8 billion for the rehabilitation of low-income housing, energy assistance, new home buyer assistance, construction of affordable housing, and economic development (HUD, Office of Policy Development and Research 2000). Just over 25 percent of this money was used for rehabilitation assistance, and only 2 percent was used for window replacement. The 2001 AHS data indicate that a larger share of assisted rehabilitation funds are now being spent on window replacement, but there is still more potential for a window replacement strategy that leverages federal and private sector funding to achieve long-term reduction in lead hazards and improvements in home energy efficiency that permanently reduce fuel bills.

Shared incentives and leveraged funding for a coordinated public/private window replacement initiative

A lead-safe window replacement initiative would provide enduring reduction in lead paint hazards, substantial home energy savings, improvements in affordability, and reductions in power plant emissions, plus higher home values and associated neighborhood revitalization. Stabilizing all deteriorated paint (including any lead paint) and conducting proper cleanup and clearance testing for lead-contaminated dust would eliminate any immediate risk of lead paint hazards, and replacing all single-pane windows would address the long-term risk of recurring dust hazards from lead paint on interior window surfaces. Replacing single-pane windows with ENERGY STAR windows would also reduce heating and cooling bills by 20 percent or more (EWC 2004; Nevin, Gazan, and Bender 1999), with associated reductions in power plant emissions. In addition to annual savings on fuel bills, there is evidence that energy efficiency, and particularly window replacement, increase residential home value (discussed later), with associated benefits for neighborhood revitalization. The multiple benefits of this upgrade strategy mean that window replacement in low-income housing could be financed in at least four ways:

1. By attracting additional funding through utility-sponsored and other charities that communicate multiple benefits related to children's health, energy efficiency, pollution prevention, low-income homeownership, and neighborhood revitalization

2. By leveraging public funding with energy-efficient mortgage (EEM) financing by combining window replacement with low-income homeownership efforts

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3. By providing matching funds and regulatory incentives for state and local governments to shift more existing public funding to window replacement
4. By encouraging window manufacturers to incorporate health information into their marketing messages to create informed consumers

The first and third tactics are related in that utility-sponsored charities could provide a source of matching funds to encourage state and local governments to shift more existing public funding to lead-safe window replacement. Many utilities already sponsor fuel funds that make charitable appeals for low-income energy assistance. These generate over $100 million per year in donations, leveraged by Low-Income Home Energy Assistance Program (LIHEAP) incentive funds for which states can apply on the basis of nonfederal contributions.

LIHEAP primarily helps low-income households pay their energy bills, but states can use 15 percent (and, with a waiver, up to 25 percent) of LIHEAP funds for weatherization. Many local jurisdictions already coordinate their weatherization and lead hazard reduction programs. LIHEAP funds are generally administered together with Weatherization Assistance Program (WAP) funds. Most fuel funds use flyers mailed out with utility bills to appeal for short-term bill-paying assistance, but some have broadened their mission to include weatherization. A lead-safe window replacement initiative could build on this model, increasing the fund-raising potential by broadening the charitable appeal to encompass childhood health protection through lead hazard reduction, long-term reductions in fuel costs for low-income families through energy efficiency, and associated reductions in power plant emissions, plus housing rehabilitation and neighborhood revitalization.

The federal government could also enhance incentives for matching funds by increasing the percentage of LIHEAP money that states can use to match fuel fund charity donations for lead-safe window replacement. Moreover, working through utility-sponsored fuel funds could leverage existing utility programs to promote ENERGY STAR products, including windows. In addition, a funding appeal highlighting the multiple benefits of lead-safe window replacement in low-income housing would help communicate the benefits of this upgrade to middle- and upper-income households.

Moreover, the fuel bill savings from window replacement can provide a way to increase low-income homeownership by leveraging public funds with Federal Housing Administration (FHA), Department of Veterans Affairs (VA), Fannie Mae, and Freddie Mac EEMs. An EEM recognizes the economic value of energy efficiency as part of the mortgage underwriting process. HUD's (2004) Energy Action Plan calls for the promotion of the FHA EEM as a prior-

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ity single-family insured loan product, and HUD has clarified and enhanced the EEM product to make it more widely available:

> The [FHA] EEM program allows a borrower to finance 100 percent of the expense of a cost-effective "energy package," i.e., the property improvements to make the house more energy efficient. A cost-effective energy package is one where the cost of the improvements, including maintenance, is less than the present value of the energy saved over the useful life of those improvements. The borrower does not need to qualify for the additional financing or provide additional downpayment. There is also no need for a second appraisal that reflects the expense of the energy package and the improvements may be applied to retrofit an existing house....
>
> [T]he mortgage lender, using the energy rating report and an EEM worksheet will determine the dollar amount of the cost-effective energy package that may be added to the loan amount. This dollar amount cannot exceed 5 percent of the property's value (not to exceed $8,000) or $4,000, which ever is greater. Regardless of the property's value, every borrower who otherwise qualifies can finance at least $4,000 of the costs of the Energy Package if the cost exceeds $4,000....The FHA maximum loan limit for the area may be exceeded by the cost of the energy efficient improvements. (HUD 2005)

With EEM financing, energy savings from lead-safe window replacement could effectively serve as down payment assistance, allowing state and local governments to support affordable housing, home ownership, energy efficiency, and lead hazard reduction with the same leveraged funds. FHA, VA, Fannie Mae, and Freddie Mac could also encourage a lead-safe window replacement homeownership initiative by providing a simplified EEM specifically for this upgrade strategy. EEMs generally require a home-specific energy rating to estimate the annual fuel savings from an energy-efficient upgrade, but the ENERGY STAR new home standard can be satisfied by a Home Energy Rating System (HERS) score *or* a set of prescriptive specifications called Builder Option Packages (BOPs) that EPA created for two reasons: "1) prescriptive specifications are an easy way to communicate ENERGY STAR qualified new home requirements to prospective partners, and 2) in states where HERS ratings are not available, BOPs represent an alternative verification method" (EPA 2005a).

A simplified EEM could encourage assisted rehabilitation and weatherization grantees to pursue a leveraged home ownership, energy efficiency, and lead

hazard reduction strategy by specifying that the lead-safe window replacement upgrade is a "rehab option package" that qualifies for EEM financing or at least that some percentage of upgrade costs would qualify. For example, if 80 percent of lead-safe window replacement upgrade costs qualified for the FHA EEM, then state and local grantees could finance a $10,000 upgrade with $2,000 of federal funding plus $8,000 added to the home buyer's mortgage, without the expense of obtaining a home-specific energy rating. Upgrade costs for lead-safe window replacements would be less than $10,000 in most assisted units, depending on the number of single-pane windows replaced, and would be closer to $3,000 per unit for a low-income homeownership effort targeting attached (row) houses for upgrades (HUD, Office of Lead Hazard Control 1999a), because row houses typically have fewer windows.

Of course, mortgage underwriters must be concerned with default risks related to loan-to-value ratios, but an analysis of AHS data indicates that home value increases by $20 for every $1 reduction in annual fuel bills, on average, consistent with a rational trade-off between fuel savings and after-tax mortgage interest (Nevin and Watson 1998). An analysis comparing this finding with the collective judgment of real estate agents participating in a *Remodeling Magazine* (*RM*) "Cost vs. Value" survey also found that the cost of window replacement can be fully recovered by the increased market value of energy-efficient windows (Nevin, Gazan, and Bender 1999). The 1993 *RM* survey actually reported that realtors in 60 metropolitan areas estimated that about 74 percent of the cost of window replacement would be recovered at resale, but an analysis of fuel savings associated with this upgrade indicated that the 1993 estimates were consistent with the energy efficiency value resulting from upgrades to clear-glass double-pane windows, plus an appearance value for new windows.

In addition, this analysis found that additional energy savings from ENERGY STAR windows could increase resale value to close to 100 percent of the cost of the upgrade (Nevin, Gazan, and Bender 1999). According to the 2003 and 2004 *RM* surveys, some combination of higher fuel costs and greater awareness of higher fuel savings with ENERGY STAR windows has since increased the estimated resale value associated with window replacement to 85 percent of the cost of the upgrade (Alfano 2004).

The 2001 AHS data suggest that the overall window replacement rate in pre-1975 housing has increased by at least 20 percent, relative to the 1989–2000 replacement rates used in the original task force model. Figure 1 shows that the model, updated to reflect 2001 AHS data on children per unit and percentage below 130 percent of poverty, plus a 20 percent increase in window replacement rates for 2000 to 2010 (relative to 1989–2000 rates),

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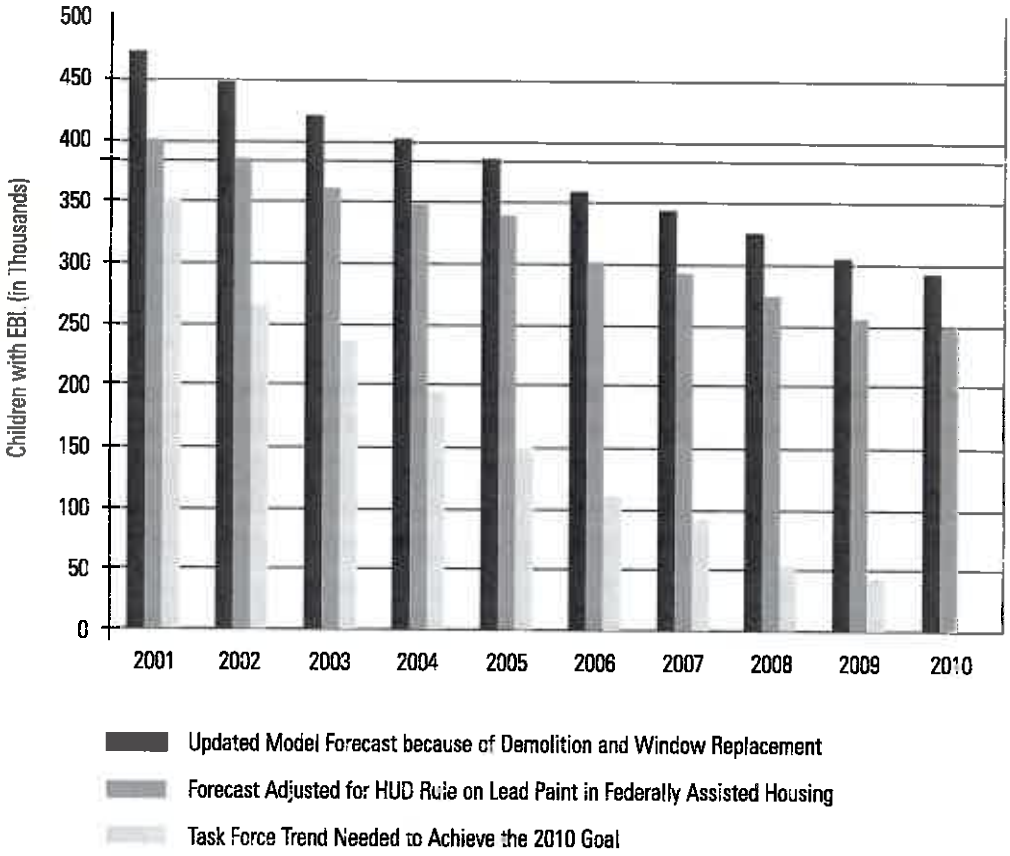
Figure 1. Forecast Decline in Children with EBL



Source: Task force model estimates (updated to reflect 2001 AHS data, and higher window replacement rates) (President's Task Force on Environmental Health Risks and Safety Risks to Children 2000).

Note: The updated model now forecasts that market trends for window replacement and demolition would reduce the number of children with EBL to 292,000 by 2010 without other efforts to reduce childhood lead exposure. The new HUD rule will also protect children living in federally assisted housing, and a lead-safe window replacement initiative could achieve the national goal to eliminate childhood lead poisoning by 2010.

now forecasts that window replacement and demolition market trends alone would reduce the number of children with EBL to 292,000 by 2010. The new HUD rule will also protect more children living in federally assisted housing, but figure 1 shows that without further action, 250,000 children would still be at risk in 2010. A public-private lead-safe window replacement initiative that leverages federal funds with EEM financing and charitable appeals, combined with the marketing strategies, enforcement, and other initiatives outlined here, holds great promise for protecting all children and eliminating childhood lead poisoning by 2010.

A broader strategy to achieve housing, health, and energy policy goals

The validation of the task force model also suggests that a more systematic effort to combine housing and health strategies could further protect children (and adults) from other diseases related in part to housing conditions. In addition, the lead-safe window replacement strategy could serve as a model for bundling home health hazard improvements with energy efficiency upgrades to leverage available resources. This intervention strategy could be accompanied by longitudinal health and housing research by using the national evaluation of the lead hazard reduction grant program as a model for tracking costs, health benefits, energy savings, and other benefits from bundled home improvements.

Although home weatherization is sometimes associated with increased indoor air pollution and mold and moisture problems, WAP has found that occupants of properly weatherized homes report a lower incidence of colds, flu, allergies, headaches, and nausea, while a control group showed no change over the same period (Berry, Brown, and Kinney 1997). Some of these health benefits may be directly related to energy efficiency improvements that reduce drafts and improve temperature consistency, but WAP also routinely repairs combustion equipment and exhaust ventilation systems to reduce the risk of carbon monoxide poisoning and other health hazards. Leaking air ducts reduce home energy efficiency and also cause moisture problems that are associated with mold-induced illness and the distribution of indoor air pollution throughout a home. An ENERGY STAR specification promotes the indoor air quality benefits of proper duct sealing, in addition to the significant energy savings potential. In fact, EPA has proposed a system that combines ENERGY STAR with other healthy housing investments (2005b).

Substandard housing conditions have been linked to a large number of adverse health outcomes (Breysse et al. 2004; Krieger and Higgins 2002; Matte and Jacobs 2000). For example, dust mites, mold, cockroaches, and other allergens in the home are triggers for asthma, especially in children. The specialized cleanup required to remove dust lead hazards, such as using a high-efficiency particulate air (HEPA) vacuum cleaner, is similar to cleanup techniques used to reduce allergens in dust. Such cleaning, together with other coordinated housing and medical interventions, has achieved statistically significant improvements in asthma in a large inner-city cohort of children in seven cities (Morgan et al. 2004). Integrating these hazard reduction protocols could simultaneously address both dust lead hazards and the most common triggers for asthma.

A cost-effective way to provide energy savings and previously unrecognized health benefits is to add wall insulation with high-density installation

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methods that provide significant energy savings related to air infiltration (Berry, Brown, and Kinney 1997). An ENERGY STAR home sealing standard combines an upgrade to ENERGY STAR windows with high-density insulation to achieve DOE-recommended levels, which vary by climate region, and better management of the fresh air supply, which can be verified by "blower door" tests (EPA 2001a). An integrated cleanup protocol, combined with ENERGY STAR home sealing and improved moisture management, will reduce lead hazards and allergens linked to asthma while at the same time yielding substantial improvements in home energy efficiency. Independent evaluation costs could also be minimized and made available to more households by training home inspectors in dust lead clearance, allergen, and blower door testing.

Further research on the relationship between housing conditions and health outcomes is needed. While the energy efficiency benefits of window replacement, high-density insulation, and duct sealing are well established, related health benefits, especially those associated with chronic disease morbidity and mortality, are only beginning to be fully understood. The experience with lead poisoning, which clearly shows the benefits of housing-based health interventions, can serve as a model in addressing other housing-related health problems that are largely ignored in housing markets and are not reflected in value and price. This contributes to inefficient cost shifting between the housing and health care sectors of the economy, substandard housing, and inadequate health care (Jacobs 2005).

If a lead-safe window replacement initiative were expanded to address other healthy home energy efficiency improvements, an evaluation that tracks costs, health benefits, energy savings, and other benefits from bundled home upgrade strategies would be essential. This information could be linked to occupant health data to be collected in association with the planned National Children's Study, which will examine the effects of environmental influences on the health and development of a large number of children across the United States, following them from before birth until age 21 (U.S. Department of Health and Human Services 2005).

With a coordinated effort, a focused window replacement campaign will provide previously unrecognized but immediate and substantial cross-cutting benefits related to energy efficiency, affordability, rehabilitation and weatherization, low-income homeownership, air pollution reduction, and prevention of childhood lead poisoning and other housing-related diseases.

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References

Agency for Toxic Substances and Disease Registry. 1988. *The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress.* Atlanta: U.S. Department of Health and Human Services.

Alfano, Sal. 2004. *Remodeling Online: 2004 Cost vs. Value Report.* World Wide Web page <http://www.remodeling.hw.net/industry-news.asp?articleID=79166&sectionID=173> (accessed April 5, 2005).

Berry, Linda G., Marylyn A. Brown, and Laurence F. Kinney. 1997. *Progress Report of the National Weatherization Assistance Program.* Oak Ridge, TN: Oak Ridge National Laboratory.

Bornschein, Robert L., Paul Succop, K. M. Kraft, Scott Clark, B. Peace, and Paul Hammond. 1987. Exterior Surface Dust Lead, Interior House Dust, and Childhood Lead Exposure in an Urban Environment. In *Trace Substances in Environmental Health, 20* (Proceedings of the University of Missouri's 20th Annual Conference, June 1986), ed. D. D. Hemphill, 322–32. Columbia, MO: University of Missouri.

Breysse, Patrick, Nick Farr, Warren Galke, Bruce Lanphear, Rebecca Morley, and Linda Bergofsky. 2004. The Relationship between Housing and Health. *Environmental Health Perspectives* 112:1583–88.

Canfield, Richard L., Christopher R. Henderson, Deborah Cory-Slechta, Christopher Cox, Todd A. Jusko, and Bruce P. Lanphear. 2003. Intellectual Impairment in Children with Blood Lead Levels below 10 µg/dL. *New England Journal of Medicine* 348:1517–22.

Clark, Scott, Robert Bornschein, Paul Succop, Sandy Roda, and B. Peace. 1991. Urban Lead Exposures of Children in Cincinnati, Ohio. *Chemical Speciation and Bioavailability* 3(3/4): 163–71.

Denno, Deborah W. 1990. *Biology and Violence.* New York: Cambridge University Press.

Dietrich, Kim N., M. Douglas Ris, Paul A. Succop, Omer G. Berger, and Robert L. Bornschein. 2001. Early Exposure to Lead and Juvenile Delinquency. *Neurotoxicology and Teratology* 23:511–18.

City Council (Full Packet) September 11, 2018 Page 214

Drucker Research Co. 2004. *Dip in Residential Sales Expected after Record-Breaking 2003: Drucker Study Sees Window and Door Demand Remaining at Historically High Levels.* World Wide Web page <http://www.windowanddoor.net/articles.php?id=136> (accessed April 5, 2005).

Duggan, Michael J., and Michael Inskip. 1985. Childhood Exposure to Lead in Surface Dust and Soil: A Community Health Problem. *Public Health Review* 13:1–54.

Efficient Window Collaborative. 2004. *University of Minnesota, Alliance to Save Energy, and Lawrence Berkeley National Laboratory.* World Wide Web page <http://www.efficientwindows.org/index.cfm> (accessed April 14, 2005).

Jacobs, David E. 1995. Lead Paint as a Major Source of Childhood Lead Poisoning: A Review of the Evidence. In *Lead in Paint, Soil, and Dust: Health Risks, Exposure Studies, Control Measures, and Quality Assurance*, ed. Michael E. Beard and S. D. Allen Iske, 175–87. American Society for Testing and Materials Special Technical Publication No. 1226. Philadelphia: American Society for Testing and Materials.

Jacobs, David E. 2005. Housing and Health: Challenges and Opportunities (Keynote speech given at a conference sponsored by the World Health Organization, Centre for Environment and Health, Noise and Housing Unit, and held on September 29–October 1, 2004, in Vilnius, Lithuania). In *Proceedings of the World Health Organization Symposium on Housing and Health*, 35–50. Bonn, Germany: World Health Organization.

Jacobs, David E., Robert Clickner, Joey Zhou, Susan Viet, David A. Marker, John W. Rogers, Pamela Broene, and Daryl C. Zeldin. 2002. The Prevalence of Lead-Based Paint Hazards in U.S. Housing. *Environmental Health Perspectives* 110:A599–A606.

Jacobs, David E., and Rick Nevin. 2006. Validation of a Twenty-Year Forecast of U.S. Childhood Lead Poisoning: Updated Prospects for 2010. *Environmental Research*. World Wide Web page <doi:10.1016/j.envres.2005.12.015>

Krieger, James, and Donna L. Higgins. 2002. Housing and Health: Time Again for Public Health Action. *American Journal of Public Health* 92(5):758–68.

Lanphear, Bruce, Mary Emond, David E. Jacobs, Michael Weitzman, Martin Tanner, Benjamin Yakir, and Shirley Eberly. 1995. A Side-By-Side Comparison of Dust Collection Methods for Sampling Lead-Contaminated House Dust. *Environmental Research* 68:114–23.

Lanphear, Bruce, Thomas Matte, John Rogers, Robert Clickner, Brian Dietz, Robert Bornschein, Paul Succop, Kathryn Mahaffey, Sherry Dixon, Warren Galke, Michael Rabinowitz, Mark Farfel, Charles Rhode, Joel Schwartz, Peter Ashley, and David Jacobs. 1998. The Contribution of Lead-Contaminated House Dust and Residential Soil to Children's Blood Lead Levels: A Pooled Analysis of 12 Epidemiological Studies. *Environmental Research* 79:51–68.

Matte, Thomas D., and David E. Jacobs. 2000. Housing and Health—Current Issues and Implications for Research and Programs. *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 77(1):7–25.

Meyer, Pamela, Timothy Pivetz, Timothy Dignam, David Homa, Jaime Schoonover, and Debra Brody. 2003. Surveillance for Elevated Blood Lead Levels among Children, 1997–2001. *Morbidity and Mortality Weekly Report* 52(SS10):1–21.

Morgan, Wayne J., Ellen F. Crain, Rebecca S. Gruchalla, George T. O'Connor, Meyer Kattan, Richard Evans III, James Stout, George Malindzak, Ernestine Smartt, Marshall Plaut, Michelle Walter, Benjamin Vaughn, and Herman Mitchell. 2004. Results of a Home-Based Environmental Intervention among Urban Children with Asthma. *New England Journal of Medicine* 351(11):1068–80.

National Academy of Sciences. 1993. *Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations*. Washington, DC: National Academy Press.

National Center for Healthy Housing. 2004. *Evaluation of the HUD Lead Hazard Control Grant Program. Final Report by the National Center for Healthy Housing and the University of Cincinnati, Department of Environmental Health*. World Wide Web page <http://www.hud.gov/utilities/intercept.cfm?/offices/lead/EvaluationFinalReport.pdf> (accessed April 22, 2005).

National Center for Healthy Housing. 2005. *CDC Windows Symposium*. World Wide Web page <http://www.centerforhealthyhousing.org/html/projects_policy.html#CDC%20Windows> (accessed April 22).

Needleman, Herbert L., Julie A. Riess, Michael J. Tobin, Gretchen E. Biesecker, and Joel B. Greenhouse. 1996. Bone Lead Levels and Delinquent Behavior. *Journal of the American Medical Association* 257:363–69.

Nevin, Rick. 2000. How Lead Exposure Relates to Temporal Changes in IQ, Violent Crime, and Unwed Pregnancy. *Environmental Research* 83:1–22.

Nevin, Rick, Heather Gazan, and Christopher Bender. 1999. More Evidence of Rational Market Values for Home Energy Efficiency. *Appraisal Journal* 67(4):454–60.

Nevin, Rick, and Gregory Watson. 1998. Evidence of Rational Market Valuations for Home Energy Efficiency. *Appraisal Journal* 66(4):401–09.

Pirkle, James L., Debra J. Brody, Elaine W. Gunter, Rachel A. Kramer, Daniel C. Paschal, Katherine M. Flegal, and Thomas D. Matte. 1994. The Decline in Blood Lead Levels in the United States. *Journal of the American Medical Association* 272(4):284–91.

President's Task Force on Environmental Health Risks and Safety Risks to Children. 2000. *Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead Paint Hazards*. Report and Appendix. Washington, DC: U.S. Department of Housing and Urban Development and U.S. Environmental Protection Agency.

U.S. Bureau of the Census and U.S. Department of Housing and Urban Development. 2001. *American Housing Survey (AHS). Analysis of Biannual AHS Data for 1989–2001*. Washington, DC: U.S. Department of Housing and Urban Development. World Wide Web page <http://www.huduser.org/intercept.asp?loc=http://www.census.gov/prod/99pubs/h150-97.pdf> (accessed September 1, 2004).

City Council (Full Packet) September 11, 2018 Page 216

U.S. Centers for Disease Control and Prevention. 1991. *Preventing Lead Poisoning in Young Children: A Statement by the Centers for Disease Control and Prevention.* Report No. 99–2230. Atlanta: U.S. Department of Health and Human Services.

U.S. Centers for Disease Control and Prevention. 1997a. *Facts on...Lead.* World Wide Web page <http://www.cdc.gov/nceh/lead/guide/1997/docs/factlead.htm> (accessed April 22, 2005).

U.S. Centers for Disease Control and Prevention. 1997b. *Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials.* Atlanta: U.S. Department of Health and Human Services.

U.S. Centers for Disease Control and Prevention. 1997c. Update: Blood Lead Levels—United States, 1991–1994. *Morbidity and Mortality Weekly Report* 46(7):141–46.

U.S. Centers for Disease Control and Prevention. 2000. Blood Lead Levels in Young Children—United States and Selected States, 1996–1999. *Morbidity and Mortality Weekly Report* 49(50):1133–37.

U.S. Consumer Product Safety Commission. 1977. *Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint.* 16 CFR 1303. *Federal Register* 42:44199.

U.S. Department of Energy, Energy Information Administration. 1995. *1993 Housing Characteristics from the 1993 Residential Energy Consumption Survey (RECS).* Washington, DC.

U.S. Department of Health and Human Services. 2005. *The National Children's Study: Overview of the Study Plan.* World Wide Web page <http://www.nationalchildrensstudy.gov/research/study_plan/explanation.cfm> (accessed April 18).

U.S. Department of Housing and Urban Development. 1995. *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.* HUD 1539–LBP. Washington, DC. World Wide Web page <http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm> (accessed April 22, 2005).

U.S. Department of Housing and Urban Development. 2004. *HUD's Energy Action Plan.* World Wide Web page <http://www.hud.gov/utilities/intercept.cfm?/offices/cpd/energyenviron/energy/library/energyactionplan.pdf> (accessed September 1).

U.S. Department of Housing and Urban Development. 2005. *HUD's Energy Action Plan and Energy-Efficient Mortgages.* World Wide Web page <http://www.mortgagebankers.org/resident/2005/fha-05-21.pdf> (accessed November 15).

U.S. Department of Housing and Urban Development, Office of Lead Hazard Control. 1999a. *Economic Assessment of the Final Rule on Lead-Based Paint: Requirements for Notification, Evaluation, and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance.* Washington, DC. World Wide Web page <http://www.hud.gov/utilities/intercept.cfm?/offices/lead/leadsaferule/completeRIA1012.pdf> (accessed September 1, 2004).

U.S. Department of Housing and Urban Development, Office of Lead Hazard Control. 1999b. *24 CFR, Part 35: Requirements for Notification, Evaluation, and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance.* World Wide Web page <http://www.hud.gov/offices/lead/leadsafe rule/index.cfm> (accessed September 1, 2004).

U.S. Department of Housing and Urban Development, Office of Policy Development and Research. 1990. *Comprehensive and Workable Plan for the Abatement of Lead-Based Paint in Privately Owned Housing. Report to Congress.* HUD–PDR No. 1295. Washington, DC. World Wide Web page <http://www.hud.gov/utilities/intercept.cfm?/offices/lead/reports/plan1990.pdf> (accessed September 1, 2004).

U.S. Department of Housing and Urban Development, Office of Policy Development and Research. 2000. *Partnership for Advancing Technology in Housing (PATH): Strategy Implementation for PATH Existing Home Goal.* Washington, DC.

U.S. Environmental Protection Agency. 1986. *Air Quality Criteria for Lead.* Volume I. EPA 600/8–83–028 a–d. Research Triangle Park, NC: Environmental Criteria and Assessment Office, Office of Research and Development.

U.S. Environmental Protection Agency. 2001a. *ENERGY STAR Home Sealing Specification.* World Wide Web page <http://www.energystarhomesamerica.com/homeseal.pdf> (accessed April 22, 2005).

U.S. Environmental Protection Agency. 2001b. *Lead: Identification of Dangerous Levels of Lead. Final Rule.* 40 CFR, Part 745. World Wide Web page <http://www.epa.gov/lead/leadhaz.htm> (accessed September 1, 2004).

U.S. Environmental Protection Agency. 2005a. *ENERGY STAR Policy Page for Labeled Homes.* World Wide Web page <http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.pt_homes_policies> (accessed November 16).

U.S. Environmental Protection Agency. 2005b. *ENERGY STAR with Indoor Air Package Pilot Specifications.* World Wide Web page. <http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.pt._bldr> (accessed July 22).

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Monetary benefits of preventing childhood lead poisoning with lead-safe window replacement

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Abstract

Previous estimates of childhood lead poisoning prevention benefits have quantified the present value of some health benefits, but not the costs of lead paint hazard control or the benefits associated with housing and energy markets. Because older housing with lead paint constitutes the main exposure source today in the US, we quantify health benefits, costs, market value benefits, energy savings, and net economic benefits of lead-safe window replacement (which includes paint stabilization and other measures). The benefit per resident child from improved lifetime earnings alone is $21,195 in pre-1940 housing and $8685 in 1940–59 housing (in 2005 dollars). Annual energy savings are $130–486 per housing unit, with or without young resident children, with an associated increase in housing market value of $5900–14,300 per housing unit, depending on home size and number of windows replaced. Net benefits are $4490–5,629 for each housing unit built before 1940, and $491–1629 for each unit built from 1940–1959, depending on home size and number of windows replaced. Lead-safe window replacement in all pre-1960 US housing would yield net benefits of at least $67 billion, which does not include many other benefits. These other benefits, which are shown in this paper, include avoided Attention Deficit Hyperactivity Disorder, other medical costs of childhood lead exposure, avoided special education, and reduced crime and juvenile delinquency in later life. In addition, such a window replacement effort would reduce peak demand for electricity, carbon emissions from power plants, and associated long-term costs of climate change.
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Keywords: Lead poisoning; IQ; Energy efficiency; Cost benefit analysis; Housing; Climate change

1. Introduction

Early childhood lead exposure impairs neurobehavioral development, reducing average educational achievement and lifetime income (National Academy of Sciences, 1993). Previous studies (Schwartz, 1994; Salkever, 1995; Landrigan et al., 2002; Grosse et al., 2002) of the monetized health benefits of avoided preschool lead exposure have focused on the present value of higher lifetime earnings, but not the cost and non-health benefits of lead paint hazard control. Some elevations in childhood blood lead can be caused by lead paint chip ingestion, inhaled air lead, and other types of exposure, but the most pervasive pathway affecting young children today in the US is lead contaminated settled house dust ingested via normal hand-to-mouth activity (Lanphear et al., 1998; Duggan and Inskip, 1985; Bornschein et al., 1987). Leaded gasoline settled as dust lead in years past, but lead emissions fell sharply through the 1980s with the phase out of lead in gasoline (US Environmental Protection Agency, 1986). The use of lead in residential paint was banned after 1977, but lead paint and the contaminated dust and soil it generates remained a hazard in 24 million older housing units in 1999–2000 (Jacobs et al., 2002).

The US Environmental Protection Agency (2001) now defines housing units with "lead paint hazards" to include units that exceed regulatory standards for lead in soil and/or household dust, and/or deteriorated lead paint. Lead paint hazard reduction can be achieved via interim controls that remove lead dust hazards and stabilize deteriorated lead paint, or via permanent abatement of these hazards

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(US Department of Housing and Urban Development, 1999) or a combination of the two. Interim controls that do not remove lead paint may be less expensive in the short term but do not provide a permanent solution without ongoing specialized maintenance. Targeting housing with young children is also problematic because the housing units with children are constantly changing as families move. However, lead hazard control using "lead-safe window replacement" is a strategy that can remove dust lead and lead paint surfaces likely to contaminate dust and soil. This can be expected to yield substantial health benefits for young children occupying such units now or in the future, plus substantial energy savings and increased residential market value (Jacobs and Nevin, 2006; Nevin and Jacobs, 2006). Here, we define lead-safe window replacement to be:

(1) Replacement of all single-pane windows with high-efficiency Energy Star windows;
(2) Stabilization of any significantly deteriorated paint;
(3) Specialized cleaning to remove any lead-contaminated dust following the repairs; and
(4) Clearance testing (which includes dust wipe analysis) to confirm the absence of lead dust hazards after project cleanup.

Replacing single-pane windows substantially reduces energy bills and also effectively targets older housing likely to have lead dust, because single-pane windows are likely to have lead paint on interior surfaces and friction on window surfaces with lead paint cause a large percentage of lead dust hazards (Jacobs and Nevin, 2006). This paper quantifies health benefits realized by young children who occupy housing that has undergone lead-safe window replacement. It also quantifies energy savings and an associated increase in home value that provide ongoing monetary benefits in units not currently occupied by families with children. We quantify the upgrade costs, market benefits, annual energy bill savings, quantifiable health benefits, and net economic benefits of lead-safe window replacement in pre-1978 housing.

2. Methods

2.1. Trends in preschool blood lead, and blood lead reduction from window replacement

National Health and Nutrition Examination Survey (NHANES) 1999–2002 blood lead data for children ages 1–5 are compared with 1991–1994 NHANES data to show the 1990s trend in elevated preschool blood lead by age of housing. The 1999–2000 National Survey of Lead and Allergens in Housing (NSLAH) data on lead paint hazard prevalence by age of housing (Jacobs et al., 2002), and trends in other lead exposure pathways, are then compared with the NHANES trend to confirm that lead paint hazards now cause the vast majority of preschool lead exposure.

The reduction in average preschool blood lead resulting from lead-safe window replacement (and the associated lifetime earnings benefit, discussed below) varies by age of housing and whether there is lead paint on interior window surfaces. Lead contaminated dust is more common in housing with lead paint on interior window surfaces. Furthermore, interior lead paint on windows is more common in older homes, and older homes have higher average lead loadings in dust. This analysis examines the percentage of housing units with lead dust hazards, and the associated reduction in average preschool blood lead resulting from lead-safe window replacement in pre-1940, 1940–1959, and 1960–1977 housing units with and without lead paint on interior window surfaces.

2.2. Lifetime earnings benefit from lead-safe window replacement

As explained in the equations and variables defined below, the average lifetime earnings benefit per resident child in housing units with lead-safe window replacement is calculated as the weighted average benefit in units with and without lead paint on interior window surfaces. The overall average benefit per housing unit with lead-safe window replacement is then derived from the benefit per resident child and the average number of resident young children per unit.

The average benefit per resident child in housing units with lead paint on window surfaces is

$$A \times B \times C \times D = E,$$

where A is the present value of lifetime earnings associated with a one point increase in IQ ($/IQ), B is IQ lost per 1 μg per deciliter (μg/dL) increase in preschool blood lead (IQ/μg/dL), C is the lead dust hazard prevalence in units with lead paint on interior window surfaces (%), D is the avoided increase in blood lead for children in units where lead-safe window replacement removes lead dust hazards and windows with lead paint on interior surfaces (μg/dL), E is the Benefit per resident child in units with lead paint on interior window surfaces.

$= A \times B \times C \times D$ ($/resident child).

The average benefit per resident child in housing units without lead paint on interior window surfaces is

$$A \times B \times F \times G = H,$$

where A and B are as defined above. F is the lead dust hazard prevalence in units *without* lead paint on interior window surfaces (%), G is the avoided increase in blood lead for children in units where lead-safe window replacement removes lead dust hazards and windows *without* lead paint on interior surfaces (μg/dL), H is the benefit per resident child in units *without* lead paint on interior window surfaces

$= A \times B \times F \times G$ ($/resident child).

The weighted average benefit per resident child in units with lead-safe window replacement is

$$(E \times I) + (H \times (1 - I)) = J,$$

where E and H are as defined above. I is the percent of housing with mostly single-pane windows that also have lead paint on interior window surfaces (%). J is the lead-safe window replacement weighted average benefit per resident child $= (E \times I) + (H \times (1 - I))$ (average $/resident child in units with single-pane windows).

The average lifetime earnings benefit per unit with lead-safe window replacement is the present value of the average benefit per unit in year 1 (M) and years 2–10 (N), where K is the average number of children ages 6–30 months per housing unit, L is the average number of children ages 6–18 months per housing unit ($K \times 0.5$), M is the lead-safe window replacement average benefit per unit in year 1 ($J \times K$), N is the lead-safe window replacement average benefit per unit in years 2–10 ($J \times L$).

The present value of lifetime earnings associated with a one point increase in IQ (A) consists of the indirect effects of increased educational achievement and workforce participation plus the direct effect of higher hourly earnings (Schwartz, 1994; Salkever, 1995). Estimates updated to 2000 dollars discounted at 3% (Grosse et al., 2002) are updated here to 2005 dollars by increasing the 2000-dollar estimates by 3% per year over the 5 years from 2000–2005, which permits a direct comparison with 2005 cost data. Further, the new estimate for the IQ/blood lead slope (i.e., IQ lost per 1 μg/dL increase in blood lead (B)) is from an international pooled analysis of the IQ loss from 2.5 to 10 μg/dL (Lanphear et al., 2005),

because the majority of children in older housing units now fall within this range.

The percentage of housing units with lead dust hazards with and without lead paint on interior window surfaces (*C* and *F*) is derived from NSLAH data for pre-1940, 1940–1959, and 1960–1977 housing. The avoided increase in blood lead by age of housing (*D* and *G*) is derived from differences in average preschool blood lead by windowsill lead dust loadings (US Department of Housing and Urban Development, 1999), and NSLAH data on lead dust loading by year-built in units with and without lead paint on interior window surfaces. The percent of units with single-pane windows with lead paint on interior window surfaces, by year-built (*I*), comes from a published comparison of Residential Energy Consumption Survey (RECS) data on single-pane windows, RECS and American Housing Survey (AHS) window replacement data, and NSLAH data on window surfaces with lead paint (Jacobs and Nevin, 2006). These data and the calculations shown above (*E*, *H*, and *J*) are then used to calculate the weighted average monetary benefit per resident children in units with lead-safe window replacement, by year-built.

Although NHANES data highlight elevated blood lead prevalence among children under age 6, children ages 6–30 months have higher blood lead levels, are especially vulnerable to lead dust ingestion as they crawl and engage in hand-to-mouth activity, and the brain is in a critical stage of development at this age (National Academy of Sciences, 1993). Therefore, this analysis quantifies average lifetime earnings benefits of avoided lead exposure for children ages 6–30 months in year 1 after lead-safe window replacement, and benefits for a new birth year cohort of children ages 6–18 months protected in years 2–10. The average number of children per housing unit in each age band, by year-built, reflects 2001 data on the average number under age 6 (Jacobs and Nevin, 2006) assuming an even distribution across the age range. The average benefit per resident child is multiplied by the average number of children ages 6–30 months per unit to calculate first-year benefits. To calculate benefits in years 2–10, the average benefit per child is multiplied by the average number of children ages 6–18 months. The lifetime earnings benefit of lead-safe window replacement by year-built is then calculated as the present value of years 1–10 benefits (discounted at 3%).

The methodology described above yields a very conservative (i.e., low) estimate of monetized lifetime earnings benefits. Benefits are only quantified for children ages 6–30 months, but some benefit would also be realized by children ages 30–72 months. Moreover, the average number of very young children per housing unit, by year-built, reflects the overall average in 2001, which likely underestimates the number of children ages 6–30 months in higher-risk housing targeted by lead-safe window replacement. Older housing units with single-pane windows are less likely to have undergone substantial renovation, and more likely to house young children in lower-income rental households, thereby harming more children because lower-income renters move more frequently. The present value calculation assumes lead-safe window replacement (which includes deteriorated paint stabilization on non-window surfaces) protects resident children for 10 years, even though it is likely that this housing improvement will last considerably longer (Jacobs and Nevin, 2006). The IQ/blood lead slope estimate is from an analysis of IQ lost in children with blood lead levels between 2.5 and 10 μg/dL (Lanphear et al., 2005), but the IQ lost per μg/dL increase in blood lead is actually higher for the large proportion of children with blood lead below 2.5 μg/dL (Canfield et al., 2003). This could especially understate lifetime earnings benefits for children in 1960-1977 housing, where most children have blood lead below 2.5 μg/dL.

2.3. Other health benefits from lead-safe window replacement

In addition to reducing average lifetime earnings, preschool lead exposure is also associated with a host of other adverse health and behavioral effects. This paper shows other estimates of additional benefits from avoided Attention Deficit Hyperactivity Disorder (ADHD), mental retardation, other medical costs of childhood lead exposure, and criminal behavior related to early childhood lead exposure.

2.4. Lead-safe window replacement costs, annual energy savings, and market value benefits

Window replacement costs and market benefits vary with home size and windows replaced. Estimates were developed for an 800 ft^2 attached home with 7 windows, a 1200 ft^2 detached home with 10 windows, and a 1800 ft^2 detached home with 16 windows. These estimates are based on U.S. Department of Housing and Urban Development (1999) estimates for replacing 7 windows in an 800 ft^2 attached home, and Remodeling Magazine (RM) estimates for 16 windows in 1993 and 10 windows in 2005 (Alfano, 2001–2005), all updated to 2005 dollars.

The RM "cost vs. value" survey data report costs for 60 US metropolitan areas. In each metro area, real estate agents in diverse neighborhoods (3–7 per metro area) were asked how much the window replacement project would add to the resale value of a "mid-priced house in an established neighborhood." Analysis of the 1993 RM survey and 1991–1996 AHS data found that pre-1980 detached homes ranged from 1600 to 2400 ft^2 across 25 metro areas in both datasets, with an average size of 1800 ft^2 (Nevin et al., 1999). Assuming a similar window to floor area suggests the 2005 RM survey cost and market value is representative of a 1200 ft^2 detached home with all 10 windows replaced. Our estimated 2005 cost and market value for an 800 ft^2 attached home with 7 windows and a 1800 ft^2 detached home with 16 windows is the same cost and value per window as the 2005 RM Survey.

The 2005 RM cost for 10 windows was 76% higher than the 1995 RM cost for 10 windows, and applying the same cost per window yields 2005 cost estimates for the larger detached home and the smaller attached home that are 111% higher than the 1993 RM cost estimate for 16 windows and the US Department of Housing and Urban Development (1999) estimate for 7 windows. These cost increases are larger than a 46% 1995–2005 increase in the Turner (2006) Construction Cost Index, consistent with an inflation-adjustment plus a real cost increase for energy-efficient features in typical 2005 replacement windows relative to mid-1990s replacement windows. Therefore, this paper uses the higher cost estimates from the 2005 RM data.

Average annual household energy savings from replacing single-pane windows with Energy Star windows (Nevin et al., 1999; US Department of Housing and Urban Development, 2000) are updated here to 2005 dollars (US Bureau of the Census, 1998, 2006). The 1993 RM survey value for window replacement has been shown to reflect the sum of the market value related to annual energy savings plus an "appearance value" for new windows (Nevin et al., 1999), but the 2005 RM survey value used in this analysis might not fully reflect the rising energy costs in late-2005 through 2006. Therefore, this analysis will underestimate the current market benefit of window replacement associated with annual energy savings (see Section 4).

Cost and value estimates for interior and exterior paint stabilization, cleanup, and clearance testing used in this paper are drawn from US Department of Housing and Urban Development (1999) estimates for the mid-1990s inflated to 2005 dollars based on the 1995–2005 change in the Turner (2006) Index. Weighted average estimates for paint stabilization reflect the cost and value for a single room, and a limited exterior surface area, divided by 5 to reflect an assumed deteriorated paint prevalence of 20% (80% of units would not require paint stabilization).

3. Results

3.1. Trends in preschool blood lead, and blood lead reduction from window replacement

Table 1 shows that preschool children with blood lead above 10 μg/dL are increasingly concentrated in older housing. The 1991–1994 NHANES data reported a higher prevalence of elevated blood lead in housing built before 1978, but some children in post-1977 housing also had

blood lead above 10 μg/dL in the early 1990s (US Centers for Disease Control and Prevention, 1997). In contrast, the 1999–2002 NHANES data show a very low prevalence over 10 μg/dL, and over 5 μg/dL, among children living in housing built after 1977. In fact, children in pre-1940 housing account for only 10% of all 1999–2002 NHANES children ages 1–5, but account for 40% of all children with blood lead over 10 μg/dL. Children in housing with year-built not reported account for another 30% of 1999–2002 NHANES children over 10 μg/dL. The vast majority of the "not reported" cases are low-income children in rental units, and old housing accounts for a disproportionate share of low-income rental units (US Bureau of the Census, 2006), so it is likely that most of the "not reported" cases are also in older housing. The few children in post-1977 housing with 1999–2002 NHANES blood lead over 10 μg/dL were all Mexican-American. The Arizona Department of Health Services (2002) also reports that 79% of Arizona children over 10 μg/dL are Hispanic, with lead glazed pottery and home remedies cited as common sources of lead poisoning. Some NHANES children in post-1977 housing with blood lead over 5 μg/dL were also likely exposed to lead paint visiting relatives or in daycare in older housing, and others could have been exposed in a prior residence.

The increasing concentration of children with elevated blood lead in older housing is consistent with historic use of lead in paint, and a 1990s decline in lead exposure via other pathways. Per capita use of lead in paint peaked from 1900 to 1930 and fell over 90% from the late-1920s to 1960 (Nevin, 2000). These trends are still evident in 1999–2000, because pre-1940 housing has lead paint on more interior surfaces and higher lead levels in paint (Jacobs et al., 2002). The NSLAH found lead paint hazards in 68% of pre-1940 homes, 43% of 1940–1959 homes, 8% of 1960–1977 homes, and just 3% of post-1977 homes. The low lead dust prevalence in post-1960 homes is consistent with a sharp decline in lead emissions and ambient air lead through the 1980s, with ambient air lead falling another 57% from 1993–2002 as lead emissions fell just 5% (US Environmental Protection Agency, 2003). The ongoing decline in air lead after the 1980s fall in emissions suggests that settling air lead still affected some children in the early-1990s, but this lead exposure source was almost entirely eliminated by 2000. A comparison of 1992–1993 and 2000–2004 monitoring data for 166 large water utilities also shows that all 166 utilities were above the action level for lead in drinking water in the early-1990s, but only 15 exceeded that level in 2000–2004 (US Environmental Protection Agency, 2006b).

The NHANES data in Table 1 also show that almost 60% of children in pre-1950 housing, 50% in 1950–1959 housing, and 40% in 1960–1977 housing have blood lead between 2 and 10 μg/dL. These NHANES data show that most of the total national health benefit of lead-safe window replacement would be realized by children with blood lead below 10 μg/dL, where every 1 μg/dL increase in blood lead is associated with an average loss of 0.52 IQ points (Lanphear et al., 2005).

Table 2 shows the increase in preschool blood lead associated with windowsill dust lead loadings above the 250 μg/ft^2 (micrograms of lead per square foot) regulatory definition of a windowsill lead dust hazard (US Environmental Protection Agency, 2001; US Department of Housing and Urban Development, 1999). Children in units with median sill dust lead loadings of 250–500 μg/ft^2 have average blood lead that is 1.98 μg/dL higher than children in units with no sill dust lead hazards, and children in units with sill loadings of 500–1000 μg/ft^2 and over 1000 ug/ft^2 have average blood lead 2.44 and 4.33 μg/dL higher, respectively. Table 3 shows NSLAH data on median sill dust lead loadings in units with lead dust hazards by age of housing and presence of lead paint on interior window surfaces. Together, Tables 2 and 3 indicate that lead-safe window replacement in housing units with dust lead hazards would reduce average preschool blood lead by 4.33 μg/dL in pre-1960 housing units with lead paint on interior window surfaces; by 2.44 μg/dL in pre-1960 units *without* lead paint on interior window surfaces and in 1960–1977 units *with* lead paint on interior window surfaces; and by 1.98 μg/dL in 1960–1977 units without lead paint on interior window surfaces.

3.2. *Lifetime earnings benefit from lead-safe window replacement*

Table 4 calculates the weighted average lifetime earnings benefit of lead-safe window replacement based on the

Table 1
Preschool blood lead (BL) prevalence by housing year-built

Year Housing Unit Built	1991–1994 BL > 10 μg/dL (%)	1999–2002 BL > 10 μg/dL (A) (%)	1999–2002 BL > 5 μg/dL (%)	1999–2002 BL > 2 μg/dL in pre-1978 Housing (B) (%)	1999–2002 BL of 2-10 μg/dL in pre-1978 Housing (A–B) (%)
Post-1989	N.A.	0.0	1.2		
1977–1989	1.6	0.6	2.8		
1960–1977	4.6	0.8	4.4	39.4	38.6
1950–1959	4.6	1.1	6.2	50.2	49.1
1940–1949	4.6	0.8	10.4	60.3	59.5
Pre-1940	8.6	5.3	20.2	64.7	59.4
Not reported	5.6	1.7	14.3	59.1	57.5

monetized value of one IQ point, the fraction of IQ lost per 1 μg/dL increase in blood lead, NSLAH data on lead dust hazard prevalence by age of housing, the reduction in average blood lead in units with lead dust hazards with and without lead paint on window surfaces, and the percent of housing units with single-pane windows that also have lead paint on interior window surfaces. The weighted average lifetime earnings benefit per young resident child is $21,195 in pre-1940 housing, $8685 in 1940–1959 housing, and $2219 in 1960–1977 housing. The average lifetime earnings benefit across all housing, based on the fraction of units with children ages 6–30 months, is $6847 in pre-1940 units, $2847 in 1940–1959 units, and $632 in 1960–1977 units. This assumes that new birth cohorts of young children are protected for a time horizon of 10 years, although the benefit is likely to last considerably longer.

Table 2
Increase in average preschool blood lead associated with windowsill dust lead

Sill dust lead (μg/ft^2)	Blood lead relative to sill dust lead < 250 μg/ft^2 (μg/dL)
250–500	+1.98
500–1000	+2.44
Over 1000	+4.33

Table 3
Median windowsill dust lead loading in units with lead dust hazards

	Pre-1960 housing (μg/ft^2)	1960–1977 housing (μg/ft^2)
Units with lead paint on interior window surfaces	Over 1000+	500–1000
Units without lead paint on interior window surfaces	500–1000	250–500

3.3. Other health benefits from lead-safe window replacement

The benefits quantified in Table 4 reflect only lifetime earnings benefits, but lead exposure also imposes many other health costs (Schwartz, 1994; Salkever, 1995; Landrigan et al., 2002). The direct health care costs for children exposed to lead includes chelation, follow-up, monitoring, visits to physicians and health care institutions, laboratory testing and related home inspections, and other costs such as transportation and time. The average cost of follow-up treatment per child is $55 (Kemper et al., 1998), which does not include the much higher cost of treating severely poisoned children. For example, for children with blood lead levels between 45 and 70 μg/dL and over 70 μg/dL, the costs are $1017 and $2625, respectively (Kemper et al., 1998).

Severe lead poisoning can also cause mental retardation, resulting in lifetime costs per affected child of just over $1 million (Honeycutt et al., 2003), including special education, home care, long-term care, other health care costs, and productivity losses due to premature morbidity. Recent data show a substantial decline in severe lead poisoning cases (Meyer et al., 2003), so there is considerable uncertainty with respect to how many mental retardation cases could be avoided due to further reductions in severe lead poisoning via lead-safe window replacement.

Lead exposure also accounts for 290,000 excess cases of ADHD in US children ages 4–17 (Braun et al., 2006). This association between increased blood lead and ADHD was evident even among children with blood lead below 5 μg/dL. Children with ADHD have a higher likelihood of receiving medical diagnoses in multiple categories, including major injuries (59% vs. 49%), asthma (22% vs. 13%), hospitalization, and emergency department admissions (Leibson et al., 2001). Median health care costs for those with ADHD were $4306 versus $1944 for those without ADHD over a 9-year time period. These medical costs related to ADHD are separate from the direct medical care costs of lead exposed children. Multiplying this $2362 increase in median health care costs times the 290,000 excess cases of ADHD associated with lead exposure indicates that an additional $685 million of health benefits could be realized by avoiding lead-induced ADHD over each 9-year time period.

There is also substantial evidence linking preschool lead exposure to crime and other behaviors that impose substantial societal costs (Denno, 1990; Dietrich et al., 2001; Needleman et al., 1996, 2002, Nevin, 2000, 2007). While other factors also contribute to criminal behavior, juvenile delinquency and other anti-social behaviors, lead exposure consistently emerges as one of the significant independent variables involved. Analysis of nine nations with very different lead exposure and crime trends shows that preschool blood lead trends explain 63–93% of the temporal variation in index crime rates (violent crime plus property crime), with a 19-year time lag, consistent with early-childhood neurobehavioral damage and the typical age of index crime offenders (Nevin, 2007). This analysis found that murder rates could be especially associated with severe lead poisoning, but there was no evidence of a lower blood lead threshold associated with trends in property crime offending by juveniles. Among the many neurochemical effects of preschool lead exposure linked to behavior is the activation of protein kinase C (PKC). PKC is known to affect long-term potentiation (a form of neuronal plasticity) and the effects of lead on PKC are potent at doses several orders of magnitude below 10 μg/dL (Lidsky and Schneider, 2003; Birnbaum et al., 2004). The National Institute of Justice (1996) has estimated the annual costs of crime in the United States to be $105 billion in property and productivity losses and medical expenses, plus an additional $345 billion per year in intangible costs for pain and suffering. Even if only 10% of these costs are associated with childhood lead poisoning, the

Table 4
Lost LifeTime Earnings Health Benefit

Value per IQ point (A)		$16,809	
IQ per 1 μg/dL (B)		0.52	
Value per avoided 1 μg/dL ($A \times B$)		$8741	
Benefit in Units with lead paint on window surfaces	Pre-1940	1940–1959	1960–1977
Lead dust hazard prevalence (C) (%)	56	43	34
Avoided μg/dL (D)	4.33	4.33	2.44
Average benefit per resident child ($E = A \times B \times C \times D$)	$21,195	$16,275	$7251
Benefit in units without lead paint on window surfaces			
Lead dust hazard prevalence (F) (%)	N.A.	17	6
Avoided μg/dL (G)	N.A.	2.44	1.98
Average benefit per resident child ($H = A \times B \times F \times G$)	N.A.	$3626	$1038
Percent of single-pane window housing units with lead paint on interior window surfaces (I) (%)	100	40	19
Weighted average benefit per resident child ($J = (E \times I) + (H \times (1-I))$)	$21,195	$8685	$2219
Number of children ages 6–30 months per unit (K)	0.068	0.069	0.060
Number of children ages 6–18 months per unit (L)	0.034	0.0345	0.030
Year 1 average benefit per unit ($J \times K$)	$1,441	$599	$133
Years 2–10 average benefits per unit ($J \times L$)	$721	$300	$67
Present value benefit per unit over 10 years	$6847	$2847	$632

crime-prevention benefits of preventing such poisoning would be $45 billion per year.

3.4. Lead-safe window replacement costs, annual energy savings, and market value benefits

Table 5 shows the estimated costs and market benefits of lead-safe window replacement for an 800 ft^2 attached home with 7 windows, a 1200 ft^2 detached home with 10 windows, and a 1800 ft^2 detached home with 16 windows.

As explained below, homes with mostly single-pane windows are likely to have monthly energy costs close to $0.09 per square foot in 2006, and replacing those windows with Energy Star windows would reduce energy bills by 15–25%. Replacing wood-frame windows lowered 1991–1996 energy bills by 15–25% in almost all of 25 metro areas examined (Nevin et al., 1999). Average 1995–1997 monthly energy bills in pre-1980 detached housing were $0.07 per square foot in the Northeast and South, and about $0.06 in the Midwest and West, but many of these units already had old windows replaced, so the average energy bill would be higher in units with inefficient single-pane windows (US Department of Housing and Urban Development, 2000). Median household costs for natural gas and fuel oil were about 50% higher in 2005 than in 1997, and median electricity costs were almost 10% higher (US Bureau of the Census, 1998, 2006). Therefore, monthly energy bills would be about $0.09 per square foot today in pre-1980 housing with mostly single-pane windows. A 15–25% reduction in monthly costs of $0.09 per square foot would yield annual savings of $130–216 in an 800 ft^2 home, $194–324 in a 1200 ft^2 home, $292–486 in an 1800 ft^2 home (as shown in Table 6). This estimated savings for an 1800 ft^2 home is also roughly consistent with a US Environmental Protection Agency (2006a) analysis showing annual energy savings from window replacement (in a 2000 ft^2 home) of $330–600 in 37 cities, $225–320 in another 38 cities, and $55–205 in just 18 cities (mainly in the South and on the California coast, due to lower EPA estimated AC savings).

3.5. Summary of lead-safe window replacement costs, benefits, and net benefits

Table 6 summarizes energy savings, costs, and market benefits of lead-safe window replacement by home size, and lifetime earnings benefits and net benefits by age of housing. Net economic benefits for each housing unit are at least $4490–5629 in pre-1940 housing and at least $491–1629 in 1940–1959 housing. Additional benefits, not reflected in Table 6, would result from avoided ADHD, other medical costs of childhood lead exposure, criminal behavior related to early childhood lead exposure and other avoided costs. Table 6 shows average benefits that are lower than costs for 1960–1977 units, reflecting the lower risk of lead paint hazards and lower dust lead loadings in 1960–1977 units that do have lead hazards. However, lower dust lead loadings are associated with the lower blood lead range (see Table 2) where IQ lost per μg/dL increase in blood lead is higher than the IQ to blood lead slope reflected in this analysis. Therefore, lifetime earnings benefits are especially likely to be understated in 1960–1977 units, so net benefits in these units may also be positive. The benefits in Table 6 also reflect average lifetime earnings benefits across all housing with single-pane windows, but these benefits are actually concentrated in the 6–7% of units with children ages 6–30 months. Therefore, net benefits would definitely be positive in 1960–1977 units with young resident children.

Table 5
Costs and market benefits of lead-safe window replacement

	800 ft^2 attached, 7 windows	1200 ft^2 detached, 10 windows	1800 ft^2 detached, 16 windows
Costs			
Window replacement	$6118	$9684	$15,494
Weighted average interior paint stabilization	$146	$146	$146
Weighted average exterior paint stabilization	$291	$291	$291
Specialized cleanup	$386	$510	$510
Lead dust clearance testing	$175	$219	$219
Average total cost	$7,116	$10,850	$16,660
Market value benefits			
Windows	$5485	$8681	$13,890
Weighted average interior paint stabilization	$144	$144	$144
Weighted average exterior paint stabilization	$270	$270	$270
Average total market value benefit	$5899	$9095	$14,304

Table 6
Net benefits of lead-safe window replacement

	800 ft^2 attached, 7 windows	1200 ft^2 detached, 10 windows	1800 ft^2 detached, 16 windows
Average annual energy savings: 15–25%	$130–216	$194–324	$292–486
Average cost (A)	($7,116)	($10,850)	($16,660)
Average market value benefit (B)	$5,899	$9,095	$14,304
Average lifetime earning benefit (C)			
Pre-1940 housing	$6847	$6847	$6847
1940–1959 housing	$2847	$2847	$2847
1960-1977 Housing	$632	$632	$632
Net societal benefit per housing unit ($B+C$–A)			
Pre-1940 housing	$5629	$5092	$4490
1940–1959 housing	$1629	$1092	$491

4. Discussion

In 2005, there were roughly 22 million pre-1960 housing units with single-pane windows, about equally divided between pre-1940 and 1940–1959 units (Jacobs and Nevin, 2006; US Bureau of the Census, 1998, 2006). Lead-safe window replacement in these units, at the average benefits and costs in Table 6 for a 1200 ft^2 home, would yield net benefits of at least $67 billion. Table 6 reflects lifetime earnings benefits for children under the age of 30 months, but children ages 30–72 months would also benefit from avoided lead exposure. The lifetime earnings benefits calculated here assume lead-safe window replacement protects resident children for 10 years, but it would likely abate lead paint hazards for much longer in most units. Lead-safe window replacement would also yield benefits from avoided ADHD, other medical costs, and criminal behavior related to early childhood lead exposure, which are not included in Table 6. The benefits reported here also do not include many other avoided costs and intangible benefits, such as lead paint litigation, special property maintenance, stress on parents, premature mortality and memory loss from lead exposure in childhood, treatment of dental caries associated with lead exposure, hearing loss, and liver, kidney and other diseases associated with lead exposure.

The lifetime earnings benefits in Table 6 reflect avoided lead dust exposure, but paint chip ingestion is often a factor in severe lead poisoning. A 1989–1990 study found that children with X-ray evidence of recent paint chip ingestion had average blood lead of 63 μg/dL (McElvaine et al., 1992). The US Department of Housing and Urban Development (1999) estimated avoided paint chip ingestion benefits to be about 10% of avoided lead dust ingestion benefits, reflecting a smaller fraction of children ingesting paint chips and a much larger benefit per child due to the severity of lead paint chip poisoning. Recent data show a substantial decline in severe lead poisoning cases (Meyer et al., 2003), so paint chip ingestion risks have likely declined relative to the risk of lead dust hazards. Therefore, this analysis does not quantify avoided paint chip ingestion benefits, but lead-safe window replacement would clearly accelerate the decline in severe poisoning cases because lead paint chips are often found in old window wells, and paint stabilization would address other paint chip ingestion risks (Jacobs and Nevin, 2006).

Extensive research clearly shows an inverse relationship between early childhood blood lead and IQ later in life,

with a higher slope at lower blood lead levels, but data limitations leave some uncertainty about the differential impact of a brief exposure with blood lead of 2–10 μg/dL as opposed to a more chronic exposure at this level. However, the chronic nature of most childhood exposure to lead contaminated dust, and especially lead dust associated with old windows with lead paint, suggests that chronic exposure is far more common than brief exposure among children in housing targeted for lead-safe window replacement. Moreover, the 30-day half-life of lead in blood suggests that NHANES blood lead data are little affected by brief exposures of 2–10 μg/dL, because a child who briefly has blood lead of just under 8 μg/dL without continuing exposure would have to be tested within the next 2 months to detect blood lead over 2 μg/dL. On the other hand, the half-life of lead in blood suggests that NHANES data on children with measured blood lead of 2–10 μg/dL do include some number of children recovering from more severe lead poisoning due to recent paint chip ingestion. Children with paint chips evident in intestinal X-rays (i.e., likely swallowed within 24 h) had average blood lead over 60 μg/dL, which means that even without further exposure those children would have average blood lead over 15 μg/dL 60 days later, and over 2 μg/dL almost 5 months after paint chip ingestion. Therefore, the data on children with measured blood lead of 2–10 μg/dL likely include relatively few children with just a brief exposure of 2–10 μg/dL, and some significant number of children with a brief exposure above 10 μg/dL.

The 2005 RM survey market value estimates may not fully reflect the increase in residential energy costs in late-2005 through 2006, and extensive evidence links home value to energy efficiency (Dinan and Miranowski, 1989; Laquatra, 1986; Johnson and Kaserman, 1983; Corgel et al., 1982; Longstreth, 1986; Halvorsen and Pollakowski, 1981). Horowitz and Haeri (1990) found that home value reflects a rational trade-off between energy bills and after-tax mortgage interest expense, as demand for energy-efficient homes raises their price relative to other homes until that higher price results in higher after-tax mortgage costs that approximately offset energy bill savings. Nevin and Watson (1998) tested this "rational market" theory against 1991–1996 AHS data, and showed a consistent rise in home value of about $20 for every $1 reduction in annual energy bills, regardless of main heating fuel (gas, electric, or fuel oil), after controlling for other variables affecting home value. The 1991–1996 after-tax mortgage interest rate was about 5%, so home buyers paying $20 more for homes per $1 reduction in energy bills made a rational trade-off between energy savings and after-tax mortgage interest. A subsequent study (Nevin et al., 1999) specifically found that the 1993 RM window replacement value estimate reflected energy efficiency value (20 times annual energy savings) plus "appearance" value of about $100 per window.

Rising energy prices increase annual savings from energy efficiency, and trends in RM survey window replacement value estimates appear to reflect such energy bill savings. The 1993 RM survey reported higher cost recovery in the East, consistent with higher Northeast fuel costs, but low-E glass that reduces solar gain to save on air conditioning costs became common in the 1990s, as did "warm-edge" spacers to improve thermal performance (Swanson, 2005). As window efficiency and energy prices increased, the RM value estimate for window replacement rose from 69% of cost in 1995 to 85% in 2003 and 2004 and 90% in 2005 (Alfano, 2001-2005). In California, large surcharges were added to residential electricity rates in 2001, and RM value estimates for window replacement in San Francisco, San Diego, Sacramento, and Los Angeles rose from an average of 61% of cost in 1999, to 91% in 2001 and 114% or higher in 2002 through 2004 (Alfano, 2001–2005).

RM survey value estimates also reflect residential energy costs that do not reflect time-of-day pricing for the higher marginal cost of peak-load generating capacity, and low-E windows produce the greatest savings when peak demand strains generating capacity. Moreover, these market value benefits do not reflect the value of avoiding emission costs not fully reflected in energy prices, including the long-term benefits of reducing carbon emissions (Stern, 2006).

For all the reasons described above, the estimated net economic benefit of $67 billion from lead-safe window replacement in pre-1960 units with single-pane windows substantially understates total benefits. In fact, benefits from avoided crime and reductions in carbon emissions from power plants due to improved housing energy efficiency from new windows could increase the minimum net economic benefits reported here by several orders of magnitude.

5. Conclusions

Lead-safe window replacement would yield at least $67 billion in net monetary benefits. It would also lower energy costs by 15–25% in pre-1960 homes with single-pane windows, which account for about 20% of all US housing units. Homes with single-pane windows were built before the era of home energy codes and are some of the least energy-efficient homes. A 15–25% energy use reduction in this inefficient segment of the housing stock could reduce total national residential energy use by 5% or more, with low-E windows yielding the greatest savings when peak demand strains generating capacity.

Lead-safe window replacement would yield additional benefits from avoided crime, special education, and medical costs, and reductions in power plant emissions and peak-load demand. The 2005 Energy Policy Act provided a federal tax credit for 10% of energy efficient improvement costs, including a credit of up to $200 for window replacement (US Environmental Protection Agency, 2006c), but more generous credits and/or direct payments via housing assistance programs are warranted by the benefits of lead-safe window replacement. For example, credits or payments of $100 per window up to

$1000 per housing unit would entail a maximum *one-time* federal expenditure of $22 billion if this incentive resulted in lead-safe window replacement in each of the 22 million pre-1960 homes with single-pane windows. By comparison, the No Child Left Behind program provides States and local school districts with more than $22 billion of federal funds *per year* (House Committee on Education & the Workforce, 2006). The combination of lifetime earnings benefits, market benefits, and energy savings alone will more than recover the one-time investment needed for lead-safe window replacement in older housing.

Public policy priorities are often evaluated from the narrow perspective of a single academic discipline, but the potential net benefits of lead-safe window replacement require a broader perspective. Weatherization programs might not recommend window replacement as the most cost-effective way to reduce home energy costs, but lead-safe window replacement benefits far exceed the energy savings per household. For those especially concerned about climate change, window replacement might seem like a small part of the global effort required, but it could be an important part of carbon emission reduction efforts. From the perspective of electricity supply planning to accommodate economic growth, the potential for peak-load demand reduction from window replacement might not be as evident as the need for new generating capacity, but the peak load impact of a large-scale window replacement initiative could be substantial. Criminologists urging additional funding for law enforcement are likely to be unaware of the growing body of research linking childhood lead exposure to crime. Education professionals and economists may be unaware of the documented impact of childhood lead exposure on educational achievement and lifetime earnings.

Lead-safe window replacement might not be viewed as the most cost-effective way to achieve policy goals defined in terms of any single discipline. But the net benefits of at least $67 billion from such an initiative are compelling and large. In fact, the lifetime earnings benefit of removing lead paint hazards and windows likely to cause lead poisoning in the future is essential to the spirit of the No Child Left Behind program. Despite substantial progress in reducing elevated preschool blood lead prevalence, lead dust hazards in older housing still leave millions of children behind when they begin their first day of school.

References

Alfano, S., 2001–2005. Cost vs. Value Report. Remodeling Online, Accessed at: 〈http://www.remodeling.hw.net/industry-news.asp?articleID=79166&sectionID=173〉.

Arizona Department of Health Services, 2002. Lead Poisoning in Arizona Annual Report 2001. Bureau of Epidemiology and Disease Control Services, Office of Environmental Health.

Birnbaum, S., Yuan, P., Wang, M., Vijayraghavan, S., Bloom, A., Davis, D., Gobeske, K., Sweatt, J., Manji, H., Arnsten, A., 2004. Protein kinase C overactivity impairs prefrontal cortical regulation of working memory. Science 306, 882–884.

Bornschein, R.L., Succop, P., Kraft, K.M., Clark, S., Peace, B., Hammond, P., 1987. Exterior surface dust lead, interior house dust and childhood lead exposure in an urban environment. In: Hemphill, D.D. (Ed.), Trace Substances in Environmental Health, vol. 20. Proceedings of the University of Missouri's 20th Annual Conference, June 1986, University of Missouri, Columbia, MO.

Braun, J.M., Kahn, R., Froehlich, T., Auinger, P., Lanphear, B.P., 2006. Exposures to environmental toxicants and Attention Deficit Hyperactivity Disorder in US children. Environ. Health Perspect. 114, 1904–1909.

Canfield, R.L., Henderson, C.R., Cory-Slechta, D., Cox, C., Jusko, T.A., Lanphear, B.P., 2003. Intellectual impairment in children with blood lead levels below 10 μg/dL. N. Engl. J. Med. 348, 1517–1522.

Corgel, J.B., Geobel, P.R., Wade, C.E., 1982. Measuring energy efficiency for selection and adjustment of comparable sales. Appraisal J. January, 71–78.

Denno, D.W., 1990. Biology and Violence. Cambridge University Press, NY.

Dietrich, K.N., Douglas, M., Succop, P.A., Berger, O.G., Bornschein, R.L., 2001. Early exposure to lead and juvenile delinquency. Neurotoxicol. Teratol. 23, 511–518.

Dinan, T.M., Miranowski, J.A., 1989. Estimating the implicit price of energy efficiency improvements in the residential housing market: a hedonic approach. J. Urban Econ. 25 (1), 52–67.

Duggan, M.J., Inskip, M., 1985. Childhood exposure to lead in surface dust and soil: a community health problem. Public Health Rev. 13, 1–54.

Grosse, S.D., Matte, T.D., Schwartz, J., Jackson, R.J., 2002. Economic gains resulting from the reduction in children's exposure to lead in the United States. Environ. Health Perspect. 110, 563–569.

Halvorsen, R., Pollakowski, H.O., 1981. The effects of fuel prices on house prices. Urban Stud. 18 (2), 205–211.

Honeycutt, A., Dunlap, L., Chen, H., al Homsi, G., Grosse, S., Schendel, D., 2003. Economic costs associated with mental retardation, cerebral Palsy, hearing loss, and vision impairment—United States, 2003. Morbidity Mortality Weekly Rep 53 (03), 57–59.

Horowitz, M.J., Haeri, H., 1990. Economic efficiency v. energy efficiency. Energy Econ. April, 122–131.

House Committee on Education & the Workforce, 2006. Issue Brief, Accessed September 15, 2006 at 〈http://www.house.gov/ed_workforce/issues/109th/education/funding/fundingmyths.htm〉

Jacobs, D.E., Nevin, R., 2006. Validation of a twenty-year forecast of US childhood lead poisoning: updated prospects for 2010. Environ. Res. 102 (3), 352–364.

Jacobs, D.E., Clickner, R., Zhou, J., Viet, S., Marker, D.A., Rogers, J.W., Broene, P., Zeldin, D.C., 2002. The prevalence of lead-based paint hazards in US housing. Environ. Health Perspect. 110, A599–A606.

Johnson, R.C., Kaserman, D.L., 1983. Housing market capitalization of energy-saving durable good investments. Econ. Inquiry July, 374–386.

Kemper, A.R., Bordley, W.C., Downs, S.M., 1998. Cost-effectiveness analysis of lead poisoning screening strategies following the 1997 guidelines of the CDC. Arch Pediatr Adolescence Med 152, 1202–1208.

Landrigan, P.J., Schechter, C.B., Lipton, J.M., Fahs, M.C., Schwartz, J., 2002. Environmental pollutants and disease in American children: estimates of morbidity, mortality and costs for lead poisoning, asthma, cancer and developmental disabilities. Environ. Health Perspect. 110 (7), 721–728.

Lanphear, B.P., Matte, T.D., Rogers, J., Clickner, R., Dietz, B., Bornschein, R.L., Succop, P., Mahaffey, K.R., Dixon, S., Galke, W., Rabinowitz, M., Farfel, M., Rhode, C., Schwartz, J., Ashley, P., Jacobs, D.E., 1998. The contribution of lead-contaminated house dust and residential soil to children's blood lead levels: a pooled analysis of 12 epidemiological studies. Environ. Res. 79, 51–68.

Lanphear, B.P., Hornung, R., Khoury, J., Yolton, K., Baghurst, P., Bellinger, D., Canfield, R.L., Dietrich, K.N., Bornschein, R., Greene, T.,

Rothenberg, S.J., Needleman, H.L., Lourdes, S., Wasserman, G., Graziano, J., Roberts, R., 2005. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. Environ. Health Perspect. 113, 894–899.

Laquatra, J., 1986. Housing market capitalization of thermal integrity. Energy Econ. July, 134–138.

Leibson, C.L., Katusic, S.K., Barbaresi, W.J., Ransom, J., O'Brien, P.C., 2001. Use and costs of medical care for children and adolescents with and without attention-deficit/hyperactivity disorder. JAMA 285 (1), 60–66.

Lidsky, T., Schneider, J., 2003. Lead neurotoxicity in children: basic mechanisms and clinical correlates. Brain 126, 5–19.

Longstreth, M., 1986. Impact of consumers' personal characteristics on hedonic prices of energy-conserving durable good investments. Energy 11 (9), 893–905.

McElvaine, M., DeUngria, E., Matte, T., Copley, C., Binder, S., 1992. Prevalence of radiographic evidence of paint chip ingestion among children with moderate to severe lead poisoning, St. Louis, Missouri, 1989 through 1990. Pediatrics 89, 740–742.

Meyer, P., Pivetz, T., Dignam, T., et al., 2003. Surveillance for elevated blood lead levels among children 1997–2001. Morbidity Mortality Weekly Rep 52, S5–S10.

National Academy of Sciences, 1993. Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations. Board on Environmental Studies and Toxicology, Commission on Life Sciences. National Academy Press, Washington, DC.

National Institute of Justice. 1996. The Extent and Costs of Crime Victimization: A New Look.

Needleman, H., Riess, J., Tobin, M., Biesecker, G.E., Greenhouse, J.B., 1996. Bone lead levels and delinquent behavior. J. Am. Med. Assoc. 257, 363–369.

Needleman, H., McFarland, C., Ness, R., Fienberg, S., Tobin, M., 2002. Bone lead levels in adjudicated delinquents. A case control study. Neurotoxicol. Teratol. 24, 711–717.

Nevin, R., 2000. How lead exposure relates to temporal changes in IQ, violent crime, and unwed pregnancy. Environ. Res. A 83, 1–22.

Nevin, R., 2007. Understanding international crime trends: the legacy of preschool lead exposure. Environ. Res. doi:10.1016/j.envres.2007.02.008.

Nevin, R., Watson, G., 1998. Evidence of rational market valuations for home energy efficiency. Appraisal J. October.

Nevin, R., Jacobs, D.E., 2006. Windows of opportunity: lead poisoning prevention, housing affordability and energy conservation. Housing Policy Debate 17 (1), 185–207.

Nevin, R., Gazan, H., Bender, C., 1999. More evidence of rational market values for home energy efficiency. Appraisal J. October.

Salkever, DS., 1995. Updated estimates of earnings benefits from reduced exposure of children to environmental lead. Environ. Res. 70, 1–6.

Schwartz, J., 1994. Societal benefits of reducing lead exposure. Environ. Res. 66, 105–124.

Stern, N., 2006. Stern Review on the Economics of Climate Change. HM Treasury, Accessed November 15, 2006 at: 〈http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm〉.

Swanson, J., 2005. "Trends in North American Residential Window Market," Window & Door Magazine, Accessed May 10, 2007 at: 〈http://www.glassfiles.com/library/article983.htm〉.

Turner, 2006. Cost Index, Accessed September 13, 2006 at: 〈http://www.turnerconstruction.com/corporate/content.asp?d=20〉.

US Bureau of the Census, 1998. American Housing Survey for the United States: 1997.

US Bureau of the Census, 2006. American Housing Survey for the United States: 2005.

US Centers for Disease Control and Prevention, 1997, Blood Lead Levels—United States, 1991–1994. 46(7).

US Department of Housing and Urban Development, 1999. Economic Assessment of the Final Rule on Lead-Based Paint: Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance, Washington DC, September 7. Accessed September 1, 2004 at: 〈http://www.hud.gov/utilities/intercept.cfm?/offices/lead/leadsaferule/completeRIA1012.pdf〉.

US Department of Housing and Urban Development, 2000. Office of Policy Development and Research. 2000 Final Draft. Partnership for Advancing Technology in Housing (PATH): Strategy Implementation for PATH Existing Home Goal.

US Environmental Protection Agency, 1986. Air Quality Criteria for Lead: Volume I of IV, Environmental Criteria and Assessment Office, EPA 600/8-83-028 a-d.

US Environmental Protection Agency, 2001. 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, Accessed September 1, 2004 at 〈http://www.epa.gov/lead/leadhaz.htm〉.

US Environmental Protection Agency, 2003. Latest Findings on National Air Quality, Accessed September 15, 2006 at: 〈http://www.epa.gov/air/airtrends/aqtrnd02/2002_airtrends_final.pdf〉.

US Environmental Protection Agency, 2006a. Cost & Energy Savings for Energy Star Qualified Windows, Accessed September 15, 2006 at: 〈http://www.energystar.gov/ia/products/windows_doors/city_savings_032706.pdf〉.

US Environmental Protection Agency, 2006b. Lead 90th Percentile Levels for 166 Large Water Utilities—Then and Now, Accessed September 15, 2006 at: 〈http://www.epa.gov/safewater/lcrmr/reductionplan_comparrison.html〉.

US Environmental Protection Agency, 2006c. Tax Credits for Windows, Doors, and Skylights, Accessed September 15, 2006 at: 〈http://www.energystar.gov/index.cfm?c=windows_doors.pr_taxcredits〉.

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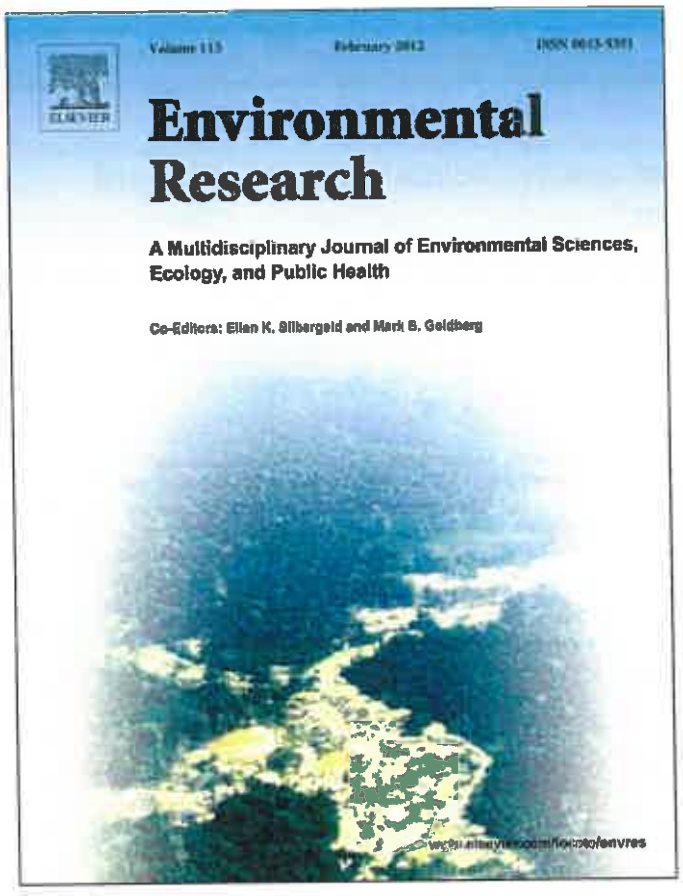

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Window replacement and residential lead paint hazard control 12 years later ☆

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ABSTRACT

Window replacement is a key method of reducing childhood lead exposure, but the long-term effectiveness has not been previously evaluated. Windows have the highest levels of interior lead paint and dust compared to other building components. Our objective was to conduct a follow-up study of residential window replacement and lead hazard control 12 years after homes were enrolled in an evaluation of the HUD Lead Hazard Control Grant Program, sampling settled lead dust in housing in four cities ($n=189$ homes). Previous work evaluated lead hazard controls up to 6 years after intervention using dust lead measurements and two years after intervention using both dust and blood lead data. But the earlier work could not examine the effect of window replacement over the longer time period examined here: 12 years. The individual homes were assigned to one of three categories, based on how many windows had been replaced: all replacement, some replacement, or non-replacement. Windows that were not replaced were repaired. We controlled for covariates such as site, housing condition, presence of lead paint, and season using longitudinal regression modeling. Adjusted floor and sill dust lead geometric mean dust lead loadings declined at least 85% from pre-intervention to 12 years after the intervention for homes with all replacement windows, some windows replaced and no windows replaced. Twelve years after intervention, homes with all replacement windows had 41% lower interior floor dust lead, compared to non-replacement homes (1.4 versus 2.4 μg/ft^2, $p<0.001$), and window sill dust lead was 51% lower (25 versus 52 μg/ft^2, $p=0.006$) while controlling for covariates. Homes with some windows replaced had interior floor and window sill dust lead loadings that were 28% (1.7 versus 2.4 μg/ft^2, $p=0.19$) and 37% (33 versus 52 μg/ft^2, $p=0.07$) lower, respectively, compared to non-replacement homes. The net economic benefit of window replacement compared to window repair (non-replacement) is $1700–$2000 per housing unit. Homes in which all windows were replaced had significantly lower lead dust. New windows are also likely to reduce energy use and improve home value. Lead-safe window replacement is an important element of lead hazard control, weatherization, renovation and housing investment strategies and should be implemented broadly to protect children.

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1. Introduction

Although lead exposures have declined in recent decades, they still remain, making continued source identification and exposure reduction important. Phase-out of lead use in gasoline, new paint, food canning, and ongoing efforts to address existing lead paint hazards in housing and other sources of lead exposure have resulted in an 84% reduction in children's blood lead levels ≥ 10 μg/dL from 1988–1991 to 1999–2004, with a geometric mean of 1.9 μg/dL in the most recent reporting period (Jones et al., 2009). (Geometric mean is a measure of central tendency used for data that are log-normally distributed.) No safe level of lead exposure has been established, and the current geometric mean blood lead level in children is still about 2 orders of magnitude above the "natural" background blood lead level (BPb), which is estimated to be 0.016 μg/dL (Smith and Flegal, 1992). A recent review suggested that about 70% of excessive exposures are related to housing with paint lead (PPb), dust lead (DPb), and soil lead (SPb) hazards (Levin et al., 2008). In 2001, the

Abbreviations: DPb, dust lead; PPb, paint lead; SPb, soil lead; BPb, blood lead; μg/ft^2, micrograms of lead dust per square foot of surface area; mg/cm^2, milligrams of lead paint per square centimeter of surface area; GM, geometric mean; HUD, U.S. Department of Housing and Urban Development; LHC, lead hazard control

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nation established a goal of eliminating childhood lead poisoning from residential lead paint by 2010 (Jacobs et al., 2000), which still has not been met (Lanphear, 2007). Identifying and controlling the remaining sources of exposure are essential to reduce and eliminate childhood lead poisoning, a disease that is entirely preventable.

Windows are prominent as a remaining lead source, because they have the highest likelihood of containing lead paint and the highest amounts of lead dust (Jacobs et al., 2002). In a previous article published in Environmental Research, lead-safe window replacement has been shown to have a net benefit of billions of dollars (Nevin et al., 2008) and its ability to predict trends in lead poisoning has been validated (Jacobs and Nevin, 2006). This current article updates those findings. For these and other reasons, such as energy savings, windows have emerged as a key aspect of residential lead hazard control. Previous work has not examined whether all or only some windows should be replaced in a given housing unit, whether windows should be repaired instead of replaced, or the precise pathway through which windows influence lead dust on floors. Window dust has been shown to be correlated with children's blood lead level (Lanphear et al., 1995). This study examined the longevity of intervention effects related to lead hazards associated with windows and the influences from floors, exterior dust, and soil lead.

HUD has been providing Lead-Based Paint Hazard Control Grants to assist states and local governments in controlling PPb, DPb and SPb hazards in low-income, private homes since 1992. To measure the technical and cost effectiveness of the federally funded interventions undertaken to reduce lead hazards, HUD initiated an evaluation covering a range of interventions, which were implemented by 14 state and local lead hazard control (LHC) grantees (Dixon et al., 2005). Data collection for the study was completed in late 1998 and included nearly 3000 dwelling units. At 1, 2, and 3 years after treatment, DPb and children's BPb were at significantly reduced levels compared to baseline (Dixon et al., 2005; NCHH and UC, 2004; Clark et al., 2011), showing that the interventions were successful for at least 3 years.

A subset of units from 4 jurisdictions in the HUD evaluation study was examined 6 years after intervention. In those dwellings, DPb remained quite low (Wilson et al., 2006). In the 6-year study, dust lead loadings on both floors and window sills declined significantly from baseline, but there was no association between the floor dust lead loadings and extent of window treatment (Wilson et al., 2006). ("Loading" means micrograms of lead divided by the surface area and "concentration" means micrograms of lead divided by the total weight of dust in the sample.) The U.S., EPA regulations that define a dust lead "hazard" are expressed in "loading" units, because loading is known to be more predictive of children's blood lead level (Lanphear et al., 1995). Although dwellings with window "treatments" (full replacement, stripping, sash replacement, or jamb liners) had lower dust lead loadings on window sills and troughs compared to dwellings where windows were only painted/cleaned, they did not have lower dust lead loadings on floors. However, window replacement and other window treatments were combined in the 6-year study, so the independent effect of window replacement could not be assessed.

Previous studies have examined the effectiveness of lead hazard control (LHC) interventions, but except for the 6-year study, they have not examined effects beyond 3 years post-intervention. Measurement of long-term effectiveness is important, because LHC interventions are generally categorized as either abatement or interim controls. Abatement refers to measures that permanently eliminate lead-based paint hazards (e.g., removal, enclosure). Interim controls are methods that temporarily reduce lead-based paint hazards (e.g., specialized cleaning, stabilization of deteriorated paint) (U.S. HUD, 1995). LHC programs often employ strategies that incorporate both abatement and interim control measures (e.g., window replacement and paint stabilization, respectively). Comprehensive abatement of PPb, when followed by a thorough cleaning of all horizontal surfaces, has been shown to significantly reduce dust lead loadings up to three and a half years following treatment. (Farfel and Chisholm, 1990; Farfel et al., 1994). Comprehensive abatement as cited in the Farfel and Chisholm papers included fixing water leaks, treating all lead-painted surfaces with replacement and enclosure methods, replacing windows, making floors smooth and cleanable, and thorough cleaning with wet washing and HEPA vacuuming. Studies conducted since then have examined the effectiveness of strategies that incorporate interim control measures as part of the treatment approach. By definition, interim controls require some degree of ongoing maintenance to maintain their effectiveness. An early randomized trial of interim control measures in Boston observed slight reductions in floor dust lead loadings 6 months after intervention and greater reductions in window sill and trough dust lead loadings (Ashengrau et al., 1998). The sample size of the study was limited, however, and none of the changes were statistically significant. A study in Baltimore of 3 levels of LHC intervention reported significant declines in DPb loadings from pre-intervention through 2 years post-intervention, with the higher intensity interventions showing greater reductions (Farfel et al., 1997).

An earlier study of the HUD evaluation cohort showed that children's PbB declined 37% over two years (Clark et al., 2011). The new study we report here is different in several respects from earlier HUD evaluation cohort studies. First, the followup period is substantially longer. Second, this study investigated the effect of replacing all windows or only some windows or no windows, while in the earlier studies, these were merged. Third, the earlier study included blood lead metrics, which integrate all exposure sources, while this new study focused exclusively on environmental dust lead inside the housing and its relationship to window replacement. Finally, the current study is especially timely given the vast amount of window replacement underway in the U.S. in the context of weatherization.

Because this new study reports environmental lead levels 12 years following intervention, it is the largest and longest assessment of modern lead hazard controls in housing reported to date. The objectives of this study were to determine if window replacement is more effective than non-replacement window treatments (interim controls) in maintaining low floor and window sill DPb loadings approximately 12 years after treatment, after controlling for confounders and effect modifiers (e.g., housing condition, paint condition, recent renovation).

2. Methods

The methods used in the 3-year HUD evaluation have been described elsewhere (Galke et al., 2005). Of the original 14 jurisdictions, we selected 4 that collectively were likely to have a mix of window replacement and non-window replacement: Vermont (Burlington, Bennington, Springfield, and scattered locations), Minnesota (Minneapolis, St Paul, and Duluth), Cleveland, and Chicago. To ensure that units were assigned to the correct window group, the unit was examined prior to enrollment in the current study to determine if windows had been replaced at some point after the initial work had been completed. If more than 3 windows had been replaced after the lead hazard control work in a dwelling with a non-replacement intervention, then the dwelling was not eligible for the current study (11 units). Dwellings with window replacement interventions had to have at least 4 replacement windows at the conclusion of the HUD Evalation intervention work to be eligible for the current study. Dwellings were also ineligible if they were boarded up, or if the resident declined to participate. All dwellings had to have baseline dust lead results available to be eligible. Additional phases of dust sampling (clearance, 6-months, 1-, 2-, 3-, and 6-years

post-intervention) were used in the analysis if available. The study did not designate a specific anniversary date for enrollment, but the average unit was enrolled 12 years after intervention and 90% of units were enrolled within 1 year of that date. An additional 9% were between 13 and 18 months of the target 12-year anniversary date and two units had sampling conducted at 20 and 25 months past the 12-year anniversary.

Each home was assessed using a standardized 16-question interview (e.g., demographics, cleaning practices, tenure), a visual review of 8 structural elements of the dwelling to assess deterioration (e.g., condition of doors, windows, roofs), and a visual assessment of paint condition on 5 specific building components in every room/location and on the exterior. The assessor also examined a 4-block area around the home for possible generators of exterior dust lead, e.g., presence of nearby demolition, battery plants, smelters or other potential lead sources. Up to 10 single-surface settled dust wipe samples were collected from floors, interior window sills, and window troughs in 5 rooms/locations and the floor at the interior entryway in each dwelling using the same procedure and the same location as in the 3-year evaluation (NCHH and UC, 2004) and 2 composite soil samples (if soil was present) were collected at each building. The same windows that were sampled approximately 12 years earlier were sampled in the current study. Data gathered did not report whether windows where dust samples were collected had been replaced. One exterior DPb sample was collected at every dwelling or building from the step or sidewalk just outside of the main entrance to the building to help assess whether tracked-in contaminated dust was a significant contributor to interior DPb.

Analysis was performed by a laboratory recognized by the EPA National Lead Laboratory Accreditation Program, with evidence of proficiency under the Environmental Lead Proficiency Analytical Testing Program. All dust wipe samples were analyzed for total lead by flame atomic absorption spectroscopy using EPA method SW-846 or equivalent. The laboratory had a minimum detection limit of 1.6–1.8 μg/sample for the 12-year samples. Laboratory methods used for the data before 12 years are described elsewhere (Galke et al., 2005; Dixon et al., 2005; Wilson et al., 2006). Thirty-four percent of the floor samples and 21% of the window samples for the data presented in this article were below the lab's minimum detection limit. Actual machine values were used for approximately 75% of these measurements.

Each home was assigned to one of 3 groups. The "all-replacement group" included only those units that had at least 4 windows replaced in the intervention and resulted in all replacement windows. The "partial replacement group" included only those that had at least 4 windows replaced in the intervention and resulted in less than all replacement windows in the unit. Non-replaced windows in this group may have received lesser treatments. The "non-replacement group" consisted only of those units that had no more than 3 windows replaced during and after intervention and had no more than 3 replacement windows in the dwelling after the intervention. Sixty-four percent of the units in this final group had some work conducted on the windows. Work included partial sash replacement, paint stripping, window repair, and repainting.

An arithmetic mean (average) DPb loading was calculated for the floors and window sills within each dwelling to represent the unit-wide dust lead level, because the arithmetic mean is used in the EPA regulations. Geometric means (GM) were used in statistical modeling, because the dust lead data were log-normally distributed. The DPb at the entryway was not included in the floor dust lead average, because it is more likely to reflect exterior sources. Time was represented by a categorical variable for 6 months, 1 year, 2 years, 3 years, 6 years, or 12 years after intervention. Models that expressed the natural log-transformed DPb loading as a function of a number of potential variables, such as pre-intervention and immediate post-intervention DPb loading, exterior DPb loading, SPb, housing conditions and characteristics (e.g., building type [single family, 2–4 units or >4 units]), exterior work, and cost of non-window interior work and others, were used to evaluate differences in window replacement groups across time. We also accounted for the effects of baseline PPb, baseline DPb, and time to interact with window replacement group. The effect of the window replacement group was allowed to vary across time. To provide an accurate prediction of DPb without eliminating large fractions of the study sample because of missing values, we fit an intercept term for each variable that had a missing value. The models accounted for the anticipated positive correlation between dust lead loadings in different dwellings within the same building.

Backward elimination of insignificant independent variables ($p \geq 0.1$) was performed, followed by additional steps to allow the addition and/or removal of variables with the SAS procedure PROC MIXED. For nominal variables with a missing category, the p-value used tests for a significant difference between the non-missing categories (i.e., missing category was disregarded). For continuous variables with a dummy variable for missing values, the p-values used tests for a significantly non-zero slope. Seasonality and grantee (site) effect were included in all the models.

We updated a previous cost-benefit analysis using a method described elsewhere (Nevin et al., 2008) to estimate the net benefit of window replacement compared to window repair (non-replacement). The analysis uses data on the cost of new windows vs. window repair, the fraction of units with young children, the resulting avoided increase in children's BPb from DPb and associated incremental average lifetime earnings increase, monetary estimates on home energy utility savings, property value increases due to new windows, and a resulting 12-year net present value. This method is conservative (likely to underestimate true net benefits) because it does not include other health effects associated with reduced childhood lead exposure, such as reduced stature, hearing loss, kidney disease and cardiovascular effects, and because benefits of window replacement are likely to last longer than 12 years. Partial replacement was not included in this analysis due to the wide range of window replacement/non-replacement in this category. Additional details on the methods and data sources used in the economic analysis are available at www.nchh.org.

3. Results

Two hundred units were enrolled, but 11 units were excluded because they did not have window replacement as part of the original intervention but did have more than 3 replacement windows at 12 years post-intervention. One hundred and eighty-nine dwellings in 124 buildings remained in the analysis, with slightly more than half in one of the 4 jurisdictions (Vermont) and the rest equally split among the remaining three. The vast majority of households were low income at 12 years, with 65% under $20,000/year, 17% from $20,000–$29,999/year, and 18% $30,000 or more per year.

Seventy-seven of the dwellings were in the all-replacement group (41%), 80 were non-replacement (42%) and 32 were partial replacement (17%). Of the 80 non-replacement units, 63 (79%) had no replacement windows, and the remaining 21% had between 8% and 33% replacement windows. In the partial replacement group, the percent of replacement windows ranged from 42% to 93% (median 82%). In Cleveland and Vermont, slightly more than half of dwellings were all-replacement, with most of the remainder in the non-replacement group. Work was conducted on the building exterior at 54% of the dwellings.

Most of the units were in buildings built before 1910 (53%) or between 1910 and 1919 (20%). Geometric mean baseline window PPb was 1.4 mg/cm^2 and ranged from < 0.1 to 9.5 mg/cm^2. Interior and exterior deterioration of key building components was observed in 9% and 12% of the homes, respectively, and 29% had an exterior DPb point source in the neighborhood. Fifty-nine percent of units had at least one painted floor, and on average 10% of all floors were painted. Fourteen percent of units had at least one carpeted floor, and on average 30% of all floors were carpeted. On average, 80% of the window sills that were sampled were painted.

3.1. Pre-intervention (baseline) results

Geometric Mean (GM) baseline floor DPb loadings were not significantly different across the 3 window replacement groups (p=0.808), but GM baseline sill DPb loading was lower for all replacement units compared to non-replacement units (152 and 328 μg/ft^2, respectively) (p=0.014) (Table 1). Sill GM baseline DPb loading was no different for partial replacement compared to no replacement or all replacement (p=0.211 and p=0.517, respectively).

3.2. Modeling results

After controlling for confounders, time and window replacement group were both significant predictors of post-intervention floor and sill DPb loadings, and the effect of window replacement group was found to be constant from 6 months to 12 years post-intervention. Homes with all replacement windows had 41% lower floor DPb loading compared to non-replacement homes (1.4 versus 2.4 μg/ft^2, p=0.006) (Table 2, Fig. 1). Homes with partial replacement had 28% lower floor DPb loading compared to the non-replacement group (1.7 versus 2.4 μg/ft^2,

Table 1
Dust lead loading and percent exceeding federal hazard standards[a] by Window Replacement Group.

Sample location	Phase	All				Non-Replacement				Partial Replacement				All Replacement			
		N	GM	GSD	% Exceed standard	N	GM	GSD	% Exceed standard	N	GM	GSD	% Exceed standard	N	GM	GSD	% Exceed standard
Floor	Pre-intervention	189	20.8	5.5	26	80	21.2	5.8	26	32	24.3	8.2	28	77	19.3	4.3	26
	Clearance	183	9.5	2.5	8	74	10.8	2.4	7	32	10.1	3.2	19	77	8.2	2.4	5
	6-Months post-intervention	163	9.2	4.6	17	69	10.3	5	14	25	17.7	3.3	32	69	6.5	4.3	14
	1-Year post-Intervention	169	8.2	3.9	15	70	9.1	3.4	13	28	18.9	3	29	71	5.4	4.1	11
	2-Years post-intervention	44	8.3	4.5	14	28	11.1	4.4	14	3	56.7	2.4	67	13	2.8	2.2	0
	3-Years post-intervention	38	5.0	11	11	23	9.5	10.2	17	3	4.5	29.6	0	12	1.5	7.4	0
	6-Years post-intervention	53	2.7	5.7	4	30	3.5	5.3	7	6	2.0	8.2	0	17	1.8	5.7	0
	12-years post-intervention	189	2.2	7.8	4	80	1.7	6.3	3	32	3.7	9.7	9	77	2.2	8.6	4
Window sill	Pre-intervention	188	221	7	43	80	328	8.5	55	32	198	5.2	44	76	152	5.8	30
	Clearance	180	19	3.8	2	73	30	3.8	3	31	17	2.8	0	76	14	3.9	1
	6-Months post-intervention	161	64	5.1	21	68	91	4.5	25	25	107	5	32	68	38	5.1	13
	1-Year post-intervention	167	62	4.6	19	69	86	4.6	28	28	91	4.7	18	70	39	4.1	10
	2-Years post-intervention	44	60	5.2	20	28	64	6.3	21	3	145	2	33	13	43	3.8	15
	3-Years post-intervention	38	48	2.9	5	23	59	3.1	9	3	69	2.1	0	12	30	2.5	0
	6-Years post-intervention	53	39	9.3	13	30	47	8.2	13	6	62	11.6	17	17	24	11.2	12
	12-Years post-intervention	188	32	9.5	13	80	54	7.3	18	32	42	9.3	13	76	16	10.5	8

[a] 40 μg/ft² for floors and 250 μg/ft² for window sills (U.S. Envrionmental Protection Agency Lead Dust Hazard Standard (40 CFR Part 745), Federal Register Jan 5, 2001, p. 1206)

$p=0.194$) and the all replacement homes were 18% lower in floor DPb loading compared to the partial replacement group ($p=0.348$), but both of these latter comparisons were not statistically significant.

Preliminary modeling did not include a variable for the jurisdiction (site), but we found that it was statistically significant for both floors and sills ($p<0.001$) when added to the models. Factors that we were unable to control for contributed to higher DPb in the more urban settings of Chicago and Cleveland than in the sampled homes in Minnesota and Vermont. Perimeter SPb was a predictor of post-intervention floor DPb loading ($p=0.038$) only in the model where site was not controlled because perimeter SPb is more homogenous within a site than between sites.

Exterior work and season were both significant influences, but the cost of non-window interior work was not. Homes where exterior work was conducted had post-intervention entry DPb loading that was 28% lower ($p=0.048$) compared to units without exterior work. Season of DPb sampling was associated with post-intervention floor DPb loading ($p<0.001$), with the highest levels observed in mid-August and the lowest in mid-February. Not surprisingly, higher floor DPb loading immediately following the work, exterior DPb loading, and exterior point sources (e.g., local demolition) were all significant or at least marginally associated with higher post-intervention floor DPb loadings ($p=0.097$, 0.007, and 0.015, respectively). Homes with a painted floor had floor post-intervention DPb loading that was 130% higher than homes without a painted floor ($p<0.001$) and a worse bare floor condition was associated with higher floor post-intervention DPb loading ($p=0.04$). Homes with 2 or more exterior system deteriorations (e.g., broken steps, severe foundation cracks, roof damage) had higher floor post-intervention DPb loading, compared to homes with no deteriorations ($p=0.031$). In homes with one deterioration, DPb loading was only marginally higher than the DPb loading in homes with no deteriorations ($p=0.064$).

Across all three window groupings, floor DPb loading levels gradually declined over time ($p<0.001$), probably because all three groups had undergone lead hazard control earlier. At 6 months, 1 year, 2 years, and 3 years, DPb loading was higher than at 6 years and 12 years (all $p<0.001$). At 6 years, there was only marginally higher DPb loading than at 12 years ($p=0.083$).

Homes with all replacement windows had post-intervention sill DPb loading that was 51% lower than non-replacement homes (25 versus 52 μg/ft², $p<0.001$) (Table 2, Fig. 2). Homes with partial replacement had post-intervention sill DPb loading that was 37% lower than non-replacement homes (33 versus 52 μg/ft², $p=0.074$). There was no significant difference between partial-replacement and all-replacement homes ($p=0.254$).

As with floors, season was associated with post-intervention sill DPb loading ($p=0.024$) and higher sill baseline DPb loading and exterior DPb loading were associated with higher post-intervention sill DPb loadings ($p<0.001$ and $p=0.004$, respectively). Higher baseline window PPb was associated with higher post-intervention sill DPb loading ($p=0.002$) across all window groups, probably because window paint lead is associated with other paint lead levels inside and outside the dwelling. Alternatively, window sills may not have been replaced when windows were. The geometric mean exterior entry DPb was 13 μg/ft² (range <1 to 1262 μg/ft²).

Housing condition was also important. A worse wiped surface condition was associated with higher post-intervention sill DPb loadings ($p<0.001$) and homes with exterior roof, gutter or downspout deterioration had sill post-intervention DPb loading that was higher than homes without deterioration ($p<0.001$).

Table 2
Parameter estimates for the linear longitudinal log interior floor and window sill DPb loading (μg/ft²) models.

Effect	Levels	Interior floor			Window sill		
		Estimate (std err)	p-Value (parameter)	p-Value (Overall)	Estimate (std err)	p-Value (parameter)	p-Value (Overall)
Intercept	–	−0.943(0.299)	0.002	0.002	1.756(0.479)	<0.001	<0.001
Seasonality	Cosine	−0.390(0.085)	<0.001	<0.001	−0.146(0.091)	0.108	0.024
	Sine	−0.431(0.078)	<0.001		−0.136(0.084)	0.107	–
Building type	2–4 Units	–	–	–	-0.493(0.205)	0.016	0.041
	>4 Units	–	–	–	−0.514(0.270)	0.058	–
	Single	–	–	–	0	.	–
Percent bare wiped floors (0 to 100%) [a]	–	0.079(0.265)	0.766	0.766	–	–	–
Percent bare wiped floors (0 to 100%) [a] *Condition bare wiped floors (1=Good to 3=Poor)	–	0.338(0.166)	0.042	0.042	–	–	–
Wiped surface condition (1=good to 3=poor)	–	–	–	–	0.735(0.134)	<0.001	<0.001
Any painted floors in wipe sample (1=Yes, 0=No)	–	0.835(0.224)	<0.001	<0.001	–	–	–
Log baseline window sill DPb (μg/ft²)	–	–	–	–	0.151(0.041)	<0.001	<0.001
Exterior point source	Missing	0	.	0.015[b]	–	–	–
	No	−0.476(0.194)	0.015	–	–	–	–
	Yes	0	.	–	–	–	–
No exterior work (1=Yes, 0=No)	–	0.333(0.168)	0.048	0.048			
Log baseline window paint Pb (mg/cm²)	Slope	–	–	–	0.268(0.084)	0.002	<0.001
	Intercept for Missing	–	–	–	−1.012(0.479)	0.035	
Log clearance DPb (μg/ft²)	Slope	0.130(0.078)	0.097	0.152	–	–	–
	Intercept for Missing	0.805(0.523)	0.124		–	–	–
Log exterior DPb (μg/ft²)	Slope	0.090(0.033)	0.007	0.009	0.100(0.035)	0.004	0.003
	Intercept for Missing	1.505(0.972)	0.122		2.089(1.020)	0.041	
Number of exterior systems with deterioration	Missing	−0.103(0.277)	0.711	0.023[b]	–	–	–
	Two to four	0.766(0.354)	0.031		–	–	–
	One	0.380(0.205)	0.064		–	–	–
	Zero	0	.		–	–	–
Roof, gutter, or downspout deterioration	Missing	–	–		−0.053(0.383)	0.890	0.001[b]
	No	–	–		−0.937(0.292)	0.001	
	Yes	–	–		0	.	
Post-intervention visit	6 months	1.752(0.155)	<0.001	<0.001	0.795(0.162)	<0.001	<0.001
	1 year	1.533(0.155)	<0.001		0.565(0.162)	<0.001	
	2 years	1.864(0.242)	<0.001		0.434(0.260)	0.096	
	3 years	1.528(0.259)	<0.001		0.146(0.278)	0.601	
	6 years	0.384(0.221)	0.083		0.298(0.234)	0.205	
	12 years	0	.		0	.	
Window replacement group	Non-Replacement	0.536(0.196)	0.006	0.023	0.720(0.194)	<0.001	0.001
	Partial Replacement	0.203(0.216)	0.348		0.257(0.225)	0.254	
	All replacement	0	.		0	.	
Grantee/site	Chicago	1.534(0.258)	<0.001	<0.001	1.222(0.276)	<0.001	<0.001
	Cleveland	0.654(0.269)	0.015		0.618(0.293)	0.035	
	Minnesota	0.501(0.211)	0.018		0.307(0.235)	0.191	
	Vermont	0	.		0	.	

[a] The percentage is expressed in its fractional form 0 to 1.0.
[b] Overall p-value does not include the missing category.

Single family homes had higher post-intervention sill DPb loading than homes in buildings with 2–4 units or >4 units ($p=0.017$ and 0.058, respectively), but post-intervention sill DPb loading in buildings with 2–4 units and >4 units are not significantly different ($p=0.930$).

Post-intervention sill DPb loadings decreased over time ($p<0.001$). At 6 months there was higher DPb loading than at 3 years, 6 years, and 12 years (all $p<0.05$). Post-intervention sill DPb loading by grantee site was significantly different ($p<0.001$).

Figs. 1 and 2 present least square mean DPb loading by phase and window replacement group for floors and window sills, respectively. Least square means are model-predicted values with all variables in the model (other than time and window replacement group) held at their mean values.

3.3. Economic results

We also examined the costs and benefits of window repair (non-replacement) versus window replacement for different-sized housing units. The incremental cost of replacing instead of repairing windows varied from $1953 to $4464 per unit. The incremental health benefit of window replacement versus window repair reflects additional reductions in childhood exposure to DPb associated with window replacement. Because there is also an economic benefit associated with improved house appearance and energy savings (Nevin et al., 2008), the net economic benefit of window replacement instead of window repair varies from over $1700 to over $2000 per unit (Table 3). Of course, net benefits would be much greater if the

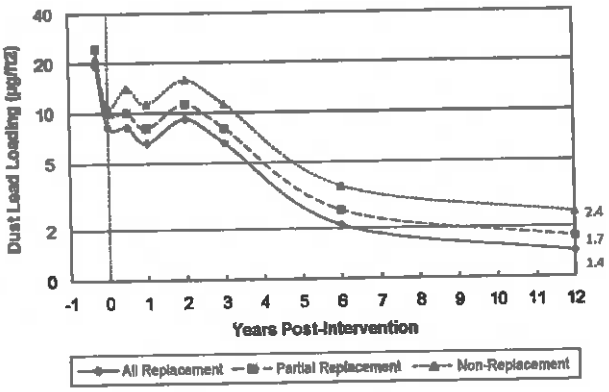

Fig. 1. Adjusted geometric mean floor dust lead loading by window replacement group from pre-intervention to 12-years post-intervention.

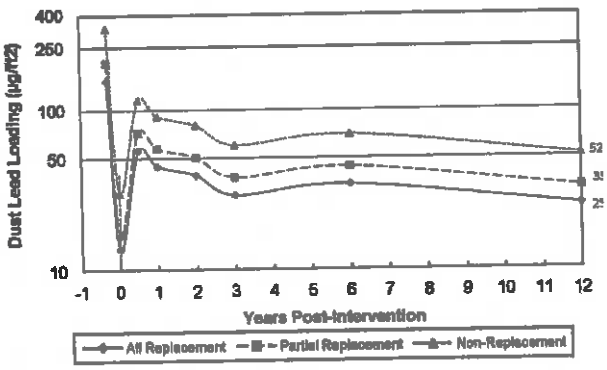

Fig. 2. Adjusted geometric mean sill dust lead loading by window replacement group from pre-intervention to 12-years post-intervention.

Table 3
Incremental costs and benefits of lead-safe window replacement.

	Size of housing unit		
	800 ft² Attached 7 Windows	1200 ft² Detached 10 Windows	1800 ft² Detached 16 Windows
Net window replacement cost	$1953	$2790	$4464
Lifetime earnings benefits per unit[a]	$1671	$1671	$1671
Appearance value	$700	$1000	$1600
Energy efficiency value	$1301	$1951	$3250
Net economic benefit	$1719	$1832	$2057

[a] Lifetime earnings benefit is calculated from avoided IQ loss due to lower DPb exposure (see www.nchh.org for details).

comparison was to windows with lead hazards that are left entirely unattended.

4. Discussion

Floor and sill DPb were substantially and significantly reduced from baseline to 12 years for all three window groups. Adjusted geometric mean baseline DPb declined from 19 to 1.4 µg/ft² on floors and 152 to 25 µg/ft² on sills at 12 years for the replacement window group. Adjusted geometric mean baseline DPb declined from 24 to 1.7 µg/ft² on floors and 198 to 32 µg/ft² on sills at 12 years for the partial replacement group. Adjusted geometric mean baseline DPb declined from 21 to 2.4 µg/ft² on floors and 327 to 52 µg/ft² on sills at 12 years for the non-replacement group.

The difference in DPb was largest when comparing the non-replacement to the all replacement group. Housing with all replacement windows had 41% lower floor and 51% lower sill DPb loading than non-replacement units, while controlling for other significant covariates ($p=0.006$ and $p<0.001$, respectively). Partial replacement units had lower floor and sill DPb loading than non-replacement, but the difference was non-significant on floors and marginally significant on sills ($p=0.194$ and 0.074, respectively). Although all replacement units had lower floor and sill DPb loading than partial replacement, these differences were not statistically significant ($p=0.348$ and 0.254, respectively).

The actual differences in DPb loading among the window replacement groups depend on the conditions and characteristics of the housing. Although the percent difference between the least square means (i.e., adjusted predicted GM 12 Year DPb loading) for the all-replacement and non-replacement units is the same for each site due to the log-linear modeling, the magnitude of the differences varies by site. For floors, the difference between the replacement and non-replacement groups ranged from 0.6 µg/ft² for Vermont (0.9 and 1.5 µg/ft², respectively) to 2.9 µg/ft² for Chicago (4.0 and 6.9 µg/ft²). For sills, differences ranged from 18 µg/ft² in Vermont (17 and 35 µg/ft²) to 62 µg/ft² for Chicago (58 and 120 µg/ft²).

Only 4% of units exceeded the current federal lead dust hazard standard of 40 µg/ft² on floors and 13% of units exceeded the federal standard of 250 µg/ft² on sills at 12 years post-intervention. Other research based on the National Health and Nutrition Examination survey indicates that the hazard standards should be reduced to approximately 10 µg/ft² on floors and 100 µg/ft² on sills (Dixon et al., 2009). Twenty-four percent of units exceeded 10 µg/ft² on floors and 28% of units exceeded 100 µg/ft² on sills at 12 years post-intervention.

The results show that replacing all windows with high levels of PPb and DPb will have the greatest effect on reducing both floor and sill DPb over a substantial time period. This public health benefit adds to other benefits associated with window replacement, including reduced energy costs and increased home value.

Although we asked residents about remodeling or repair work in the 6 months before DPb sampling, that variable was not found to be a predictor of floor or sill DPb. That may be because the question did not discriminate between activities that could or could not disturb lead-based paint.

This study has several limitations. The study units were a subset of homes treated from 1994 to 1999 as part of the evaluation of the HUD lead-based paint hazard control grant program. It was not feasible to randomize the interventions in the evaluation, because the interventions were determined by each jurisdiction. It is also possible that the selection of the four sites for this current study created some bias in the results. Because one of the four sites had many of the all-replacement windows, it is possible that site is confounded with the window replacement results, even after statistical modeling.

Data on condition of household maintenance by residents were missing in nearly 40% of the homes, so they were not included in the models discussed above. Using the limited data available, however, we did find that the study interviewer's assessment of basic general upkeep and cleanliness was associated with higher post-intervention floor and sill DPb loadings ($p=0.004$ and 0.036, respectively). More adults living in the unit and a unit being vacant were associated with higher

post-intervention sill DPb loadings (p=0.01 and 0.09, respectively). This is consistent with the previous 6-year study (Wilson et al., 2006) and with other publications from the HUD evaluation.

Similar to other recent studies, DPb loadings were quite low and many were below limits of detection. Although we attempted to overcome this using an analytical method with a low detection limit, it is possible that we may have been able to detect additional significant variables or larger effect sizes had DPb loadings been higher. Nevertheless, the fact that DPb loadings have remained so low for such a long time increases the likelihood that modern lead hazard control methods are effective for a substantial time period.

5. Conclusions

Because older windows have high levels of PPb and DPb and can be major sources of energy loss and significant indicators of housing price, window replacement is likely to have multiple public health, environmental, and economic benefits, many of which have not been previously recognized. This study also shows that there are multiple lead factors that influence post-treatment interior DPb loading. Any community lead hazard control strategy should address all sources including lead on the exterior of homes and the demolition of nearby buildings with lead-based paint. Although window replacement alone may not eliminate all lead-based paint hazards at a given housing unit, this study demonstrates that complete window replacement is likely to have a significant positive impact on the lead safety of homes over the long run. Public and private sector initiatives are needed to promote window replacement to achieve such benefits and to move toward longer-lasting and healthier housing.

Competing interests

The authors declare they have no competing interests. The study was approved by an Institutional Review Board.

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References

Ashengrau, A., Hardy, S., Mackey, P., Pultinas, D., 1998. The impact of low technology lead hazard reduction activities among children with mildly elevated blood lead levels. Environ. Res. 79 (1), 41–50.

Clark, S., Galke, W., Succop, P., Grote, J., McLaine, P., Wilson, J., Dixon, S., Menrath, W., Roda, S., Chen, M., Bornschein, R., Jacobs, D., 2011. Effects of HUD-supported lead hazard control interventions in housing on children's blood lead. Environ. Res. 111 (2), 301–311.

Dixon, S.L., Gaitens, J.M., Jacobs, D.E., Strauss, W., Nagaraja, J., Pivetz, T., Wilson, J.W., Ashley, P.J., 2009. U.S. children's exposure to residential dust lead, 1999–2004: II. The contribution of lead-contaminated dust to children's blood lead levels. Env. Health Perspect. 117, 468–474.

Dixon, S., Wilson, J., Clark, C.S., Galke, W., Succop, P., Chen, M., 2005. Effectiveness of lead-hazard control interventions on dust lead loadings: findings from the evaluation of the HUD lead-based paint hazard control grant program. Environ. Res. 98, 303–314.

Farfel, M.R., Chisholm, J.J., 1990. Health and environmental outcomes of traditional and modified practices of abatement of residential lead-based paint. Am. J. Public Health 80 (10), 1240–1245.

Farfel, M.R., Chisholm, J.J., Rodhe, C.A., 1994. The longer-term effectiveness of residential lead paint abatement. Environ. Res. 66 (2), 217–221.

Farfel, M.R. et al., 1997. Lead-based paint abatement and repair and maintenance study in Baltimore: Findings based on two years of followup. U.S. Environmental Protection Agency. 747-R-97-005. Available from: 〈http://www.epa.gov/lead/pubs/24folup.pdf〉 (accessed 29.07.2010).

Galke, W., Clark, C.S., McLaine, P., Bornschein, R.L., Wilson, J., Jacobs, D.E., Succop, P., Roda, S., Breysse, J., Grote, J., Menrath, W., Dixon, S., Chen, M., Buncher, R., 2005. National evaluation of the U.S. Department of Housing and Urban Development lead-based paint hazard control grant program: study methods. Environ. Res. 98 (3), 315–328.

HUD, U.S., 1995. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing. U.S. Department of Housing and Urban Development. HUD-1539-LBP. Washington DC.

Jacobs, D.E., Matte, T.D., Moos, L.V., Nilles, B., Rodman, J., 2000. Eliminating childhood lead poisoning: a federal strategy targeting lead paint hazards. Report of the President's Task Force on Children's Environmental Health Risks and Safety Risks to Children. U.S. Department of Housing and Urban Development and U.S. Environmental Protection Agency, Washington, DC. Available from: 〈http://www.hud.gov/offices/lead/library/hhi/FedLeadStrategy2000.pdf〉 (accessed 29.07.2010).

Jacobs, D.E., Clickner, R.L., Zhou, J.L., Viet, S.M., Marker, D.A., Rogers, J.W., Zeldin, D.C., Broene, P., Friedman, W., 2002. The prevalence of lead-lased paint hazards in U.S. housing. Environ. Health Perspect. 110, A599–A606.

Jacobs, D.E., Nevin, R., 2006. Validation of a twenty-year forecast of U.S. childhood lead poisoning: updated prospects for 2010. Environ. Res. 102 (3), 352–364.

Jones, R.L., Homa, D.M., Meyer, P.A., Brody, D.J., Caldwell, K.L., Pirkle, J.L., Brown, M.J., 2009. Trends in blood lead levels and blood lead testing among U.S. children aged 1 to 5 years, 1988-2004. Pediatrics 123, E376–E385.

Lanphear, B.P., 2007. The conquest of lead poisoning: a pyrrhic victory. Environ. Health Perspect. 115, A484–A485.

Lanphear, B.P., Emond, E., Weitzman, M., Jacobs, D.E., Tanner, M., Winter, N., Yakir, B., Eberly, S., 1995. A side-by-side comparison of dust collection methods for sampling lead-contaminated house dust. Environ. Res. 68, 114–123.

Levin, R., Brown, M.J., Kashtock, M.E., Jacobs, D.E., Whelan, E.A., Rodman, J., Schock, M.R., Padilla, A., Sinks, T., 2008. Lead exposure in U.S. children, 2008: implications for prevention. Environ. Health Perspect. 116, 1285–1293.

NCHH and UC, 2004. Evaluation of the HUD Lead Hazard Control Grant Program: final report. National Center for Healthy Housing and University of Cincinnati. Columbia, MD. Available from: 〈http://www.nchh.org/LinkClick.aspx?fileticket=1jFfxfohcig%3d&tabid=273〉 (accessed 29.07.2010).

Nevin, R., Jacobs, D.E., Berg, M., Cohen, J., 2008. Monetary benefits of preventing childhood lead poisoning with lead-safe window replacement. Environ. Res. 106, 410–419.

Smith, D.R., Flegal, A.R., 1992. The public health implications of humans' natural levels of lead. Am. J. Public Health 82 (11), 1565–1566.

Wilson, J., Pivetz, T., Ashley, P.J., Strauss, W., Jacobs, D.E., Menkedick, J., Dixon, S., Tsai, H.C., Brown, V., 2006. Evaluation of HUD-funded lead hazard control treatments at six years post-intervention. Environ. Res. 102 (2), 237–248.

Replacing Windows Reduces Childhood Lead Exposure: Results From a State-Funded Program

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Context: Despite considerable evidence that window replacement reduces childhood lead exposure and improves energy conservation and market value, federal policies in childhood lead poisoning, home improvement, and weatherization programs all tend to discourage it. **Objective and Intervention:** To evaluate a state bond-financed pilot program that replaced old lead-contaminated windows with new lead-free energy efficient ones. **Design and Setting:** Pre-/post evaluation in 1 urban and 1 rural jurisdiction. **Participants:** Low-income households (n = 96). **Main Outcome Measures:** Dust wipe sampling, visual assessment, and physical and mental self-reported health at baseline and 1 year. **Results:** Geometric mean lead dust (PbD) from baseline to 1 year for interior floors, interior sills, and exterior troughs declined by 44%, 88%, and 98%, respectively ($P < .001$); 1 year later, levels remained well below baseline but rose slightly compared with clearance sampling just after intervention. PbD declined significantly on both sills and troughs in both the urban and rural jurisdictions from baseline to 1 year. On interior floors, PbD significantly declined by 58% ($P = .003$) in the rural area and 25% ($P = .38$) in the urban area, where the decline did not reach statistical significance. Households reported improvements in uncomfortable indoor temperatures ($P < .001$) and certain health outcomes. Economic benefits were estimated at $5 912 219 compared with a cost of $3 451 841, resulting in a net monetary benefit of $2 460 378. Residents reported that they were "very satisfied" with the window replacement work (87%). **Conclusion:** Local and state governments should fund and operate window replacement programs to eliminate a major source of childhood lead exposure, improve energy bills, increase home market value, and create local construction and industrial jobs. Federal agencies should encourage (not discourage) replacement of old windows contaminated with lead. In budget climates such as Illinois with reduced public expenditures, making wise investments such as lead-safe window replacement is more important than ever.

KEY WORDS: childhood lead poisoning prevention, healthy housing, housing, lead, lead dust, lead poisoning, windows

The most recent data from the Centers for Disease Control and Prevention show that 535 000 children in the United States younger than 6 years have blood lead levels above the Centers for Disease Control and

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Prevention reference value of 5 $\mu g/dL$.[1] The 2 main sources of childhood lead exposure during the past few decades in the United States were leaded gasoline and lead paint.[2,3] Today, deteriorated lead-based paint and the contaminated residential dust and soil it generates are responsible for the majority of elevated blood lead levels.[4] The main childhood exposure pathway is normal hand-to-mouth contact and ingestion of lead-contaminated settled dust.[5-8]

A national housing survey shows that windows have average paint lead loadings about twice that of other building components.[9] Windows are also the most likely building component to be rated in "poor" condition. In homes constructed before 1940, 41% of window exteriors and 21% of window interiors have lead-based paint. Geometric mean (GM) sill and trough lead dust (PbD) loadings ($\mu g/ft^2$) are roughly 10 and 100 times higher than on floors, respectively.[9,10] Loading means unit weight of lead (micrograms) divided by unit surface area (square feet) and is how US regulatory PbD standards are expressed. These national findings are similar to earlier data in Illinois, where the present study was conducted.[11] Floor, sill, and trough PbD are all significantly correlated with children's blood lead levels, making PbD a good exposure metric.[7,8,12]

Abatement of leaded components, especially window replacement, is the most durable, longest-lasting option[13] but can be more expensive than other control methods such as paint stabilization. Beyond lead poisoning prevention, window replacement is also known to improve energy conservation and the market value of homes.[14]

However, federal programs have tended to discourage window replacement. For example, the Department of Energy's weatherization programs do not typically replace windows, because larger energy savings may be accomplished through insulation and air sealing, and weatherization assistance programs have a "walk away" policy if the cost of lead hazard control is deemed to be too large.[15] The Department of Housing and Urban Development's (HUD) lead hazard control program guidance requires time-consuming testing and photographing of virtually all windows before replacement, which is not required for any other building component.[16] Such federal weatherization and lead poisoning program policies discourage window replacement. This present study examines a state bond program that could help fill that gap.

In 2007, the Illinois General Assembly passed Public Act 095-0492, establishing the Comprehensive Lead Education, Reduction, and Window Replacement Program (ClearWin). The primary stated goal of ClearWin is "to assist residential property owners to reduce lead paint hazards through window replacement in pilot communities." The ClearWin program is a primary lead poisoning prevention program focusing on proactive window replacement in low-income, high-risk neighborhoods, instead of responding only to children who have already been poisoned. The Assembly mandated that the Illinois Department of Public Health administer the first window replacement program to be run by a public health agency in the nation.

The primary objectives were (1) to determine whether a state health department can cost-effectively conduct a window replacement program in both small and large cities such as Peoria and Chicago (Englewood neighborhood) using state bond financing; and (2) to quantify reductions in PbD in homes where windows are replaced from baseline to 1 year after treatment.

Methods

The study, approved by an institutional review board, examined approximately 100 housing units, equally divided between Chicago and Peoria, a convenience sample drawn from the 466 units treated under the larger ClearWin Program. PbD wipe samples were collected before, immediately after (clearance sampling), and nominally 1 year after window work was completed. Health interviews and housing condition visual assessments were done before the work and nominally 1 year after window replacement.

PbD was measured using the standard HUD wipe method, with analysis in laboratories accredited by the US Environmental Protection Agency National Lead Laboratory Accreditation program.[17] Interior floor, window sill, and window trough samples were collected at the interior entryway, in the living room, bedroom, and kitchen. Bare floors were preferred over carpets. For PbD values below the detection limit, the uncensored laboratory instrument output value was used if available, or if not, it was replaced with detection limit/$\sqrt{2}$. Fifty-five percent of the samples were below the detection limit, and instrument values were used for 99% of these measurements. For each sample type (entry floor, interior floor, interior window sill, and exterior window trough), the dwelling average PbD was calculated for each visit and transformed using the natural logarithm.

All ClearWin contractors were trained and followed "lead-safe window replacement" work practices that established containment to prevent the spread of lead dust during the work. To maximize energy benefits, the ClearWin protocol required high-efficiency (R-5) replacement windows, exceeding US Environmental Protection Agency's Energy Star standard (R-3.3) for

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efficient windows in Illinois' climate zone. The windows were manufactured in Illinois to maximize the program's job creation potential within the state. Contractors replaced old, painted, single-pane windows with new energy-efficient windows, removed debris, and conducted specialized cleaning. Clearance PbD testing was done either by or under the supervision of the Chicago or Peoria Health Departments to determine whether cleanup was adequate and to document compliance with Illinois clearance standards (40 $\mu g/ft^2$ on floors, 200 $\mu g/ft^2$ on interior window sills, and 400 $\mu g/ft^2$ on exterior window troughs).[18] For all analyses, the final clearance PbD value was used if recleaning and resampling was conducted. Clearance sampling ranged from 1 to 14 months after preintervention sampling (dependent on when windows were replaced), and 1 year postintervention interview data were collected from 5 to 22 months after window replacement (mean, 13 months).

Multivariable models were used to predict 1-year PbD and expressed the natural log-transformed PbD loading as a function of potential variables. These included variables, such as site, housing conditions, and characteristics (eg, building type [single family, 2-4 units or >4 units]), wiped surface types and conditions, time since clearance, seasonality, paint conditions (from visual paint inspection) in the home, resident characteristics, and reported cleaning habits. Backward elimination of nonsignificant independent variables ($P > .1$) was performed for the multivariable models, followed by additional steps to allow the addition and/or removal of variables with the SAS procedure PROC MIXED. A seasonality variable was retained regardless of significance because it has been shown to be important in other lead dust studies. For nominal variables with a missing category, the P value used tests for a significant difference between the nonmissing categories (ie, missing category was disregarded). For continuous variables with a dummy variable for missing values, the P values used tests for a significantly nonzero slope.

A standardized health interview was drawn from the Centers for Disease Control and Prevention National Health Interview Survey, the Behavioral Risk Factor Surveillance System, and the HUD National Survey of Lead and Allergens in Housing and previously used in several other healthy housing studies. It included physical and mental health questions about 1 adult and up to 4 children per household and also housing condition measures. The interview was used in an exploratory analysis to determine whether self-reported housing conditions and physical and mental health of adult and child residents changed between baseline and follow-up. For the Chicago urban group, interview data were available for 44 adults and 73 children living in 44 dwellings. For the Peoria rural group, interview data were available for 48 adults and 98 children living in 48 dwellings (totals: 92 dwellings, 92 adults, 171 children).

To assess mental health, the health interview included a measure of "serious psychological distress (SPD)" in adults and a "strengths and difficulties" score for children. Adult SPD included 6 measures (feeling sad, nervous, restless, hopeless, worthless, or that everything was an effort).[19] Each question asked how often the respondent experienced this symptom during the past 30 days (score 0-4), and the 6 scores were summed to yield a total score ranging from 0 to 24. Kessler's definition of SPD as a score of more than 13 was used.[20] To assess child behavior and emotions, adult participants were asked 4 questions from the "Strength and Difficulties Questionnaire", asking the respondent whether their child was poorly behaved, worried, unhappy, depressed or tearful, or had a poor attention span. The 4 responses were summed to yield a total Strength and Difficulties Questionnaire score ranging from 0 to 8, with higher scores indicating more difficulties.[21]

For dichotomous variables (eg, yes/no), the Cochran-Mean Haenszel test determined whether the percent "yes" was different at baseline versus 1 year postintervention. Weighted least squares determined whether the change in percent "yes" from baseline to 1 year postintervention differed for the Chicago and Peoria groups. For ordinal variables (eg, frequency of exhaust fan use, frequency of asthma symptoms), the Cochran-Mean Haenszel test determined whether mean pre- and postintervention scores differed. For continuous variables (eg, age), a 2-sample t test determined whether the Chicago and Peoria group mean differed. For nominal variables, the Fisher exact test determined whether the percentages in the Chicago and Peoria groups differed. We used SAS version 9.4 for all analyses.[22] Statistical significance is defined as $P < .05$ while marginal significance is defined as $.05 \leq P < .1$.

Results

Demographics

Nearly 100 homes had PbD sampling at baseline and 1 year (Chicago, n = 47; Peoria, n = 49) (see Supplemental Digital Content Table 1, available at: http://links.lww.com/JPHMP/A195). Of these, 92 households with 92 adults and 171 children completed health interviews administered by researchers, with the adult responding for both themselves and their children. The data show that the program succeeded in targeting

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TABLE 1 Lead Dust by Sample Type, Time of Visit, and Jurisdiction

Sample Type and Visit	ClearWin N	ClearWin % Exceed Standard[a]	ClearWin GM (95% CI)	HUD Natl Eval N	HUD Natl Eval GM (95% CI)	ClearWin GM Versus Natl Eval GM P^b	ClearWin Chicago N	ClearWin Chicago % Exceed Standard[a]	ClearWin Chicago GM (95% CI)	ClearWin Peoria N	ClearWin Peoria % Exceed Standard[a]	ClearWin Peoria GM (95% CI)	ClearWin Chicago Versus Peoria, P^c
Entry floor													
Baseline	95	15%	5.7 (4.0-8.1)	98	19.4 (14.0-26.8)	<.001	46	15%	6.6 (4.2-10.3)	49	14%	5.1 (2.9-8.7)	.438
Clearance	89	7%	2.4 (1.6-3.5)	98	8.4 (6.7-10.5)	<.001	44	11%	3.5 (2.0-6.1)	45	2%	1.6 (1.0-2.7)	.023
1 y	95	6%	3.5 (2.6-4.7)	98	12.0 (9.2-15.7)	<.001	46	9%	5.5 (3.5-8.6)	49	4%	2.3 (1.6-3.3)	.009
Interior floor													
Baseline	96	17%	7.5 (5.2-10.7)	98	18.3 (13.8-24.3)	<.001	47	17%	9.9 (5.9-16.7)	49	16%	5.7 (3.4-9.5)	.069
Clearance	96	2%	2.5 (1.9-3.3)	98	8.2 (6.8-9.9)	<.001	47	4%	3.1 (2.0-4.7)	49	0%	2.0 (1.4-2.9)	.155
1 y	96	5%	4.1 (3.1-5.6)	98	7.8 (5.8-10.4)	<.001	47	11%	7.5 (4.8-11.6)	49	0%	2.4 (1.7-3.3)	<.001
Window sill													
Baseline	96	38%	144 (94-223)	49	130 (67-252)	.540	47	34%	161 (89-288)	49	41%	130 (67-252)	.587
Clearance	96	3%	5 (4-7)	49	4 (3-7)	<.001	47	6%	6 (3-10)	49	0%	4 (3-7)	.455
1 y	96	8%	17 (12-25)	49	9 (5-16)	<.001	47	11%	32 (20-52)	49	6%	9 (5-16)	.001
Window trough													
Baseline	94	78%	2737 (1638 -4572)	77	1,984 (1046-3763)	.547	45	78%	2415 (1311-4451)	49	78%	3069 (1339-7037)	.579
Clearance	87	2%	7 (4-10)	77	14 (10-20)	.058	38	5%	13 (6-28)	49	0%	4 (3-6)	.009
1 y	94	11%	46 (29-73)	77	302 (206-443)	<.001	45	13%	171 (116-252)	49	8%	14 (7-27)	<.001

Abbreviations: CI, confidence interval; GM, geometric mean; HUD, Department of Housing and Urban Development.
[a]Federal clearance standards: floor = 40 $\mu g/ft^2$; interior window sill = 250 $\mu g/ft^2$; exterior window trough = 400 $\mu g/ft^2$.
[b]P value from the test that GM PbD for ClearWin is different from the National Evaluation for a specific visit.
[c]P value from the test that GM PbD for Chicago is different from Peoria for a specific visit.

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high-risk, low-income households with young children as intended. The majority of adults (67%) had an annual household income of less than $30 000. Adults in both groups were mostly female (79%), and approximately 41% had a high school education or less. Chicago and Peoria adults differed by age (Chicago adults 60 years of age versus Peoria adults 42 years of age, $P < .001$), but children in both cities averaged between 7 and 8 years. All Chicago participants were black, while Peoria participants were split almost evenly between non-Hispanic white and black. Chicago residents lived in their homes about 3 times longer on average ($P < .001$), and overall 93% of homes were in single family buildings (see Supplemental Digital Content Table 1, available at: http://links.lww.com/JPHMP/A195).

Trends in lead dust

There were large statistically significant reductions in interior floor, window sill, and window trough PbD from baseline to clearance, and those reductions were sustained through 1 year (Tables 1 and 2). Between baseline and 1 year postintervention, GM PbD for interior floors, interior sills, and exterior troughs declined by 44% ($P = .006$), 88% ($P < .001$) and 98% ($P < .001$), respectively. At baseline, the percentage of ClearWin units above clearance dust standards for floors, sills, and troughs was 17%, 38%, and 78%, but immediately following cleanup and window replacement, it declined to 2%, 3%, and 2% of the units, respectively. A year later, the percentage with PbD greater than clearance thresholds rose slightly on floors, sills, and troughs to 5%, 8%, and 11%, respectively, suggesting that levels remained well below baseline but that even with window replacement, ongoing cleaning by residents is still needed.

Baseline GM PbD was marginally significantly higher on interior floors in Chicago than Peoria ($P = .069$), but there were no significant differences on other surfaces. Although Peoria generally had lower GM PbD at subsequent visits than Chicago, the only statistically significant difference in the change in GM PbD between visits was for window troughs, which had greater reductions from baseline to clearance and 1 year postintervention than Chicago ($P = 0.024$ and $P < 0.001$, respectively). On window sills, Peoria had marginally greater reduction from baseline to 1 year ($P = .05$) and a marginally smaller increase from clearance to 1 year ($P = .06$), that is, the reduction on window surfaces in both urban and rural areas is not much different,

TABLE 2 Changes in Geometric Mean Lead Dust

	ClearWin		HUD Natl Eval		ClearWin Versus Natl Eval	ClearWin Chicago		ClearWin Peoria		ClearWin Chicago Versus Peoria
Sample Type and Visit	% Change	P[a]	% Change	P[a]	P	% Change	P[a]	% Change	P[a]	P[b]
Entry floor										
Overall	...	.002	...	<.001	.875	...	.179	...	.003	.368
Baseline to clearance	−59%	<.001	−57%	<.001	NA	−46%	NA	−68%	<.001	NA
Baseline to 1 y	−39%	.039	−38%	.069	NA	−16%	NA	−55%	.016	NA
Clearance to 1 y	46%	.120	44%	.022	NA	55%	NA	41%	.312	NA
Interior floor										
Overall	...	<.001	...	<.001	.287	...	.001	...	<.001	.224
Baseline to clearance	−67%	<.001	−55%	<.001	NA	−69%	<.001	−65%	<.001	NA
Baseline to 1 y	−44%	.006	−57%	<.001	NA	−25%	.373	−58%	.003	NA
Clearance to 1 y	67%	.031	−5%	.743	NA	140%	.007	18%	.155	NA
Window Sill										
Overall	...	<.001	...	<.001	.004	...	<.001	...	<.001	.096
Baseline to clearance	−96%	<.001	−92%	<.001	.010	−96%	<.001	−97%	<.001	.885
Baseline to 1 y	−88%	<.001	−70%	<.001	.002	−80%	<.001	−93%	<.001	.052
Clearance to 1 y	230%	<.001	285%	<.001	.587	443%	<.001	105%	.063	.072
Window trough										
Overall	...	<.001	...	<.001	.002	...	<.001	...	<.001	<.001
Baseline to clearance	−100%	<.001	−99%	<.001	.347	−99%	<.001	−100%	<.001	.024
Baseline to 1 y	−98%	<.001	−85%	<.001	<.001	−93%	<.001	−100%	<.001	<.001
Clearance to 1 y	586%	<.001	1,993%	<.001	.015	1,203%	<.001	246%	.007	.034

Abbreviation: HUD, Department of Housing and Urban Development; NA, not applicable.
[a] P value from the test that the relative change in GM PbD between the visits for the study group is nonzero.
[b] P value from the test that the relative changes in GM PbD between the visits are different for 2 jurisdictions.

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suggesting that the program worked well in both (Table 2).

Entry floors were analyzed separately from interior floors because of the potential for track-in. The change in GM PbD for entry floors over the 3 visits was significant for both cities combined ($P = .002$) and for Peoria (55% reduction; $P = .003$) but not for Chicago (16% reduction; $P = .18$). For both cities combined, baseline GM PbD on entry floors (5.7 $\mu g/ft^2$) was significantly greater than 1 year postintervention GM PbD (3.5 $\mu g/ft^2$) ($P = .04$) (Tables 1 and 2).

Comparing these results to the National Evaluation of the HUD Lead Hazard Control Grant program,[8] with the exception of baseline window sill ($P = .54$) and window trough GM PbD ($P = .55$), the National Evaluation had significantly higher GM PbD on entry floors, interior floors, sills, and troughs at all 3 visits (Table 1). The changes in GM PbD across the 3 visits for the National Evaluation were not significantly different from ClearWin on entry floors ($P = .88$) or interior floors ($P = .29$); however, on window sills and troughs, the reductions in GM PbD from baseline to clearance and baseline to 1 year were greater for ClearWin and the increases from clearance to 1 year were smaller for ClearWin (all $P < .001$) (Table 2).

Predictors of lead dust

The ClearWin only and combined interior floor models were very similar. Carpeting had lower PbD than hard surfaces while controlling for other predictors (see Supplemental Digital Content Table 2, available at: http://links.lww.com/JPHMP/A196). The higher PbD was on sills and entry floors, the higher it was on interior floors (all $P < .001$) (see Supplemental Digital Content Table 2, available at: http://links.lww.com/JPHMP/A196). Surprisingly, season was not a significant influence. In the combined model, site was significant ($P < .001$) but floor PbD as not significantly different for Chicago homes in ClearWin and the National Evaluation ($P = .3$).

The ClearWin only and combined window sill models were also very similar. The worse the condition of the wiped sills, the higher the sill PbD while controlling for other predictors. At 1 year, the higher the 1 year trough level was, the higher the sill PbD (both $P < .001$). The interaction of site (city) and baseline sill PbD was significant in the ClearWin only model ($P < .001$). In Chicago, higher baseline sill PbD was associated with higher 1 year sill PbD ($P < .001$), but in Peoria, they were not significantly associated ($P = .52$) (see Supplemental Digital Content Table 3, available at: http://links.lww.com/JPHMP/A197). In the combined model, higher baseline sill PbD was significantly associated with higher 1 year sill PbD ($P < .001$), but the interaction between site and baseline sill PbD was not significant. In the combined model, site was significant ($P < .001$) but sill PbD was not significantly different for Chicago homes in ClearWin and the National Evaluation ($P = .16$).

TABLE 3 Costs and Benefits (N = 466 units)

ClearWin Long-Term Monetized Benefits	Total
Installed window cost (A)	$3 071 841
Number of windows replaced	7747
Long-term energy benefit	$1 529 974
Other market (home resale) value	$770 885
Total market and energy value at $297/window (B)	$2 300 859
Housing built before 1940 (health benefit = $24 571 per child)	$3 341 656
Housing built 1940-1959 (health benefit = $10 068 per child)	$251 700
Housing built 1960-1979 (health benefit = $2572 per child)	$18 004
Total monetized health benefit (C)[a]	$3 611 360
Administrative cost (D)[b]	$380 000
Total benefits (B + C)	$5 912 219
Total costs (A + D)	$3 451 841
Net benefits (B + C − A − D)	$2 460 378

[a]Health benefits calculated from number of actual children living in ClearWin homes by age of housing.
[b]Costs do not include minor repairs and mandated program evaluation costs.

Health and housing condition

The overall mean score for satisfaction with window replacement was 1.2, between very satisfied (score of 1) and satisfied (score of 2) out of a 5-point scale from very satisfied to very unsatisfied. Chicago's mean score was 1.3, while Peoria's was 1.1 ($P = .17$, comparing the 2 mean scores), showing that people in both jurisdictions were equally satisfied with the program (data not shown). The percentage of people reporting uncomfortable indoor temperatures in both summer and winter improved greatly, as did dampness (Figure). At 1 year postintervention, fewer participants reported water or dampness issues in their home ($P = .06$), and the percentage of people reporting uncomfortable indoor temperatures in both summer and winter significantly decreased ($P = .001$ and $P < .001$, respectively) (Figure).

The percentage of children experiencing headaches, respiratory allergies, and 3 or more ear infections significantly improved between baseline and 1 year postintervention (7% improved, $P = .02$; 12% improved, $P < .001$; and 5% improved, $P = .06$, respectively). Mental health significantly improved for children in Chicago but not those in Peoria ($P = .01$ and $P = .32$,

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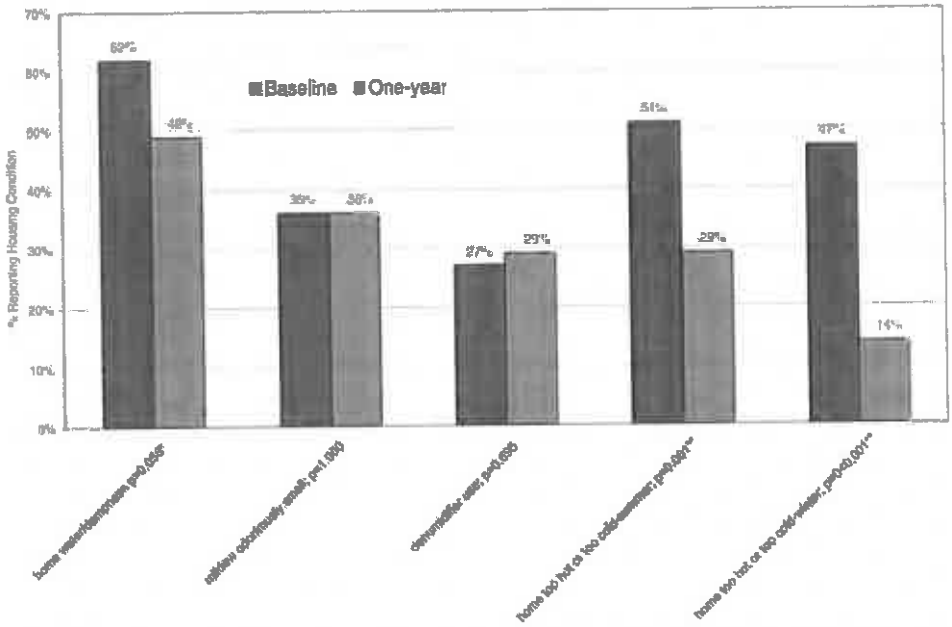
FIGURE Housing Moisture and Comfort Conditions From Baseline to 1 Year Postintervention



respectively). The general health score of children improved significantly at the 1-year postintervention visit ($P = .013$) (see Supplemental Digital Content Table 4, available at: http://links.lww.com/JPHMP/A198).

The percentage of adults experiencing sinusitis and hay fever improved from pre- to 1 year postintervention (18%, $P = .001$; and 5%, $P = .096$, respectively), although the percentage of those reporting hypertension ($P = .025$) and a heart condition marginally increased ($P = .08$) (see Supplemental Digital Content Table 5, available at: http://links.lww.com/JPHMP/A199). Both of these chronic ailment increases were primarily found in the Chicago group, whose mean age was more than that of the Peoria group. Overweight and chronic bronchitis also saw reductions in both groups combined, but these improvements did not reach statistical significance. There was no significant change in adult mental health as reflected in the SPD score.

Economic costs and benefits

Using a previously validated methodology,[23] total benefits are at least $6 million and net benefits are nearly $2.5 million (Table 3). The health economic benefit is predominately associated with gains in lifetime earnings due to avoided loss of IQ (higher IQ is associated with both higher lifetime earnings and reduced exposure to lead). The cost data show an installed window cost of approximately $400/window, demonstrating the savings from bulk purchase programs for window replacement as was done for ClearWin. Benefits are likely underestimated because factors such as reduced need for special education, reduction in stress, reduced property management costs, avoided litigation from lead poisoned children, reduced cardiovascular disease associated with reduced blood lead level, reduced criminal and antisocial behavior in later life associated with early childhood lead exposure, and others could not be assigned a dollar value easily.

Discussion

The economic analysis clearly shows that Illinois' investment in windows is dwarfed by the benefits of the program and that the program is ready to expand beyond its pilot phase, which was limited to Chicago and Peoria. In difficult budget climates in states such as Illinois, making wise investments such as those in ClearWin is more important than ever.

There was very little attrition in the ClearWin study (100 homes enrolled at baseline, 96 homes had PbD data at both baseline and 1 year [Chicago: N = 47, Peoria: N = 49], and 92 completed health interviews, including 44 adults and 73 children in Chicago; in the Peoria group, interview data were available for 48 households with 48 adults and 98 children).

This study shows that window replacement achieves large sustained reductions in PbD on window sills and troughs over at least a year and probably much longer given the low levels of reaccumulation. Reductions on

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floors tended to be less than those on windows, especially in Chicago perhaps because of track-in of exterior PbD or other factors. In Peoria, the reduction in interior floor GM PbD from baseline to 1 year was 58% ($P = .003$), compared with 25% in Chicago ($P = .37$). For entry floor GM PbD from baseline to 1 year, Peoria declined by 55% ($P = .02$) and Chicago declined by 16% ($P = .18$). The data also show that clearance testing is needed for window replacement programs to ensure that cleanup is done properly (initial failure rates were as high as 30% for some contractors). One possible reason for the slightly better PbD trends in Peoria may be due to smaller size of urban area.

A 6-year follow-up study of lead hazard control in units treated under the HUD Lead Hazard Control Grant program found that window replacement, sash replacement, and/or window jamb liners yield lower PbD on window sills and troughs than window painting and/or cleaning, although that study combined replacement with friction reduction and was thus limited in its ability to examine the independent effect of window replacement.[24] A more recent study of 12-year follow-up data showed that lower floor PbD levels were associated with window replacement performed as part of federally funded lead hazard control programs aimed mostly at already poisoned children.[25]

There are several possible explanations for the lower sill PbD values observed in ClearWin. The National Evaluation units likely had higher PbD after window work because clearance standards were higher in the 1990s and ambient air lead standards were also higher in the 1990s than during the more recent ClearWin study. The National Evaluation study data were mostly collected during the mid- to late-1990s.

For the ClearWin health interview data, the exploratory analysis suggested that some health improvements could conceivably be related to window replacement, such as headaches and sinus problems, perhaps due to the effect of less drafty homes associated with improved windows, although another possible explanation could be seasonal influences or other influences not measured. It also showed other health improvements that could less plausibly be associated with window replacement, such as overweight or increased use of bait traps (data not shown). The percentage of children with learning disabilities and with asthma increased slightly between the 2 visits ($P = .025$ and .046, respectively), but it seems unlikely that this would be due to window replacement and may be spurious.

Limitations

A limitation of this study is that there were no soil or blood lead measurements, although it is known that PbD is correlated with both[26] and is thus a good marker for housing-related lead dust exposures. Indeed, blood lead measurements are confounded by other nonhousing sources of exposure such as diet. Soil measurements may have been able to show why window trough levels increased slightly over the follow-up period if reentrainment of soil lead occurred and then settled onto window troughs.

Another limitation of the present study was that Pb levels in paint and exterior dust could not be collected. ClearWin homes focused on window replacement, but the Evaluation housing units typically had additional lead hazard controls implemented, although clearance standards for the latter were higher, suggesting that Evaluation homes may have had higher PbD at postintervention. The homes studied here were a convenience sample that may reduce the generalizability of the results to the broader cohort of ClearWin homes due to unknown sources of bias, although nearly all homes in both groups were single family houses in low-income neighborhoods at high risk of lead poisoning with a high prevalence of lead-based paint hazards. Lead-based paint hazards (including high dust lead levels) are present in 24 million housing units, including both low- and moderate-income populations.[9]

The time frame for various interview questions fluctuated. For example, preintervention questions about certain health conditions (eg, headaches in children and sinusitis in adults) asked whether the person had experienced the condition in the "last 12 months." In the 1-year postintervention interview, this phrase was changed to "since window replacement." In some of the housing condition questions (eg, resident used traps, bait stations, or poisons to control mice/rats), no time frame was specified in the preintervention question but the phrase "since window replacement" was added to the 1-year postintervention question. Because the 1-year postintervention visits were conducted between 5 and 22 months after window replacement work was completed (mean 13 months), the preintervention and 1-year postintervention time frames for such questions were not always equal. The impact of unequal time periods on participants' answers is unknown but likely had some minor effect.

The exploratory analysis on health outcomes associated with window replacement requires further research. Although reduced drafts and moisture intrusion could plausibly be associated with respiratory conditions, such as ear infections or respiratory allergies, asthma and overweight indicators showed conflicting trends, perhaps due to nonwindow unmeasured factors such as medication and diet.

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Conclusions

The results show that a state health department can successfully implement a window replacement program that dramatically reduces childhood lead exposure. This pilot program in 2 communities shows that the program should be expanded. Dust lead levels declined and the reductions were sustained, showing that children benefited from the program. Because dust lead is significantly correlated with blood lead levels, it is likely that children in the present study had a decline in blood lead level. Furthermore, the economic benefits far outweigh the costs, making investment in window replacement a wise use of funds.

On average, residents gave the program high marks, reporting that they were "very satisfied" with the window replacement using a 5-point scale (very satisfied, satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied).

Local and state governments should fund such window replacement programs to eliminate a major source of childhood lead exposure, create jobs, and improve energy efficiency, and federal agencies should encourage window replacement in order to prevent exposure and realize large monetary benefits for the nation.

REFERENCES

1. US Centers for Disease Control and Prevention. Blood lead levels in children aged 1-5 years—United States, 1999-2010. *MMWR Morb Mortal Wkly Rep.* 2013;62(13):245-248. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6213a3.htm. Accessed July 28, 2015.
2. Agency for Toxic Substances and Disease Registry. The nature and extent of childhood lead poisoning in children in the United States: a report to Congress. http://stacks.cdc.gov/view/cdc/13238. Published 1988. Accessed July 28, 2015.
3. Jacobs DE. Lead-based paint as a major source of childhood lead poisoning: a review of the evidence. In: Beard ME, Allen Iske SD, eds. *Lead in Paint, Soil and Dust: Health Risks, Exposure Studies, Control Measures and Quality Assurance.* Philadelphia, PA: American Society for Testing and Materials; 1995:175-187.
4. Levin R, Brown MJ, Kashtock ME, et al. Lead exposure in US children, 2008: implications for prevention. *Environ Health Persp.* 2008;116:1285-1293.
5. Duggan MJ, Inskip M. Childhood exposure to lead in surface dust and soil: a community health problem. *Public Health Rev.* 1985;13:1-54.
6. Bornschein RL, Succop P, Kraft KM, Clark S, Peace B, Hammond P. Exterior surface dust lead, interior house dust and childhood lead exposure in an urban environment. http://www.researchgate.net/publication/236534700_Exterior_surface_dust_lead_interior_house_dust_lead_and_childhood_lead_exposure_in_an_urban_environment. Published 1987. Accessed July 28, 2015.
7. Lanphear BP, Emond E, Jacobs DE, et al. A side-by-side comparison of dust collection methods for sampling lead-contaminated house dust. *Environ Res.* 1995;68:114-123.
8. National Center for Healthy Housing and University of Cincinnati. Evaluation of the HUD Lead Hazard Control Grant Program. http://www.hud.gov/offices/lead/library/misc/NatEval.pdf. Published 2004. Accessed July 28, 2015.
9. Jacobs DE, Clickner RL, Zhou JY, et al. The prevalence of lead-based paint hazards in US housing. *Environ Health Persp.* 2002;110:A599-A606.
10. US Department of Housing and Urban Development. American health housing survey: lead and arsenic findings. http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_REPORT.pdf. Published 2011. Accessed July 28, 2015.
11. Gordon J, Nevin R. *Evaluation of the Pilot Phase of the ClearWin program.* Urbana, IL: Illinois Sustainable Technology Center University of Illinois at Champaign; 2014.
12. Clark CS, Galke W, Succop P, et al. Effects of HUD-supported lead hazard control interventions in housing on children's blood lead. *Environ Res.* 2011;111:301-311.
13. .US Department of Housing and Urban Development. *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.* Washington, DC: US Department of Housing and Urban Development; 1995. http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/lbp/hudguidelines1995. Accessed July 28, 2015.
14. Nevin R, Jacobs DE. Windows of opportunity: lead poisoning prevention, housing affordability and energy conservation. *Hous Policy Debate.* 2006;17(1):185-207.
15. US Department of Energy Weatherization Program Guidance. LIHEAP IM 2001-15. http://www.acf.hhs.gov/programs/ocs/resource/lead-paint-hazard-control-and-weatherization. Accessed July 28, 2015.
16. US Department of Housing and Urban Development. Policy guidance number: 2013-01. http://portal.hud.gov/hudportal/documents/huddoc?id=pgi_2013-01.pdf. Accessed July 28, 2015.
17. US Department of Housing and Urban Development. *HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1995.* Washington, DC: US Department of Housing and Urban Development. http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/lbp/hudguidelines. Updated 2012. Accessed July 28, 2015.
18. Illinois Administrative Code 845.205(c). http://www.leadsafeillinois.org/uploads/documents/benchbook-3-illinois-laws-with-summary.pdf. Accessed July 28, 2015.
19. .Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med.* 2002;32:959-976.
20. Dey AN, Lucas JW. Physical and mental health characteristics of US- and foreign-born adults: United States, 1998-2003. Advance Data From Vital and Health Statistics, number 369, March 1, 2006. US Centers for Disease Control Division of Health Interview Statistics. http://www.cdc.gov/nchs/data/ad/ad369.pdf. Accessed February 3, 2015.

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21. Pastor PN, Reuben CA, Duran CR. Identifying emotional and behavioral problems in children aged 4-17 years: United States, 2001-2007. US Centers for Disease Control and Prevention Office of Analysis and Epidemiology, National Health Statistics Report Number 48, February 24, 2012. http://www.cdc.gov/nchs/data/nhsr/nhsr048.pdf. Accessed February 3, 2015.
22. SAS Institute, Inc. *SAS: Version 9.3*. Cary, NC: SAS Institute, Inc; 2002-2010.
23. Jacobs DE, Nevin R. Validation of a twenty-year forecast of US childhood lead poisoning: Updated prospects for 2010. *Environ Res*. 2006;102(3):352-364.
24. Wilson J, Pivetz T, Ashley PJ, et al. Evaluation of HUD-funded lead hazard control treatments at six years post-intervention. *Environ Res*. 2006;102(2):237-248.
25. Dixon SL, Jacobs DE, Wilson J, Akoto J, Clark CS. 2010. Window replacement and residential lead paint hazard control 12 years later. *Environ Res*. 2010;113:14-20.
26. Lanphear BP, Matte TD, Rogers J, et al. The contribution of lead-contaminated house dust and residential soil to children's blood lead levels. *Environ Res*. 1998;79:51-68.

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	Ann Arbor, MI	Baltimore County, MD	Boston, MA	Boulder, CO	Burnsville, MN	Durham, NC	Gary, IN	Grand Rapids, MI	Kansas City, MO	Lansing, MI	Los Angeles, CA	Rochester, NY	Sacramento, CA	Santa Cruz, CA	Seattle, WA	Washington, DC
Program Fee	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$16 per year	N/A	N/A	$35 per unit, not to exceed $2,000
Registration or License Fee	$25 per building or complex $100 per unit for 1-2 family dwellings, townhouses, or condos; $60 per unit for 3-30 unit buildings; $45 per unit for 31+ unit buildings; $60 per sleeping room in rooming house; $90 per unit or sleeping room for	Owner occupied, 1-2 unit buildings, $40 per unit. Owner occupied, 3+ unit buildings, $50 per unit. Not owner occupied, $50 per unit.	$25 per unit for initial registration, $15 per unit for renewal (cap of $2,500 per building, $5,000 per complex of two or more buildings)	$70 per building	License fees: $130 per multifamily building, plus $10 per unit. $80 per townhome building in complex, plus $10 per unit. $250 per manufactured home park that owns unit, $40 per unit owned/rented by park.	$200 per year for 2 unit buildings, $400 per year for 3+ unit buildings	$75 initial registration fee per unit ($175 if not registered by 3/31), $25 per unit annually each subsequent year	Certificate of Compliance issued before expiration date $165 per building + $50 per unit and/or $20 per room; after expiration, $250 per building + $80 per unit	No registration fee Failure to register by 1/31: $50 per month per unit for max of $500, $200 per month per structure	$400 new registration fee, $200 upon change of ownership Base fee $215 for 1-2 family buildings, $150 for multiple family structures, townhouses and condos. Plus $25 per unit for single family, duplex, and townhouses/ condos. $18 per unit for multiple dwellings.	$43.32 per unit per year	Certificate of occupancy $60 for single family, $80 for two family, $100 for three family + $10 per unit over 5 units, $100 for rooming house + $10 per unit over 5 units, with separate fees for mixed and non-residential	N/F	$45 per year per building	Every 5 years, $175 for property + 1 unit, $2 for each additional unit (plus $20 late fee after registration due date)	$21.50 per unit annually
Inspection Fee		Dependent on inspectors' charges	$50 per unit for 1-3 unit buildings, $75 per unit for all other buildings, which include the initial and one follow-up inspection.	$250 per inspection	$150 per building annual fire inspection	No charge for initial inspection or first reinspection	No inspection charge if no violations found, otherwise $75 per unit	$80 per hour, more for after-hours, weekend, or holiday inspections	No fee for initial inspection		Included in registration fee	N/F	$127 per unit, $80 rescheduling fee	$20 per unit including annual inspection and one reinspection if needed	$130 per unit for municipal inspector, $25 for each additional inspection	N/F

Reinspection Fee	for 1-2 family buildings, $30 for 3-30 unit buildings, $25 for 31+ unit buildings, $40 per sleeping room in rooming houses, $60 per unit/sleeping room for	N/F	For third or more inspection, $50 per unit	$107 per hour	$185 per unit	No charge for first reinspection	N/F	N/F	$100 for any inspection after the first	$50 for 2nd inspection, $100 for 3rd, $150 for 4th	N/F	N/F	$127 per unit for each additional inspection	N/F	N/F	$90 per unit
Self-Certification Fee	N/A	N/A	N/A	N/A	N/A	No charge	N/A	N/A	N/A	N/A	N/A	N/A	Inspection fee waived	20% of units, $20 per unit. No inspection	N/A	N/A
Penalties	charged amount equal to initial inspection fee. No shows charged amount equal to initial inspection fee + $50 per scheduled hour. Reinspection cancellations and no shows charged	N/F	$300 per month charged to property owners on the chronic offenders list	N/F	Renting without license after 30 day notice, $1,000 per unit plus subject to misdemeanor violation, $600 for second, $800 for third or more violation in 12 months.	$300 per month civil penalty for failing to register, not to exceed $5,000	N/F	N/F	N/F	$150 per month fee charged to noncompliant property owners	N/F	Case management fee of $100 assessed against any property with unabated violations outstanding for more than 1 year	N/F	N/F	$150 per day for first 10 days, $500 per day thereafter	N/F

LEAD-FREE KIDS: PREVENTING LEAD POISONING IN PHILADELPHIA

December 2016

Prepared By:

Philadelphia Department of Public Health

Philadelphia Department of Licenses & Inspections

Overview

It has long been recognized that exposure to lead in childhood can cause lifelong learning and behavior problems. The number of children exposed to lead has fallen dramatically over the years, and federal funding to respond to the problem has fallen sharply in parallel. However, scientific studies have repeatedly found subtle adverse effects at lower blood lead levels that were once considered safe, and federal guidelines have repeatedly lowered the threshold for action. This combination of reduced funding and newly-recognized risks at lower levels creates a need for a new approach to preventing childhood lead poisoning in Philadelphia. This plan summarizes how the City of Philadelphia proposes to expand its current activities and add new tactics to address the risk to children from lead from paint, with greater emphasis on primary prevention and enforcement of regulations regarding housing.

Background

Lead Poisoning

Lead poisoning in childhood is a cause of learning and behavior problems. The recognition of these effects and the consequent approach to prevention of lead poisoning has changed markedly over the years. In 1960, these developmental problems were recognized at blood levels above 60 micrograms per deciliter (µg/dL), but in the decades since then studies have shown that subtle damage is seen at much lower levels that were once thought to be safe. Because of this, levels for action on lead exposure have fallen repeatedly over the years. In 1991, the Centers for Disease Control and Prevention (CDC) lowered its threshold for action for children's blood lead levels from 25 µg/dL to 10 µg/dL, calling the new threshold a "level of concern." Additional studies since then have identified possible risks at even lower blood lead levels. Based on these findings, the CDC in 2012 changed its approach and terminology again, calling a blood lead level of 5 µg/dL a "reference" level, above which a child's risk should be evaluated and monitored.

The primary source of lead poisoning in the United States among children today is lead in paint. Lead was added to paint in the U.S. from the early part of the 20th century to 1978, so any housing unit that was built before 1978 is likely to have lead-containing paint on the walls. Intact paint containing lead poses very little risk, but when that paint chips or peels, it creates flakes and dust that can be ingested by children, especially toddlers.

Scope of the Problem in Philadelphia

According to the U.S. Census, there are 580,000 occupied housing units in Philadelphia, of which 306,000 (53%) are owner-occupied and 273,000 (47%) are rentals.[i] Philadelphia estimates that about 551,000 (95%) of these housing units have the potential of lead-based paint because they were built before 1978.[ii] Approximately 56,000 of these units house children aged 6 or under, of which a little more than half are owner-occupied and a little less than half are rentals[iii].

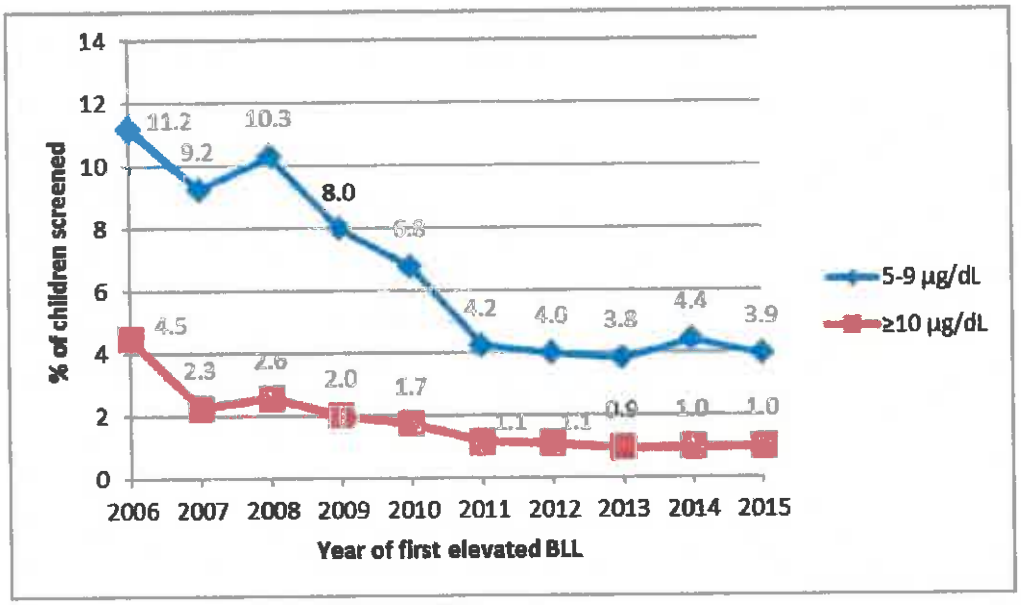
Screening of children for elevated blood lead levels

It is recommended that children be tested for lead at one year and two years of age. In Philadelphia in 2015, among children born in 2012, 76% of children were tested by age two and 88% were tested by age 3.[iv]

Trends in elevated lead levels among children in Philadelphia

The number of children newly identified as having blood lead levels above 10 µg/dL on venous blood samples[1] has fallen from 1,413 (4.5% of those tested) in 2006 to 369 (1.0% of those tested) in 2015. The number of children with blood lead levels between 5 and 9 µg/dL has fallen from 3,527 (11.2%) to 1,477 (3.9%) during the same time period.

Figure 1. Incidence of newly-identified young children with blood lead levels on venous samples of greater than 5 µg/dL



[1] Lead levels can be measured by blood sample taken from a vein (venous sample) or from a fingerstick (capillary sample). Capillary samples can yield false positive results from small amounts of lead on the skin (e.g. from lead-containing dust), so venous samples are considered more valid.

Philadelphia Laws

The Philadelphia Health Code section on "Residential and Occupancy Hygiene" (6-403) prohibits lead-based paint in housing in which the health department determines that it "creates a health hazard to children under the age of 6." If the presence of lead is identified by testing, the health department "shall issue an order to the owner, his agent, or occupant to eliminate the hazard." If that person does not eliminate the hazard, the department may contract with others to eliminate the hazard and charge the costs to the owner. This is the law that is used by the Philadelphia Department of Public Health's (PDPH) Lead and Healthy Homes Program (LHHP) to enter homes, test for lead, and order owners to remediate hazards.

In addition, in 2012, Philadelphia's Lead Paint Disclosure law (6-800) went into effect. This law requires that landlords renting residences built before March 1978 in which children aged six or under are residing: 1) have the residence inspected and certified as "Lead Free" or "Lead Safe," 2) provide this certificate to tenants for their signature, and 3) provide a copy of this certificate signed by the tenant to PDPH. In addition, owners selling residences are required to notify buyers of potential lead risks. PDPH has received approximately 1,500 Lead Free or Lead Safe certificates from landlords, of an estimated 26,000 properties for which these certificates are required. The Lead Paint Disclosure Law includes provisions for fines or penalties up to $2,000 per day for landlords who fail to comply, but this law has not yet been proactively enforced.

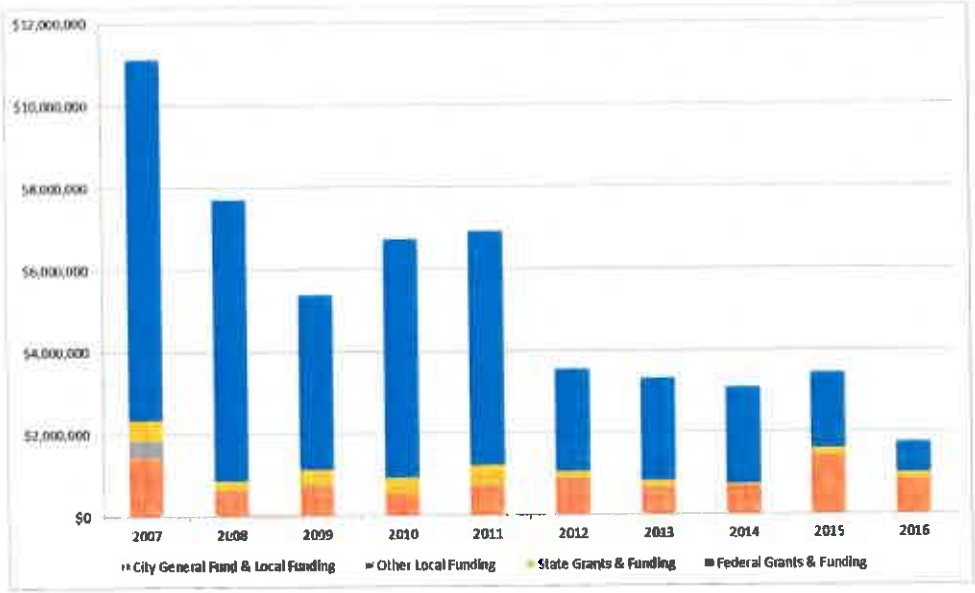
Lead Poisoning Prevention in Philadelphia

For many years, LHHP has addressed lead poisoning in children by identifying children with elevated blood lead levels and working with families, homeowners, and landlords to reduce lead hazards in homes. Currently, the primary focus of the program is children with blood lead levels of 10 µg/dL and above. LHHP attempts to contact the families of these children, provides education, conducts inspections and assesses the risk of lead paint, issues orders to property owners to remediate lead paint hazards, and works with the City of Philadelphia Law Department to bring enforcement actions against property owners who fail to remediate their properties. In addition, when possible, LHHP provides education for families of children with blood lead levels between 5 and 9 µg/dL. This education-driven approach for children with blood lead levels under 10 is consistent with the approach of other jurisdictions.

Funding for Lead Poisoning Prevention Programs

Historically, much of the funding for lead poisoning prevention has come from federal grants, particularly from the Department of Housing and Urban Development (HUD) and from the Centers for Disease Control and Prevention (CDC). In FY 2007, overall funding for LHHP was approximately $11 million, much of which was used for remediation of properties. With federal budget cuts, overall funding for lead poisoning prevention in FY 2016 had fallen to less than $2 million.

Figure 2. Funding for lead poisoning prevention at the Philadelphia Department of Public Health, Fiscal Years 2007 - 2016



Plan

In order to address the effects of lead poisoning, and respond to changing guidance on action levels, the Philadelphia Department of Public Health (PDPH), the Department of Licenses and Inspections (L&I), and the Law Department will enhance their efforts for both primary and secondary prevention.

Primary Prevention

The City will strengthen its work to prevent all children from being exposed to lead from paint, with greater efforts on education and enforcement. PDPH will:

- Incorporate education about lead risks and identification of potential lead risks from peeling paint into protocols for various infant home visiting programs.
- Increase door-to-door outreach to an additional 400 families per year in neighborhoods with the highest prevalence of lead poisoning cases in the city, offering inspections and testing for lead. PDPH has already reached more than 100 families in the Kensington area as part of its Healthy Neighborhoods project.
- Develop and disseminate advertising messages warning about the risks of lead and the requirements of the Lead Paint Disclosure Law. Messages will build on the successful summer 2016 marketing campaign, which used transit posters and digital ads to

educate landlords and tenants about their responsibilities and rights to maintain a lead safe home. The advertisements will refer people to the PDPH website for more information.

- Provide additional training for L&I inspectors to look for property maintenance violations that may be indicative of potential lead paint hazards, such as chipping and peeling paint, when responding to housing complaints in homes with pregnant women and/or children aged six or under. If L&I inspectors find such violations, they will refer that home to the Lead & Healthy Homes Program (LHHP) for follow-up. L&I will track the number and frequency of these violations through more detailed data collection.
- Partner with L&I on initiatives to increase the number of landlords who submit the required Lead Free or Lead Safe certificates. The agencies will collaborate to:
    - Update L&I materials, including the "Partners for Good Housing" handbook, to include more information about the Lead Paint Disclosure Law. L&I will also use these materials to communicate with landlord and tenant associations about the law's requirements.
    - Modify the rental license application and online renewal form to require that landlords attest to whether the rental unit was built before 1978 and whether a child aged six or under is or will be living there. If so, the application and online renewal form will require that landlords certify that they have submitted the required Lead Safe or Lead Free certificate.
    - Improve data collection and data sharing between PDPH and L&I, including the creation of a process allowing PDPH to determine if landlords who certify on their rental license applications and renewals that they have submitted Lead Safe or Lead Free certificates have done so.
    - Over the longer term, automate data-sharing across PDPH and L&I by requiring that all rental license applications and renewals be completed online or in-person and implementing technological changes that allow for real-time checks of Lead Safe and Lead Free certificates. By creating this real-time check, PDPH will allow L&I to automatically deny license renewals for landlords not in compliance with the Lead Paint Disclosure Law.
- Take enforcement actions against landlords who do not submit Lead Free or Lead Safe certificates as required by the Lead Paint Disclosure Law.
    - Send notices to landlords who rent older properties in which young children are thought to be living, reminding them of their obligations under the Lead Paint Disclosure Law.
    - Issue Code Violation Notices (CVNs) to landlords required to submit Lead Free or Lead Safe certificates who do not do so after repeated notices.

- Pursue court-ordered fines for landlords who do not submit Lead Free or Lead Safe certificates despite receiving CVNs.
- Conduct additional enforcement, including issuing Notices of Violation and pursuing court-ordered remediation, fines, liens and other remedies, for non-compliant landlords with multiple properties, higher-risk properties, or repeated noncompliance.
- Make landlords with outstanding Notices of Violation ineligible for rental license renewal.

Secondary Prevention

In addition to working to prevent lead poisoning, the City will respond quickly to cases of elevated blood lead levels to prevent further exposure to affected children. City agencies will enhance enforcement of the Residential and Occupancy Hygiene law and use new strategies to reduce the impact of lead exposure. The Department of Public Health will:

- Identify pediatric health care providers with low rates of blood lead screening in children under their care and work with them to increase screening.
- Identify rental properties containing lead in which children with elevated blood lead levels (≥10 µg/dL) are currently living and strengthen efforts to require landlords to remediate these properties, or remediate properties at landlord's expense if landlords do not fulfill their obligations.
    - Identify children under the age of 6 with an elevated blood lead level using data from the state's surveillance system. Promptly contact families of children with elevated blood lead levels, and inspect their homes for lead hazards.
    - Improve acceptance of services by affected families by offering families incentives to allow visits for education and inspections.
    - Issue orders to landlords to remediate lead from their rental properties.
    - For properties that landlords do not remediate within 30 days of the order, PDPH will either remediate immediately or seek court-ordered remediation. If PDPH remediates the property, the department will pursue court-ordered reimbursement for remediation costs plus fines, and place municipal liens if landlords do not repay PDPH voluntarily.
    - In cooperation with Lead Court, PDPH and Law will streamline the adjudication process by reducing the number of times individual cases get continued to additional appearances and requiring more immediate compliance by uncooperative landlords, and increase recovery of remediation costs and fines.
    - Refer all unreimbursed costs to Revenue and Law for aggressive collection actions.

- Request Health Code changes to strengthen enforcement of existing requirements for landlords to remediate properties and hold landlords accountable to those requirements.
- Seek to establish a fund for the City to cover remediation costs that are ultimately unreimbursed by landlords.

- Identify privately-owned homes in which a child with elevated blood lead level (≥10 µg/dL) lives and ensure that they are remediated.
  - As with rental properties, promptly contact families of children with elevated blood lead levels, conduct education and inspection activities, and refer families for additional supportive services as appropriate.
  - As with rental properties, order remediation for homes with lead-based paint hazards.
  - Work to increase financial assistance, using grants and/or low-interest loans, to help low-income homeowners defray costs of remediation.

Evaluation and Surveillance

This plan will be evaluated on an ongoing basis, and the health department will conduct surveillance for lead poisoning and markers for lead exposure in children.

- Primary prevention activities will be evaluated by tracking measures of educational activities (for example, the number of materials distributed, number of home visits in which lead risks are discussed, number of visits to the website) and the number of Lead Free and Lead Safe certificates received from landlords.
- Secondary prevention activities will be evaluated by tracking measures of home-based interventions, such as the number of families educated, number of homes remediated overall, number of homes remediated by landlords, and the percent of enforcement actions that lead to remediation by landlords or recoupment of remediation costs from landlords.
- Overall lead exposures in children will be monitored through surveillance of blood lead screening results. Simultaneous with this plan, PDPH also released its first annual lead poisoning surveillance report. This report includes information on lead screening and lead exposure trends city-wide as well as at a zip code level.

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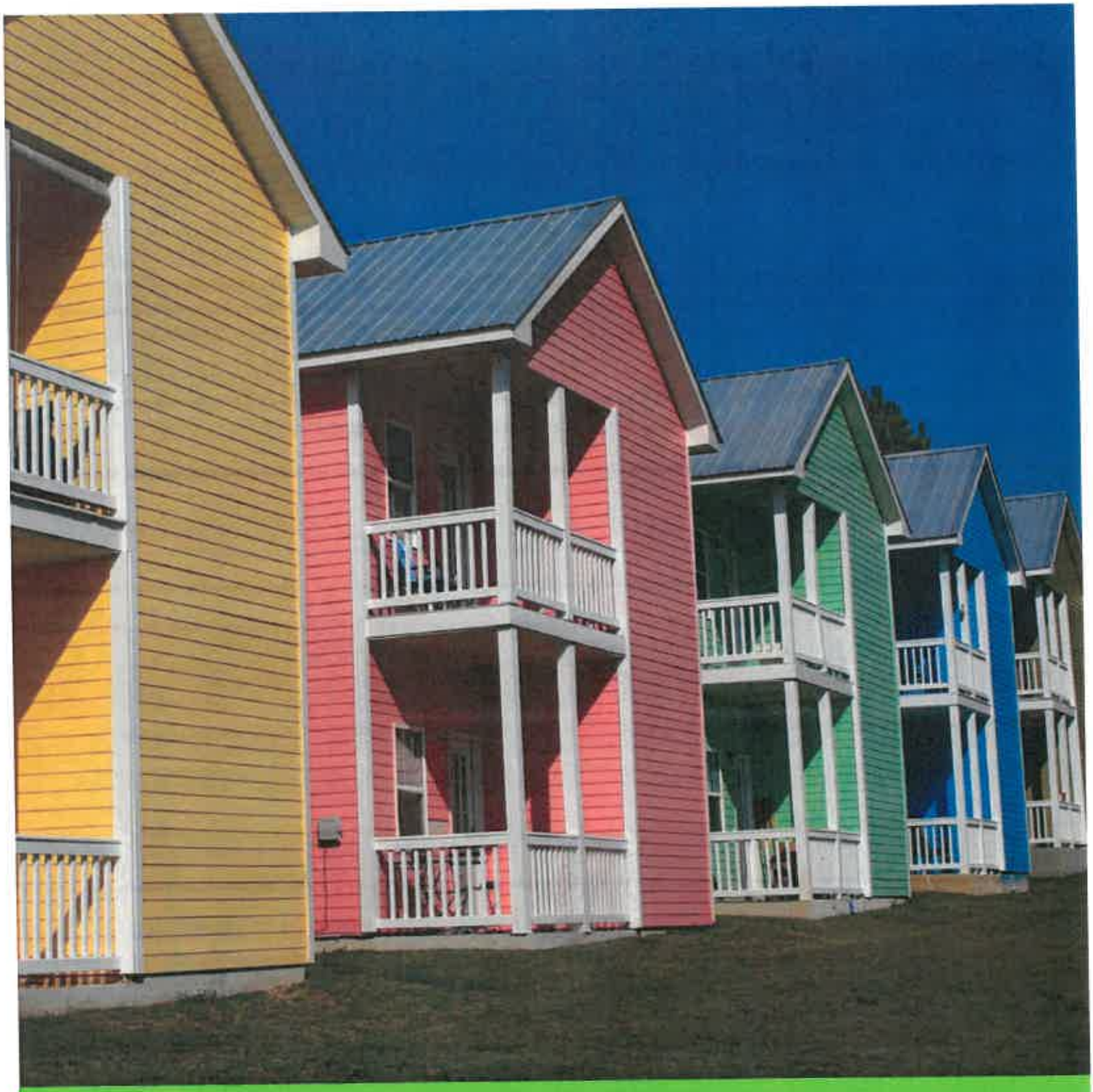
[i] 2010-2014 American Community Survey (ACS) 5 year estimates
[ii] Estimated based on Philadelphia Office of Property Assessment (OPA) and Philadelphia Department of Licenses and Inspections (L&I) data
[iii] Estimated based on ACS and OPA data
[iv] Philadelphia Department of Public Health, 2015 Childhood Lead Poisoning Prevention Surveillance Report.



A Guide to Proactive Rental Inspection Programs

ChangeLab Solutions

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SUBSTANDARD HOUSING AND HEALTH

Substandard housing conditions pose an acute risk to young children, seniors, and people with chronic illnesses.[1,2,3] Nationwide, more than 23 million people have asthma; it is the most common chronic ailment among children in the United States.[4,5] By one estimate, 39% of asthma cases in children under 6 can be traced to residential exposure to indoor air hazards.[6] Housing-related injuries result in roughly 4 million emergency room visits and 70,000 hospital admissions.[7] Nationwide, in 2000, there were an estimated 1.8 million falls leading to emergency room visits among those age 65 and older; the majority of falls take place within the home.[8] Exposure to lead paint chips and related dust are the leading cause of elevated lead levels in children in the U.S.[9]

LOCALITIES: TOWNS, CITIES, COUNTIES AND OTHER FORMS OF LOCAL GOVERNMENT

Throughout this document, the term "localities" refers to towns, cities, counties, and other forms of local government. State and local law will determine which local governmental body governs relevant code enforcement activities.

INTRODUCTION

Substandard conditions in the home are responsible for a wide array of significant health problems, such as childhood lead poisoning; exacerbated asthma and respiratory conditions that result from exposure to mold, pests, and other household allergens; and increased rates of injury and mortality among the elderly. As rental housing is more likely to be substandard than owner-occupied housing, tenants are at higher-than-average risk. Local governments can play a critical role in improving resident health by implementing programs to improve the quality of their housing stock.

Most localities maintain code enforcement programs to ensure the safety and welfare of their citizens. Traditionally, these programs have been complaint-based; that is, in response to a resident complaint about a substandard housing condition, a municipal code enforcement officer will conduct a housing inspection and, if the complaint is substantiated, the officer will begin enforcement proceedings.

Proactive rental inspection (PRI) programs are different. Under a PRI program, most covered rental units are inspected on a periodic basis to ensure that they are safe and habitable, and that property values are maintained. Typically, inspections take place at designated intervals, though they may also be triggered by an event, such as a change in tenancy. While the hallmark of proactive rental inspection programs is that inspections are not complaint-based, localities with proactive rental inspection programs generally conduct complaint-based inspections too.

This guide:

1. describes the advantages of proactive rental inspection programs;
2. details the components of PRI programs and provides an overview of options for program design;
3. examines challenges that may arise in implementing PRI; and
4. suggests broader strategies for success when adopting a PRI program.

PRI BY ANY OTHER NAME...

Proactive rental inspection (PRI) programs may go by any number of names. For example, they may be referred to as "systematic code enforcement," "periodic code enforcement," "rental housing inspection," or "rental registration and licensing." It is the regular, mandatory nature of inspections that differentiates these types of programs from complaint-based rental housing inspection programs.

REDUCING COMPLAINT-BASED INSPECTIONS

According to the author of a study examining North Carolina proactive rental inspection programs, "[t]he number of complaints a city receives about substandard housing is an important measure of program effectiveness. If inspections programs result in code compliance, a city should receive fewer complaints. Greensboro's program began in 2004 . . . after a high of 1,427 housing complaints in 2005, the number of complaints fell by 61 percent to 871 in 2007."[10] In the city of Asheville (which was also included in the study), the number of complaints between 2001 and 2003 fell from 227 to 60.[11] After the program was discontinued, the number of complaints increased again, reaching 189 in 2007.[12]

ADVANTAGES OF PROACTIVE RENTAL INSPECTION (PRI) PROGRAMS

In many instances, PRI programs may be more effective than complaint-based programs in ensuring safe and healthy housing, preserving housing stock, protecting vulnerable tenants, and maintaining neighborhood property values.

PRI Programs Preserve Safe and Healthy Rental Housing

By relieving tenants of the burden of having to force reticent landlords to make needed repairs, systematic inspections can help ensure that a locality's rental housing stock is maintained and that residents live in healthy conditions.

Between the establishment of Los Angeles's Systematic Code Enforcement Program (SCEP) in 1998 and 2005, "more than 90 percent of the city's multifamily housing stock [was] inspected and more than one and half million habitability violations [were] corrected. The result [was] an estimated $1.3 billion re-investment by owners in the city's existing housing stock."[13]

For example, between 2008 and 2013, under Sacramento's Rental Housing Inspection Program, housing and dangerous building cases were reduced by 22 percent.[14]

According to a study of PRI programs in five North Carolina cities, the City of Greensboro alone brought more than 8,700 rental properties up to minimum standards in four years under its proactive rental inspection program (RUCO).[15, 16, 17]

In addition, by ensuring that landlords are aware of poor conditions before they worsen, systematic code enforcement encourages preventative maintenance, which is more cost effective than deferred maintenance, and thereby helps landlords to maintain their properties.[18]

PRI Programs Help Protect the Most Vulnerable Tenants

Often, the most vulnerable tenants don't complain.[19, 20, 21, 22] Some tenants are unaware that they have a right to safe and habitable housing. They may not know about existing tenant protections or code enforcement programs. Or they may have language barriers or disabilities that make it difficult to navigate the code enforcement system. Many tenants may be afraid to complain about their housing for fear of increased rent or landlord retaliation (such as eviction). Residents may be undocumented or have limited income that hampers their ability to move.

As a result of these barriers, the housing inhabited by the most vulnerable populations, which is frequently the worst housing, is often the most likely to fall through the cracks of a complaint-based code enforcement system. In 2009, Linda Argo, the Director of the Department of Consumer and Regulatory Affairs (DCRA) for the District of Columbia, testified before the D.C. City Council about the need for their proactive rental inspection

PROTECTING TENANTS FROM RETALIATORY ACTIONS

Most states have laws that protect tenants from landlord retaliation when they submit complaints regarding housing safety. California law, for example, prohibits a landlord from retaliating against a tenant for complaining to an appropriate agency about the habitability of a rental unit.[23] The law prohibits retaliatory rent increases, service decreases, eviction, or threats of such.[24] In some states, localities include protections within their local laws.

However, even when tenants have legal protections, they may be hindered from asserting these protections due to limited resources and insufficient availability of affordable or free legal services for low-income tenants.[25]

Proactive PRI programs may help to reduce tenant fear of landlord retaliation, as well as actual retaliation, since the inspections and compliance actions are prompted by a municipal program rather than by tenant complaints.

program. She explained, "[i]t's quite clear that a complaint-based system is no longer sufficient if we want to maintain safe housing conditions for all residents, especially our most vulnerable - the poor, the elderly, the non-English speakers."[26] She noted that "[f]or the vast majority of properties named in the slumlord lawsuits [initiated by the Attorney General], DCRA had not received any recent complaints from residents of those buildings. And for the worst of the properties, we never received a single complaint."[27]

PRI Programs May Preserve Neighborhood Property Values (and a Locality's Property Tax Base)

One of the lessons localities have drawn from the foreclosure crisis is that it is crucial to prevent concentration of blighted properties, in part because poorly maintained, substandard housing can have a negative effect on neighboring property values. By addressing housing conditions proactively, and by quickly identifying and targeting exterior substandard conditions alongside interior code violations, proactive rental inspection programs can ensure that properties don't become blighted, thereby preserving property values. From a financial standpoint, this benefits landlords and homeowners. Maintaining neighborhood property values also benefits the entire locality because it preserves the local tax base.

STATE LAW, PREEMPTION AND PROACTIVE RENTAL INSPECTIONS

Code enforcement is an exercise of a government's "police power." Police power is the inherent power of government to act to protect the health, safety, and welfare of its citizens. The extent of the police power that a locality may exercise is dependent on its state constitutional or statutory law.

In a few states, the law may establish that code enforcement is administered by the state.[28] In most states, however, code enforcement occurs at the city or county level. In some states, state law expressly authorizes localities to establish a code enforcement program. In other states, the state constitution or state law may give localities broad "home rule" power - the authority to enact laws, such as a proactive rental inspection program - without a specific delegation of power from the legislature.

State legislatures can also preempt the authority of localities to enact proactive rental inspection programs by enacting state laws that override or limit a locality's authority to establish a program. Some states, including Arizona, Georgia, North Carolina, and Tennessee, prohibit or significantly restrict systematic interior inspections of rental units.[29] Greensboro, North Carolina had a successful proactive rental inspection program until the legislature preempted the city's authority to operate that program.[30, 31]

It is important to review your state law to determine if the authority to start a PRI program resides with your locality or with your state.

UNDERSTANDING PRI PROGRAMS

There is no standard PRI program. Programs vary according to the types of rental housing in a locality, the needs of the particular locality, the availability of resources, and (to an extent) state law. This guide provides an overview of the key components of PRI programs and the different ways localities have implemented them.

Though details vary, PRI programs typically share a basic program structure:

- **Registration.** The locality requires property owners to register their rental properties or to obtain a certificate or license in order to rent housing units.
- **Periodic Inspections.** The locality requires periodic inspections of all covered rental properties. Inspections occur on a periodic basis, usually every few years, to ensure that the housing is adequately maintained.
- **Enforcement.** If a property fails inspection, the locality initiates enforcement measures.

Types of Rental Housing Included Within the Program

A locality must also decide on the types of rental housing to include in its program. The types of housing included are usually determined by the most pressing needs in the community and by the availability of resources for inspection and enforcement.

Targeting Particular Neighborhoods

Some localities, particularly when first initiating a rental housing inspection program, target particular neighborhoods or areas. This can enable a locality to focus limited resources where they are most needed.

Sacramento, for example, piloted a rental housing inspection program by targeting two neighborhoods, each of which contained a large number of rental properties with a high incidence of dangerous building cases, code enforcement cases, and police and fire calls for service.[34] The program was successful and, in 2008, Sacramento expanded the program citywide.[35]

Similarly, Kansas City, MO expanded its program incrementally, implementing the program initially in areas where 30 percent or more of the housing units were rentals, the housing inventory was basically sound but exhibited substantial deterioration, and neighborhood residents had expressed interest in a systematic housing inspection program.[36]

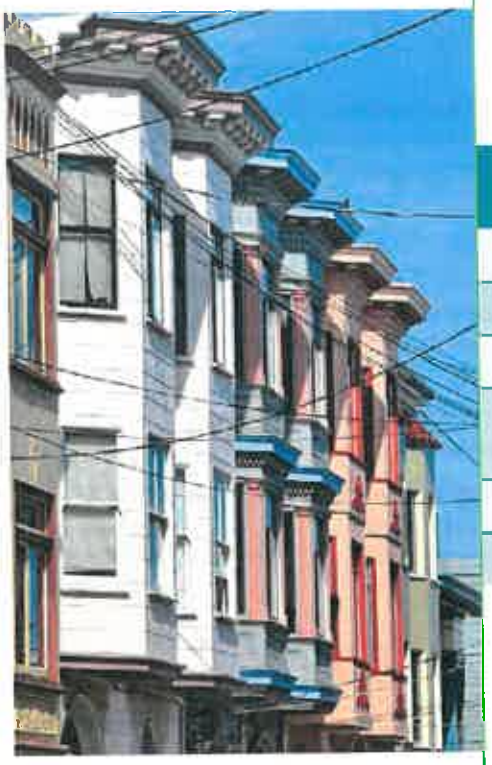
Beginning in 1986, St. Louis required a certificate of inspection with each change in tenancy in certain housing conservation districts.[37, 38] This policy was expanded to cover the entire city in 2012 because it had proven successful in sustaining and improving the quality of residential housing, and city officials determined that it could be helpful in enforcing minimum housing standards and securing the health and safety of all St. Louis residents.[39]

Practice Tip

Phasing in the initial inspections over time or targeting particular neighborhoods can help to ease the transition from a complaint-based program to a systematic one.[32]

PHASING IN PRI PROGRAMS

A PRI program requires a substantial initial investment of time and resources. An early audit of Los Angeles' program found that the goal of inspecting every multi-unit rental property every three years was not achievable at first because of backlogs and the length of time inspections took. The auditor recommended several strategies, including inspecting the oldest properties first, conducting initial drive-by exterior reviews, focusing on properties with histories of complaints and/or non-compliant owners/tenants, and establishing staggered review schedules from three to five or more years based on selected criteria (e.g., rent, location, history).[33]



Targeting Properties Based on Number of Units

Localities often limit a program's scope to properties that contain a specified minimum number of units.

LOCALITY	Rental Properties Covered by PRI, By # of Units on the Property
Seattle, WA	1 or more units
Los Angeles, CA	2 or more units
Washington, DC	3 or more units
San Francisco, CA (exterior inspection)	3 or more units (and hotels with 6 or more units)
Grand Rapids, MI	1 or more units
Santa Cruz, CA	1 or more units

Multi-unit properties: Most programs cover multi-unit rental properties, but some programs restrict that coverage to properties with a certain number of units. Los Angeles's Systematic Code Enforcement Program applies to residential properties with two or more units, so long as at least one of those units is rented or offered for rent.[44] Washington DC's proactive inspection program applies to all multi-family rental properties with more than three units.[45] San Francisco conducts periodic inspections of the exterior and common areas of residential buildings with three or more dwelling units and hotels consisting of six or more guest rooms.[46] In contrast, Seattle's registration and inspection provisions apply to rental housing properties irrespective of size or number of units.[47]

Single-family homes: Some PRI programs cover single-family homes. Recently, Grand Rapids expanded its registration and inspection program for multi-family properties to include single-family rental housing and abandoned and vacant residential properties.[48] Reporting that the number of families living in single-family rental units increased from 4,568 to 7,771 between 2006 and 2009, the working group recommended adding single-family rental units in order to: (1) ensure that substandard housing did not disproportionately impact families with children; (2) increase market equity for all investment property owners by promoting consistent code compliance across all types of rental housing; and (3) ensure a standard of quality and affordability for all rental units, particularly in the central city, to promote urban neighborhoods.[49] Santa Cruz, a college town where single-family homes are often rented to groups of students, also includes single-family rental homes within its program.[50]

Other Commonly-Exempted Units

Localities have also adopted a variety of other ways to focus their rental inspection resources.

Owner-occupied: Several localities exempt buildings if the property owner lives in one of the units.[51] Boston, for example, exempts buildings of six or fewer units if the owner occupies one of the units.[52] The rationale for this exemption is that buildings where the landowner resides are likely to be adequately maintained.

Practice Tip

When targeting neighborhoods, a locality should use criteria that pertain to the quality of housing and/or the need for inspection, such as those criteria employed by Sacramento and Kansas City, MO, as described above. Classifications or targeting based on the race, color, religion, sex, familial status, national origin, or disability status of residents may result in discrimination claims.[40, 41, 42, 43]

Government regulated or subsidized: Many localities, including Boston and Seattle, exempt federal, state, or locality-owned or managed buildings, as well as Section Eight and other subsidized housing, because these housing categories are subject to other inspection requirements.[54] Should the frequency of these other mandated inspections be reduced,[55, 56] it may be advisable to extend municipal rental inspection programs to cover these properties.

New-construction: Some localities exempt newly-built housing, as it is presumed to be in good condition. In Santa Cruz, for example, housing built within the preceding five years is exempt from the inspection program.[57]

Hotels and motels: Non-residential hotels, motels, and other transient housing are also commonly exempted from rental housing inspection ordinances.[58, 59] However, given that vulnerable tenants may live in these types of properties on a long-term basis, it may be important to include them in municipal periodic rental inspection programs if no other standards are applied to ensure that they remain in habitable condition.

Registration and Licensing of Rental Property

Rental Registration

In order to implement a PRI program, a locality needs to know what rental properties exist and who owns them.[60] To determine this, many localities require owners to register their rental properties or units.

Registration requirements are common in systematic rental housing inspection programs, but can also be implemented independently, or in conjunction with other city administrative functions such as business licensing.

In addition to informing a locality of the location of rental housing, information gathered during registration may help a locality to inventory its rental housing stock, which can be valuable for planning purposes. For example, registration and licensing can allow municipal housing, commerce, and planning agencies to monitor fluctuations in the number of rental units over time, which may help them plan for growth or reduction, or manage situations like the foreclosure crisis.

Frequency of renewal: Localities vary in how frequently they require registration renewal. For example, Kansas City, MO requires annual registration.[61] Some localities require registration to be updated when there is a change in ownership, in addition to or in place of renewal on a fixed term basis.

Registration fees: Many localities charge fees for property registration (detailed in a later section). Some localities do not charge a fee, but a failure to register may result in significant enforcement fees.[62]

Rental Licensing

In lieu of a registration requirement, some localities require property owners to obtain a license before renting a housing unit. To ensure the habitability of rental units prior to tenant occupancy, localities may require an inspection as a prerequisite to a license.

VACANT PROPERTY REGISTRATION

Some localities, such as Grand Rapids, require owners to register all rental property - including vacant and abandoned properties.[53] Requiring the registration of vacant and abandoned property can help prevent blight in neighborhoods, especially in localities with high foreclosure or vacancy rates.

Practice Tip

In the PRI context, the terms license and registration may be used interchangeably from one locality to the next. Sometimes municipal rental housing registration requirements are standalone – not tied to additional regulatory schemes – and primarily serve the purpose of allowing a locality to index and gather information about its rental properties. In other instances, municipal rental housing registration requirements are the same as license requirements and are part of a locality's rental housing inspection program. Some municipal PRI programs use the term "certificate of compliance" or "certificate of occupancy" in lieu of the term "license."

Therefore, it is important to look beyond PRI program titles and terminology to understand the actual design and function of a program.

Examples of communities that use a licensing approach are Boulder, CO and Baltimore County, MD.[63]

Ann Arbor prohibits occupancy of a dwelling unless it has a valid certificate of compliance. After a property has been inspected and is determined to be in conformance with the code, the property owner is responsible for applying for the certificate of compliance.[64] Ann Arbor also has provisions for the issuance of a temporary certificate of compliance if, due to inspection service scheduling difficulties, an inspection cannot be conducted prior to the expiration of a current certificate.[65]

In Washington, D.C., to obtain a license to operate a housing business, an owner must allow an inspection of the property to determine that it is in compliance with all applicable building and housing laws and regulations.[66]

Similarly, Boulder utilizes a licensing scheme to ensure compliance with the city's property maintenance code prior to occupancy.[67] Boulder has provided that in cases where an inspection uncovers deficiencies that cannot be corrected prior to occupancy, the owner or operator may apply for a temporary license, which is issued for a limited time if the number and severity of violations does not constitute an imminent health and safety hazard to the public or to occupants.[68]

Frequency of Periodic Inspections

Whether in conjunction with a registration system or a licensing requirement, the defining characteristic of PRI programs is routine inspection of rental housing. As described above, some localities require an inspection as a prerequisite to initial registration, licensing, or occupancy. Many PRI programs also require additional periodic inspections. The frequency with which localities elect to conduct these inspections is often heavily dependent on the extent of a locality's resources. In addition to periodic inspections, certain events may trigger, accelerate, or decelerate inspections.

LOCALITY	FREQUENCY OF INSPECTION
Los Angeles, CA	Every 3 years
Baltimore County, MD	Every 3 years
Boulder, CO	At registration. At renewal of license, which is required every 4 years. Upon transfer of ownership.
Ann Arbor, MI	Not more than 2.5 years
Kansas City, MO	Every 2 to 4 years, depending on compliance
Grand Rapids, MI	Every 2, 4 or 6 years, depending on compliance
Boston, MA	Every 5 years for most properties. Rental units belonging to chronic offender landlords inspected every three years. Problem properties inspected annually.

Periodic Inspections on a Fixed Basis

Many PRI programs require inspections on a cyclical basis, usually every few years. Baltimore County and Los Angeles require an inspection every three years.[70] Boulder requires an inspection at registration, upon renewal of a rental license - generally every four years - or upon transfer of ownership.[71] Ann Arbor specifies that the period between inspections shall be no longer than 2.5 years.[72]

Practice Tip

While a systematic rental housing inspection program may require inspections on a fixed cycle, the actual timeline on which municipal inspectors are able to work their way through inspections of covered housing may, in some cases, be longer.[69]

Inspection Frequency Based on Prior Compliance

A number of localities set a baseline standard for the frequency of inspections and then allow for deviation from that standard based on a property's record of compliance. Several localities require less frequent inspections once a property owner establishes a record of compliance. In Kansas City, MO, for example, certificates of compliance are valid for two years; however, owners may be issued certificates for up to four years if there have been no violations since the last date of certification.[73]

Grand Rapids conducts inspections when owners apply for a certificate of compliance, which is a prerequisite for occupancy.[74] The certificate is valid for two, four, or six years, depending on the record of compliance, the presence or absence of violations, and the degree of compliance with the program's registration and fee requirements.[75] Grand Rapids will issue a six-year certificate if: the property has no violations and has not changed ownership since its last certification; the owner applies for an inspection and re-registers the property on time; and there are no outstanding fees, taxes, or assessments against the property.[76] A four-year certificate is issued if the owner applies for an inspection and re-registers the property on time, and the property is brought into compliance with the code prior to expiration of the current certificate or within the timeframe specified on any notice of violation.[77] In other cases, Grand Rapids will issue a two-year certificate.[78]

Boston requires that properties covered by its program are inspected at least once every five years, but it also has mechanisms to target bad actors and problem properties for more frequent inspection.[79] For example, in Boston, owners of problem properties - those which have received four or more sustained complaints for noise; or complaints for noxious, noisome, or unsanitary conditions; or police calls for arrestable offenses - must annually request an inspection from the city, and develop a management plan to remediate the property's persistent substandard conditions.[80] Additionally, Boston operates a chronic offender point system which tracks violations and assigns them a point value. Owners who have accrued a certain number of points are classified as chronic offenders and must request an inspection of each rental unit once every three years.[81]

Self-Certification

A number of localities allow property owners to "graduate" into self-certification programs if they have established a record of passing inspections with no violations. Self-certification programs can give localities a way to allocate their limited resources to properties most in need of inspections. It can also serve as an incentive for property owners to ensure that their property complies with all applicable codes.

For example, in Sacramento, all rental housing properties are subject to routine periodic inspection by the city.[84] Rental housing property may be placed in the self-certification program if: (1) the inspector has found no violations, or all violations identified in the initial inspection were abated within 30 days; (2) the property owner and local contact representative are in compliance with all of the provisions in the housing code; and (3) the property owner is not delinquent on any payments to the city of fees, penalties, or taxes.[85] Under Sacramento's self-certification program, property owners are responsible – annually and upon a change in tenancy – for inspecting their housing units, making repairs necessary to comply with the housing code, completing a self-certification form for each unit, and providing a copy of this form to the occupants of the respective units.[86] Rental units included within the self-certification program are still subject to random inspections.[87] Properties in the program receive a discount on the Rental Inspection Housing Program fee.[88]

Rental property owners in Santa Cruz can request to participate in the self-certification program if the property is well-maintained and has had no code violations in the preceding three years.[89] In order to remain in the program, owners must annually self-certify each residential dwelling unit and pay an annual self-certification fee.[90] While the city will generally inspect other units annually,[91] participants in the self-certification program are subject to a reduced inspection cycle: twenty percent of the units on each property (or at least one unit on smaller properties) are inspected not more than once every five years, so long as the property does not deteriorate to the point of no longer meeting eligibility standards for the self-certification program.[92]

Practice Tip

Programs that only conduct inspections during vacancies will overlook units in poor shape, fail to discover conditions that residents might point out, and offer little protection to long-term tenants. In addition, because there is no tenant to verify that needed repairs are made, the locality may need to spend additional resources checking to make sure that property owners comply with repair orders, or repairs may not even be made.

Boston's program originally provided for inspection upon change in tenancy and depended on owners to report turnover to the city.[82] Notably, under that program, 98 percent of the city's 20,000-plus inspections were the result of tenant complaints rather than reported turnovers. Boston revised its program in 2012 to address this issue, adding regular inspections to all non-exempt rental properties.[83]

Vacancy Inspections

Some localities require inspections only when a unit is vacated due to a change in tenancy.[93] Inspections and repairs may be easier to conduct and less disruptive when a tenant is not present. In addition, by conducting repairs before a tenancy begins, a rental housing inspection program can help protect future tenants from being exposed to dangerous conditions, such as deteriorating lead-based paint or fire hazards.

Notice of Inspection and Entry of Occupied Units

Notice of Inspection

Unlike most complaint-based inspections, proactive rental inspections are undertaken without a request from the occupant. As a result, notice of a pending inspection serves an array of critical functions. By informing tenants about the purpose and process of inspections, notice can allay tenant fears, prepare tenants for a stranger to arrive at door, and encourage tenants to permit entry. Giving tenants notice of the scheduled date and time of an inspection can also increase the likelihood that a tenant will be home and available to permit the inspector to enter. Notice also provides localities with an opportunity to educate tenants and landlords about their rights and duties under the law. Finally, notice can alleviate some privacy concerns that residents may have by giving them the opportunity to, in advance of inspections, store personal items that are unrelated to code enforcement.

Practice Tip

Notices should be clearly worded and provided in a manner that takes into account language and other communication barriers.[94]

In developing notices and other materials to support a periodic rental inspection program, it is important to look at local government policies for guidance on language access. Depending on the applicable federal, state, and local laws, translation of the notice into commonly spoken languages may not only be a best practice, it may be a requirement.

Some programs notify property owners and rely on them to give notice to tenants.[96] However, the critical goals of notice are better served by providing notice directly to tenants as well; in the cases where housing inspection is most needed to address egregious code violations, landlords may be least likely to communicate notice to tenants. Programs provide notice to tenants by mail, posting notice at the property, or both.[97, 98, 99]

LANDLORD ENTRY

States often have laws defining the reasons for which a landlord may enter a rental property, and the amount of notice a landlord must provide to a tenant before entry. Whether rental housing inspection is a permissible reason for entry depends on state and local law, and this should be considered in designing a proactive rental inspection program.

In addition to the legal question, there are also practical considerations that may impact whether a PRI program encourages or requires landlord presence at inspections. Tenants may be intimidated and not feel comfortable talking openly with an inspector in the presence of the property owner or manager.[95] This dynamic may reduce the ability of the code inspector to effectively identify substandard living conditions.

Tenant Consent to Inspector Entry

Under the 4th Amendment to the U.S. Constitution, tenants have the right to be secure in their homes against unreasonable searches. At the same time, state and local police power authorize laws that are reasonably related to the public health, safety, and welfare of residents. The U.S. Supreme Court has recognized that local inspection powers are of "indispensable importance to the maintenance of community health."[100] There is a strong government interest in preventing "even the unintentional development of conditions which are hazardous to public health and safety."[101]

A government agent's entry into a private home without the tenant's consent is presumed to be unreasonable, unless there are emergency circumstances or a warrant to justify the intrusion.[102] Therefore, an inspector must have affirmative consent from the resident prior to or at the time of the inspection. Programs may allow inspectors to obtain tenant consent for entry at the time of the inspection[103] or through a pre-inspection consent form.[104]

Under a complaint-based inspection program, where the inspection is generally requested by a tenant, securing permission is typically very straightforward. However, under a PRI program, it may be more complicated for inspectors to get consent to enter from the tenant, for a variety of reasons. For example, a tenant may be wary of government inspectors, have privacy concerns, or even not understand why an inspector has come to the residence. Moreover, the tenant may not be able to be present at the time of an inspection due to work or other obligations.

Practice Tip

Education and outreach by municipal and community groups, discussed later, is often an effective strategy for gaining tenant trust and cooperation.

MUNICIPAL INSPECTORS OR APPROVED PRIVATE INSPECTORS

PRI programs may deploy municipal inspection employees or contractors, or allow licensed third-party inspectors. Many programs, including those in Los Angeles, Fort Worth, and Sacramento, use municipal inspectors. Other localities, including Boulder and Baltimore, require property owners to contract with a licensed home inspector.[105] In Boston and Seattle, property owners may use public inspectors or authorized private inspectors.[106]

These differing practices may proceed from state law, historical practice, or a political or economic decision by a locality not to hire additional municipal employees. For example, in Washington, the state supreme court examined the rental inspection program of the City of Pasco, under which (1) landlords could choose from a range of public or private inspectors and (2) landlords did not need to furnish the city with details of the inspection report – only a certification of compliance based upon inspection.[107] The court found that this program did not constitute "state action" or violate state or constitutional protections against unreasonable search. This ruling has affected how other Washington cities have designed their rental inspection programs.

While tenants often give consent to the inspector to enter, a tenant may deny consent for any of the reasons mentioned above. Where necessary, PRI ordinances may empower the locality to seek an administrative inspection warrant from a court of competent jurisdiction.[108, 109, 110]

Scope of Inspection

PRI programs must designate whether inspections will include: (1) exteriors of buildings; (2) interior common areas; and/or (3) individual units in a building.

Exterior Inspections

Many programs include exterior inspection, while some focus *exclusively* on exterior buildings, yards, and, sometimes, common areas of buildings. Exterior inspections can help to identify nuisances and blighted property, and prevent crime and fires. Analysis of data from the American Housing Survey, conducted by the Census Bureau for the U.S. Department of Housing and Urban Development, has found that exterior and interior conditions are related: the greater the number of certain exterior problems, the more likely that housing has associated interior problems. For example, a sagging roof portends interior problems with pests and moisture.[111] However, an exterior inspection alone cannot identify unsafe and substandard conditions, such as electrical, plumbing, and structural problems, that reside within the rental unit or the building's stairs, hallways, and other common areas.[112, 113]

Kansas City, Missouri's program conducts inspections of exteriors of buildings, accessory buildings, and yards; in multi-unit buildings, it also conducts inspections of common areas. It only inspects the interior of units that are vacant at the time of the inspection.[114]

San Francisco conducts periodic inspections of the exterior and common areas of apartment houses and hotels,[115] and will only inspect the interior of dwelling units upon the receipt of occupant complaints, or if it is determined that an interior inspection is reasonably necessary to determine whether a housing code violation exists.[116]

Practice Tip

Beginning a PRI program with exterior inspections and vacant unit inspections may be one strategy for launching a program in communities with obstacles to systematic interior inspections.

RESOURCES FOR HEALTHY HOUSING INSPECTIONS

U.S. Centers for Disease Control and Prevention's Healthy Housing Inspection Manual, developed for environmental health professionals, inspectors, and others, has a visual assessment data collection form as well as a resident questionnaire. The U.S. Department of Housing and Urban Development (HUD) has developed a rating tool for health and safety hazards based on a tool used in the United Kingdom.[117] The Pediatric Environmental Home Assessment was created to assist health professionals during home visits.[118]

Interior Inspections

The most comprehensive systematic rental housing inspection programs mandate interior inspections of rental units, to ensure that the areas where tenants spend most of their time are in safe and healthy condition.

Most municipal code enforcement departments have procedures and checklists that identify what inspectors should look for when conducting an interior inspection of a residence.[119, 120] These materials, usually designed for complaint-based programs, can be easily adapted for proactive rental inspection programs. However, the process of implementing a systematic rental inspection program can also afford an opportunity to review other aspects of code enforcement, such as the scope of interior inspections, to ensure that the program effectively protects the health of residents.

Sampling formulas: Often, localities cannot devote all the resources necessary to inspect every unit in multi-unit buildings. Instead, these localities may use sampling formulas. In Sacramento, for example, the inspection of a multi-unit building includes all common areas and a random sampling of no less than ten percent of rental housing units.[121] If the inspector determines that a property is in violation of any standard, the inspector is authorized to inspect additional, or all, units of that property.[122]

Seattle uses a different formula: in buildings containing 20 or fewer units, a minimum of two units must be inspected. In buildings containing more than 20 units, 15 percent of the rental units must be inspected, up to 50 rental units in each building.[123]

Practice Tip

It is important that code enforcement officials independently determine which units to sample, rather than letting owners select which units are to be inspected. This ensures that representative units, not just the best-maintained ones, are inspected.

LEAD HAZARD INSPECTIONS

While lead-based paint was banned for residential use in 1978, lead remains a health hazard for those who live in housing constructed prior to 1978, particularly for children.

Some PRI programs specifically address lead hazards. Rochester, New York, for example, requires all multi-unit buildings to undergo visual assessment for deteriorated paint and bare soil violations as part of housing inspection.[124] Owners of housing containing five or fewer units in identified high-risk areas are responsible for having dust samples taken and tested, and submitting the results to the Lead Inspection Unit.[125] When enacting the law, Rochester established a citizen advisory group to assist with public education and implementation.[126] An independent evaluation of the ordinance found that by 2010 (four years after the law was enacted), the city had inspected nearly all pre-1978 rental units.[127] This evaluation suggests that the lead law contributed significantly to declines in children's blood lead levels.[128] In addition, 94% of units passed visual inspections and 89% of units tested passed dust wipe inspections – much higher rates than were predicted based on prior local and national studies – indicating lead safety of rental housing had improved since enactment of the law.[129] Finally, while property owners had concerns that the cost of complying with the law would cause widespread abandonment of rental properties due to low property values and narrow profit margins in Rochester's rental housing market, that scenario did not transpire.[130]

Washington DC's law requires rental property owners to obtain a clearance report from a licensed professional, indicating that there are no lead dust hazards or deteriorated paint in any pre-1979 homes that are to be occupied by a family with a child.[131]

Enforcement to Address Code Violations

One of the most important elements of any rental inspection program - complaint-based or proactive - is enforcement when violations are discovered. Implementing appropriate remedies for identified code violations (and when a property owner fails to make repairs) helps ensure that program goals are met and tenants are protected from substandard housing conditions.

Localities use a range of tools to enforce property maintenance, housing, sanitary, and health laws. The methods a locality may use are often dependent on state law and on what powers the state delegates to localities.

Generally, the move from a complaint-based system to proactive rental inspection doesn't require major changes in the types of actions taken in response to violations. However, if a locality's existing complaint-based rental inspection program is facing enforcement challenges, the locality should take the opportunity to address these challenges in designing and implementing a more comprehensive program.

The primary goal of PRI programs is to ensure that housing is properly maintained. When an inspection reveals a substandard condition in a covered dwelling, most localities will issue a notice or order to comply, setting out the owner's rights and obligations, as well as the consequences of continued non-compliance.[132] The order will typically specify a time window for compliance. Los Angeles, for example, allows no more than 30 days for correction of non-serious violations, with the possibility of an extension if significant progress has been completed by the end of 30 days.[133] For violations that pose a serious risk to the health or safety of the occupants or the public, Los Angeles requires that the substandard condition must be abated (repaired) in no more than 14 days, with no possibility of extension.[134]

If a violation poses an imminent danger to the health or safety of tenants, most programs move quickly to remedy the situation. In Los Angeles, the city can order that the landlord fix the violation within 48 hours, and then re-inspect the building within the next 24 hours. If the condition has not been abated, the city is authorized to make the repair and then require the property owner to reimburse the city.[135]

Fines, which are a common component of program enforcement when an owner fails to make repairs in a timely manner, are discussed further in the **Funding PRI Programs** section (see page 19).

A few interesting enforcement approaches are described below:

Rent Escrow Accounts

One interesting feature of the Los Angeles Systematic Code Enforcement Program is the city's Rent Escrow Account Program (REAP), which is activated when a property owner fails to fix code violations within the time allotted. After a hearing on the violations, the property units may be ordered into REAP by the manager of the Housing Department. When a property is in REAP, tenants receive a rent reduction for the cited code violations at the property and are given the option of paying their reduced monthly rent into an escrow account or to the landlord. The city records the Notice of REAP as a property lien,

Practice Tip

To prevent evictions and maximize the number of units that can be "saved" and preserved in the rental housing market, PRI programs should strive to exhaust all options for bringing a failing or illegal unit up to code.

Practice Tip

For clarity, in developing a rental licensing program, a locality might consider specifying that an owner's failure to obtain a license is a valid defense that a tenant can use against eviction proceedings.

CDBG FUNDING

Code enforcement is an eligible expense under Community Development Block Grants (CDBG), which are provided by HUD on a formula basis to entitlement communities (cities and urban counties), and to states for non-entitlement communities.[136] The International Code Council recently published guidelines for code officials regarding the use of CDBG funds for this purpose.[137]

which may restrict refinancing or sale of the property. The property owner is assessed a monthly administrative fee per rental unit. To clear the title of the REAP Notice, the property must come into compliance with codes and all fees due the Housing Department must be paid.[138] The Housing Department contracts with several nonprofit organizations to provide outreach to tenants about the program and to assist landlords in expediting compliance.[139]

Registration as a Prerequisite to Eviction Actions

Anne Arundel County, MD, requires that property owners obtain a rental license before renting residential property consisting of two or more units.[140] In an eviction action brought by an owner who had failed to obtain the required license, the Maryland Court of Appeals, the state's supreme court, held that the owner could not evict a tenant before complying with the county licensing requirement.[141]

Monitoring Substandard Properties

In 2007, faced with a backlog of unresolved substandard housing cases and a slow rate of compliance, the city of Lansing created a new program to track and monitor unsafe and substandard housing: the Neighborhood Enhancement Action Team (NEAT). NEAT tracks properties that have been 'tagged' as unsafe for habitation based on internal or external conditions. A tagged property is transferred to the NEAT program after 90 days of noncompliance. For every month that the violations are not addressed, the landlord incurs a $150 fee. Property owners are not charged the fee if they can demonstrate progress toward habitability. This incentive has had a dramatic effect on the number of tagged properties in the city, which has steadily decreased from 740 in 2007 to 362 in 2013 (224 of which were NEAT properties). At the start of the program, about half of the properties had been tagged for 5-7 years; ten months into the program, the average length of time a property was tagged had dropped to 147 days.[142]

Funding PRI Programs

Most systematic rental inspection programs are funded, solely or in part, by fees levied against property owners. Localities commonly impose fines and penalties for housing code violations or other program violations. Examples of fee schedules from a number of localities are described below.

Registration, license, and program fees: Localities commonly charge registration, program, licensing, or certificate fees to cover the costs of implementing and administrating a proactive rental inspection program. These fees are often charged based on the size of the rental property. For example, they may be determined based on the number of rental units; or apportioned at different rates for small, medium or large buildings; or assessed by square footage.

Localities may charge these fees on a one-time or recurring basis, depending on the nature of the fee and the length of the program cycle. For example, Antioch, CA charges a one-time initial registration fee when a property enters the program.[143] In contrast, Santa Cruz, CA charges an annual registration fee and requires that landlords annually reregister all rental units.[144]

Inspection fees: In addition to registration, licensing, or programming fees, some localities assess inspection fees annually (or for each period of a program's cycle) for units subject to mandatory inspection; others assess inspection fees only when an inspection is to actually take place. Localities with self-certification programs may discount or waive the inspection fee for units that are owner-inspected, although they may charge a separate self-certification fee.

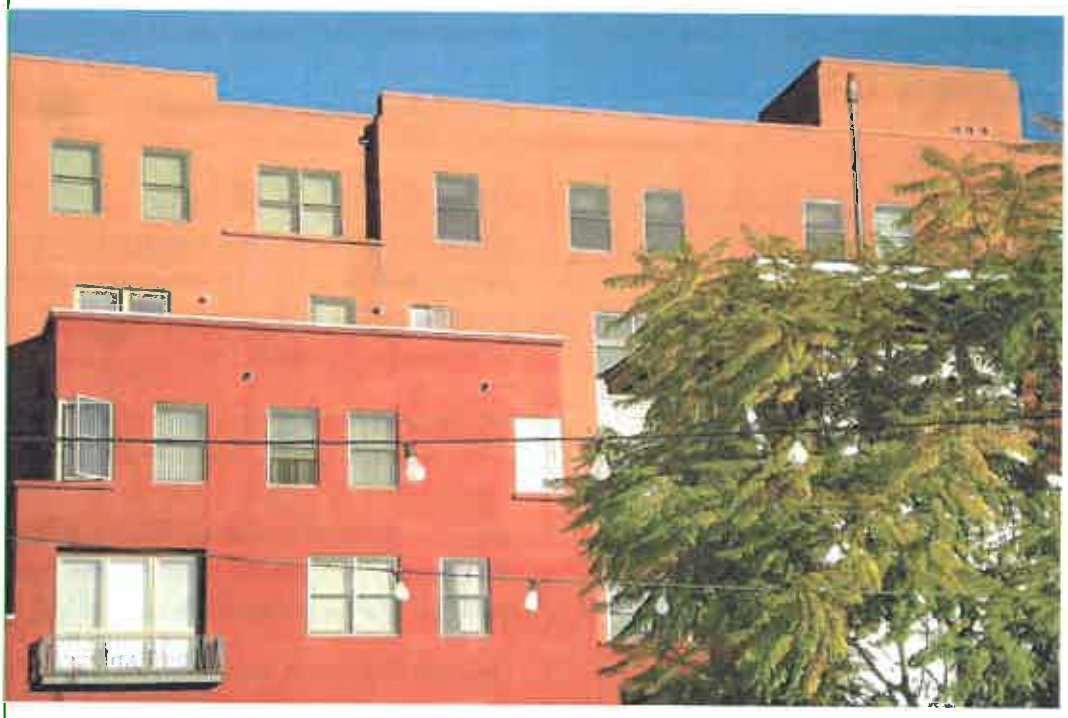
Re-inspection fees: Most localities charge a reinspection fee to cover the cost of additional inspections after violations are uncovered during an initial inspection. Targeting these costs to property owners not in compliance can keep fee costs down for landlords who do maintain their properties appropriately. As an incentive for owners to remedy code violations, some localities will only charge this fee on the second or subsequent reinspection, if violations have not been corrected within a specified period after the initial inspection.

Other fees: Some localities impose a fee for rescheduling or for missed appointments. Several localities impose penalties for late payment of any of the required fees. Where the locality provides for abatement of code violations, the abatement fee may cover the costs incurred by the locality, including administration and labor.

Penalties/Fines for violation: Localities may impose administrative or civil (monetary) penalties for violations of the proactive rental inspection program and property maintenance codes. Localities sometimes impose criminal fines as well.[148]

Practice Tip

Relying heavily on penalties to sustain a program may result in an unpredictable funding stream. Sacramento began its PRI program with a focused pilot program. The city anticipated that the cost of the program would be offset by the revenue from fines and penalties.[145] However, with the implementation of the pilot program, property owners brought their properties into compliance more quickly than anticipated. As a result, the pilot program assessed significantly fewer penalties and generated less revenue than expected.[146] To help ensure that the program could be self-sustaining, Sacramento adopted a different fee schedule when implementing its city-wide program.[147]



A Sample of Fee Schedules for PRI Programs

	KANSAS CITY, MO Residential Rental Registration and Inspection Program[48]	SACRAMENTO, CA Rental Housing Inspection Program[49]	BOULDER, CO Rental Licensing Program[50]	SANTA CRUZ, CA Rental Dwelling Unit Inspection Program[51]	WASHINGTON, DC Rental Housing Business License[52]
Program fee		$16 per year			$35 per unit, for buildings with three or more units, charged at the issuance or renewal of the license (not to exceed $2000 biennially)
License or Registration fee	No fee to register Delinquent registration fee for properties not registered by 1/31: $50 in February, increasing by $50 per month, to a maximum penalty of $500 Additional $200 per month per structure for failure to register		$70 per building charged before a rental license is issued or renewed, covering all units within the building In addition, $70 per unit for units attached to a building but individually owned	$45 per year per building	$21.50 annually per unit at the initial issuance of the license
Self-certification fee		Inspection fee waived for units in self-cert program		20% of units @ $20 per unit	
Inspection fee		$127 per unit for rental housing units subject to mandatory inspections $127 per unit for each additional unit inspected because of a violation discovered on the property $80 rescheduling fee	$250 per inspection performed	$20 per unit, to cover the cost of an annual inspection and one compliance reinspection, if necessary Not paid by units in the self-certification program	
Reinspection fee	$100 for second and each subsequent re-inspection	$127 per unit for reinspection of each rental housing unit that fails to correct violations within the required timeframe	$107 per hour, payable if the owner fails to correct any violation after the first compliance reinspection		$90 for any reinspection of a licensee's premises for routine housing code violations
Penalties	Localities may also impose civil and criminal penalties for violation of a rental housing inspection ordinance or other applicable city codes				

Evaluation

Evaluation is an important, though often overlooked, component of government programs. The purpose of PRI programs is to preserve housing stock, improve habitability for tenants, and ensure that the locality receives property taxes. In these days of shrinking public resources, it is important to make certain that programs achieve their desired outcomes. Also, to ensure effective funding mechanisms, it is necessary to evaluate the costs of programs versus the revenue generated by their fees and penalties.

Under Boston's systematic rental inspection program, an annual report must be provided to the city council detailing the activities of the program, including the number of inspections requested and performed each month by the various types of inspectors, the total number of violations identified through inspections, the number of exemptions requested and granted, the number of violations prosecuted, the amount of fines levied and collected, and an overall assessment of the program and plans for improvements.[154]

Beginning in 2014, Seattle, which adopted a periodic rental inspection program in 2012, will require an annual report to the city council that will include an evaluation of properties' registration status (including details about any previously unidentified housing units that have been discovered); property owners' compliance in allowing inspections to be completed within the applicable 60-day timeframe; the results of inspections where properties have a previous history of violations; whether the program fees actually reflect the program costs; the number of inspections that have resulted from complaints; the extent to which the civil warrant process has been used; and any audits and findings on inspections.[155]

Kansas City, MO requires its city council to review its program provisions and requirements at least every two years to determine whether to maintain, modify, or terminate the program.[156]

Staff in Santa Cruz, CA will provide their city council with a report of rental housing units saved and lost following the first round of proactive registration and inspections.[157]

VENTURA, CA: INNOVATIVE SOLUTIONS

In the initial phase of the city's proactive inspection program, inspectors in Ventura, CA found 15 illegal converted rental units—just a small fraction of the 300-500 such units that officials believe exist. In order to meet the city's commitment to address substandard housing and promote a healthy environment, staff made an innovative recommendation, informed by a collaboration with community members: Grant amnesty to illegally converted units for 30 months, suspending all fines and penalties while owners brought the units up to code. Eligibility was confined to second units on properties that allowed residential use, with an occupancy date prior to the city council's initial action.

Low-income landlords were also eligible for newly created Affordable Rental Housing Preservation Loans to cover the cost of compliance, on the condition that tenants be charged federally established affordable rates for the duration of the 15-year loan term.[158] The program includes an educational component, bases fees on the in-service date (when the property was first occupied), and waives zoning violations that do not impact health and safety, including setbacks, lot coverage, and on-site parking requirements. As of August 2013, the city had received 53 applications, and had inspected and approved 41 properties, with another 5 in process.[159]

CHALLENGES WHEN IMPLEMENTING PRI PROGRAMS

PRI programs can yield important improvements in a locality's housing stock. But they may also amplify many of the challenges that arise with traditional complaint-based programs, because (1) proactive inspection programs typically bring inspectors into contact with a much wider cross-section of a locality's housing, and (2) inspections are not initiated exclusively by tenant complaints. In some cases, code enforcement activities can potentially result in displacement of tenants. This section examines some common challenges, and the following section offers strategies for addressing these challenges to maximize the effectiveness and benefits of PRI programs.

Uninhabitable and "Illegal" Units

In extreme cases, an inspector may find substandard conditions that immediately threaten the health and safety of residents. PRI programs should include measures that require landlords to fix properties quickly; however, in the worst cases, the locality may require a tenant to vacate the property.

Inspectors may also encounter "illegal" units: units that have not been registered or licensed, and units that exist in violation of zoning or building codes. Where possible, localities should aim to bring units into compliance to preserve rental housing stock.

Where uninhabitable or illegal units cannot be brought into compliance, relocation programs and supportive social programs, discussed in more detail below, are critical to ensure that tenants remain housed.

Tenant-Side Code Violations

Because PRI program inspectors are not only invited into rental housing units by tenants filing complaints, they are more likely to uncover tenant-side code violations or illegal occupancies than they would under complaint-based programs. Because the central goal of proactive rental inspection programs is to maintain housing in safe and healthy condition, code enforcement should prioritize remedying such violations rather than displacing tenants from their homes.

Hoarding: About three to five percent of Americans suffer from hoarding.[160,161,162,163] Severe hoarding not only puts a tenant and other occupants of a housing unit at risk, but may place neighboring residents at risk of fire, disease, or infestation of vermin.[164,165,166] This disorder is not widely understood and localities often struggle with effective ways to address hoarding.[167] For example, one study out of New York found that "almost a quarter of individuals seeking help for housing problems from a community eviction prevention organization met the criteria for [hoarding disorder]; only about half of these individuals were receiving mental health treatment."[168] However, as hoarding is a form of mental illness,[169] localities should identify ways to assist hoarders without rendering them homeless.[170,171]

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DISPLACEMENT AND HEALTH

Like substandard conditions, housing instability, displacement, and homelessness have significant, negative impacts on health. Children and adults who experience housing instability and homelessness are at greater risk for poor health than those in stable housing.[172] Stable housing can improve mental health outcomes for residents, reduce stress-related health outcomes, and provide a stable foundation for accessing other critical social and health services.[173]

Practice Tip

As localities aim to improve the health of families and communities through code enforcement, it is critical that they consider and address any potential for displacement, to ensure that health gains through better housing conditions are not paired with health losses through displacement.

For example, there are over 20 hoarding task forces across the state of Massachusetts, organized by a range of agencies, including county health departments, senior services agencies, housing authorities, local governments, and housing nonprofits. These task forces are supported by a Statewide Steering Committee on Hoarding (SSCH), facilitated by MassHousing, a housing nonprofit. The SSCH was created to bring together professionals from different sectors to address the complex psychological and policy issues associated with hoarding. To date, the SSCH has conducted trainings for over 2,000 people, and has developed a risk assessment tool.[174, 175]

Overcrowding: Overcrowding of units, especially in localities with expensive or tight housing markets, is another challenge for PRI programs. Low-income residents may have few alternatives to shared housing.[176, 177] However, where inspectors find that occupancy levels violate applicable codes, tenants may be displaced.

Rent Increases

When property owners make substantial repairs to a rental unit, they may pass the cost of repairs along to tenants in the form of significant rent increases. However, by identifying conditions early, periodic rental inspection programs may also help limit the cost of deferred maintenance. In addition, some states have laws that prevent landlords from collecting rents if a municipal inspection has identified violations and repairs remain outstanding after a reasonable time.[178]

STRATEGIES FOR SUCCESS

As increasing number of localities have enacted PRI programs, a number of strategies have emerged to address the above challenges and ensure successful programs. We highlight a few below.

Involve Diverse Stakeholders in Designing the Program

As described above, PRI programs differ from locality to locality. The most effective programs are targeted to local housing stock characteristics and the specific concerns of the community. In taking this approach, proactive code inspections program should be designed with input from diverse stakeholder groups.[179] In Seattle, for example, the city council required the Department of Building Inspections to convene a Residential Rental Property Licensing and Inspection Stakeholder Group, which would issue recommendations for the Rental Registration and Inspection Ordinance.[180] The stakeholder group met almost a dozen times over a six-month period, with the assistance of a professional facilitator and mediator. The input of all represented groups was carefully documented.[181]

Involve Community-Based Organizations in Implementation

Proactive rental housing inspection programs bring code enforcement officers into contact with a broader cross-section of residents than do complaint-based programs - including many residents who have not affirmatively sought out housing inspections. In order to help educate tenants and landlords about rental housing inspections, allay resident concerns, and ensure effective implementation of inspections, some localities have involved community members and nonprofit organizations in the implementation of their programs.

In Los Angeles, after repeated incidents in which city inspectors were unable to gain entry into homes for lead inspections, the Healthy Homes Collaborative, an association of community-based organizations, partnered with the Los Angeles Housing Department and the L.A. County Department of Public Health to ensure that violations are repaired safely. Under the partnership, a member of the collaborative visits selected homes prior to scheduled city inspections. The collaborative representative assists residents in preparing for inspections by educating residents about lead hazards and lead-safe work practices, providing information and referrals about blood lead testing and how to report unsafe repair work, listing potential defects, and informing residents of their legal rights.[182] Significantly, city inspectors who visited properties that were pre-visited by collaborative staff have gained entry 80 percent of the time, compared with 20 percent for homes that were not pre-visited.[183]

Similarly, with difficult cases, such as those involving hoarding, overcrowding, or potential displacement, housing inspectors should collaborate with social and legal services agencies and community organizations, which can assist tenants by helping them access critical supportive services.

Provide Training for Code Enforcement Staff

As proactive rental inspection programs bring inspectors into wider contact with residents, it is very important that officers be able to interact effectively with a diverse population. In tandem with implementing proactive rental inspection programs, localities can provide training to code enforcement officers to ensure that they are prepared to: conduct inspections in a culturally sensitive manner; be attentive to the special concerns of particular groups (e.g., seniors, undocumented persons); and employ effective strategies to overcome language and other communication barriers. In particular, having multilingual inspectors and support staff ensures that all tenants are able to communicate effectively throughout the inspection process.

The Boston Inspectional Services Department briefs and trains other city staff who might interact with the program, such as the building division. Division heads are briefed on the program's budget, staffing, and operations at biweekly meetings.[184]

Provide Education, Outreach and Ongoing Support for Landlords and Tenants

Unlike complaint based-systems, PRI programs affirmatively aim to interface with most landlords and tenants. Ensuring that all parties understand the program and their obligations under the program helps to ease the transition.

A number of localities have developed programs to help educate landlords and tenants about the rental inspection program and their obligations; many also provide written materials and checklists for tenants and landlords on applicable housing code provisions. Other localities carry out far-reaching publicity campaigns, including billboards, posters on bus shelters,[185] and notices on property tax and water bills.[186] Los Angeles conducts a full range of workshops and monthly drop-in sessions to address questions.[187] Sacramento requires that owners distribute city-approved forms concerning tenants' rights and

responsibilities before the commencement of any tenancy.[188] With the support of the mayor's office, Boston's Inspectional Services Department holds monthly landlord seminars to discuss the rental registration program and inspection process. These seminars are scheduled in the evening to encourage attendance.[189, 190] Kansas City, KS, staff are working with a local community college to develop an online training program for landlords.[191] Programs should also work with tenant housing organizations and legal aid organizations to ensure that tenants can understand and assert their rights.

Implement Complementary Programs

Finally, PRI programs can be more effectively implemented when the locality also puts into place complementary programs to address related housing issues.

Funded relocation: Funded tenant relocation assistance programs help ensure that displacement resulting from code enforcement efforts doesn't result in housing instability and homelessness, which have significant negative health impacts.[192, 193, 194] Los Angeles, for example, has a Tenant Relocation Assistance Program, which entitles a tenant to financial assistance from the property owner to find new housing.[195] Often, relocation programs will provide different levels of funding for temporary and permanent displacement. In some instances, owners may be unable or unwilling to pay relocation fees to tenants promptly – or at all. For this reason, and because low-income tenants often lack sufficient assets to move readily, it is critical that localities set aside designated funds to pay tenants when landlords cannot. Municipal relocation ordinances sometimes allow the locality to place a lien on the property to recoup these relocation payments from the owner.

Financial assistance for low-income landlords to make repairs: There are some instances where low-income property owners may be unable to make repairs on rental properties, a situation magnified by the recent mortgage and credit crises. Financial assistance for low-income landlords can help ensure that needed repairs get made.

Rent control: As mentioned in the previous section, tenants may be subject to rent increases after a landlord conducts repairs to bring a unit into compliance. In some localities, where permitted under state law, rent control laws may protect tenants from sharp rent increases by limiting allowable pass-throughs of program fees. For example, in Los Angeles, landlords are permitted to pass through the registration and inspection fees onto tenants, but if they do so, they must pass the charges along as prorated monthly fees so that tenants can absorb the cost over the course of a year.[196] In addition, while localities with rent control ordinances allow landlords to recoup their capital improvement costs from tenants, they may require that the costs be recouped in a gradual fashion over a period of time, such as several years.[197]

Public access to code violation information: By providing tenants and the public with readily available registration status and code violation information about specific properties, localities can incentivize rental owners to comply with registration requirements and give the community tools for enforcement as well as critical information.

Grand Rapids provides online access to its lists of registered properties, allowing tenants or prospective tenants to easily find out whether properties are registered and whether registered properties have certificates of compliance.[198] Boston will maintain an online, searchable Chronic Offenders Registry that includes a list of landlords who regularly fail to correct problems.[199]

In an effort to increase prospective tenants' access to rental property information, Code for America, in collaboration with the City of San Francisco and other industry stakeholders, developed a reportable, uniform data standard for housing code violations.[200] By adopting a uniform data standard, San Francisco ensures that the data is available for use in additional applications – the sum effect of which is to increase consumer access to housing information. A number of other localities have also committed to adopting the standard, including Las Vegas, NV; Kansas City, MO; Gary and Bloomington, IN; Olathe, KS; and Bayside, WI.[201]

CONCLUSION

Health and housing are tightly connected. To protect residents from an array of housing related health risks – such as asthma, allergies, lead poisoning, and injury – localities must ensure that local housing stock is well-maintained and in compliance with applicable housing and property maintenance codes. Proactive rental inspection programs can effectively achieve this by: addressing housing conditions before they become severe; protecting vulnerable tenants who often fall through the cracks of a complaint-cased system; and preserving critical housing stock. At the same time, PRI programs can benefit landlords and communities by protecting the property values of rental housing and neighboring homes.

There are many different ways to design a municipal PRI program. The most effective programs will be tailored to the characteristics of the local rental housing stock, factor in on-the-ground political and resource limitations, anticipate potential challenges in adoption and implementation, and incorporate broad-based strategies to ensure that local rental housing remains not only safe and healthy, but stable and affordable for all tenants.

[1] Krieger J. and Higgins D., "Housing and Health: Time Again for Public Health Action." *Public Health Matters*, 92(5):758-768, 2002.

[2] U.S. Department of Housing and Urban Development, Federal Healthy Homes Work Group, "Advancing Healthy Housing: A Strategy for Action." Page 14, 2013. Available at: *http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/advhh*

[3] Marshall, S., Runyan, C., Yang, J., et al, "Prevalence of Selected Risk and Protective Factors for Falls in the Home." *American Journal of Preventative Medicine*. 28(1):95-101, 2005.

[4] U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, *Healthy People 2020*. Washington, DC. Available at: *www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=36*

[5] Pollack, C., Egerter, S., Sadegh-Nobari, T. et al, "Where We Live Matters for Our Health: The Links Between Housing and Health." *Issue Brief 2: Housing and Health*. RWJF Commission to Build a Healthier America, 2008. Available at: *www.commissiononhealth.org/PDF/e6244e9e-f630-4285-9ad7-16016dd7e493/Issue%20Brief%202%20Sept%2008%20-%20Housing%20and%20Health.pdf*

[6] U.S. Department of Housing and Urban Development, Federal Healthy Homes Work Group, "Advancing Healthy Housing: A Strategy for Action." Page 14, 2013. Available at: *http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/advhh*

[7] See Pollack et al, *supra* note 5.

[8] Kochera, A., "Falls Among Older Persons and the Role of the Home: An Analysis of Cost, Incidence, and Potential Savings from Home Modification." *Issue Brief 56*. AARP Public Policy Institute, 2002. Available at: *http://assets.aarp.org/rgcenter/il/ib56_falls.pdf*

[9] Gould, E., "Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control." *Environmental Health Perspectives*, 117(7):1162-7, 2009.

[10] Hickey, C. "Ensuring Housing Quality: Proactive Minimum Housing Code Inspections of Rental Properties in North Carolina Cities 3." Master's thesis, University of North Carolina at Chapel Hill: 2008. Available at: *http://ghc.illkd.com/wp-content/uploads/2008/04/enhancinghousingquality.pdf*

[11] *Id.*

[12] *Id.*

[13] Harvard Kennedy School, ASH Center for Democratic Governance and Innovation, Systematic Code Enforcement Program, 2005. Available at: *www.innovations.harvard.edu/awards.html?id=7497*

[14] Report to Council, City Council of Sacramento, Ordinance Revisions to City Code Chapter 8.120 Relating to the Rental Housing Inspection Program, 2013. Available at: *http://sacramento.granicus.com/MetaViewer.php?view_id=22&clip_id=3277&meta_id=399614*

[15] *See* Hicky, *supra* note 10.

[16] The state of North Carolina passed legislation in 2011 barring, or preempting, many forms of local periodic rental inspection ordinances, so while the North Carolina programs provide valuable data they are not currently active. See, e.g. Mulligan, C., "New Periodic Inspections Law Brings New Requirements and Legal Risks." *The Public Servant*. 2012. Available at: *http://governmentandpublicsector.ncbar.org/newsletters/publicservantfebruary2012/periodicinspectionslaw*

[17] North Carolina Session Law 2011-281 (S 683). Available at: *www.ncga.state.nc.us/Sessions/2011/Bills/Senate/PDF/S683v0.pdf*

[18] Poor and deferred maintenance can lead to both increased maintenance costs and increased health expenditures. For example, deferring maintenance can lead to a failure to discover water leakage, which may lead to further structural damage, the accumulation of mold, and the degradation of hazardous materials that contain toxins like asbestos or lead. See, e.g., Cummins, S. and Jackson, R., "The Built Environment and Children's Health 6." 2001. Available at: *http://198.246.124.22/healthyplaces/articles/the_built_environment_and_children_health.pdf*

[19] *See, e.g.*, Public Roundtable on the Department of Consumer and Regulatory Affairs Proactive Housing Inspections Program, Testimony of Linda Argo, Council of the District of Columbia Committee on Public Services and Consumer Affairs. 2009. Available at: *http://newsroom.dc.gov/show.aspx/agency/dcra/section/7/release/18803/year/2009*

[20] *See, e.g.*, Oregon Public Health Institute, "Rental Housing and Health Equity in Portland Oregon: A Health Impact Assessment of the City's Rental Housing Inspections Program." 2012. Available at: *www.healthimpactproject.org/resources/body/OPHI-hia_final-report_8.29.pdf*

[21] *See, e.g.*, Human Impact Partners and Legal Aid of Marin, "Marin Healthy Homes Project: A Health Impact Asessment." 2012. Available at: *www.humanimpact.org/component/jdownloads/finish/8/185/0*

[22] *See, e.g.*, Pfeiffer, S. and Rohr, R., "Unsafe Building In Chinatown Prompts Tenants' Rights Campaign." 90.9 WBUR. 2012. Available at: *www.wbur.org/2012/04/23/tenants-rights*

[23] Cal. Civil Code § 1942.5.

[24] *Id.*

[25] For example, in California, for every 8,000 eligible low-income individuals, there is one legal services attorney. Legal Aid Association of California, *Strategic Plan 2011-2015, Executive Summary, 1.* 2011. Available at: *www.calegaladvocates.org/library/item.371319-LAACs_20112015_Strategic_Plan*

[26] *See* "Public Roundtable," *supra* note 19.

[27] *Id.*

[28] In New Jersey, for example, code enforcement is a state function, although the state has a cooperative Housing Inspection Program in which cities undertake the inspections for compensation from the state. N.J. Stat. Ann. § 55:13A-1 *et seq.* Under New Jersey's State Local Cooperative Housing Inspection Program (SLCHIP), in 79 localities, local inspectors perform cyclical inspections and compliance inspections of hotels, motels, and multiple dwellings and earn compensation for the locality. New Jersey Department of Community Affairs, Bureau of Housing Inspection, State of New Jersey. Available at: *www.nj.gov/dca/divisions/codes/offices/housinginspection.html#5*

[29] *See, e.g.*, Ariz. Rev. Stat. Ann. § 9-1302 (limiting the authority of city code enforcement programs to conduct inspections of the interior rental units); Ga. Code Ann. § 36-74-30 (same); N.C. Gen. Stat. Ann. § 153A-364 (same); Tenn. Code. Ann. § 6-54-511 (same).

[30] *See* Hickey, *supra* note 10.

[31] S.B. 683, Gen. Assem., Reg. Sess. (Nc. 2011) (narrowing the grounds upon which a city can conduct a periodic inspection, adding a requirement of "reasonable cause" to believe a substandard condition may exist in a residential building or structure).

[32] Most departments retain their complaint-based systems within their newly enacted PCE programs. *See*, e.g., Los Angeles, Cal Municipal Code § 5-20.401 ("Inspections may also be complaint based.").

[33] Los Angeles City Auditor, Review of the City's Systematic Code Enforcement Program. 2001. Available at: *http://controller.lacity.org/stellent/groups/electedofficials/@ctr_contributor/documents/contributor_web_content/lacityp_008107.pdf*

[34] Report to Council, City Council of Sacramento, Proposed Residential Rental Housing Inspection Pilot Program, 2006. Available at: *http://sacramento.granicus.com/MetaViewer.php?meta_id=67355&view=&showpdf=1*

[35] Sacramento, Cal. Municipal Code ch. 8.120.

[36] Kansas City, Mo. Code of Ordinances § 56-357.

[37] City of St. Louis, MO. Public Permits: Housing Conservation. N.d. Available at: *www.stlcitypermits.com/PublicPermits.aspx*

[38] St. Louis, Mo., Ordinance 69202. (2009). Available at: *www.slpl.lib.mo.us/cco/ords/data/ord9102.htm*

[39] *Id.*

[40] The Fair Housing Act, 42 U.S.C. 3601 *et seq.*

[41] U.S.C.A. Const. Amend. XIV. Several states and localities have enacted mirroring legislation to the Fair Housing Act that may provide for even greater protection and enforcement against discrimination. *See, e.g.*, Conn. Gen. Stat. Ann. § 46a-64c (2013); Cal. Govt. Code § 12955 (2013); N.C. Gen. Stat. Ann. § 41A-4 (2013).

[42] Courts have permitted at least two anti-discrimination lawsuits to proceed against localities for their targeting practices. *See* 2922 Sherman Ave. Tenants' Ass'n v. Dist. of Columbia, 444 F.3d 673, 687 (D.C. Cir. 2006) (disparate treatment theory).

[43] Gallagher v. Magner, 619 F.3d 823, 845 (8th Cir. 2010) (disparate impact theory).

[44] Los Angeles, Cal. Housing Code § 161.301.

[45] City of Washington, D.C., Department of Consumer and Regulatory Affairs, "What is the Proactive Inspections Program?" N.d. Available at: *http://dcra.dc.gov/book/about-proactive-inspections/what-proactive-inspections-program*

[46] San Francisco, Cal. Housing Code § 303 and § 401.

[47] Seattle Municipal Code § 22.214.040. The Seattle registration and inspection program will be phased in through 2016, beginning with properties with 10+ units, followed by properties with 5-9 units, and finally by properties with 1-4 units.

[48] Grand Rapids, Mich. Municipal Code § 901.2 (within Title VIII, Chapter 140: Property Maintenance Code).

[49] Working group, "Supporting the Long-Term Sustainability of Housing and Neighborhoods in Grand Rapids." 2010. Available at: *http://roofstoroots.org/userfiles/Supporting%20the%20Long-Term%20Sustainability%20of%20Housing%20and%20Neighborhoods%20FINAL%20V2.pdf*

[50] Santa Cruz, Cal. Municipal Code § 21.06.020(E).

[51] *See also* Los Angeles, Cal. Municipal Code § 161.301 (exempting dwelling units within a condominium).

[52] Boston, Mass. Municipal Code § 9-1.3.

[53] Grand Rapids, Mich. Rental Property Municipal Code § 901.2.

[54] *Id.;* Seattle, Wash. Municipal Code § 22.214.030.

[55] Center on Budget and Policy Priorities, "Comparison Between Section 8 Voucher Reform Act (SEVRA 2010), Affordable Housing and Self -Sufficiency Improvement Act (AHHSIA) and Current Law." June 2011. Available at: *www.cbpp.org/files/SEVRA-SESA-current%20law%20comparison.pdf*

[56] Center on Budget and Policy Priorities, "Rental Assistance Reform is Urgently Needed to Help Programs Cope With Funding Shortfalls." 2013. Available at: *www.cbpp.org/files/Rental-Assistance-Reform-Summary-4-3.pdf*

[57] Santa Cruz, Cal. Municipal Code § 21.06.030(B).

[58] *Id.*

[59] However, New Jersey's state-wide inspection program applies to hotels as well as multifamily properties. State of New Jersey Department of Community Affairs, Bureau of Housing Inspection. N.d. Available at: *www.nj.gov/dca/divisions/codes/offices/housinginspection.html*

[60] Registration requirements are common in systematic rental housing inspection programs, but can also be implemented independently, or in connection with other city programs like business license requirements or rent control.

[61] Kansas City, Mo. Code of Ordinances § 56-352(o).

[62] City of Grand Rapids, Code Compliance Division. "Rental and Vacancy Property FAQ's." N.d. Available at: *http://grcity.us/community-development/Code-Compliance-Division/Pages/Rental%20and%20Vacant%20Property%20FAQ's.aspx*

[63] Boulder, Colo. Rev. Code of Ordinances § 10-3-2; Baltimore County, Maryland Code of Ordinances § 35-6-105.

[64] Ann Arbor, Mich. Housing Code § 8:516.

[65] *Id at* § 8:516(3)(c).

[66] Washington, D.C. Housing Code § 200.3-200.5, 202.1-202.3.

[67] Boulder, Colo. Municipal Code § 10-3-2(a).

[68] *Id.* at § 10-3-8.

[69] *See, e.g.,* LA City Lead Poisoning Prevention Pilot Program, Healthy Homes Collaborative. N.d. Available at: *http://healthyhomescollaborative.org/Information/Lead/LACityLeadPoisoningPreventionPilotProgram/tabid/67/Default.aspx*

[70] Baltimore County, Md. Code of Ordinances §§ 35-6-107, 35-6-108; Los Angeles, Cal. Housing Code § 161.353.

[71] Boulder, Colo. Rev. Code of Ordinances § 10-3-3.

[72] Ann Arbor, Mich. Municipal Code § 8:511(1)(a).

[73] Kansas City, Mo. Code of Ordinances § 56-362.

[74] Grand Rapids, Mich. Municipal Code § 1000.1.

[75] *Id.* at § 1000.3.

[76] *Id.* at § 1000.3(1).

[77] *Id.* at § 1000.3(2).

[78] *Id.* at § 1000.3(3).

[79] In a similar vein, Boston's inspection department identifies properties in each neighborhood – based upon their inspection record, court records, documented constituent complaints, and any information related to the status of the property – for priority inspection early in the five-year cycle. Boston, Mass. Municipal Code § 9-1-3(c).

[80] Boston, Mass. Municipal Code §§ 9-1-3(a) and (f).

[81] *Id.* at § 9-1-3(g).

[82] City of Boston, Mayor's Office, "Inspection Ordinance Brings Sweeping Change to Rental Housing Standards in Boston." 2012. Available at: *www.cityofboston.gov/news/default.aspx?id=5903*

[83] *Id.*

[84] Sacramento, Cal. Municipal Code § 8.120.080.

[85] *Id.* at § 8. 120.150(A).

[86] *Id.* at § 8.120.160.

[87] *Id.* at § 8.120.180.

[88] *Id.* at § 8.120.190.

[89] Santa Cruz, Cal. Municipal Code §§ 21.06.080(A) and (C).

[90] *Id.* at §§ 21.06.080(B) and (D).

[91] *Id.* at § 21.06.070(B)(1).

[92] *Id.* at § 21.06.080(B). In contrast, self certification is the norm for the program in Berkeley, CA, which requires that all owners annually self-certify their rental units. Berkeley, Cal. Municipal Code § 12.48.050(A). However, an owner or a tenant may request instead that the city conduct an inspection to ascertain compliance with the applicable housing safety standards. If the Housing Department is not available to conduct the inspection, owners are still required to annually self-certify. *Id.* at § 12.48.050(B). If no violations are found during the city inspection, or any violations are corrected within the cure period, the unit will be exempt from the annual self-certification for approximately three years following the inspection or upon revocation of the certificate of compliance. Additionally, every rental unit is subject to a periodic city inspection, not more than once every three years. *Id.* at § 12.48.070(A).

[93] *See, e.g.*, Kansas City, Mo. Code of Ordinances § 56-364.

[94] For example, Washington, D.C. offers the Proactive Inspection Consent Form on their website in Spanish, Korean, Vietnamese, and Amharic. Department of Consumer and Regulatory Affairs, "About Proactive Inspections." N.d. Available at: *http://dcra.dc.gov/service/proactive-inspection-consent-forms*

[95] *See* Human Impact Partners, *supra* note 21.

[96] *See, e.g.*, Antioch, Cal. Municipal Code § 5-20.402, 5-20.403.

[97] *See, e.g.*, Sacramento, Cal. Municipal Code § 8.120.090 (requiring that the city shall serve written notice to the owner and the local contact representative, and shall mail a copy of the inspection notice to the rental housing units on the property).

[98] Los Angeles, Cal. Municipal Code § 161.602.2 (requiring that the General Manager give written notice to the owner and the tenants. Notice to the tenants may be mailed or posted in the public area of the premises.).

[99] *See also*, Los Angeles, Cal. Municipal Code § 161.604 (requiring that the city shall provide written notice to the occupant in each unit that an inspection occurred, including a telephone number and address where the occupant can get further information about the inspection).

[100] *Camara v. Municipal Court of City & County of San Francisco*, 387 U.S. 523, 537 (1967) (quoting *Frank v. Maryland*, 359 U.S. 360, 372 (1959)).

[101] *Camara v. Municipal Court of City & County of San Francisco*, 387 U.S. at 535.

[102] *Id.* at 528-529.

[103] *See, e.g.*, Los Angeles, Cal. Municipal Code § 161.601 ("This authority shall be subject to the following limitations: (1) If the premises is occupied, the General Manager shall first present proper credentials to the occupant and request entry explaining his reasons... If entry is refused or cannot be obtained, the General Manager shall have recourse to every remedy provided by law to secure lawful entry and inspect the premises, including but not limited to securing an inspection warrant pursuant to California Code of Civil Procedure.").

[104] *See, e.g.*, City of Sacramento, Rental Housing Inspection Program, "Tenant Consent to Inspect Rental Housing Units." 2012. Available at: *http://portal.cityofsacramento.org/~/media/Files/CDD/Code%20Compliance/Programs/Rental%20Housing/RHIPTenantConsent2-7-2012.ashx*

[105] Boulder, Colo. Rev. Code of Ordinances § 10-3-7(b)(1); Baltimore County, Md. Code of Ordinances § 35-6-107(b).

[106] Boston, Mass. Municipal Code § 9-1.3; Seattle, Wash. Municipal Code § 22.214.020(9).

[107] *City of Pasco v. Shaw*, 161 Wash.2d 450, 465 (2007).

[108] *See, e.g.*, Antioch, Cal. Municipal Code, § 5-20.205 (also allocating the costs of obtaining a warrant to the property owner).

[109] The U.S. Supreme Court, in a challenge to a San Francisco housing inspection program, clarified that administrative searches, such as routine housing inspections, do not require the same showing of particular probable cause to validate an inspection warrant as required with a criminal search warrant. Instead, any reasonable legislative program or standards that clarify why a unit is subject to inspection will satisfy the "cause" requirement of an administrative warrant. *Camara v. Municipal Court of City & County of San Francisco, 387 U.S. 523, 538-39 (1967) ("[I]t is obvious that 'probable cause' to issue a warrant to inspect must* exist if reasonable legislative or administrative standards for conducting an area inspection are satisfied with respect to a particular dwelling. Such standards, which will vary with the municipal program being enforced, may be based upon the passage of time, the nature of the building (e.g., a multifamily apartment house), or the condition of the entire area, but they will not necessarily depend upon specific knowledge of the condition of the particular dwelling.").

[110] Some states may have particular statutes addressing the requirements. *See, e.g.*, Cal. Code of Civ. Pro. § 1822.52 (California has enacted into law this reduced cause showing for administrative warrants); N.C. Gen. Stat. Ann. § 160A-424(a)(narrowly defining "reasonable cause" for the purpose of preemption).

[111] National Center for Healthy Housing, "Relationship between Interior Problems and Exterior Problems Based on the American Housing Survey - 2009 National Data for Occupied Housing." National Center for Healthy Housing. 2009. Available at: *www.nchh.org//Portals/0/Contents/Interior_and_Exterior_2009_National.pdf*

[112] Centers for Disease Control and Prevention. Healthy Housing Reference Manual. 2006. Available at: *www.cdc.gov/nceh/publications/books/housing/housing.htm*

[113] Centers for Disease Control and Prevention. Healthy Housing Inspection Manual. 2008. Available at: *www.cdc.gov/nceh/publications/books/inspectionmanual/*

[114] Kansas City, Mo. Code of Ordinances § 56-363.

[115] San Francisco, Cal. Housing Code § 303(a).

[116] *Id.*

[117] U.S. Department of Housing and Urban Development, Healthy Homes Rating Tool. N.d. Available at: *http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhrs*

[118] National Center for Healthy Housing. Pediatric Environmental Home Assessment. Online training. N.d. Available at: *www.nchh.org/Training/OnlineTraining.aspx*

[119] *See, e.g.*, City of Los Angeles Housing Department, "Preparing Residential Property for the Housing Habitability Inspection." 2005. Available at: *http://lahd.lacity.org/lahdinternet/Portals/0/Code/inspectionprep.pdf*

[120] *See, e.g.*, City of Sacramento, Rental Housing Inspection Program. General Inspection Checklist. 2011. Available at: *http://portal.cityofsacramento.org/~/media/Files/CDD/Code%20Compliance/Programs/Rental%20Housing/RHIPInspectionChecklistSampleCopy.ashx*

[121] Even localities that only inspect a sampling of rental units may require owners who self-certify to conduct self-inspections of each and every dwelling unit in a multi-unit property. *See* Sacramento, Cal. Municipal Code § 8.120.160.

[122] Sacramento, Cal. Municipal Code § 8.120.080(B).

[123] Seattle, Wash. Municipal Code § 22.214.050(G)(1).

[124] Rochester, N.Y. Municipal Code § 90 *et. seq.*

[125] *Id.*

[126] Korfmacher, K., Ayoob M., and Morley, R. , "Rochester's Lead Law: Evaluation of a Local Environmental Health Policy Innovation." *Environmental Health Perspectives*. 2012 February; 120(2); 309-315. Available at: *http://ehp.niehs.nih.gov/1103606/*

[127] *Id.*

[128] *Id.*

[129] *Id.*

[130] *Id.*

[131] D.C. Official Code, § 9-231.01 *et seq.*

[132] *See, e.g.*, Los Angeles, Cal. Municipal Code § 161.702.

[133] *Id.* at §§ 161.704.2-704.3.

[134] *Id.* at § 161.704.4.

[135] *Id.* at § 161.704.5.

[136] 24 CFR § 570.202(c).

[137] International Code Council. *International Code Council Guide to HUD CDBG Funds.* Available at: *www.iccsafe.org/gr/Pages/HUD-webcast.aspx*

[138] *Id.* at § 162 *et seq.*

[139] Los Angeles City, Los Angeles Housing Department, *REAP Outreach.* 2013. Available at: *http://lahd.lacity.org/lahdinternet/REAPOutreach/tabid/303/language/en-US/Default.aspx*

[140] Anne Arundel, Md. County Code § 11-10-102.

[141] *McDaniel v. Baranowski*, 419 Md. 560 (2011). In this case, the county code did not specifically identify an owner's failure to obtain a license as a defense against eviction.

[142] Email from Scott Sanford, City of Lansing Lead Housing Inspector. September 11, 2013.

[143] Antioch, Cal. Municipal Code § 5-20.501; City of Antioch, City of Antioch Master Fee Schedule 7 (2013). Available at: *www.ci.antioch.ca.us/CityGov/Finance/Master-Fee-Schedule-07-01-13.pdf*

[144] Santa Cruz, Cal. Municipal Code § 21.06.060; Santa Cruz, Cal. Resolution No. NS-28,345 (2011).

[145] "Rental Housing Inspection Pilot Program Update," Staff Report to Council, City Council of Sacramento, CA. 2007. Available at: *http://sacramento.granicus.com/MetaViewer.php?meta_id=122879&view=&showpdf=1*

[146] *Id.*

[147] Sacramento, Cal Ordinance NO. 2013-0013, § 8.120.050 (May 28, 2013).

[148] Depending on state law, funds collected through criminal enforcement may be restored to the enforcing locality, or allotted between the locality, state, and/or other government bodies.

[149] Kansas City, Mo. Code of Ordinances § 56-375.

[150] Sacramento, Cal. Resolution No. 2013-0171. Available at: *http://sacramento.granicus.com/MetaViewer.php?view_id=22&clip_id=3277&meta_id=399614*

[151] Boulder, Colo. Municipal Code §§ 10-3-12, 10-3-16, 10-3-17, 4-20-18.

[152] Santa Cruz, Cal. Municipal Code § 21.06.060; Santa Cruz, Cal. Resolution No. NS-28,345 (2011).

[153] Washington, D.C. Housing Code § 207. The DC ordinance also specifies an abatement fee in the amount of $175, plus $30 for each person-hour of labor beyond the first person-hour to cover city abatement of violations.

[154] Boston, Mass. Municipal Code § 9-1.3.

[155] Seattle, Wash. Ordinance No. 124011, § 17.

[156] Kansas City, Mo. Code of Ordinances § 56-376.

[157] Phone conversation with Alex Khoury, Assistant Director of the Planning Commission, City of Santa Cruz. July 17, 2013.

[158] City of Ventura. "Substandard Housing Policy." Administrative Report to City Council. July 2, 2009. Available at: *http://archive.cityofventura.net/meetings/city_council/2009/07-20-09/item%2003.pdf*

[159] Phone conversation with Andrew Stuffler, Chief Building Official, Ventura, CA. August 27, 2013.

[160] Samuels, J. et al, "Prevalence and Correlates of Hoarding Behavior in a Community-Based Sample." *Behaviour Research and Therapy,* Volume 46, Issue 7, July 2008, Pages 836-844, Doi: 10.1016/j.brat.2008.04.004. Available at: *www.ncbi.nlm.nih.gov/pmc/articles/PMC2483957/*

[161] Iervolino, A. et al, "Prevalence and Heritability of Compulsive Hoarding: A Twin Study. " *American Journal of Psychiatry,* 166:1156-1161, 2009.

[162] Mueller, J. et al, "The Prevalence of Compulsive Hoarding and Its Association with Compulsive Buying in a German Population-Based Sample." *Behaviour Research and Therapy,* 47(8): 705-709, 2009.

[163] American Psychiatric Publishing, "Obsessive Compulsive and Related Disorders." 2013. Available at: *www.dsm5.org/Documents/Obsessive%20Compulsive%20Disorders%20Fact%20Sheet.pdf*

[164] Frost, R., Steketee, G., and Williams, L., "Hoarding: A Community Health Problem." *Health and Social Care in the Community,* 8(4):229-234, 2000.

[165] Patronek, G., "Hoarding of Animals: An Under Recognized Public Health Problem in a Difficult to Study Population." *Public Health Reports.* 114(1):81-87, 1999.

[166] Castrodale, L. et al, "General Public Health Considerations for Responding to Animal Hoarding Cases." *Journal Of Environmental Health,* 72(7): 14-18, 2010.

[167] *Id.*

[168] Rodriquez, C., "Prevalence of Hoarding Disorder in Individual at Potential Risk of Eviction in New York City: A Pilot Study." *The Journal of Nervous and Mental Disease,* 200(1): 91-94, 2012.

[169] See American Psychiatric Association, *supra* note 163.

[170] Bratiotis, C., "Community Services." International OCD Foundation. N.d. Available at: *www.ocfoundation.org/hoarding/community_services.aspx*

[171] *See* Rodriquez, C., *supra* note 168.

[172] Jacobs, D., "Environmental Health Disparities in Housing." *American Journal of Public Health*, 101(S1):S119, 2011.

[173] Lubell, J., Crain, R. and Cohen, R., "The Positive Impacts of Affordable Housing on Health: A Research Summary." Washington, DC: Center for Housing Policy and Enterprise Community Partners. 2011. Available at: *www.nhc.org/publications/Housing-and-Health.html*

[174] *See* Bratiotis, C., *supra* note 170.

[175] International Exchange on Hoarding, "Massachusetts Statewide Steering Committee on Hoarding." N.d. Available at: *www.hoardingtaskforce.org/taskforces/massachusetts-statewide-steering-committee-on-hoarding*

[176] Evans, G. and Kantrowitz, E. "Socioeconomic Status and Health: The Potential Role of Environmental Risk Exposure." *Annual Review of Public Health*, 23:303-331, 2002.

[177] Curtis, M. "Effects of Child Health on Housing in the Urban U.S." *Social Science and Medicine. 71(12): 2049-2056, 2010.*

[178] *See, e.g.*, Cal. Civil Code § 1942.4.

[179] Grand Rapids, discussed above, also convened a working group of city staff and community members to expand its program to include single-family housing. Grand Rapids Work Group, *supra* note 49.

[180] Seattle, Wash. Resolution No. 31221 (June 1, 2010).

[181] A wealth of insightful documents detailing the stakeholder input process is available on the website of the Seattle Department of Planning and Development. City of Seattle Department of Planning and Development, "Rental Registration & Inspection." Available at: *www.seattle.gov/dpd/codesrules/changestocode/rentalregistrationprogram/background/default.htm*

[182] For information on the Healthy Homes Collaborative, *see supra* note 69.

[183] *Id.*

[184] Phone conversation with Indira Alvarez, Assistant Commissioner, Inspectional Services Department, City of Boston. July 23, 2013.

[185] *Id.*

[186] Phone conversation with Kathy O'Donnell, Baltimore County Rental Registration Program. July 30, 2013.

[187] Los Angeles Housing and Community Development, "Landlord - Tenant Informational Workshops." 2013. Available at: *http://lahd.lacity.org/lahdinternet/RentStabilization/LandlordTenantInformationalWorkshops/tabid/481/language/en-US/Default.aspx*

[188] Sacramento, Cal. Ordinance NO. 2013-0013, § 8.120.055 (May 28, 2013); Rental Housing Association of Sacramento Valley, Resident's Rights Form. 2013. Available at: *www.cityofsacramento.org/dsd/code-compliance/rhip/documents/ResidentsRightsandResponsibilitiesForm.pdf*

[189] City of Boston, Inspectional Services Department. Flyer for August 2013 Landlord Seminar. 2013. Available at: *www.cityofboston.gov/images_documents/Rental%20Flyer%20August%2015_tcm3-39891.pdf*

[190] City of Boston. Inspectional Services Department Website. N.d. Available at: *www.cityofboston.gov/isd/default.asp*

[191] Phone conversation with Debby Graber, Rental Licensing Program Coordinator for the Neighborhood Resource Center, Kansas City, KS. July 24, 2013.

[192] Ma, C., Gee, L., and Kushel, M., "Associations Between Housing Instability and Food Insecurity with Health Care Access in Low-Income Children." *Ambulatory Pediatrics*, 8(1):50-57, 2008.

[193] Kushel, M., et al. "Housing Instability and Food Insecurity as Barriers to Health Care Among Low-Income Americans." *Journal of General Internal Medicine*, 21(1):71-77, 2006.

[194] Reid, K., Vittinghoff, E. and Kushel, M., "Association between the Level of Housing Instability, Economic Standing and Health Care Access: A Meta-Regression." *Journal of Health Care for the Poor and Underserved*, 19(4): 1212-1228, 2008.

[195] Los Angeles, Cal. Municipal Code § 163.02 *et. seq.*

[196] Los Angeles, Cal. Municipal Code § 151.05.1.

[197] *See, e.g.*, San Francisco, Cal. Admin. Code § 37.3 (restricting annual rent increases based on capital improvements).

[198] City of Grand Rapids, "Rental Property Program Overview." N.d. Available at: *http://grcity.us/community-development/Code-Compliance-Division/Pages/Rental%20Properties.aspx*

[199] Phone conversation with Indira Alvarez, Assistant Commissioner, Inspectional Services Department, City of Boston. July 23, 2013.The registry will be publicly available online once the inspection process starts, in January 2014.

[200] Badger, Emily, "It's About to Get Much Easier to Dig Up Your Apartment's Deep, Dark Secrets. " *The Atlantic Cities*. 2013. Available at: *www.theatlanticcities.com/housing/2013/06/soon-youll-know-your-apartment-buildings-deep-dark-secrets/6013/*

[201] *Id.* City of Minneapolis (MN).

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A Survey of Proactive Rental Inspection Programs Throughout the United States

Prepared by the Cook County Department of Public Health, Lead Poisoning Prevention and Health Homes Unit

March 2015

Executive Summary

In recent decades, the importance of maintaining healthy and safe environments in homes has gained focus in the public health arena. This concern is partially driven by discoveries of adverse health effects from environmental hazards like peeling lead paint or carcinogens such as radon and asbestos, but overall is the result of residents being concerned with unsafe conditions existing in properties where they reside. Proactive rental inspection (PRI) programs may reduce those concerns.

Communities which have PRI programs have experienced a range of successes as a result of their PRI programs beyond providing healthier and safer homes for residents—the communities have noticed increased reinvestment by owners in their properties, preservation of property values, reductions in the number of housing complaints received, among other positive outcomes. PRI programs also protect vulnerable tenants who are unable due to language barriers or disability, or unwilling out of fear of retaliation, to complain about their housing conditions.[1]

The Cook County Department of Public Health developed this White Paper to describe some programs in place across the United States with regard to PRIs, so that suburban Cook County may consider implementing a PRI program that best addresses its population's needs with regard to this issues.

Introduction

PRI programs aim to reduce dangerous housing conditions and nuisances, protect the health, safety, and welfare of the residents, and to ensure that rentals meet applicable building codes by inspecting units on a periodic basis. This is in stark contrast to traditional rental inspection programs, which provide for inspection by a municipal inspector only when a resident complains to the city about his or her building or unit. PRI programs, in requiring owners to register with the local government, also allow the city or county to track the contact information for the owner who can be contacted when an emergency or dangerous condition arises. An added bonus is that it encourages owners to undertake preventive maintenance and reinvest in their properties.

Participating communities

PRI programs have been implemented in numerous communities across the United States. Most are implemented through city ordinances passed at the local level, while other places have worked at a county level to get the programs enacted[2]. Just some of the participating communities, and those discussed in this White Paper, are: Los Angeles, Sacramento, and Santa Cruz, California; Boulder, Colorado; Washington, D.C., Gary, Indiana; Baltimore County, Maryland; Boston, Massachusetts; Ann Arbor, Grand Rapids, and Lansing, Michigan; Burnsville, Minnesota; Kansas City, Missouri; Rochester, New York; Durham, North Carolina; and Seattle, Washington.

Subject properties

While there is variation in the types of properties that are included under the program, the vast majority of the researched communities require all units that are offered for rent to participate in the PRI program. Some other communities require only properties with a certain number of units to participate, such as two or three or more, while others even require abandoned or vacant properties to participate—particularly useful in communities with a derelict building problem. Baltimore County, Maryland, is unique in that it includes only properties with six or fewer units in its PRI program.[3]

Excluded properties

The studied communities routinely exempt certain properties from participation in the PRI programs, for instance:

- Commercial properties, such as hotels [although some municipalities expressly require hotels to participate in the program];
- Properties regularly inspected by another agency, such as licensed health care facilities like nursing homes and assisted living facilities, which are subject to their own inspections;
- Government regulated and/or subsidized housing, such as Section 8 housing or that owned by the federal government or local housing authority;
- New construction (i.e., properties that are less than five years old);
- Properties rented for less than 12 month period—vacation rentals, for example;

- Properties with a specified number of units (Baltimore County excludes properties with seven or more units, Boston excludes those with six or fewer units)
- Properties where the owner lives on-site [although some communities specify that this exemption applies only to buildings containing a certain number of units]; and
- Units occupied as an element of employment on the premises (e.g., housekeepers, nannies, etc.).[4, 5, 6, 7, 8, 9, 10, 11,12,13,14]

Such exemptions, however, are not necessarily automatic. In Sacramento, for example, owners of units exempted from the program are required to submit an "Application for Exemption" to the Community Development Department. The department will follow up with the unit owners should more information be needed.[15] Similarly, Rochester, New York, requires applications of exemptions for one- or two-unit properties that are owner or relative occupied to be excluded from the requirements, and applications for waiver are required for Section 8 tenant-occupied unit subject to housing authority inspections.[16]

Elements of PRI Programs

There are typically three steps to the PRI program process. First, properties must either be registered with the city—so the city knows the rental exists and who owns it—or have a certificate of compliance or a license in order to rent the property. Next, the property must undergo a periodic inspection, the frequency of which may vary greatly, to ensure it is adequately maintained to provide a safe and healthy environment for residents. Last comes enforcement; should the property fail inspection, the local laws mandates which procedures must be followed.

Registration

Most communities require property owners to inform the city or county that they possess rental units, either through the use of a registration process or by requiring a certificate of compliance (or certificate of occupancy) or a rental license to be obtained prior to renting out the units. In registering with the local government agency, owners must submit their contact information and how many units exist at the property. Most communities require that the property be registered again any time there is a change in ownership, and a certificate of compliance or rental license is likewise often required to be renewed annually, or upon a specified frequency, or upon a change in tenancy.[17]

Many communities require registration to be renewed on an annual basis.[18,19,20,21,22] Sacramento and Seattle only require registration to be renewed every five years.[23,24] Grand Rapids, Michigan, requires even vacant and abandoned properties to be registered with the city.[25]

Inspection

Under the PRI program, properties are subject to an inspection, often at the outset, before a certificate of compliance or a rental license is issued, and then periodically from that time on. Just how often properties are inspected varies among the studied communities. The time periods range from 2.5 or three years, all the way up to five or 10 years. Some specific examples of the varying frequency of inspections are:

- Boston previously required inspections only upon changes in tenancy, which was not met with much success. The city has since amended its program to require inspections every five years, with some exception (i.e., chronic offenders or problem properties).[26]
- Los Angeles requires inspections every three years, or more frequently upon the request of the tenant.[27]
- Burnsville, Minnesota, staggers its inspections so that one-third of each property's units is inspected every year—resulting in inspections on individual units occurring every three years.[28]
- Grand Rapids, Michigan, varies the length of time between inspections based on owners' compliance with the program and registration and fee requirements, and the presence or absence of violations. For example, the certificate of compliance will be issued for six years if there are no violations, the property has not changed hands since the last certification, the owner has applied for inspection and reregisters on time and owes no outstanding fees, taxes, or assessments. The certificate will be for four years should the owner apply and register on time and violations are corrected either before the expiration of the certification period or within the time specified on a notice of violation. Otherwise, the certification will be good for only two years.[29]

Once a property has demonstrated a record of compliance, some communities call for a decrease in the frequency of inspections, or may even allow for enrollment in a self-certification program, which comes at a lower cost to the property owners. Annual registration is typically required, and often requires a fee to be paid, although it is often reduced for subsequent renewals after the initial registration.

Enforcement

When an inspection is failed, most communities allow 30 days to abate the violations. [Sometimes more/less time is provided, depending on the severity of the violations.] After that time, a follow-up inspection is performed, usually for a fee. When the violations are not addressed at all, the city could start an enforcement action against the owner.

Los Angeles has a strict enforcement program whereby abatement deadlines vary depending on the severity of the violation. Non-serious violations receive a notice to comply requiring correction of the condition within 30 days, and more time may be given if, by the end of the 30 days, significant progress has been made towards correcting it. Conditions that pose a serious risk to the health and safety of residents is required to be abated within 14 days, with no extensions provided. When it comes to conditions that pose an imminent danger to the health and safety of residents, the city can order the landlord to fix the condition within 48 hours and the city will reinspect within 24 hours of that time. Should the condition still exist, the city may make the repair and charge the cost back to the owner.[30]

<u>The Mechanics of Inspections</u>

Who performs inspections? Most of the programs require that inspections be carried out by municipal inspectors or licensed private home inspectors, but the qualifications for the inspectors are not clear from the studied communities' requirements. Only Boulder, Colorado, explicitly lists what is required on its website, which involves meeting state and/or local certifications to be qualified as an inspector.[31] In

the case of programs that allow self-certification, an inspection is performed by the owner him or herself.[32]

Scope of inspections. Most inspections call for, at the very least, inspection of the interior of the unit, so where residents spend most amount of their time is safe and healthy.[33] It is not uncommon, however, for the inspection to encompass the exterior of the property and the common areas as well.

Notice of the inspection is ideally given directly to tenants, but some programs specify that notice is given to landlords who then, in turn, notify the tenants.[34]

The studied PRI programs typically focus on a visual inspection of the units, but just how thorough the inspection is varies from community to community. Often a checklist is provided on the city website for the inspector to follow, which includes such items as the condition of the unit's (1) interior (is there peeling paint, are windows and doors in good repair, are smoke detectors present and hardwired?—Washington, D.C.[35]); (2) exterior (is the building exterior "maintained so as not to pose a threat to public health, safety or welfare"—Boulder[36]); and (3) common areas (are common areas "clear at all times and in a safe and sanitary condition"—Santa Cruz, California[37]).

Other inspection examples are found in the following communities:

- Grand Rapids requires a comprehensive inspection of the interior and the exterior of the property.[38]
- In Burnsville, the exteriors and common areas of participating properties are inspected annually, but individual units are inspected only every three years.[39]
- Rochester, New York, requires all multi-unit buildings to have visual inspections for deteriorated paint and bare soil violations, and also requires buildings with five or fewer units in certain high-risk areas to have dust samples taken for testing, with results submitted to the Lead Inspection Unit.[40]
- Washington, D.C., mandates owners to obtain a clearance report from a licensed professional, indicating no lead dust hazards or deteriorated paint in any pre-1979 homes occupied by a family with a child.[41]
- In Santa Cruz, inspections not only encompass compliance with state and local housing, building, and zoning codes, but also such things as substandard maintenance conditions, improper living arrangements (overcrowding, renting of spaces not intended for habitation), parking and trash issues, and unpermitted construction.[42]

Number of units inspected. Not all programs require every unit to be inspected on an annual basis. For example, the program in place in Sacramento calls for a random sampling of no less than 10 percent of rental housing units. If any violations are found, the city inspector is authorized to inspect more, if not all, other units.[43] In Burnsville, only one-third of all units are inspected annually. At the end of a three-year period, all units have been inspected, meaning that individually units are inspected triennially.[44]

Further, Washington, D.C., has a proactive inspection program where entry must be allowed in a certain percentage of units for inspection, based on the size range of the building. For buildings with up to four

units, entry must be allowed in 50 percent of the units; for buildings with between five and 49 units, entry into 30 percent is required; and for those with 50 or more units, entry must be provided into 15 percent of the units, including at least one unit per floor and the basement.[45] Seattle, similarly, requires all units to be inspected when only one unit exists at the property; for buildings with 20 or less units, at least two must be inspected; for building with 20 or more units, 15 percent must be inspected, or up to 50 units total in each building.[46]

An important note with regard to sampling units to inspect—property owners should not be permitted to choose themselves which units will be inspected. That may lead to a skewed sample, where only those in the best condition are subject to inspection.[47]

Self-Certification. Several of the studied communities (Sacramento, Santa Cruz,[48] and Durham, North Carolina[49]) allow for owners to self-certify that their units meet applicable standards. Owners must qualify to participate in self-certification programs by having a record of passing inspections with no violations. Inspection fees may be reduced when units are owner-inspected, but a separate self-certification fee may be charged. In Durham, self-certified units are exempt from inspections for three years, except those that are randomly selected for an inspection.[50]

In Santa Cruz, properties are eligible for the self-certification program when they are well-maintained and have no code violations in three years. This subjects the units to a reduced inspection cycle where 20 percent of the units (or at least one unit) is inspected no more than every five years, as long as the property condition does not deteriorate. The property is required to pay an annual self-certification fee of $20 per unit for 20 percent of the units.[51]

In Sacramento, self-certification is allowed when no violations are found (or if found, abated within 30 days) and the owner is in compliance with provisions of the housing code and is not delinquent on fees, penalties or taxes. Annually, or upon a change in tenancy, participating owners must inspect their units using the city's self-certification checklist, make repairs, complete the self-certification form, and give a copy of the form to tenants.[52] Units are, however, subject to random inspections; 10 percent of the units will be randomly inspected.[53] Should violations be found, the property is no longer eligible for self-certification and will be inspected on an annual basis until no violations are found.

PRI Program Fees

The fees involved in the various stages of the PRI programs studies are all over the board, but depending on the fees set by a city, significant revenue may be generated. The following are the various types of fees common in PRI programs:

- *Program Fee*. Few communities charge a so-called program fee in order to participate in the PRI program. Rather, it is more common for the communities to assess a registration or licensing fee to program participants. Washington, D.C., charges a program fee, amounting to $35 per unit in a building with three or more units, which is charged at the original issuance or renewal of a license (up to $2,000 maximum). Sacramento charges a $16 per year program fee.[54]

- *Registration or License Fee*. Some communities require a license in order to legally rent units, but others simply assess a registration fee upon PRI program participants, ranging from $21.50 to $75 per unit in the studied communities. It is common that, after the initial annual registration fee, a lesser amount is charged for subsequent renewals, ranging from $15 to $25 based on the research. Late fees may be imposed on participants failing to register timely. A whole host of options regarding registration and licensing fees exist in the studied communities:
    - Santa Cruz charges a per building and per unit registration fee—$45 per building plus $20 per unit for the inspection.[55]
    - Seattle charges $175 for the property, including one unit every five years, plus $2 for each additional unit beyond the first unit.[56]
    - Los Angeles charges $43.32 per unit per year, which includes the cost of inspection whether or not the unit is due for inspection that year. [57]
    - Washington, D.C., charges a license fee of $21.50 per unit at the issuance of the license in addition to the program fee.[58]
    - Gary, Indiana, charges a $75 initial registration fee for each unit, $25 per unit each subsequent year.[59]
    - Grand Rapids does not charge a registration fee, but charges for a certificate of compliance.[60]
    - No fee is charged in Kansas City, Missouri, either, but if registration requirements are not complied with, late fees are imposed.[61]
- *Inspection Fee*. Although some programs include the costs for covering inspections into the registration fee, several programs charge a separate inspection fee, as high as $250 per unit.
    - Santa Cruz charges $20 per unit.[62]
    - Boulder charges $250 per unit for an inspection.[63]
    - Sacramento charges $127 per inspection, plus an $80 rescheduling fee.[64]
    - Grand Rapids charges $80 per hour for an inspection—more for after-hours, weekend, or holiday inspections.[65]
    - Gary does not charge an inspection fee as long as no violations are found. If violations are found, the owner is charged $75.[66]
    - Lansing, Michigan, charges a base fee per building, plus a per unit fee for the inspection. Specifically, a $215 base fee is charged for one- to two-family buildings, plus $25 per unit. Multiple family structures are charged a $150 base feel, plus $18 per unit.[67]
    - Boston charges $50 per unit for one- to three-unit buildings and $75 per unit for all other buildings. These costs include the first inspection and one follow up inspection. For three or more inspections, an additional $50 per inspection per unit is charged.[68]
- *Reinspection Fee*. Some programs charge a fee for a subsequent inspection, when the first inspection(s) fail due to violations.
    - Boston's program includes in the inspection fee two inspections, but the third and subsequent inspections are subject to a $50 charge.[69]
    - Other programs charge for any inspection past the first inspection: Washington, D.C., $90[70]; Kansas City, $100[71]; Boulder, $107[72]; Santa Cruz $107[73]; and Sacramento $127.[74]

- *Penalties*. Under most of the studied PRI programs, communities may impose civil or criminal penalties on owners who are noncompliant with program requirements. For example, in Boston, property owners included on the chronic offenders list are charged a penalty of $300 per month for as long as they remain a chronic offender.[75] In Lansing, noncompliant property owners are charged a $150 per month noncompliance fee.[76]

Lessons Learned

In considering whether to establish a PRI program in Cook County, it is important to note the problems and solutions other communities have posed, as well as additional actions those communities have taken to improve their programs' success.

Protecting and educating landlords

- Ann Arbor, Michigan, which requires an inspection prior to a certificate of compliance being issued, as mandated in order to rent, provides for a temporary certificate when scheduling conflicts prevent an inspection from being performed prior to the expiration of the current certificate.[77]
- Landlords in Los Angeles are allowed to charge tenants for PRI registration and inspection fees, as long as the costs are spread out throughout the year. [78]
- Baltimore County provides tips on how to avoid disputes between landlords and tenants on the county website.[79]
- In Boston, monthly landlord seminars are held by the Inspectional Services Department to discuss the PRI registration and inspection process.[80]

Protecting residents' rights

- Los Angeles is very active in educating residents, landlords, and owners in the risks of environmental dangers and the PRI program. Workshops and monthly drop-in sessions are held where questions that the landlords or residents have about the program are addressed. Also, should inspectors be unable to gain access to units needing inspection, an association of community-based organizations called the Healthy Homes Collaborative, partnered with the Los Angeles Housing Department and the Los Angeles County Department of Public Health, is called in. A member of the collaborative will teach residents about the dangers of lead and the need for blood lead testing, teach them how to report unsafe repairs, and advise them regarding their legal rights. Access to units increased from 20 percent to 80 percent when the collaborative is involved.[81]
- Sacramento, along with the Rental Housing Association, developed a "Residents Rights Form" that is distributed to tenants by owners upon taking possession of the unit.[82]
- In Washington, D.C., to combat language barriers that hinder the program, signs posted in the common areas of buildings and on tenants' doors are posted in both English and Spanish.[83]
- In Boston, hoarding issues discovered during inspections are referred to various state hoarding taskforces, supported by the Statewide Steering Committee on Hoarding (SSCH) facilitated by

MassHousing. The taskforces focus on addressing the psychological and policy issues resulting from hoarding.[84]

- Seattle's program requires that a renter be notified at least two days prior to the inspection to arrange access.[85]

Phasing in the program

- When Los Angeles' program was getting started, the three year frequency of inspection proved to be too much for the city to keep up with. Instead, the city implemented a phased-in approach, focusing first on oldest properties and those with a history of complaints, conducted drive-by exterior reviews, and then created a staggered inspection schedule from there.[86]
- Sacramento first initiated a pilot PRI program in two neighborhoods high in rentals, dangerous building conditions and code violations, and police/fire calls, before expanding to the entire city when the program proved successful.[87]

Special Programs

- What happens when you have an owner who fails to correct violations and lets them rack up? Boston's Chronic Offenders Program: Boston maintains a point system, tracking and accruing points for violations. When a certain amount of points is reached during a specified period of time, they are labeled a "chronic offender." Being labeled as such subjects the property owner to fines and possible court prosecution, inspection every two years by Boston's Inspectional Services Department (no non-ISD inspections allowed), and are only removed from the chronic offenders list when there are no more than two points accumulated in a 12 month period.[88]
- Boston's Problem Properties: Annual inspections are required for "problem properties," and owners must create a management plan, when a property has received four or more noise complaints or other complaints for "noxious, noisome, or unsanitary conditions, or police calls for arrestable offenses."[89]

Measuring success

- Boston requires an annual report to be submitted to the city council providing an assessment of the program and spelling out metrics for the year including the number of inspections requested and the number of those performed on a monthly basis by the various inspectors, violations found and prosecuted, exemptions requested and granted, and fines imposed and collected.[90]
- The city council in Kansas City takes a look at the city's PRI program provisions and requirements every two years to assess whether to maintain, modify, or terminate the program.[91]
- Seattle compiles an annual report including the following information: (1) an evaluation of properties' registration status; (2) owners' compliance with 60-day deadline in which to perform inspections: (3) results of inspections of properties with past violations; (4) whether program fees reflect program costs; (5) the number of inspections performed as a result of complaints; and (6) how often the civil warrant process has been resorted to.[92]

Resulting benefits

Generally, tenants benefit from PRI programs by their units inspected without having to make a complaint. This benefits those fearful of retaliation, those ignorant of their rights or how to go about making a complaint, and those vulnerable tenants who live in the most deplorable housing—the poor, the elderly, and the immigrant population facing language barriers.[93]

Benefits also extend to communities, by preventing blight, maintaining property values and the local tax base, protecting the character of neighborhoods, and preserving available housing for residents. At a lower level, PRIs makes owners accountable for the conditions of their properties, requiring landlords to perform preventative maintenance before problems at their properties become severe, and preventing the additional costs associated with deferred maintenance.[94,95] Both Grand Rapids, Michigan, and Gary, Indiana, note that the PRI programs provide the city with contact information of owners so they may be contacted with emergent or hazardous conditions at their properties. Grand Rapids' program even provides property owners with email notifications and online tools to assist in property management.[96, 97]

Some of the specific benefits recognized by participating communities are the following:

- Rochester saw a significant decline of blood lead levels due to the city's PRI program.[98]
- Sacramento has experienced a 22 percent reduction in housing and dangerous building cases.[99]
- Sacramento also saw a drop in the number of parcels with any type of violation discovered upon inspection—down from 69% in fiscal year (FY) 2008/2009 to 30% in FY 2011/2012.[100]
- Los Angeles found 90 percent of the city's multifamily housing was inspected between 1998 and 2005. The city saw 1.5 million habitability violations rectified and $1.3 billion reinvested by owners.[101]
- Greensboro, North Carolina, saw 8,700 rentals brought up to minimum standards within four years.[102]

Conclusion

Implementing a proactive rental inspection program could result in significant health benefits for tenants residing in the improved units, as well as positive implications from the standpoint of increased reinvestment in the subject properties and increased property values. The examples provided in this White Paper are varied and numerous, and should provide a good foundation for the creation of a PRI program here. Cook County should consider which aspects of the programs discussed in this White Paper, or which elements could be established that, would be best suited for the residents and property owners of this area.

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[1] ChangeLab Solutions, "A Guide to Proactive Rental Inspection Programs."2014. Retrieved from http://changelabsolutions.org/sites/default/files/Proactive-Rental-Inspection-Programs_Guide_FINAL_20140204.pdf

[2] *Id.*

[3] Baltimore County Maryland. (2014). Rental Housing Registration. Retrieved from http://www.baltimorecountymd.gov/Agencies/permits/rentalregistration/index.html

[4] Seattle.gov. Rental Registration & Inspection Code. Retrieved from http://www.seattle.gov/dpd/codesrules/codes/rentalregistration/default.htm
[5] City of Burnsville Minnesota. Rental Licensing and Inspections. Retrieved from http://www.burnsville.org/index.aspx?NID=1291
[6] City of Sacramento. Rental Housing Inspection Program. Retrieved from http://portal.cityofsacramento.org/Community-Development/Code-Compliance/Programs/Rental-Housing
[7] *Id.*, Baltimore, Registration.
[8] City of Gary, Indiana. 2013. Rental Registration Affidavit. Retrieved from http://www.gary.in.us/building-department/pdf/Exemption_Affidavit.pdf
[9] City of Boulder, Colorado. Rental Housing Licensing – Frequently Asked Questions. Retrieved from https://www-static.bouldercolorado.gov/docs/rental-housing-licensing-frequently-asked-questions-1-201406161134.pdf
[10] *Id.* ChangeLab, "Guide."
[11] City of Kansas City, Missouri. Rental Property Registration. Retrieved from http://kcmo.gov/neighborhoods/neighborhood-preservation/rental-property-registration-2/
[12] City of Boston. 2012. Re-Inspection Ordinance. Retrieved from http://www.cityofboston.gov/images_documents/Rental%20Inspection%20Ordinance-Signed%20Copy_tcm3-35341.pdf
[13] Ann Arbor, Michigan Code of Ordinances. Chapter 105 Housing Code, 8:511 Inspections. Retrieved from https://www.municode.com/library/#!/mi/ann_arbor/codes/code_of_ordinances?nodeId=TITVIIIBURE_CH105HOCO_8_516CECO
[14] City of Lansing, Michigan. Inspection Portal. Retrieved from http://www.lansingmi.gov/inspection_portal
[15] *Id.* Sacramento, Program.
[16] City of Rochester, New York. Certificate of Occupancy. Retrieved from http://www.cityofrochester.gov/article.aspx?id=8589935004
[17] *Id.* ChangeLab, "Guide."
[18] *Id.* Kansas City.
[19] City of Grand Rapids. Rental Property Registration FAQ's. Retrieved from http://grcity.us/community-development/Code-Compliance-Division/Pages/Rental%20and%20Vacant%20Property%20FAQ's.aspx
[19] *Id.* Burnsville.
[20] City of Gary, Indiana. Rental Registration/Inspection Program Fact Sheet. Retrieved from http://www.gary.in.us/building-department/pdf/Rental_Registration_Fact_Sheet.pdf
[21] *Id.* Burnsville.
[22] *Id.* Boston.
[23] City of Sacramento. Rental Housing Inspection Program Ordinance. Accessible via link from http://portal.cityofsacramento.org/Community-Development/Code-Compliance/Programs/Rental-Housing
[24] *Id.* Seattle, Code.
[25] *Id.* ChangeLab, "Guide."
[26] *Id.*
[27] Los Angeles Housing and Community Investment Department. Systemic Code Enforcement Program. Retrieved from http://lahd.lacity.org/lahdinternet/CEUSCEP/tabid/395/language/en-US/Default.aspx
[28] *Id.* Burnsville.
[29] *Id.* ChangeLab, "Guide."
[30] *Id.*
[31] City of Boulder, Colorado. 2011. The Rental License Handbook. Retrieved from https://www-static.bouldercolorado.gov/docs/PDS/forms/340_Rental_License_Handbook.pdf
[32] *Id.* ChangeLab, "Guide."
[33] *Id.*
[34] *Id.*
[35] DC.gov. 2011. Post Licensure Inspection Report One and Two Family Dwellings. Retrieved from http://dcra.dc.gov/sites/default/files/dc/sites/dcra/publication/attachments/BBL_post_licensure_BBL_checklist_v1.8.pdf

[36] *Id*. Boulder, Handbook.
[37] City of Santa Cruz, California. 2010. Resolution of the City Council of the City of Santa Cruz Adopting Checklists for Residental Rental Dwelling Unit Inspection Program. Retrieved from http://www.cityofsantacruz.com/home/showdocument?id=17385
[38] City of Grand Rapids. Rental Property Registration FAQ's. Retrieved from http://grcity.us/community-development/Code-Compliance-Division/Pages/Rental%20and%20Vacant%20Property%20FAQ's.aspx
[39] *Id*. Burnsville.
[40] *Id*. ChangeLab, "Guide."
[41] *Id*.
[42] *Id*. Santa Cruz, Resolution.
[43] *Id*. ChangeLab, "Guide."
[44] *Id*. Burnsville.
[45] DC.gov. How do these inspections work? Retrieved from http://dcra.dc.gov/book/about-proactive-inspections/how-do-these-inspections-work
[46] *Id*. ChangeLab, "Guide."
[47] *Id*.
[48] *Id*.
[49] City of Durham. Proactive Rental Inspection Program – An Overview. Retrieved from http://durhamnc.gov/ich/cb/nis/Documents/PRIP%20Documents/web%20PRIP%20Overview%206-15-2012.pdf
[50] *Id*.
[51] *Id*. ChangeLab, "Guide."
[52] *Id*.
[53] *Id*. Sacramento, Program.
[54] *Id*. ChangeLab, "Guide."
[55] *Id*.
[56] Seattle.gov. Rental Registration and Inspection Ordinance (RRIO) Program Fees. Retrieved from http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p2127179.pdf
[57] *Id*. ChangeLab, "Guide."
[58] *Id*.
[59] *Id*. Gary, Fact Sheet.
[60] City of Grand Rapids. 2014. Housing and Zoning Fee Schedule. Retrieved from http://grcity.us/community-development/Code-Compliance-Division/Documents/032612pes1105.pdf
[61] *Id*. ChangeLab, "Guide."
[62] *Id*.
[63] *Id*.
[64] *Id*.
[65] *Id*. Grand Rapids, Fee Schedule.
[66] *Id*. Gary, Fact Sheet.
[67] Lansingmi.gov. Code Compliance Activity Fees FY 2013. Retrieved from http://www.lansingmi.gov/media/view/AR_M355N_20120716_092226/2639
[68] *Id*. Boston.
[69] *Id*.
[70] *Id*. ChangeLab, "Guide."
[71] *Id*.
[72] *Id*. ChangeLab, "Guide."
[73] City of Santa Cruz, California. 2010. Frequently Asked Questions. Retrieved from http://www.cityofsantacruz.com/home/showdocument?id=15490
[74] *Id*. ChangeLab, "Guide."
[75] *Id*. Boston.
[76] *Id*. ChangeLab, "Guide."
[77] *Id*.

[78] *Id.*
[79] Baltimore County, Maryland. Landlords and Tenants: Tips on Avoiding Disputes. Retrieved from http://www.oag.state.md.us/CONSUMER/landlordTenantPDF.pdf
[80] *Id.* ChangeLab, "Guide."
[81] *Id.*
[82] *Id.* Sacramento, Program.
[83] *Id.* ChangeLab, "Guide."
[84] *Id.*
[85] *Id.*
[86] *Id.*
[87] *Id.*
[88] *Id.* Boston.
[89] *Id.*
[90] *Id.*
[91] *Id.*
[92] *Id.*
[93] ChangeLab Solutions, "Healthy Housing Through Proactive Rental Inspection."2014. Retrieved from http://changelabsolutions.org/sites/default/files/Healthy_Housing_Proactive_Rental_Inspection_FINAL_20140421.pdf
[94] *Id.*
[95] *Id.* Gary, Fact Sheet.
[96] *Id.* Grand Rapids, FAQ's
[97] *Id.* Gary, Fact Sheet.
[98] *Id.*
[99] *Id.*
[100] City of Sacramento City Council Report. May 28, 2013. Ordinance Revisions to City Code Chapter 8.120 Relating to the Rental Housing Inspection Program. Retrieved from http://sacramento.granicus.com/MetaViewer.php?view_id=22&clip_id=3277&meta_id=399614
[101] *Id.*
[102] *Id.* ChangeLab, "Healthy Housing."

F-4

Mayor
Robert J. Lovero

7th Ward
Rafael Avila

A CENTURY OF PROGRESS WITH PRIDE

6700 W 26th Street • Berwyn, IL 60402 • Ph: (708) 788-0355 • Fax: (708) 749-6417 • Berwyn-IL.gov

To: Mayor Robert J. Lovero
Members of the City Council

From: Rafael Avila
Alderman 7th Ward

DATE: September 5, 2018

Re: Handicap Parking space @1529 Kenilworth Avenue

Please be advised that Tina Gera-Durso lives and owns the building known as 1529 Kenilworth Avenue.

During a recent council meeting Tina's handicap parking space application #1207 was denied. Since Tina Gera-Durso health condition is , I am asking that we allow Tina to have a handicap parking space be installed in front of her home.

I hope that the rest of the city council members agree and support my recommendation.

Thank you for your time and consideration.

Sincerely,

Rafael Avila
7th Ward Alderman

Application Number 1207

Berwyn Police Department

6401 West 31st. Street
Berwyn, Illinois 60402
708-795-5600
Fax 708-795-5627
Emergency Call 911

Handicapped - Parking / Zone Request Form

To : Mayor Robert J. Lovero
From: Berwyn Police Department Community Service Division
Date : 6/15/2018
Officer: T Young#183

Applicant Name: Tina Gera-Durso

Address: 1529 S Kenilworth Ave Berwyn Il 60402

Telephone:

Nature of Disability:

Information

	Yes	No
Doctor's Note/ Affidavit:	x	
Owner's Support Letter	x	
Garage:	x	
Driveway:		x
Off Street:	x	
On Street:	x	

	Yes	No
Interviewed:	x	
Handicapped Plate		x
Handicapped Placard	x	
Wheelchair:		
Walker / Cane:		
Oxygen:		

Meets Police Dept Requirements		Yes	No
	Space	x	
	Zone		x

Report # 18-05664

7th Ward Alderman: RAFAEL AVILA

Staff Recommendation

Approved Denied X

J-1

The City of Berwyn

Anthony T. Bertuca
City Attorney

A Century of Progress with Pride

September 11, 2018

Margaret M. Paul
City Clerk
City of Berwyn
6700 W. 26th Street
Berwyn, Illinois 60402

Re: 17 CV-06485

Dear Ms. Paul:

Please put this item on the September 11, 2018 agenda authorizing the settlement of the above referenced matter for the total of $10,000.00 based upon City Council authority granted in Executive session.

Very truly yours,

Anthony T. Bertuca

Anthony T. Bertuca
City Attorney

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2567 www.berwyn-il.gov

J-2

The City of Berwyn

Ruth E. Volbre
Assistant City
Administrator

A Century of Progress with Pride

September 11, 2018

To: Mayor Robert J. Lovero & City Council Members

From: Ruth Volbre, Assistant City Administrator

Re: 2018 Holiday Decoration RFP

Dear Mayor and Council:

At the August 14th meeting, City Council authorized the issuance of the annual Holiday Decoration RFP; sealed bids were opened on September 5th. Two different contractors submitted sealed bids, and the lowest bid was Arte Verde Garden in the amount of $36,535.00. This bid is in line with estimates. Arte Verde was also the low bidder in 2012, 2013, 2014, 2015, 2016 and 2017; the company successfully executed the contract in each of these years. Finally, staff requests that Council authorize an additional 10% ($3,653.50) to the bid price as a contingency for any unforeseen circumstances.

Recommended Actions:

Staff recommends authorization to execute a contract with Arte Verde Gardens to provide holiday decorations to the City of Berwyn in an amount not to exceed $40,188.50.

Sincerely,

Ruth E. Volbre

Ruth Volbre
Assistant City Administrator

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2567 www.berwyn-il.gov

CITY OF BERWYN

PROJECT NAME: 2018 Holiday Decorations

BID DATE: SEPTEMBER 5, 2018 **BID TIME:** 10:30AM

DATE RECEIVED	VENDOR / ADDRESS			AMOUNT
09/04/18 @ 6:13PM	ARTE VERDE GARDEN CENTER & LANDSCAPE 15630 IL Route 76 Popular Grove, IL 61065		ROOSEVELT RD CERMAK RD OGDEN AVE DEPOT DISTRICT	$ 4,750.00 $ 11,985.00 $ 7,500.00 $ 12,300.00
09/05/18 @ 9:03AM	LANDSCAPE CONCEPTS MGMT 31745 N. ALLEGHANY ROAD GRAYSLAKE, IL 60030		ROOSEVELT RD CERMAK RD OGDEN AVE DEPOT DISTRICT	$ 12,038.00 $ 23,059.00 $ 18,502.00 $ 23,656.00

J-3

BERWYN FIRE DEPARTMENT

6700 W. 26th Street • Berwyn, IL 60402-0701
708.484.1644
Fax 708.788.3039 • Emergency 9-1-1

Denis O'Halloran
Fire Chief
do'halloran@ci.berwyn.il.us

Thomas Hayes
Assistant Fire Chief
thayes@ci.berwyn.il.us

Mayor Robert J. Lovero

September 6, 2018

To: **Mayor Robert Lovero**
Members of City Council

From: **Battalion Chief Mario J. Manfredini**

Re: **Fire Prevention Week Open House – Street Closure**

Honorable Mayor Lovero and Members of City Council,

On Saturday October 13, 2018 between the hours of 10:00am – 1:00pm the Berwyn Fire Department in conjunction with the Berwyn Firefighters Local 506 will be hosting our first annual Open House at Fire Station No.2 located at 6615 W. 16th Street.

We will have a variety of Public Education materials, presentations, interactive learning and demonstrations that day including vehicle displays, auto extrication, a live fire demonstration and a car seat check-up. We will have representatives from MacNeal – Loyola Hospital and the Berwyn Police Department "Coffee With A Cop" in our own kitchen.

I'm first sending this invitation to all elected officials and their constituents but I'm asking for permission to shut down Clarence Avenue (north of 16th Street) to our through alleys behind the fire station between the hours of 8:00am – 2:00pm to provide a safe environment for our vehicles and visitors to walk without any vehicle traffic.

I will attach a map of the area in question and a flier for the event, thank you for your consideration.

Respectfully,

Mario J. Manfredini
Battalion Chief

Fire Is Everyone's Fight

Google Maps Open House Street Closure Requested - Barricade Locations Noted

Imagery ©2018 Google, Map data ©2018 Google 20 ft

THREE BARRICADES REQUESTED
IN NOTED LOCATIONS

FIRE PREVENTION WEEK OPEN HOUSE

Saturday October 13, 2018
from 10:00am – 1:00pm
Berwyn Fire Station 2
@ 6615 W. 16th Street

SEE FIREFIGHTERS, FIRE TRUCKS & AMBULANCES
LEARN ABOUT PREVENTING FIRES
LIVE FIRE & VEHICLE EXTRICATION
PUT OUT A "FIRE" IN THE SQUIRT HOUSE
TEDDY BEAR CLINIC
FREE CAR SEAT CHECK UP
COFFEE WITH A COP (9AM-11AM)
GAMES, PRIZES AND MUCH MORE!

REFRESHMENTS SERVED
Families welcome - Come join the fun and excitment!

K-1

The City of Berwyn

Robert J. Lovero
Mayor

A Century of Progress with Pride

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2675
www.berwyn-il.gov

September 7, 2018

Mayor Robert J. Lovero
Members of the City Council
City of Berwyn

Subject: Payroll September 5, 2018

Ladies and Gentlemen:

The current payroll has been prepared for review by the finance department and is ready for approval at the September 11, 2018 meeting.

Payroll: September 5, 2018 in the amount of $1,239,653.22

Respectfully Submitted,

Finance Department

K-2

The City of Berwyn

Robert J. Lovero
Mayor

A Century of Progress with Pride

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-2675
www.berwyn-il.gov

September 7, 2018

Mayor Robert J. Lovero
Members of the City Council
City of Berwyn

Subject: Payables September 11, 2018

Ladies and Gentlemen:

The current payables were prepared for review by the finance department and are ready for approval at the September 11, 2018 meeting.

Payables: September 11, 2018 in the amount of $1,736,805.73

Respectfully Submitted,

Finance Department

CITY of BERWYN

Payment Register

From Payment Date: 9/8/2017 - To Payment Date: 9/12/2018

Number	Date	Status	Void Reason	Reconciled/ Voided Date	Source	Payee Name	Transaction Amount	Reconciled Amount	Difference
01 - General Cash									
Check									
47049	08/24/2018	Open			Accounts Payable	RICHARD JOUSEF MONDRAGON	$3,500.00		
47050	08/27/2018	Open			Accounts Payable	Jeanine Reardon	$521.10		
47051	08/28/2018	Open			Accounts Payable	AT & T	$2,683.71		
47052	08/28/2018	Open			Accounts Payable	AT&T Long Distance	$574.70		
47053	08/28/2018	Open			Accounts Payable	Industrial Organizational Solutions,Inc.	$7,480.00		
47054	08/29/2018	Open			Accounts Payable	Combined Veterans of Berwyn	$2,000.00		
47055	09/04/2018	Open			Accounts Payable	Brad Catalano	$1,296.16		
47056	09/04/2018	Open			Accounts Payable	Buddy Bear Car Wash	$1,163.00		
47057	09/05/2018	Open			Accounts Payable	Chase	$433.21		
47058	09/05/2018	Open			Accounts Payable	Emerson Parent-Teacher Association	$100.00		
47059	09/12/2018	Open			Accounts Payable	ABC Commercial Maintenance Services, Inc.	$4,746.65		
47060	09/12/2018	Open			Accounts Payable	Able Card, LLC	$1,527.13		
47061	09/12/2018	Open			Accounts Payable	Across the Street Productions	$2,600.00		
47062	09/12/2018	Open			Accounts Payable	AETNA	$38,305.60		
47063	09/12/2018	Open			Accounts Payable	Air One Equipment, Inc.	$1,499.63		
47064	09/12/2018	Open			Accounts Payable	American Mobile Shredding & Recycling, Inc.	$250.00		
47065	09/12/2018	Open			Accounts Payable	American Red Cross-Health & Safety Services	$36.00		
47066	09/12/2018	Open			Accounts Payable	AMS Electric, Inc.	$390.00		
47067	09/12/2018	Open			Accounts Payable	Amsterdam Printing & Litho Corporation	$433.70		
47068	09/12/2018	Open			Accounts Payable	Applied Controls, Inc.	$904.82		
47069	09/12/2018	Open			Accounts Payable	Aqua Chill of Chicago # 22	$123.00		
47070	09/12/2018	Open			Accounts Payable	Artistic Engraving	$286.75		
47071	09/12/2018	Open			Accounts Payable	AT & T	$3,704.66		
47072	09/12/2018	Open			Accounts Payable	AT& T	$6,825.27		
47073	09/12/2018	Open			Accounts Payable	B. Davids Landscaping	$3,295.00		
47074	09/12/2018	Open			Accounts Payable	Baker & Taylor Entertainment, Inc.	$223.37		
47075	09/12/2018	Open			Accounts Payable	Barge Terminal & Trucking	$2,366.93		
47076	09/12/2018	Open			Accounts Payable	Berwyn Ace Hardware	$101.19		
47077	09/12/2018	Open			Accounts Payable	Berwyn Development Corporation	$364,750.00		
47078	09/12/2018	Open			Accounts Payable	Blackstone Publishing	$277.30		
47079	09/12/2018	Open			Accounts Payable	Blades of Glory, Inc.	$1,605.00		
47080	09/12/2018	Open			Accounts Payable	Building Services of America,LLC	$205.90		
47081	09/12/2018	Open			Accounts Payable	Bus & Truck of Chicago, Inc.	$3,169.44		
47082	09/12/2018	Open			Accounts Payable	C. J. Camel	$500.00		
47083	09/12/2018	Open			Accounts Payable	Case Lots, Inc.	$620.70		
47084	09/12/2018	Open			Accounts Payable	Cassidy Tire	$262.50		
47085	09/12/2018	Open			Accounts Payable	CDW Government, Inc.	$1,330.54		
47086	09/12/2018	Open			Accounts Payable	Central Sod Farms Inc	$180.00		
47087	09/12/2018	Open			Accounts Payable	Chicago Office Products Co.	$2,822.75		
47088	09/12/2018	Open			Accounts Payable	Cintas Corporation	$198.33		
47089	09/12/2018	Open			Accounts Payable	Clearchannel Outdoor	$10,650.00		
47090	09/12/2018	Open			Accounts Payable	Comcast Cable	$255.84		
47091	09/12/2018	Open			Accounts Payable	ComEd	$29,036.17		

Payment Register

From Payment Date: 9/8/2017 - To Payment Date: 9/12/2018

Number	Date	Status	Void Reason	Reconciled/ Voided Date	Source	Payee Name	Transaction Amount	Reconciled Amount	Difference
47092	09/12/2018	Open			Accounts Payable	Complete Temperature Systems, Inc.	$2,147.00		
47093	09/12/2018	Open			Accounts Payable	Continental Research Corporation	$199.71		
47094	09/12/2018	Open			Accounts Payable	Crestline Specialties, Inc.	$1,403.49		
47095	09/12/2018	Open			Accounts Payable	Dearborn National Life Insurance Company	$7,494.19		
47096	09/12/2018	Open			Accounts Payable	Debbie Hutchens	$600.00		
47097	09/12/2018	Open			Accounts Payable	Deece Automotive	$1,544.00		
47098	09/12/2018	Open			Accounts Payable	Del Galdo Law Group, LLC	$11,811.62		
47099	09/12/2018	Open			Accounts Payable	Demco Educational Corporation	$1,775.49		
47100	09/12/2018	Open			Accounts Payable	Diamond Graphics, Inc.	$475.00		
47101	09/12/2018	Open			Accounts Payable	DuPage Topsoil, Inc.	$350.00		
47102	09/12/2018	Open			Accounts Payable	E.F.P., Incorporated	$9,764.84		
47103	09/12/2018	Open			Accounts Payable	Ecolab	$558.36		
47104	09/12/2018	Open			Accounts Payable	Edmund P. Wanderling	$4,225.00		
47105	09/12/2018	Open			Accounts Payable	Emergency Medical Products, Inc.	$14.70		
47106	09/12/2018	Open			Accounts Payable	Empire Cooler Service, Inc.	$92.00		
47107	09/12/2018	Open			Accounts Payable	Federal Express Corporation	$195.21		
47108	09/12/2018	Open			Accounts Payable	Felco Vending, Inc.	$140.00		
47109	09/12/2018	Open			Accounts Payable	Fire Service, Inc.	$2,437.68		
47110	09/12/2018	Open			Accounts Payable	First Book National Book Bank	$3,995.90		
47111	09/12/2018	Open			Accounts Payable	Global Emergency Products	$421.43		
47112	09/12/2018	Open			Accounts Payable	Goldstar Products INC.	$5,072.25		
47113	09/12/2018	Open			Accounts Payable	Great Lakes Concrete, LLC	$641.00		
47114	09/12/2018	Open			Accounts Payable	Grove Masonry Maintenance, Inc.	$10,800.00		
47115	09/12/2018	Open			Accounts Payable	H & H Electric Company	$1,633.45		
47116	09/12/2018	Open			Accounts Payable	Hannah Rapp	$20.30		
47117	09/12/2018	Open			Accounts Payable	Hastings Air-Energy Control	$606.99		
47118	09/12/2018	Open			Accounts Payable	Health Care Service Corporation	$947,711.39		
47119	09/12/2018	Open			Accounts Payable	Hellx Camera & Video	$242.00		
47120	09/12/2018	Open			Accounts Payable	Heritage Funeral Home	$250.00		
47121	09/12/2018	Open			Accounts Payable	Housing Forward	$6,000.00		
47122	09/12/2018	Open			Accounts Payable	Illinois Homicide Investigators Association	$2,025.00		
47123	09/12/2018	Open			Accounts Payable	Infinity Communications Group	$2,775.00		
47124	09/12/2018	Open			Accounts Payable	Ingram Library Services LLC	$4,065.26		
47125	09/12/2018	Open			Accounts Payable	Intersection Media, LLC	$1,670.00		
47126	09/12/2018	Open			Accounts Payable	Interstate Battery System of Central Chicago	$270.50		
47127	09/12/2018	Open			Accounts Payable	ITOA	$325.00		
47128	09/12/2018	Open			Accounts Payable	J & L Uniforms	$74.99		
47129	09/12/2018	Open			Accounts Payable	Jack's Rental, Inc.	$2,534.07		
47130	09/12/2018	Open			Accounts Payable	Jim Quinn	$150.00		
47131	09/12/2018	Open			Accounts Payable	JNC Consulting, Inc.	$2,750.00		
47132	09/12/2018	Open			Accounts Payable	John Wirtz	$10.00		
47133	09/12/2018	Open			Accounts Payable	Jose C. Hernandez	$10.00		
47134	09/12/2018	Open			Accounts Payable	Just Tires	$20.00		
47135	09/12/2018	Open			Accounts Payable	K-Five Hodgkins LLC	$2,153.92		
47136	09/12/2018	Open			Accounts Payable	Kane , McKenna, & Associates, Inc	$1,731.25		
47137	09/12/2018	Open			Accounts Payable	Klein, Thorpe and Jenkins, LTD.	$3,338.66		
47138	09/12/2018	Open			Accounts Payable	Laner Muchin, Ltd.	$6,723.75		

Payment Register

From Payment Date: 9/8/2017 - To Payment Date: 9/12/2018

Number	Date	Status	Void Reason	Reconciled/ Voided Date	Source	Payee Name	Transaction Amount	Reconciled Amount	Difference
47139	09/12/2018	Open			Accounts Payable	Lauterbach & Amen, LLP	$4,200.00		
47140	09/12/2018	Open			Accounts Payable	Lectorum Publications Inc.	$432.85		
47141	09/12/2018	Open			Accounts Payable	Lyons Tree Service, Inc.	$2,630.00		
47142	09/12/2018	Open			Accounts Payable	Mazza Healthcare LLC	$2,449.73		
47143	09/12/2018	Open			Accounts Payable	McDonough Mechanical Services, Inc.	$4,987.00		
47144	09/12/2018	Open			Accounts Payable	Menards	$537.49		
47145	09/12/2018	Open			Accounts Payable	Midwest Tape	$965.97		
47146	09/12/2018	Open			Accounts Payable	Miguel A. Santiago Consulting, Inc	$5,000.00		
47147	09/12/2018	Open			Accounts Payable	Mike & Sons	$335.00		
47148	09/12/2018	Open			Accounts Payable	Networkfleet, Inc.	$691.18		
47149	09/12/2018	Open			Accounts Payable	Office Depot	$369.14		
47150	09/12/2018	Open			Accounts Payable	Oriental Trading Company	$149.48		
47151	09/12/2018	Open			Accounts Payable	PACE Suburban Bus	$500.00		
47152	09/12/2018	Open			Accounts Payable	Partners & Paws Veterinary Services	$366.20		
47153	09/12/2018	Open			Accounts Payable	Partsmaster	$794.38		
47154	09/12/2018	Open			Accounts Payable	Patrick N. Murray	$2,100.00		
47155	09/12/2018	Open			Accounts Payable	PHS Locksmith	$466.40		
47156	09/12/2018	Open			Accounts Payable	Pitney Bowes	$3,954.15		
47157	09/12/2018	Open			Accounts Payable	PNC Bank, N.A.	$43,290.66		
47158	09/12/2018	Open			Accounts Payable	Power Washing Pros	$9,980.00		
47159	09/12/2018	Open			Accounts Payable	Professional Pest Control, Inc.	$185.00		
47160	09/12/2018	Open			Accounts Payable	Quinn Stitt	$10.35		
47161	09/12/2018	Open			Accounts Payable	Reliable Materials-Lyons LLC	$4,987.00		
47162	09/12/2018	Open			Accounts Payable	Richard C. Dahms	$1,215.00		
47163	09/12/2018	Open			Accounts Payable	Rocky Mountain Tracking	$539.55		
47164	09/12/2018	Open			Accounts Payable	Roscoe Company	$2,034.80		
47165	09/12/2018	Open			Accounts Payable	Santo Sport Store	$375.00		
47166	09/12/2018	Open			Accounts Payable	Sarah's Pony Rides	$225.00		
47167	09/12/2018	Open			Accounts Payable	Schultz Supply Company, Inc.	$218.68		
47168	09/12/2018	Open			Accounts Payable	Scout Electric Supply	$117.00		
47169	09/12/2018	Open			Accounts Payable	Seneca Systems, Inc	$80.00		
47170	09/12/2018	Open			Accounts Payable	Servicios Fuentes LTD	$825.00		
47171	09/12/2018	Open			Accounts Payable	Sharon Lorenzi	$7.50		
47172	09/12/2018	Open			Accounts Payable	Sherwin Williams Company	$201.52		
47173	09/12/2018	Open			Accounts Payable	Sirchie Finger Print Laboratories	$461.28		
47174	09/12/2018	Open			Accounts Payable	Specialty Mat Service	$336.96		
47175	09/12/2018	Open			Accounts Payable	Specialty Store Unlimited	$102.08		
47176	09/12/2018	Open			Accounts Payable	Sportsfields, Inc.	$731.50		
47177	09/12/2018	Open			Accounts Payable	Sprint	$1,512.20		
47178	09/12/2018	Open			Accounts Payable	Standard Equipment Company	$3,516.31		
47179	09/12/2018	Open			Accounts Payable	Suburban Tree Consortium	$575.00		
47180	09/12/2018	Open			Accounts Payable	Superior Awards	$60.00		
47181	09/12/2018	Open			Accounts Payable	SWF Products	$152.00		
47182	09/12/2018	Open			Accounts Payable	SYNCB / AMAZON	$1,603.32		
47183	09/12/2018	Open			Accounts Payable	SYNCB / AMAZON	$890.62		
47184	09/12/2018	Open			Accounts Payable	Tammy Sheedy	$47.22		
47185	09/12/2018	Open			Accounts Payable	Target Auto Parts	$2,123.92		
47186	09/12/2018	Open			Accounts Payable	Tele-Tron Ace Hardware	$416.22		
47187	09/12/2018	Open			Accounts Payable	The Children's Clinic	$10,000.00		
47188	09/12/2018	Open			Accounts Payable	Tracey Bornheim	$600.00		

Payment Register

From Payment Date: 9/8/2017 - To Payment Date: 9/12/2018

Number	Date	Status	Void Reason	Reconciled/ Voided Date	Source	Payee Name	Transaction Amount	Reconciled Amount	Difference
47189	09/12/2018	Open			Accounts Payable	Traffic Control & Protection, Inc.	$8,689.50		
47190	09/12/2018	Open			Accounts Payable	Truckpro - Chicago	$29.49		
47191	09/12/2018	Open			Accounts Payable	Tryad Automotive	$625.48		
47192	09/12/2018	Open			Accounts Payable	Uline	$354.28		
47193	09/12/2018	Open			Accounts Payable	Unique Plumbing	$40,264.88		
47194	09/12/2018	Open			Accounts Payable	US Gas	$422.40		
47195	09/12/2018	Open			Accounts Payable	Verizon Wireless - LeHigh	$1,519.66		
47196	09/12/2018	Open			Accounts Payable	Village of Romeoville Fire Academy	$525.00		
47197	09/12/2018	Open			Accounts Payable	VS Printing Services, LLC	$120.00		
47198	09/12/2018	Open			Accounts Payable	Waukegan Roofing Co., Inc.	$650.00		
47199	09/12/2018	Open			Accounts Payable	West Suburban Chief's of Police Association	$175.00		
47200	09/12/2018	Open			Accounts Payable	Winzer	$258.93		
47201	09/12/2018	Open			Accounts Payable	Yearbook LLC	$1,485.00		
47202	09/12/2018	Open			Accounts Payable	ANTHONY CHICO	$75.00		
47203	09/12/2018	Open			Accounts Payable	ANTHONY LEOPOLD	$425.00		
47204	09/12/2018	Open			Accounts Payable	BOB BARCAL	$200.00		
47205	09/12/2018	Open			Accounts Payable	BRIAN DOMINICK	$225.00		
47206	09/12/2018	Open			Accounts Payable	CHRIS NOWAK	$675.00		
47207	09/12/2018	Open			Accounts Payable	DAN KRIER	$150.00		
47208	09/12/2018	Open			Accounts Payable	GARY COPP	$350.00		
47209	09/12/2018	Open			Accounts Payable	GINA JONES	$325.00		
47210	09/12/2018	Open			Accounts Payable	GLENN DIVITA	$150.00		
47211	09/12/2018	Open			Accounts Payable	JACOB MIJARES	$325.00		
47212	09/12/2018	Open			Accounts Payable	JERRY MAIN	$750.00		
47213	09/12/2018	Open			Accounts Payable	JESSICA BENET	$100.00		
47214	09/12/2018	Open			Accounts Payable	JIM STEIN	$225.00		
47215	09/12/2018	Open			Accounts Payable	JUAN SERRANO	$200.00		
47216	09/12/2018	Open			Accounts Payable	JUAN VARGAS	$150.00		
47217	09/12/2018	Open			Accounts Payable	KRISTIAN CUATE	$125.00		
47218	09/12/2018	Open			Accounts Payable	KRISTINA NOWAK	$600.00		
47219	09/12/2018	Open			Accounts Payable	MATT ARMSTRONS	$175.00		
47220	09/12/2018	Open			Accounts Payable	MIKE CARROLL	$325.00		
47221	09/12/2018	Open			Accounts Payable	PATTI GRANDOLFO	$600.00		
47222	09/12/2018	Open			Accounts Payable	ROBERTO SALGADO	$125.00		
47223	09/12/2018	Open			Accounts Payable	SEBASTIAN NAVARRO	$250.00		
47224	09/12/2018	Open			Accounts Payable	STACI GRECO	$325.00		
Type Check Totals:					176 Transactions		$1,736,805.73		
01 - General Cash Totals									

Checks	Status	Count	Transaction Amount	Reconciled Amount

CITY of BERWYN

Payment Register

From Payment Date: 9/8/2017 - To Payment Date: 9/12/2018

Number	Date	Status	Void Reason	Reconciled/ Voided Date	Source	Payee Name	Transaction Amount	Reconciled Amount	Difference
					Open	176	$1,736,805.73	$0.00	
					Stopped	0	$0.00	$0.00	
					Total	176	$1,736,805.73	$0.00	

	All	Status	Count	Transaction Amount	Reconciled Amount
		Open	176	$1,736,805.73	$0.00
		Stopped	0	$0.00	$0.00
		Total	176	$1,736,805.73	$0.00

Grand Totals:

	Checks	**Status**	**Count**	**Transaction Amount**	**Reconciled Amount**
		Open	**176**	**$1,736,805.73**	**$0.00**
		Stopped	**0**	**$0.00**	**$0.00**
		Total	**176**	**$1,736,805.73**	**$0.00**
	All	**Status**	**Count**	**Transaction Amount**	**Reconciled Amount**
		Open	**176**	**$1,736,805.73**	**$0.00**
		Stopped	**0**	**$0.00**	**$0.00**
		Total	**176**	**$1,736,805.73**	**$0.00**

K-3

NORTH BERWYN PARK DISTRICT

September 1, 2018

The Honorable Mayor
Robert J Lovero

City Council
City of Berwyn
6700 W. 26th Street
Berwyn, Il 60402

Subject: Fall Festival

Dear Mayor Lovero and Aldermen:

I respectfully request your approval to close the alley ways surrounding Berwyn gardens park on Saturday, October 27, 2018 for the district's annual Fall Festival. The fest will run from 12Noon – 4pm, this event is attended by over 800 people from the community.

I request the alleys north and south of Berwyn Gardens, from Wenonah to Grove, and the streets Clinton and Home closed between the alley ways. Closure would begin at 5am on Saturday, and be back open by 6pm that evening.

Please feel free to contact me if you have any questions regarding this request.

Sincerely

Joseph C. Vallez
Executive Director

1619 WESLEY AVENUE, BERWYN, ILLINOIS 60402 • PHONE: 708.749.4900 • FAX: 708.749.4966 • WEBSITE: NBPLAYUN.ORG

August 2018 X-4

City of Berwyn

Girl Scouts have been selling cookies for over 100 years! In our council, we have been sponsoring our Fall Product Program for at least 50 years that I am aware of! That's certainly something any organization can be proud of but something we could never do with our Girl Scouts without support from YOU! Whether you give us permission to be in your community, and/or purchased a box of Girl Scout Cookies® and/or supported our Fall Product Program, please know that **YOU** make a difference in girls' lives every time!

Our **Fall Product Program**, which consists of nuts, candy and magazines, gives our girls the opportunity to earn start-up money for their troops. . Most Girl Scouts participate in our Fall Product Program by asking family and friends for support but there are a few troops who host a booth site in a local business and still some who sell door to door.

Fall Product order taking is from **October 1-21, 2018**, with delivery before Thanksgiving

During our **Cookie Program**, our girls do much the same but participation is much higher which I'm sure you can attest to as you see Girl Scouts ringing doorbells, in front of your favorite store or at a neighborhood meeting. Our Cookie Program strengthens our girls' 5 Skills for Daily Life which are:

Goal Setting - Decision Making - Money Management - People Skills - Business Ethics

Cookie Program door - door order taking is from **January 1-21, 2019**, with delivery in February and cookie booths from Feb-May

If your community requires us to apply for a permit, please see the Fall Product and Cookie detail sheet below. If that is sufficient information to process our request on behalf of our Girl Scouts, please simply check the box below and fax (630-544-5999) or scan (lmiller@girlscoutsgcnwi.org) it back to Linda Miller.

If more information is needed before processing our permit request, please send the forms to Linda Miller and we'll be sure to fill them out and get them back to you right away.

We are among the largest councils in the country and because we have 50,000+ Girl Scouts, distribution of badges to individuals is not possible; however, your permit or letter of approval (in a PDF format) can be e-mailed to each girl and troop efficiently from our office.

If you require a Certificate of Insurance, an updated Certificate of Insurance is automatically sent to you directly from our insurance agent on or about January 1st of each year. If you do not have it in your files, please let us know by checking the box below and we'll be sure to get that to you as well.

If you have questions or need additional information, please don't hesitate to e-mail Linda Miller at lmiller@girlscoutsgcnwi.org or call 855-456-8347 ext.1948.

Thank you for being there for our girls as we begin our 106th year of making a difference!

Most Sincerely,

Linda Miller

K-5

City Council Communication – Request for Block Party

To: Mayor Robert J. Lovero and Members of the Berwyn City Council

From: Residents of the 19 00 Block of Home (i.e. 1200 Block of Home)

Date: 9/26/18

Re: Request for Block Party Approval

Dear Mayor Lovero and City Council:

The residents of the above listed street request approval for our Block Party to be held on:

Requested Date: Sept. 29th, 2018 from 8:00 a.m. until 9:00 p.m.

Rain Date: none, 2018 from 8:00 a.m. until 9:00 p.m.

We have also submitted the following forms with this request:

- Completed City of Berwyn Event Application, and
- A petition signed by at least 50% of the homeowners residing on our block.

I am the organizer of the Block Party. I have received and read the Berwyn Code of Ordinances regarding Block Parties and Bounce Houses. My neighbors and I agree to abide by all the laws of the City of Berwyn and State of Illinois. In addition, we state that:

- We understand that the **use of fireworks is illegal** in Berwyn and in Illinois. We understand that our use of fireworks during our block party may result in the cancelling of our permit resulting in the ending of our party along with the possible issuance of tickets and fines.
- We also understand that Live Bands, DJ's or any amplified music must be kept at a reasonable level so as not to disturb other neighbors.
- We agree to clean up our block after the party.

As the permit holder, I understand that I am accepting responsibility for the activities conducted during the time of this permit. I also agree to notify all my neighbors of the date and time of the Block Party.

Thank you for considering our Block Party request,

Hope Geldes

Print Name

1922 Home Ave

Address

[redacted]

Phone Number

[redacted] .com

E-mail Address

PLEASE RETURN TO THE OFFICE OF THE CITY CLERK 8 WEEKS PRIOR TO YOUR REQUESTED DATE
6700 W 26th St, Berwyn, IL 60402 Phone: 708-749-6452

Rev. 4-2018

K-6

City Council Communication – Request for Block Party

To: Mayor Robert J. Lovero and Members of the Berwyn City Council

From: Residents of the 19 00 Block of Wenonah Ave (i.e. 1200 Block of Home)

Date: 9/6/18

Re: Request for Block Party Approval

Dear Mayor Lovero and City Council:

The residents of the above listed street request approval for our Block Party to be held on:

Requested Date: 9/29/18, 2018 from 8:00 a.m. until 9:00 p.m.

Rain Date: 10/6/18, 2018 from 8:00 a.m. until 9:00 p.m.

We have also submitted the following forms with this request:

- Completed City of Berwyn Event Application, and
- A petition signed by at least 50% of the homeowners residing on our block.

I am the organizer of the Block Party. I have received and read the Berwyn Code of Ordinances regarding Block Parties and Bounce Houses. My neighbors and I agree to abide by all the laws of the City of Berwyn and State of Illinois. In addition, we state that:

- We understand that the **use of fireworks is illegal** in Berwyn and in Illinois. We understand that our use of fireworks during our block party may result in the cancelling of our permit resulting in the ending of our party along with the possible issuance of tickets and fines.
- We also understand that Live Bands, DJ's or any amplified music must be kept at a reasonable level so as not to disturb other neighbors.
- We agree to clean up our block after the party.

As the permit holder, I understand that I am accepting responsibility for the activities conducted during the time of this permit. I also agree to notify all my neighbors of the date and time of the Block Party.

Thank you for considering our Block Party request,

Patrick Watkins

Print Name

1938 Wenonah Ave

Address

[redacted]

Phone Number

[redacted]

E-mail Address

PLEASE RETURN TO THE OFFICE OF THE CITY CLERK 8 WEEKS PRIOR TO YOUR REQUESTED DATE
6700 W 26th St, Berwyn, IL 60402 Phone: 708-749-6452

Rev. 4-2018

Robert J. Lovero
Mayor

K-7

Charles D. Lazzara
Building Director

A Century of Progress with Pride

6700 West 26th Street Berwyn, Illinois 60402-0701 Telephone: (708) 788-2660 Fax: (708) 788-1427
www.berwyn-il.gov

September 4, 2018

Honorable Robert J. Lovero
Mayor of the City of Berwyn
Members of City Council

Re: Building and Local Improvement Permits

Gentlemen:

Attached is the financial report of Building and Local Improvement Permits issued by the City of Berwyn for the month of August 2018, along with a copy of Permit Statistics for this same period.

Respectfully,

Charles D. Lazzara
Building Director

Report Of Building Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address			Issued	Permit No.		Cost Of Improvements	Cost Of Permit
QMI LLC	1220 S. Wisconsin Avenue	reinspection for electrical rough and fee for preliminary framing for joists in ceiling and floor 2ND FLOOR ADDITION TO INCLUDING 3 BEDROOM AND 2 BATHROOM. REFRAMING 1ST FLOOR, INSTALL NEW INSULATION AND DRYWALL, INSTALL NEW STAIRCASE, REMODEL THE KITCHEN	8/3/2018	Bldg-B	8608-4	$0.00	$115.00
Sonia Gil	1940 S. Clinton Avenue	PAYING FOR UNDERGROUD INSPECTIONS ON B-1	8/14/2018	Bldg-B	8708-2	$0.00	$150.00
Santiago Daniel	6531 W. 26th Place	electrical rough reinspection and structural prelim inspection -- REMODELING THE BASEMENT - ADDING 3 BEDROOM, 1 BATHROOM, FRAMING EXISTING UTILITY ROOM AND RELOCATE STAIRS - NO WASHING MACHINE - JUST UTILITY SINK - UPGRADE WATER METER TO 3/4". INSTALL WI	8/3/2018	Bldg-B	8714-1	$0.00	$115.00
Shivani Anand	2224 S. Highland Avenue	PLUMBING FINAL AND WATER PRESSURE TEST REINSPECTION	8/30/2018	Bldg-B	8743-3	$0.00	$100.00
Christina Solis	3613 S. Gunderson Avenue	ADDITIONAL ROUGH REINSPECTION INSPECTION AND ELECTRICAL FINAL REINSPECTION	8/3/2018	Bldg-B	8800-1	$0.00	$100.00
Healy Renovations LLC	3747 S. Wisconsin Avenue	additional inspection - CHLOROLOY inspection, gas pressure test and 3 plumb underground pvc inspection	8/14/2018	Bldg-B	8871-2	$0.00	$250.00
Healy Renovations LLC	3747 S. Wisconsin Avenue	FEES ONLY: FRAMING/ HVAC/ BUILDING	8/24/2018	Bldg-B	8871-3	$0.00	$195.00
Jose G Rico & Erik Corral	1231 S. Highland Avenue	BUILDING FINAL REINSPECTION FOR GUT AND REHAB TO INCLUDE NEW BATHROOM INSTALL IN BASEMENT. BASEMENT TO BECOME RECREATION ROOM, CHECK FOR EGRESS IN BASEMENT, ADDING NEW A/C UNIT AND R/R FURNACE, FULL KITCHEN REMODEL AND FULL REMODEL OF 2 EXISTING BATHROOMS	8/3/2018	Bldg-B	8932-3	$0.00	$65.00
Hector Garcia Living Trust	3630 S. Highland Avenue	DIG UP STREET TO LOCATE AND REPAIR SEWER VIDEO.	8/9/2018	Bldg-B	8937-1	$3,000.00	$105.00
Hector Garcia Living Trust	3630 S. Highland Avenue	REINSPECTION PRE-POUR STREET	8/22/2018	Bldg-B	8937-2	$0.00	$50.00
Hector Garcia Living Trust	3630 S. Highland Avenue	reinspection fee only for failed prepour street on 8/23/18	8/24/2018	Bldg-B	8937-3	$0.00	$50.00
Walton Contractors LLC	2231 S. Grove Avenue	UPGRADE WATER SERVICE TO 1".	8/2/2018	Bldg-B	8964-1	$7,500.00	$1,630.00
1221 S. Harlem LLC	1221 S. Harlem Avenue #C	ROUGH FRAMING INSPECTION	8/10/2018	Bldg-B	8987-1	$0.00	$140.00
Alicia Aguilar Santos	6953 W. 30th Street	paying for additional inspection - plumbing underground kitchen sink basement insulation and final plumbing reinspection	8/13/2018	Bldg-B	9004-2	$0.00	$165.00
JAMES LYNCH	2341 S. Gunderson Avenue	ELECTRICAL ROUGH REINSPECTION REMODEL THE KITCHEN AND 3 EXISTING BATHROOMS - R/R CABINETS, COUNTERTOP, SINKS, VANITY. R/R THE DRYWALL IN THE EXISTING 1 BEDROOM, 1 EXISTING BATHROOM AND 1 RECREATIONAL SPACE WITH WINDOWS TO EGRESS CODE ON THE 2ND FLOOR .	8/13/2018	Bldg-B	9017-1	$0.00	$50.00

Report Of Building Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 **And** 8/31/2018

Name and Address			Issued	Permit No.		Cost Of Improvements	Cost Of Permit
SOMETHING MADE NEW LLC	2630 S. Oak Park Avenue	DUMPSTER ON THE STREET TO REMOVE CONSTRUCTION DEBRIS DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	8/1/2018	Bldg-B	9027-3	$0.00	$50.00
SOMETHING MADE NEW LLC	2630 S. Oak Park Avenue	PRE-POUR SIDEWALK FEE ONLY. HEATHER RIDGE	8/16/2018	Bldg-B	9027-4	$0.00	$50.00
Concordia/Cermak Plaza Associa	7111 W. Cermak Road	INTERIOR REMODELING FOR TONY'S FRESH MARKET, 2 NEW HANDICAP BATHROOMS AND NEW BREAKROOM.	8/1/2018	Bldg-B	9073-0	$12,500,000.00	$3,727.50
ADL Renovations	3512 S. East Avenue	ADDING ATTACHED GARAGE W/ ADDITION (4) BEDROOM/CLOSET---. (3 1/2 BATHROOMS. --BEDRROM IN IN EACH FL, BATHROOMS (1) IN EACH FL WT BMST BATHROOM.	8/2/2018	Bldg-B	9074-0	$50,000.00	$575.00
Patricia Huizar	1823 S. Highland Avenue	NEW 23X24 GARAGE 12' HEIGHT.	8/3/2018	Gar-B	9075-0	$10,000.00	$275.00
Koko Marina West LLC	7001 W. Ogden Avenue	REMODEL AND BUILD OUT FOR DENTAL OFFICE -- RELOCATE EXISTING BATHROOM AND EXPAND FRONT DENTAL OFFICE INTO REAR APT. - IN THE RESIDENTIAL SPACE - RELOCATE BATHROOM, TURN BEDROOM INTO OPERATORY ROOM, CONVERT KITCHEN INTO LUNCH ROOM/BREAK ROOM. ----------NO	8/7/2018	Bldg-B	9076-0	$95,873.00	$2,890.00
Raul Everardo Vazquez Sanchez	6513 W. 27th Place	DEMOLISH EXISTING GARAGE SIZE OF NEW GARAGE 32' 50' X 22' HEIGHT 14'. DEMO EXISTING GARAGE POUR NEW SLAB 4" GRAVEL AND 6" CONCRETE, BUILD A NEW GARAGE W/ 2'X4' FOR WALLS AND 2X6 FOR JOIST. ALL ASSOCIATED EXTERIOR FIXTURES.	8/6/2018	Bldg-B	9077-0	$8,000.00	$325.00
Milan A. Marek	3524 S. Gunderson Avenue	COMPLETE HOUSE DEMO DUE TO FIRE. REBUILD A NEW SINGLE FAMILY HOUSE. INSTALL A NEW 1 1/2 WATER SERVICE. 1ST FLOOR WILL CONSIST OF KITCHEN, 1 BEDROOM, 1 1/2 BATHS, DINING ROOM, AND LIVING ROOM. 2ND FLOOR ILL CONSIST OF 3 BEDROOM, 2 BATHROOM AND MECHANICAL R	8/6/2018	Bldg-B	9078-0	$180,000.00	$6,370.00
Bernard J. Kowalski	6818 W. 26th Street	2ND STORY ADDITION FOR 2ND FLOOR UNIT. CURRENTLY 1ST FLOOR HAS 2 UNITS-PLANS ON SPLITTING INTO 2 UNITS TOP AND BOTTOM. 1ST FLOOR COMPLETE REMODEL AND DECONVERT 1ST FLOOR BATHROOM INTO INTO A LAUNDRY ROOM AND COMMON AREA. 2ND FLOOR WILL BE A SEPARATE UNIT	8/7/2018	Bldg-B	9079-0	$80,000.00	$2,275.00
PRAIRIE CAVE LLC	2824 S. Highland Avenue	INTERIOR REMODEL - 1ST FLOOR- KITCHEN, DINING ROOM, LIVING ROOM, 2 EXISTING BEDROOM AND 1 EXISTING FULL BATHROOM. 2ND FLOOR - ADDING MASTER BATHROOM ROOM AND 1 MASTER BATHROOM. BASEMENT - EXISTING BEDROOM, EXISTING BATHROOM, LAUNDRY ROOM. MECHANICAL ROOM	8/9/2018	Bldg-B	9080-0	$88,000.00	$3,645.00
Caleb J. Kimmel	6444 W. 27th Street	BUILD NEW GARAGE 21X22 WITH 15' HEIGHT. JULIE DIG #X2211464	8/10/2018	Gar-B	9081-0	$6,500.00	$300.00

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Report Of Building Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 **And** 8/31/2018

Name and Address			Issued	Permit No.		Cost Of Improvements	Cost Of Permit
Miguel Avalos	1427 S. Harvey Avenue	CREATE 2 NEW BEDROOMS IN THE BASEMENT BY BUILDING 3 WALLS, USING EXISTING DUCT WORK IN THE CEILING -- OWNER STATES EGRESS WINDOWS EXIST - THIS WILL BE CHECK ON THE BUILDING FINAL INSPECTION.	8/10/2018	Bldg-B	9082-0	$200.00	$100.00
Pete Highland Realty Ltd	2123 S. Home Avenue	FRAME OUT BASEMENT WITH EXISTING BATHROOM, STORAGE ROOM, LAUNDRY AND MECHANICAL ROOM, CREATE AN OPEN RECREATION SPACE, CREATE 2 BEDROOM =S IN ATTIC AND ADD 3/4 BATHROOM, 1ST FLOOR REMODEL KITCHEN AND BATHROOM, ALL NEW ELECTRIC, PLUMBING AND HVAC. NEW FURN	8/10/2018	Bldg-B	9083-0	$107,400.00	$2,755.00
Darlene Tomecek	3536 S. Kenilworth Avenue	DEMO AND REBUILD A 19'(WIDE) X 22' X 14'(H) GARAGE.	8/14/2018	Gar-B	9084-0	$3,200.00	$325.00
Ethel Rus	3834 S. Clinton Avenue	INSTALL 4 NEW SUPPLY VENTS AND RETURN VENT IN BASEMENT, REMODEL KITCHEN, FRAMES OUT BASEMENT FOR 1 BEDROOM AND RECREATIONAL AREA, COMPLETE REMODEL 2 EXISTING BATHROOMS (1ST FLOOR AND BASEMENT) ALL ELECTRIC, PLUMBING AND HVAC TO CODE. NEW ELECTRICAL SERVIC	8/14/2018	Bldg-B	9085-0	$35,000.00	$1,160.00
Maria Guadalupe Carreno	3810 S. Ridgeland Avenue	INSTALL (1) NEW BATHROOM, BEDROOM, AND CLOSET IN BASEMENT. REMOVE CURRENT CLOSETS AND REPLACE WITH NEW ONES. REMOVE PANELS ON WALLS AND CEILING AND REPLACE WITH DRYWALL. INSTALL NEW FLOOR AND REFINISH BASEMENT STAIRS. BRING WINDOWS TO EGRESS CODE WHERE N	8/14/2018	Bldg-B	9086-0	$1,400.00	$830.00
Lopez & Garcia	3708 S. Wesley Avenue	DEMOLISH EXISTING GARAGE. SIZE OF NEW GARAGE 24 X 22 W/ 13FT HEIGHT . JULIE DIG # A2261888-00A	8/15/2018	Bldg-B	9087-0	$23,500.00	$325.00
Garcia Homes, Inc.	2404 S. Cuyler Avenue	2ND FLOOR ADDITION AND INTERIOR REMODEL. - 1ST FLOOR TO INCLUDE 1 EXISTING BEDROOM AND ELIMINATE 1 BEDROOM TO INCREASE THE SIZE OF THE KITCHEN, KITCHEN, LIVING ROOM, DINING ROOM AND 1 EXISTING FULL BATHROOM. 2ND FLOOR ADDITION TO INCLUDE MASTER BEDROOM,	8/15/2018	Bldg-B	9088-0	$108,000.00	$3,980.00
Maria Radjevic	6446 W. 27th Place	DEMO THE GARAGE.	8/16/2018	Gar-B	9089-0	$0.00	$40.00
Getsemani Nava	2443 S. Clinton Avenue	INSTALL NEW BATHROOM USING EXISTING TOILET FIXTURE(EXISTING TOILET AND EXHAUST FAN) IN BASMENT. FRAME, ADD LIGHT , FIXTURES, CABINETS, SINK, HEAT TO CODE. RELOCATE AND REPLACE WATER HEATER. INSTALL NEW COPPER PIPING THROUGHOUT HOUSE. RELOCATED LAUNDRY UNI	8/22/2018	Bldg-B	9090-0	$10,500.00	$735.00

Report Of Building Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address			Issued	Permit No.		Cost Of Improvements	Cost Of Permit
Alan Garcia & Maria Garcia	1840 S. Gunderson Avenue	2 UNIT. MAKE ILLEGAL BEDROOMS IN BASEMENT LEGAL, INSTALL EGRESS WINDOWS AND INSTALL PERMANENT HEAT SOURCE. INSTALL EXHAUST FANS IN 2 BATHROOM AND 2 KITCHENS-RDV CHECK FOR ELECTRICAL HOOK UP FOR EXHAUST FAN IN BATHROOMS. DECONVERT BASEMENT KITCHEN-CAP ALL	8/22/2018	Bldg-B	9091-0	$1,700.00	$140.00
Hector & Sylvia Trujillo	3824 S. Highland Avenue	ATF ATTIC WALLS INSULATE AND DRYWALL FOR STORAGE, ATF BASEMENT BATHROOM, DECONVERT BASEMENT KITCHEN. CHECK FOR EGRESS.	8/22/2018	Bldg-B	9092-0	$1,500.00	$540.00
Elias Lopez Vazquez	2640 S. Lombard Avenue	RADIATORS TO FORCED AIR-INSTALL ATTIC FURNACE AND VENTS IN EACH ROOM	8/23/2018	Bldg-B	9093-0	$3,500.00	$350.00
Gus Santiago	3803 S. Ridgeland Avenue	ATF: KITCHEN REMODEL W/T CAN LIGHTS ENLARGED LIVING ROOM (PARTION WALL REMOVED) BASEMENT FINISHED W/T BATHROOM INSTALL. INSTALL EGRESS WINDOW. EGRESS SIGNED. REMOVAL OF OLD RER DECK AND INSTALLATION OF NEW LAYERED DECK . NEW STAMPED PATIO IN YARD. COMPLE	8/24/2018	Bldg-B	9094-0	$5,000.00	$705.00
Daniel & Kim Leali	6826 W. 29th Place	GARAGE DEMO IN 2017. ERECT NEW (2) CAR GARAGE (19 X 23') W/ HEIGHT OF 14'.	8/27/2018	Bldg-B	9095-0	$18,500.00	$300.00
Richard Plaza	1326 S. Scoville Avenue	ADD NEW CONTROLLABLE PERMANENT HEAT SOURCE IN LAUNDRY ROOM, BEDROOM, REC ROOM AND BATHROOM, EXTERIOR WALLS WERE DRYWALL AND INSTALLED RECESSED LIGHTING, INSTALL EGRESS WINDOW TO BEDROOM AND REC ROOM IN BASEMENT, RENOVATED THE MAIN FLOOR BATHROOM WITH TUB,	8/28/2018	Bldg-B	9096-0	$2,500.00	$500.00
FP BUCKTHORN LTD	2625 S. Clarence Avenue	BUILD OFFICE IN BASEMENT, ADDING 1 BEDROOM AND 1 BATHROOM IN ATTIC, ALL NEW ELECTRIC, PLUMBING AND HVAC TO CURRENT CODE, R/R EXISTING KITCHEN AND BATHROOMS, SIDING ON GARAGE. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND E	8/29/2018	Bldg-B	9097-0	$75,000.00	$665.00
Ann Nowak & Benjamin Frinfrock	2332 S. Clinton Avenue	DEMO AND REBUILD GARAGE - 24' X 25.6' X 15'(H).	8/31/2018	Gar-B	9098-0	$18,350.00	$350.00
Kayla T. Fauria	1217 S. Home Avenue	OPEN MIDDLE BEDROOM DOORWAY TO CREATE OPEN OFFICE AREA - REMOVING BEDROOMS....COMPLIANCE REPAIRS - MIDDLE BEDROOM MUST HAVE A CONTROLLABLE PERMANENT HEAT SOURCE, ANY OPEN LIGHTS IN CLOSETS, STORAGE ROOMS, STAIRWELLS AND BASEMENT CEILING TO BE MADE FULLY ENC	8/31/2018	Bldg-B	9099-0	$5,000.00	$285.00
J Pass LLC	1411 S. Highland Avenue	NEW CONSTRUCTION OF A SINGLE FAMILY HOUSE. 5 BEDROOMS- 4 BATHROOMS - 1ST FLOOR WILL CONSIST OF KITCHEN, 1 BEDROOM, 1 BATHROOM, LIVING ROOM AND DINING ROOM. 2ND FLOOR WILL CONSIST OF 3 BEDROOMS, 2 BATHROOMS AND LAUNDRY ROOM, BASEMENT WILL CONSIST OF 1 BEDR	8/31/2018	Bldg-B	9100-0	$200,000.00	$5,835.00

Report Of Building Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 **And** 8/31/2018

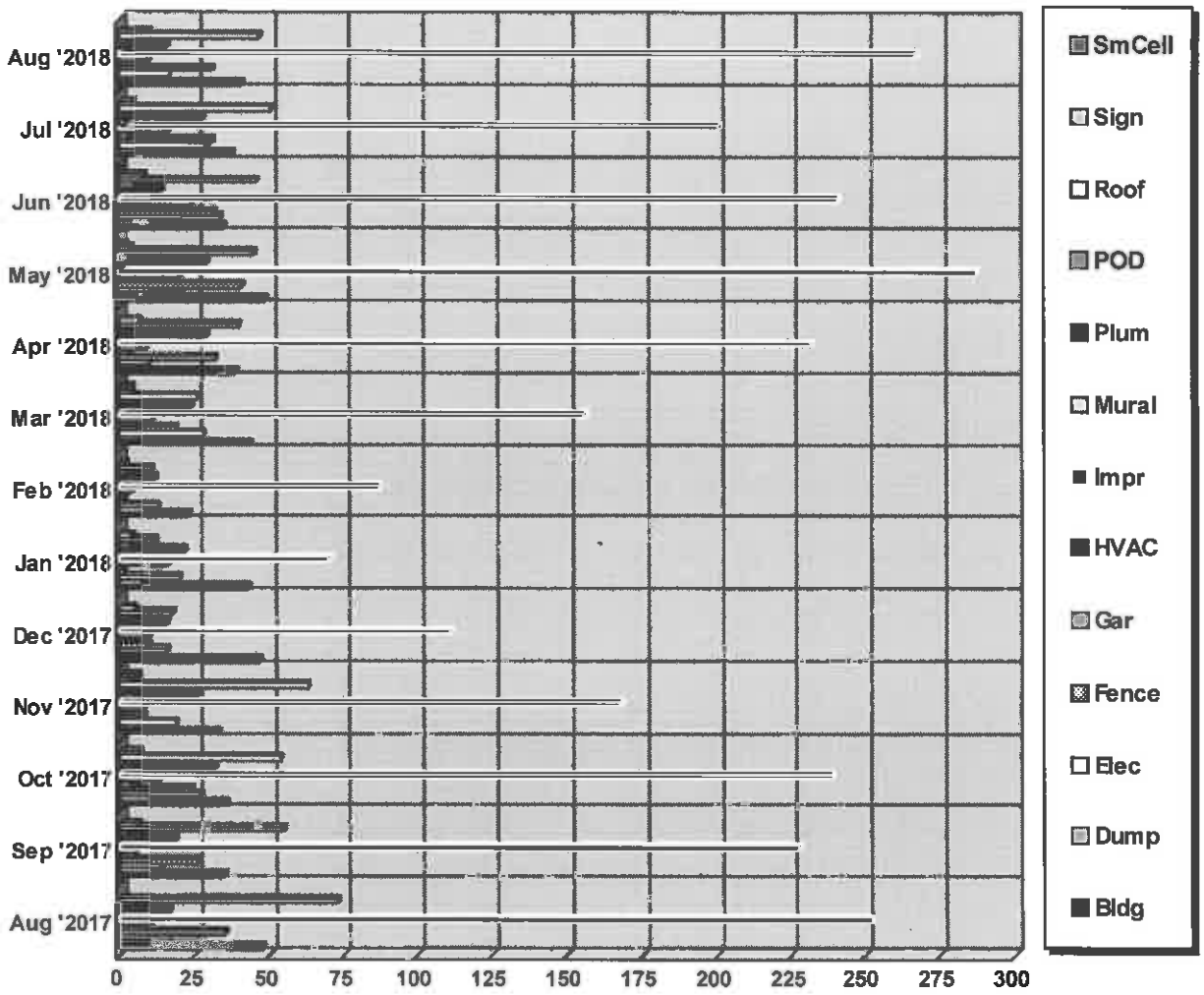
Name and Address			Issued	Permit No.		Cost Of Improvements	Cost Of Permit
Daniel Cooper	2324 S. Clinton Avenue	INTERIOD DEMO OF 1ST FL/2 AND FL KITCHEN AND BATHROOM, BMST DEMO TO STUDS. 2ND FL BATHROOM TO HAVE CONTROLLABLE PERMANENT HEAT SOURCE INSTALLED. INSTALL EGRESS 2ND FL BEDROOM. KITCHEN COUNTERS TO HAVE GFCI OUTLETS INSTALLED. BATHROOMS TO HAVE GFCI OUTLETS	8/31/2018	Bldg-B	9101-0	$34,950.00	$585.00
46	**Building Permits Issued During Period**			**Totals . . . . .**		**$13,684,073.00**	**$44,267.50**

City Council (Full Packet) September 11, 2018 Page 333

Permits Issued

Tuesday, September 4, 2018 9:43 AM

For Period Beginning 8/1/2017 *And Ending* 8/31/2018



Permit Detail

2018	August	Bldg	41	
2018	August	Dump	13	
2018	August	Elec	17	
2018	August	Fence	31	
2018	August	Gar	5	
2018	August	HVAC	10	
2018	August	Impr	267	
2018	August	Plum	16	
2018	August	POD	3	
2018	August	Roof	47	
2018	August	Sign	10	
				460
2018	July	Bldg	38	
2018	July	Dump	23	
2018	July	Elec	29	
2018	July	Fence	31	
2018	July	Gar	3	
2018	July	HVAC	16	
2018	July	Impr	201	
2018	July	Mural	2	
2018	July	Plum	28	
2018	July	POD	1	
2018	July	Roof	51	
2018	July	Sign	5	
				428

2018	June	Bldg	35	
2018	June	Dump	11	
2018	June	Elec	34	
2018	June	Fence	32	
2018	June	Gar	5	
2018	June	HVAC	24	
2018	June	Impr	241	
2018	June	Plum	14	
2018	June	POD	5	
2018	June	Roof	46	
2018	June	Sign	8	
2018	June	SmCell	1	
				456

Permit Detail

2018	May	Bldg	49	
2018	May	Dump	11	
2018	May	Elec	21	
2018	May	Fence	41	
2018	May	Gar	4	
2018	May	HVAC	20	
2018	May	Impr	287	
2018	May	Mural	1	
2018	May	Plum	29	
2018	May	POD	4	
2018	May	Roof	45	
2018	May	Sign	4	
2018	May	SmCell	2	
				518
2018	April	Bldg	39	
2018	April	Dump	4	
2018	April	Elec	10	
2018	April	Fence	32	
2018	April	Gar	3	
2018	April	HVAC	9	
2018	April	Impr	232	
2018	April	Plum	29	
2018	April	POD	2	
2018	April	Roof	40	
2018	April	Sign	7	
				407
2018	March	Bldg	44	
2018	March	Dump	9	
2018	March	Elec	28	
2018	March	Fence	19	
2018	March	Gar	3	
2018	March	HVAC	11	
2018	March	Impr	156	
2018	March	Plum	24	
2018	March	POD	4	
2018	March	Roof	26	
2018	March	Sign	4	
2018	March	SmCell	4	
				332
2018	February	Bldg	23	
2018	February	Dump	9	
2018	February	Elec	13	
2018	February	Fence	1	
2018	February	Gar	2	
2018	February	HVAC	4	
2018	February	Impr	87	
2018	February	Plum	12	
2018	February	POD	2	
2018	February	Roof	11	
2018	February	Sign	2	
				166
2018	January	Bldg	43	
2018	January	Dump	8	
2018	January	Elec	20	
2018	January	Fence	1	
2018	January	HVAC	16	
2018	January	Impr	70	
2018	January	Plum	22	
2018	January	POD	4	
2018	January	Roof	12	
2018	January	Sign	4	
				200
2017	December	Bldg	47	
2017	December	Dump	2	
2017	December	Elec	16	
2017	December	Fence	10	
2017	December	Gar	2	
2017	December	HVAC	10	
2017	December	Impr	111	
2017	December	Plum	16	
2017	December	POD	4	
2017	December	Roof	18	
2017	December	Sign	5	
				241
2017	November	Bldg	33	
2017	November	Dump	19	
2017	November	Elec	19	
2017	November	Fence	8	
2017	November	Gar	1	
2017	November	HVAC	8	
2017	November	Impr	168	
2017	November	Plum	26	
2017	November	POD	2	
2017	November	Roof	63	
2017	November	Sign	3	
2017	November	SmCell	6	
				356
2017	October	Bldg	36	
2017	October	Dump	10	
2017	October	Elec	27	
2017	October	Fence	24	
2017	October	Gar	4	
2017	October	HVAC	13	
2017	October	Impr	239	
2017	October	Plum	32	
2017	October	POD	1	
2017	October	Roof	54	
2017	October	Sign	7	
				447
2017	September	Bldg	35	
2017	September	Dump	11	
2017	September	Elec	14	
2017	September	Fence	26	
2017	September	Gar	5	
2017	September	HVAC	5	
2017	September	Impr	228	
2017	September	Plum	19	
2017	September	POD	2	
2017	September	Roof	55	
2017	September	Sign	6	
				406
2017	August	Bldg	48	
2017	August	Dump	11	
2017	August	Elec	26	
2017	August	Fence	35	
2017	August	Gar	10	
2017	August	HVAC	10	
2017	August	Impr	252	
2017	August	Plum	17	
2017	August	POD	3	
2017	August	Roof	73	
				485

Total Permits Issued ***4902***

Permits Issued By The Building Department

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Building	Permits Issued:	41	Cost of Improvements:	$13,646,023.00
Dumpster	Permits Issued:	13	Cost of Improvements:	$2,600.00
Electrical	Permits Issued:	17	Cost of Improvements:	$13,241.00
Fence	Permits Issued:	31	Cost of Improvements:	$81,323.00
Garage	Permits Issued:	5	Cost of Improvements:	$38,050.00
HVAC	Permits Issued:	10	Cost of Improvements:	$63,814.10
Local Improvement	Permits Issued:	267	Cost of Improvements:	$1,573,817.61
Plumbing	Permits Issued:	16	Cost of Improvements:	$25,308.00
POD	Permits Issued:	3	Cost of Improvements:	$130.00
Roofing	Permits Issued:	47	Cost of Improvements:	$335,754.14
Sign	Permits Issued:	10	Cost of Improvements:	$85,470.00

Total Permits: 460 Total Improvements: $15,865,530.85

Fees Collected

Alley Open Fee	$75.00
Backfill Inspection	$130.00
Building Permit Fee	$14,930.00

Permits Issued By The Building Department

Tuesday, September 04, 2018

Between: ***8/1/2018*** ***And*** ***8/31/2018***

Building Final	$8,470.00
Chimney Liner Rough	$50.00
Chimney Liner Final	$50.00
Gutter/Downspout Final Inspection	$200.00
Masonry Final Inspection	$525.00
Local Improvement Permit Fee	$26,590.00
Electrical Rough	$3,100.00
Electrical Permit Fees	$575.00
Preliminary Electric	$250.00
Electrical Underground	$400.00
Electrical Service	$350.00
Electrical Final	$5,250.00
Sign Permit Fees	$1,065.00
Footing Inspection	$335.00
Preliminary Framing	$195.00
Framing Rough	$2,990.00
Fence Permit Fee	$985.00
Foundation Inspection	$195.00
Plumbing Rough	$1,950.00
Plumbing Permit Fees	$320.00
Plumbing Final	$2,800.00
Plumbing Inspection	$150.00
Preliminary Plumbing	$200.00
Plumbing Inspection Underground	$1,150.00
Plumbing Underground-Tap	$350.00
Plumbing Underground-Service	$350.00
Plumbing Underground-Divorce	$350.00
Plumbing Underground-PVC Installatio	$550.00
umbing Underground-Bedding Inspecti	$550.00
Plumbing Underground-Head Test	$550.00
Chloroloy Inspection	$150.00
Post Hole/Pier Inspection	$2,060.00
RPZ Test/DDCA Valve	$150.00
HVAC Permit Fees	$1,085.00
HVAC Rough	$1,925.00
Service Charge	$2,965.00
HVAC Final	$2,625.00
Insulation/Fire Stopping Inspection	$1,420.00
Water Meter Fee	$1,750.00
Tap Fee	$6,000.00

Permits Issued By The Building Department

Tuesday, September 04, 2018

Between: ***8/1/2018*** ***And*** ***8/31/2018***

Demolition Fees	$100.00
Demo Final Inspection	$50.00
Dumpster/POD	$1,900.00
Parkway Use	$100.00
Parkway Inspection	$275.00
Pre-Pour Inspection	$3,100.00
Slab Pre-Pour	$335.00
Stack Test	$900.00
Sidewalk Opening	$300.00
Pre-Pour Strt/Sdwk/Alley	$650.00
Street Opening	$600.00
Roof Covering Permit Fees	$4,500.00
Roof Final Inspection	$3,300.00
Siding Final Inspection	$300.00
Garage Permit Fee	$490.00
Gas Pressure Test	$250.00
Water Pressure Test	$250.00
Preliminary Fire Department	$100.00
Rough Fire Department	$440.00
Final Fire Department	$550.00
Health Department	$100.00
ATF Fine	$250.00
Lintel Inspection	$175.00
Restoration Inspection	$500.00
Total Fees Collected	$115,625.00

Report Of Building/Improvement Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

	Name and Address	P.I.N. #		Census Class	Permit Issued	Permit #	Cost Of Improvements	Cost Of Permit
1	SOMETHING MADE NEW LLC 2630 S. Oak Park Avenue	16-30-306-029-000	DUMPSTER ON THE STREET TO REMOVE CONSTRUCTION DEBRIS DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING	R	8/1/2018 Bldg-B	9027-3	$0.00	$50.00
2	Concordia/Cermak Plaza Asso 7111 W. Cermak Road	99-99-999-000-003	INTERIOR REMODELING FOR TONY'S FRESH MARKET, 2 NEW HANDICAP BATHROOMS AND NEW BREAKROOM.	C	8/1/2018 Bldg-B	9073-0	$12,500,000.00	$2,090.00
3	Cibrook Ltd 2416 S. Harvey Avenue	16-29-118-025-000	paying for 3 additional plumbing inspection	R	8/1/2018 Impr-L	77867-3	$0.00	$150.00
4	Mark Blanek & Christine Budd 6935 W. 30th Place	16-30-323-023-000	TEAR OFF AND RESHINGLE THE GARAGE. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/1/2018 Roof-L	80025-0	$2,100.00	$90.00
5	Luisa Molina 1312 S. Scoville Avenue	16-19-212-028-000	r/r sidewalk at rear of house to alley and new patio 25x10 at rear of house. Julie dig x2060689	R	8/1/2018 Impr-L	80026-0	$3,500.00	$120.00
6	Lifetime Properties 2736 S. Highland Avenue	16-29-309-035-000	/to and reroof house and garage roof. Call for inspection.	R	8/1/2018 Roof-L	80027-0	$12,000.00	$230.00
7	Bradley Napiorkowski 3828 S. Wenonah Avenue	16-31-326-025-000	R/R 16 WINDOWS - FAMILY ROOM, DINING ROOM, LIVING ROOM AND 3 BEDROOM WINDOWS - WINDOWS TO EGRESS CODE WHERE REQUIRED. R/R 3 STROM DOORS.	R	8/1/2018 Impr-L	80028-0	$6,318.00	$165.00
8	1900 Cuyler LLc 1900 S. Cuyler Avenue	16-20-321-016-000	T/O AND RESHINGLE HOUSE ROOF. CALL FOR FINAL INSPECTION ICE AND WATER SHIELD TO CODE NO POWER VENTS	R	8/1/2018 Roof-L	80029-0	$7,200.00	$170.00
9	Robert Vasquez 6439 W. 27th Street	16-30-405-045-000	TEAR OFF AND REROOF THE BUILDING WITH MOD BIT.	R	8/1/2018 Roof-L	80030-0	$20,628.43	$365.00
10	Walter Patzelt 3841 S. Clinton Avenue	16-31-329-013-000	COMPLIANCE VIOLATIONS TO INCLUDE FRONT GFI OUTLET REQUIRES REPAIR, REMOVE 6 OUTLET ADAPTER IN BEDROOM, GFI OUTLETS ENTIRE BASEMENT, OUTSIDE REAR W/COVER, GARAGE (NOT OPENER), FRONT HANDRAIL REQUIRES REPAIR, FLEX WATER CONNECTIONS ON HOT WATER TANK TO BE S	R	8/1/2018 Impr-L	80031-0	$1,600.00	$190.00

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Report Of Building/Improvement Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address		P.I.N. #		Census Class	Permit Issued	Permit #	Cost Of Improvements	Cost Of Permit
Mr. Tito	1407 S. Home Avenue	16-19-120-003-000	INSTALL A CAR PORT NEXT TO GARAGE.	R	8/1/2018 Impr-L	80032-0	$1,000.00	$0.00
11								
Jolanta Chacinska	6445 W. Sinclair Avenue	16-31-226-036-000	T/O AND RESHINGLE HOUSE ROOF AND REPAIR GARAGE ROOF. CALL FOR FINAL INSPECTION.	R	8/1/2018 Roof-L	80033-0	$8,013.00	$185.00
12								
Hilario Llamas	1431 S. Wenonah Avenue	16-19-119-015-000	R/R 27 WINDOWS, REMOVE EXISTING STUCCO-USE HOUSE WRAP AND INSTALL NEW SIDING. BRING WINDOWS TO EGRESS CODE WHERE NEEDED.	R	8/1/2018 Impr-L	80034-0	$21,745.00	$390.00
13								
Ann T. Lorenzen	3436 S. Clarence Avenue	16-31-232-025-000	REMOVE THE FENCE ON THE SOUTHSIDE OF THE PROPERTY AND INSTALL A 4FT PICKET FENCE, REMOVE THE FENCE ALONG THE ALLEY AND INSTALL A 6FT WOOD FENCE.	R	8/1/2018 Fence-L	80035-0	$2,000.00	$135.00
14								
Shamrock Co, Inc.	6956 W. Ogden Avenue	16-31-312-001-000	INSTALL MECHANICAL HOOD, CHANGE OUT KITCHEN HOOD AND IN NEW HOOD/EXHAUST FAN	C	8/1/2018 Impr-L	80036-0	$7,820.00	$460.00
15								
Samuel & Erika Lopez	2737 S. Cuyler Avenue	16-29-309-016-000	R/R EXISTING CONCRETE FRONT STAIRS, APPROACH, LANDING, AND WALKWAY FROM CITY WALK TO ALLEY (8/6/18) r/r existing patio at rear of house and new concrete on Northside of property 10" only.	R	8/1/2018 Impr-L	80037-0	$8,500.00	$195.00
16								
Bertha F. Jimenez	1516 S. Cuyler Avenue	16-20-123-027-000	T/O AND RESHINGLE HOUSE ROOF. CALL FOR FINAL INSPECTION.	R	8/1/2018 Roof-L	80038-0	$5,760.00	$140.00
17								
Walton Contractors LLC	2231 S. Grove Avenue	16-30-104-017-000	UPGRADE WATER SERVICE TO 1".	R	8/2/2018 Bldg-B	8964-1	$7,500.00	$1,630.00
18								
ADL Renovations	3512 S. East Avenue	16-31-403-015-000	ADDING ATTACHED GARAGE W/ ADDITION (4) BEDROOM/CLOSET---. (3 1/2 BATHROOMS. --BEDRROM IN IN EACH FL, BATHROOMS (1) IN EACH FL WT BMST BATHROOM.	R	8/2/2018 Bldg-B	9074-0	$50,000.00	$575.00
19								
Francisco J. Martinez	6533 W. 38th Street	16-31-418-052-000	REPAIR VENT SYSTEM IN KITCHEN ON ISLAND VENT AND CONNECTION TO STACK IN BATHROOM.	R	8/2/2018 Plum-L	79874-1	$0.00	$50.00
20								
V & M A Plenys	3104 S. Wesley Avenue	16-31-201-047-000	SEWER REPAIR AND INSTALL CLEAN OUT	R	8/2/2018 Plum-L	80039-0	$2,800.00	$105.00
21								

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Report Of Building/Improvement Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address		P.I.N. #		Census Class	Permit Issued	Permit #	Cost Of Improvements	Cost Of Permit
JESUS PADILLA-VELAZQUEZ	3629 S. Oak Park Avenue	16-31-400-019-000	STRUCTURAL INSPECTION TO DETERMINE IF THE WALL BETWEEN THE LIVING ROOM AND DINING ROOM IS LOAD BEARING. --	R	8/2/2018 Impr-L	80040-0	$0.00	$0.00
22								
Francisco Rojas	1313 S. Ridgeland Avenue	16-20-107-004-000	TUCKPOINTING BOTH SIDES OF HOME. REPLACE BRICKS WHERE NEEDED. POWERWASHING ENTIRE HOME AND GRINDING. IF GRINDING MUST TENT OR TARP AREA. WET GRINDING IS ALSO ALLOWED.	R	8/2/2018 Impr-L	80041-0	$2,000.00	$40.00
23								
Jose Almanza	3600 S. Wenonah Avenue	16-31-310-013-000	INSTALLING 74FT OF 5FT TALL TRADITIONAL BOARD ON BATTEN PRIVACY FENCE. SOUTH SIDE FENCE JULIE DIG A2080236	R	8/2/2018 Impr-L	80042-0	$2,850.00	$135.00
24								
Eugene Kwok	1934 S. Kenilworth Avenue	16-19-321-028-000	DUMPSTER ON THE STREET TO REMOVE UNWANTED ITEMS - TENANT PULLING THE PERMIT. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/2/2018 Dump-L	80043-0	$0.00	$50.00
25								
WALTER	2422 S. Grove Avenue	16-30-111-030-000	CLEAN OUT AND DISCARD ITEMS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/2/2018 Dump-L	80044-0	$250.00	$140.00
26								
Anthony J & Jennifer L Bertuc	3537 S. Clinton Avenue	16-31-305-009-000	INSTALL/REPLACE 185FT OF 5FT WHITE VINYL FENCE. (2) WALK GATES. RR FENCE ON NORTH SIDE. RR FENCE ON SOUTH SIDES AND EXTEND ALONG THE SIDES. NEIGHBOR PERMISSION OBTAINED. MUST BE AT LEAST 15FT BACK FROM THE FRONT LOT LINE. JULIE DIG # X1900582	R	8/2/2018 Fence-L	80045-0	$6,784.00	$135.00
27								
Angelica Alvarado	2429 S. Clarence Avenue	16-30-219-010-000	R/R BOILER AND HOT WATER HEATER. A WATTS 9-D DOUBLE CHECK VALVE IS ACCEPTABLE ON SINGLE FAMILY RESIDENCES ONLY. MULTI-FAMILY RESIDENCES REQUIRE A RPZ VALVE.	R	8/2/2018 HVAC-L	80046-0	$5,723.00	$235.00
28								
Lanzillotti	6713 W. 26th Street	16-30-225-032-000	CUT AN ENTRY WAY DOOR ON BRICK WALL ON THE EAST SIDE OF THE BUILDING, INSTALL A NEW WALK IN COOLER AND FREEZER AND NEW 200 V 30 AMP CIRCUIT.	C	8/2/2018 Impr-L	80047-0	$3,700.00	$50.00
29								

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Report Of Building/Improvement Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address		P.I.N. #		Census Class	Permit Issued	Permit #	Cost Of Improvements	Cost Of Permit
Armando Lopez	6818 W. 29th Place	16-30-319-013-000	REPLACE SHINGLE ON ROOF, REPLACE EXHAUST FAN IN THE BATHROOM, ELIMINATING 2 PORCH SKYLIGHTS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/2/2018 Impr-L	80048-0	$2,300.00	$90.00
30								
Coleen A. Levy & John M.Covi	2734 S. Cuyler Avenue	16-29-308-032-000	FRONT PORCH - STEPS REPLACING EXISTING STAIRS DECK. REPLACING 3 STRINGERS ON SEVEN STEPS.	R	8/2/2018 Impr-L	80049-0	$750.00	$40.00
31								
Eduardo Canedo	1302 S. Ridgeland Avenue	16-19-215-024-000	LIGHT POWERWASH FRONT OF BUILDING FROM WINDOWS UP SPOT TUCK POINT WHERE NEEDED. SPOT TUCK POINT AL AROUND BUILDING WHERE NEEDED.	C	8/2/2018 Impr-L	80050-0	$3,000.00	$130.00
32								
Fabian & Maria Valencia	1301 S. Highland Avenue	16-20-109-001-000	INSTALL CLAY TILE OVERLAY ON BOTH FRONT AND REAR STEPS. SEAL COATING ON TOP.	R	8/2/2018 Impr-L	80051-0	$400.00	$50.00
33								
QMI LLC	1220 S. Wisconsin Avenue	16-19-101-027-000	reinspection for electrical rough and fee for preliminary framing for joists in ceiling and floor 2ND FLOOR ADDITION TO INCLUDING 3 BEDROOM AND 2 BATHROOM. REFRAMING 1ST FLOOR, INSTALL NEW INSULATION AND DRYWALL, INSTALL NEW STAIRCASE, REMODEL THE KITCHEN	R	8/3/2018 Bldg-B	8608-4	$0.00	$115.00
34								
Santiago Daniel	6531 W. 26th Place	16-30-404-031-000	electrical rough reinspection and structural prelim inspection -- REMODELING THE BASEMENT - ADDING 3 BEDROOM, 1 BATHROOM, FRAMING EXISTING UTILITY ROOM AND RELOCATE STAIRS - NO WASHING MACHINE - JUST UTILITY SINK - UPGRADE WATER METER TO 3/4". INSTALL WI	R	8/3/2018 Bldg-B	8714-1	$0.00	$115.00
35								
Christina Solis	3613 S. Gunderson Avenue	16-31-413-006-000	ADDITIONAL ROUGH REINSPECTION INSPECTION AND ELECTRICAL FINAL REINSPECTION	R	8/3/2018 Bldg-B	8800-1	$0.00	$100.00
36								

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Report Of Building/Improvement Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address		P.I.N. #		Census Class	Permit Issued	Permit #	Cost Of Improvements	Cost Of Permit
Jose G Rico & Erik Corral	1231 S. Highland Avenue	16-20-102-017-000	BUILDING FINAL REINSPECTION FOR GUT AND REHAB TO INCLUDE NEW BATHROOM INSTALL IN BASEMENT. BASEMENT TO BECOME RECREATION ROOM, CHECK FOR EGRESS IN BASEMENT, ADDING NEW A/C UNIT AND R/R FURNACE, FULL KITCHEN REMODEL AND FULL REMODEL OF 2 EXISTING BATHROOMS	R	8/3/2018 Bldg-B	8932-3	$0.00	$65.00
37								
Patricia Huizar	1823 S. Highland Avenue	16-20-310-008-000	NEW 23X24 GARAGE 12' HEIGHT.	R	8/3/2018 Gar-B	9075-0	$10,000.00	$275.00
38								
Chicago Title Land Trust Comp	6933-35 W. Stanley Avenue	16-31-112-022-000	DUMPSTER ON THE STREET TO REMOVE UNWANTED ITEMS LEFT FROM A TENANT AND CONSTRUCTION DEBRIS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	C	8/3/2018 Dump-L	79381-1	$0.00	$50.00
39								
Luis Jose Ayala, Jr. & Lauren	3710 S. Clinton Avenue	16-31-320-024-000	Replacing attic windows. New frame. Painting Frames where needed, fascia on roof.	R	8/3/2018 Impr-L	80052-0	$155.00	$40.00
40								
Timothy & Bernice Juettner	1821 S. Grove Avenue	16-19-315-009-000	REPLACE (20) WINDOWS IN EXISTING OPENINGS 3DH 3RD FL LIVING ROOM//1DH 3RD FL KITCHEN//1DH 3RD FL BEDROOM #2// 2DH AND 1 PW 2ND FL LIVING ROOM//1DH 2ND FL KITCHEN//1DH 2ND FL OFFICE// 1 PW 2ND FL BEDROOM #3// 1DH BMST KITCHEN //1PW BMST LIVING ROOM//1CH 2N	R	8/3/2018 Impr-L	80053-0	$16,125.00	$315.00
41								
T & E Salinas	2425 S. Gunderson Avenue	16-30-222-010-000	REPLACE GUTTERS AND DOWNSPOUTS ON HOUSE. DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY.	R	8/3/2018 Impr-L	80054-0	$2,600.00	$55.00
42								
DLN Enterprises	6746 W. Ogden Avenue	16-31-400-001-000	REPLACING (11) WINDOWS IN EXISTING OPENINGS. 2ND FL: KITCHEN/BATHROOM/DINING/FAMILY/2ND FL BEDROOM/2ND FL BEDROOM (2). BRING WINDOWS TO EGRESS CODE WHERE NEEDED.		8/3/2018 Impr-L	80055-0	$6,911.00	$165.00
43								
Gregory R. Aguirre & Kristine A	1432 S. Cuyler Avenue	16-20-115-034-000	T/O AND RESHINGLE HOUSE ROOF. ICE AND WATER SHIELD TO CODE NO POWER VENTS DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/3/2018 Roof-L	80056-0	$12,000.00	$280.00
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Report Of Building/Improvement Permits Issued By The City Of Berwyn

Tuesday, September 04, 2018

Between: 8/1/2018 And 8/31/2018

Name and Address		P.I.N. #		Census Class	Permit Issued		Permit #	Cost Of Improvements	Cost Of Permit
Angel & Gloria Favila	2811 S. Cuyler Avenue	16-29-317-043-000	R/R CONCRETE WALK SOUTHSIDE FROM CITY WALK TO ALLEY, R/R CONCRETE FRONT STAIRS AND APPROACH, ON NORTH SIDE NEW CONCRETE 18" X 40' ONLY. JULIE DIG X 2131751	R	8/3/2018	Impr-L	80057-0	$4,600.00	$135.00
45									
Triwin Investments Internationa	2538 S. Ridgeland Avenue	16-30-231-031-000	R/R FENCE ON THE SOUTH SIDE OF THE PROPERTY - INSTALL A 5FT WOOD FENCE - HAS PERMISSION FROM 2540 RIDGELAND.	R	8/3/2018	Fence-L	80058-0	$2,000.00	$135.00
46									
Marvin Peek	1313 S. Kenilworth Avenue	16-19-114-012-000	EGRESS WINDOW INSTALL IN BASEMENT	R	8/3/2018	Impr-L	80059-0	$900.00	$90.00
47									
John O. Magnus Sr. & Judith A	2845 S. Ridgeland Avenue	16-29-316-045-000	R/R 3 WINDOWS IN LIVING ROOM	R	8/3/2018	Impr-L	80060-0	$2,863.00	$55.00
48									
EDUARDO N. TOMEO	1810 S. Kenilworth Avenue	16-19-313-023-000	R/R ALL WINDOWS - INSTALL EGRESS WHERE NEEDED	R	8/3/2018	Impr-L	80061-0	$9,540.00	$210.00
49									
Brian A. Vazzana & Veronica M	1831 S. Euclid Avenue	16-19-409-014-000	R/R A/C UNIT A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/3/2018	HVAC-L	80062-0	$4,469.00	$140.00
50									
Kayla T. Fauria	1217 S. Home Avenue	16-19-104-011-000	PRELIMINARY PLUMBING INSPECTION PER COMPLIANCE INSPECTION TO DETERMINE PLUMBING CODE VIOLATIONS.	R	8/3/2018	Plum-L	80063-0	$0.00	$50.00
51									
Joseph Martello & Akemi Nishi	1333 S. Home Avenue	16-19-112-016-000	R/R WINDOWS- 2 DOUBLE HUNGS IN DINING ROOM, CASEMENT IN FRONT BEDROOM, SLIDER IN ATTIC AND CASEMENT IN BACK OFFICE-CHECK FOR EGRESS	R	8/3/2018	Impr-L	80064-0	$4,750.00	$135.00
52									
North Shore Holdings	3304 S. East Avenue	16-31-224-015-000	AFTER THE FACT: BUILDING : INSTALLING (3) BEDROOMS EGRESS WINDOWS ON AN EXPIRED PERMIT. ADDING PERMENANT HEAT SOURCE TO BASEMENT (VENT INSTALLED) CONCRETE WORK (GARAGE FLOOR AND APRON).	R	8/3/2018	Impr-L	80065-0	$2,850.00	$605.00
53									
Adolfo & Martha Linares of Ber	6225-09 W. 26th Street	16-29-126-037-000	INSTALL OF ADDITIONAL SPRINKLER HEADS.	C	8/3/2018	Impr-L	80066-0	$5,982.00	$90.00
54									

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Laddie Vetrovic	2713 S. Ridgeland Avenue	16-29-308-006-271	INSTALL A NEW AWNING AND DOUBLE SIDED ILLUMINATES SIGN TO CODE - EXTERIOR SIGN REQUIRES AN EXTERIOR DISCONNECT.		8/3/2018 Sign-L	80067-0	$1,000.00	$100.00
55								
Timothy Swanson	1538 S. Kenilworth Avenue	16-19-129-037-000	PRELIMINARY ELECTRICAL INSPECTION TO SPEAK WITH OWNER ABOUT WHAT NEEDS TO BE BROUGHT TO CODE.	R	8/3/2018 Elec-L	80068-0	$0.00	$50.00
56								
Joseph Bohil & Irene Kubik	2424 S. Elmwood Avenue	16-30-222-028-000	R/R SIDING ON HOUSE AND INSTALL 3 DOORS. HOUSE WRAP INCLUDED.	R	8/3/2018 Impr-L	80069-0	$7,410.00	$180.00
57								
Marilyn Evans Trust	7115 W. 16th Street	16-19-125-034-000	SPOT TUCKPOINTING ON MASONRY RESIDENCE	R	8/3/2018 Impr-L	80070-0	$1,860.00	$40.00
58								
David & Ruby Ocampo	2509 S. Kenilworth Avenue	16-30-116-004-000	T/O RR HOUSE ONLY -RE ROOF WITH ARCH SHINGLES-INSTALL EFLT 15LBS. -INSTALL ICE/WATER SHIELD -INSTALL 4 VENTS (TURTLE) -INSTALL VYNIL SIDDING ON THE DORMER (FRONT) HOUSE. -REMOVE GUTTERS FROM HOUSE WITH DOWNSPOUTS AND REINSTALL NEW GUTTERS AND DOWNSPOUTS.	R	8/3/2018 Roof-L	80071-0	$9,490.25	$250.00
59								
MARCELA RODRIGUEZ	2103 S. Kenilworth Avenue	16-19-330-001-000	TEAR OFF ROOF HOUSE AND GARAGE RE-ROOF W/T ARCH SHINGLES, INSTAL FELT, ICE/WATER SHIELD. INSTALL (4) TURTLE VENTS HOUSE. INSTALL (2) TURTLE VENTS GARAGE. REMOVE GUTTERS FROM HOUSE AND GARAGE WITH DOWNNSPOUTS. INSTALL NEW GUTTERS ON HOUSE/GARAGE. INSTALL (	R	8/3/2018 Roof-L	80072-0	$15,895.92	$340.00
60								
Chris Tasevski Trust	3124 S. Oak Park Avenue	16-31-107-029-000	MINOR TUCKPOINTING AROUND BUILDING	C/R	8/3/2018 Impr-L	80073-0	$750.00	$40.00
61								
Juan Diaz	3727 S. Cuyler Avenue	16-32-317-053-000	R/R EXISTING CONCRETE FRONT APPROACH, SOUTHSIDE SIDEWALK FROM CITY WALK TO ALLEY AND INSTALL NEW CONCRETE PAD WHERE PREVIOUS ASPHALT WAS INSTALLED. MUST LEAVE 4-6" SPACE FROM PROPERTY LOT LINE ON SOUTHSIDE.	R	8/3/2018 Impr-L	80074-0	$6,000.00	$150.00
62								

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Raul Everardo Vazquez Sanch	6513 W. 27th Place	16-30-410-037-000	DEMOLISH EXISTING GARAGE SIZE OF NEW GARAGE 32' 50' X 22' HEIGHT 14'. DEMO EXISTING GARAGE POUR NEW SLAB 4" GRAVEL AND 6" CONCRETE, BUILD A NEW GARAGE W/ 2'X4' FOR WALLS AND 2X6 FOR JOIST. ALL ASSOCIATED EXTERIOR FIXTURES.	R	8/6/2018 Bldg-B	9077-0	$8,000.00	$325.00
63								
Milan A. Marek	3524 S. Gunderson Avenue	16-31-405-038-000	COMPLETE HOUSE DEMO DUE TO FIRE. REBUILD A NEW SINGLE FAMILY HOUSE. INSTALL A NEW 1 1/2 WATER SERVICE. 1ST FLOOR WILL CONSIST OF KITCHEN, 1 BEDROOM, 1 1/2 BATHS, DINING ROOM, AND LIVING ROOM. 2ND FLOOR ILL CONSIST OF 3 BEDROOM, 2 BATHROOM AND MECHANICAL R	R	8/6/2018 Bldg-B	9078-0	$180,000.00	$6,320.00
64								
Juan Torres	1234 S. Home Avenue	16-19-103-038-000	PRELIMINARY ELECTRICAL INSPECTION TO DETERMINE CODE COMPLIANCE.	R	8/6/2018 Elec-L	79357-3	$0.00	$50.00
65								
Thomas Thorsen	1435 S. Scoville Avenue	16-19-221-015-000	COMPLIANCE: ATF***REPAIR (2) KITCHEN COUNTER GCFI'S COUNTER OUTLETS. RIGHT SIDE OF STOVE, OPEN GROUND ONE REVERSED POLARITY-OWNER. ENCLOSE ALL OPEN LIGHT BULBS ON STORAGE ROOM LIGHTS. 2ND FL. BEDROOM MUST HAVE CONTROLLABLE HEAT SOIURCE(BASEBOARD HEATER).	R	8/6/2018 Impr-L	80075-0	$2,000.00	$240.00
66								
Samuel J. Guarino	3742 S. Lombard Avenue	16-32-319-038-000	furnace repl 80% eff 90 kbtu's installing chimney liner flex alum a/c repl 13 seer 2ton condenser 3ft from property line.	R	8/6/2018 HVAC-L	80076-0	$5,785.00	$190.00
67								
Victor & Beth Mercado	3110 S. Wesley Avenue	16-31-201-048-000	INSTALL 5' SOLID CEDAR FENCE AND 5' CHAIN LINK FENCE. NEIGHBOR PERMISSION OBTAINED 3114 WESLEY. JULIE DIG #A2140021	R	8/6/2018 Fence-L	80077-0	$3,944.00	$135.00
68								
Good Shepherd Lutheran Chur	1844 S. Grove Avenue	99-99-999-000-026	T/O RR GARAGE ROOF ONCE SHINGLES. REPLACE ALUM FASCIA AS NEEDED.	R	8/6/2018 Roof-L	80078-0	$2,900.00	$0.00
69								
Jaime Saucedo	6425 W. 32nd Street	16-31-210-015-000	R/R 7 DOUBLE HUNG WINDOWS IN PORCH-NON EGRESS	R	8/6/2018 Impr-L	80079-0	$1,750.00	$40.00
70								

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Eddieberto Morales & Sharon F 2810 S. Harvey Avenue	16-29-318-025-000	REPLACE EXISTING FENCE PANELS AND POSTS WHERE NEEDED ON SOUTH SIDE OF PROPERTY, INSTALL PAVER BRICKS AT FRONT PORCH ENTRY.	R	8/6/2018 Impr-L	80080-0	$1,000.00	$50.00
71							
Luis & Laur Molina 1642 S. Clinton Avenue	16-19-304-036-000	REPLACE SOFFIT IN FRONT FAÇADE OF HOME. SCAFFOLD ON PRIVATE PROPERTY.	R	8/6/2018 Impr-L	80081-0	$1,000.00	$40.00
72							
Eliseo Flores Jr. 3019 S. Maple Avenue	16-30-321-006-000	UPGRADE SERVICE TO 200AMP	R	8/6/2018 Elec-L	80082-0	$2,400.00	$125.00
73							
Brian J. Pack & Christine M. Gi 7040 W. 34th Street	16-31-130-002-000	R/R GUTTERS AND DOWNSPOUTS ON THE GARAGE. DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY.	R	8/6/2018 Impr-L	80083-0	$1,300.00	$40.00
74							
Alfred Linares 1901 S. Elmwood Avenue	16-19-423-001-000	INSTALLATION OF NEW WINDOWS AND GARAGE DOOR. BRING WINDOWS TO EGRESS CODE WHERE NEEDED.	C	8/6/2018 Impr-L	80084-0	$2,920.00	$105.00
75							
Dorothy E. Tanczyn Trustee 3741 S. East Avenue	16-31-418-047-000	T/O AND RR SHINGLES TO CODE. NEW GUTTERS DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY.	R	8/6/2018 Roof-L	80085-0	$6,278.00	$155.00
76							
Edward G. Owen 1330 S. Wisconsin Avenue	16-19-109-031-000	T/O AND REROOF WITH MODIFIED BIT. 1/2" INSULATION. CALL FOR FINAL INSPECTION. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/6/2018 Roof-L	80086-0	$7,000.00	$205.00
77							
E. Knospe/Fabing 2426 S. Oak Park Avenue	16-30-112-053-000	PUT LANDSCAPING FABRIC AND LOOSE RIVER ROCK ON PARKWAY IN FRONT OF 2424 OAK PARK, PUT COBBLESTONES AROUND EDGE OF SQUARE AREA IN PARKWAY IN FRONT OF 2426 OAK PARK, PUT LOOSE RIVER ROCK IN SQUARE AREA BETWEEN HOUSES, PUT PAVERS IN AREA NEXT TO PORCH 3X11 I	R	8/6/2018 Impr-L	80087-0	$3,600.00	$170.00
78							
STRATA INVESTMENTS LLC 2532 S. Kenilworth Avenue	16-30-115-026-000	DECONVERT THE ATTIC BATHROOM - CAP ALL PIPES BACK AT THE SOURCE --------- PRELIMINARY PLUMBING INSPECTION TO DETERMINE IF 1ST FLOOR BATHROOM AND KITCHEN PLUMBING IS TO CODE.	R	8/6/2018 Plum-L	80088-0	$500.00	$140.00
79							

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Koko Marina West LLC	7001 W. Ogden Avenue	16-31-311-024-000	REMODEL AND BUILD OUT FOR DENTAL OFFICE – RELOCATE EXISTING BATHROOM AND EXPAND FRONT DENTAL OFFICE INTO REAR APT. - IN THE RESIDENTIAL SPACE - RELOCATE BATHROOM, TURN BEDROOM INTO OPERATORY ROOM, CONVERT KITCHEN INTO LUNCH ROOM/BREAK ROOM. ---------NO	C/R	8/7/2018 Bldg-B	9076-0	$95,873.00	$2,890.00
80								
Bernard J. Kowalski	6818 W. 26th Street	16-30-306-004-000	2ND STORY ADDITION FOR 2ND FLOOR UNIT. CURRENTLY 1ST FLOOR HAS 2 UNITS-PLANS ON SPLITTING INTO 2 UNITS TOP AND BOTTOM. 1ST FLOOR COMPLETE REMODEL AND DECONVERT 1ST FLOOR BATHROOM INTO INTO A LAUNDRY ROOM AND COMMON AREA. 2ND FLOOR WILL BE A SEPARATE UNIT	C	8/7/2018 Bldg-B	9079-0	$80,000.00	$2,700.00
81								
Samuel & Erika Lopez	2737 S. Cuyler Avenue	16-29-309-016-000	ADDITIONAL PRE-POUR FEE	R	8/7/2018 Impr-L	80037-1	$0.00	$50.00
82								
MARCELA RODRIGUEZ	2103 S. Kenilworth Avenue	16-19-330-001-000	DUMPSTER FOR ROOFING DEBRIS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/7/2018 Dump-L	80072-1	$300.00	$50.00
83								
Kimberley Freeland	1926 S. Euclid Avenue	16-19-416-036-000	INSTALL EM LIGHTS IN FRONT AND REAR HALLWAYS.	R	8/7/2018 Elec-L	80089-0	$1,500.00	$90.00
84								
Sara Ramirez	2113 S. Euclid Avenue	16-19-425-005-000	DUMPSTER ON THE STREET TO REMOVE UNWANTED ITEMS - DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/7/2018 Dump-L	80090-0	$0.00	$50.00
85								
John & Ana Fuentes	1523 S. East Avenue	16-19-228-011-000	R/R FRONT WOOD STEPS TO CODE.	R	8/7/2018 Impr-L	80091-0	$2,700.00	$205.00
86								
Martin D. Garcia & Jennifer D.	2324 S. Oak Park Avenue	16-30-112-035-000	INSTALL NEW METER SOCKET AND GROUND ROD. VENT KITCHEN SINK.	R	8/7/2018 Impr-L	80092-0	$1,150.00	$150.00
87								
John O. Magnus Sr. & Judith A	2845 S. Ridgeland Avenue	16-29-316-045-000	R/R GARAGE OVERHEAD DOOR	R	8/7/2018 Impr-L	80093-0	$1,050.00	$40.00
88								
Agent Equity Partners, LLc	6513 W. Cermak Road	16-30-205-003-000	NEW FIRE ALARM FOR TINA'S PLACE	C	8/7/2018 Impr-L	80094-0	$8,150.00	$1,130.00
89								

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Magda Houlberg & Jennifer Ric	2828 S. Wenonah Avenue	16-30-310-022-000	SOUTHSIDE INSTALL 5'+1' OPEN LATTICE WOOD FENCE/GATES, NORTHSIDE TOWARDS FRONT AND BACK INSTALL FENCE/GATE 5'+1' OPEN LATTICE WOOD HOOK UP TO NEIGHBORS FENCE-PERMISSION ON FILE. JULIE DIG A002152423	R	8/7/2018 Fence-L	80095-0	$5,075.00	$135.00
90								
Trinity Community Church	7022 W. Riverside Drive	99-99-999-000-020	R/R BOILER, REUSING EXISTING CHIMNEY LINER	C	8/7/2018 Impr-L	80096-0	$26,545.00	$50.00
91								
James Erhart	3710 S. Cuyler Avenue	16-32-316-039-000	R/R FURNACE. USING EXISTING CHIMNEY LINER.	R	8/7/2018 HVAC-L	80097-0	$3,894.00	$115.00
92								
Virginia M. Abar	6533 W. 33rd Street	16-31-219-024-000	R/R 8 WINDOWS-BEDROOMS, FRONT AND SIDE LIVING ROOM. CALL FOR FINAL INSPECTION. CHECK FOR EGRESS.	R	8/7/2018 Impr-L	80098-0	$1,300.00	$0.00
93								
tara & Roger Waysok	1524 S. Scoville Avenue	16-19-228-029-000	R/R GARAGE APRON.	R	8/7/2018 Impr-L	80099-0	$1,490.00	$90.00
94								
Ventures Trust 2013-I-H-R	3808 S. Wesley Avenue	16-31-421-016-000	ELECTRIC-KITCHEN-INSTALL GFCI, DINING ROOM INSTALL 4 OUTLETS AND CEILING FIXTURE, LIVING ROOM INSTALL CEILING FAN, OUTLETS AND SWITCHES, VESTIBULE INSTALL CEILING FIXTURE AND 1 IN PORCH ENTRY, BEDROOM 1 INSTALL CEILING FIXTURE, 4 OUTLETS AND CLOSET FIXTUR	R	8/7/2018 Impr-L	80100-0	$7,779.00	$380.00
95								
Luis Dominguez	1310 S. Elmwood Avenue	16-19-214-025-000	TEAR OFF AND RESHINGLE THE HOUSE.	R	8/7/2018 Roof-L	80101-0	$7,000.00	$155.00
96								
Daniel & Gwendolyn Munroe	1237 S. Highland Avenue	16-20-102-019-000	RE-SEAL ALL COPING TILES WITH TAR AT TOP WALLS ON NORTH AND SOUTH SIDES. SPOT GRIND AND SPOT TUCK POINT NORTH AND SOUTH COMMON BRICK AS NEEDED. R/R 15 BRICKS ON THE SOUTH SIDE, RE-SEAL DETERIORATED TAR ON NORTH WALL AND RE-SEAL DETERIORATED BRICKS ON THE	R	8/7/2018 Impr-L	80102-0	$1,989.00	$40.00
97								
Joseph & Mary Estrada	2440 S. Clarence Avenue	16-30-218-030-000	GRIND AND TUCKPOINT TOP 2' OF CHIMNEY, RE-SEAL AND RESURFACE THE TOP OF THE CHIMNEY, RE-TAR CHIMNEY FLASHING.	R	8/7/2018 Impr-L	80103-0	$639.00	$40.00
98								
Marilyn Evans Trust	7115 W. 16th Street	16-19-125-034-000	TEAR OFF AND RESHINGLE THE GARAGE. NO POWER VENTS	R	8/7/2018 Roof-L	80104-0	$0.00	$40.00
99								

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Marjorie Nowacki	2834 S. Cuyler Avenue	16-29-316-036-000	R/R FRONT LANDING AND REBUILD THE WING WALLS.	R	8/7/2018 Impr-L	80105-0	$1,500.00	$90.00
100								
Armando R. Torres	1317 S. Cuyler Avenue	16-20-108-006-000	R/R 2 POST ON THE NORTH SIDE FENCE -- REINSTALLING THE EXISTING FENCE PANELS.	R	8/7/2018 Fence-L	80106-0	$410.00	$85.00
101								
Thomas E. Regan	3441 S. Highland Avenue	16-32-132-060-000	REPLACE FRONT DOOR AWNING	R	8/7/2018 Impr-L	80107-0	$680.00	$40.00
102								
Claudia M. & Martin Pinon	2529 S. Grove Avenue	16-30-117-011-000	R/R DRIVEWAY-RIBBONS ONLY AND R/R SIDEWALK FROM CITY WALK TO ALLEY. REPLACING ALL THE IS EXISTING ONLY. NO NEW CONCRETE ALLOWED. (8/9/18) H/OI WILL PLACE PERMBEABLE RIVER ROCK ON RIBBONS FOR DECORATIVE PURPOSES.	R	8/7/2018 Impr-L	80108-0	$10,300.00	$225.00
103								
George Blanas	3145 S. Euclid Avenue	16-31-201-033-000	DUMPSTER ON THE STREET TO REMOVE UNWANTED ITEMS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/7/2018 Dump-L	80109-0	$0.00	$50.00
104								
TALL SPRUCE PROPERTIES,	6725 W. Riverside Drive	16-30-200-034-000	PRELIMINARY INSPECTIONS TO VERIFY WHAT NEEDS TO BROUGHT TO CODE	R	8/7/2018 Impr-L	80110-0	$0.00	$0.00
105								
Nick Pasturczak	1835 S. Maple Avenue	16-19-309-013-000	REMODEL 2ND FLOOR BATHROOM - REPLACE DRYWALL AND TILES, REPLACE FIXTURES -- NOT REPLACING TUB. . - REPLACE EXHAUST FAN	R	8/7/2018 Impr-L	80111-0	$3,000.00	$305.00
106								
Denys A Graham	3321 S. Wesley Avenue	16-31-223-011-000	TEAR OFF AND RESHINGLE THE HOUSE AND GARAGE, REMOVE OLD SIDING ON THE HOUSE AND GARAGE, INSTALL TYVEK AND NEW SIDING TO CODE AND R/R GUTTERS AND DOWNSPOUTS TO CODE. NO POWER VENTS ICE AND WATER SHIELD TO CODE DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPE	R	8/7/2018 Impr-L	80112-0	$39,621.00	$685.00
107								
Frank Vomacka Sr.	1841 S. Wesley Avenue	16-19-410-017-000	T/O AND RESHINGLE FRONT ROOF AND REPLACE FLAT ROOF. CALL FOR FINAL INSPECTION.	R	8/7/2018 Roof-L	80113-0	$9,900.00	$200.00
108								

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Mario & Maria Peralta	3814 S. Home Avenue	16-31-327-018-000	REDO DECK AND EXTEND SIZE OF DECK TO 12'X8' -MOVING STAIRS TO WEST SIDE OF THE DECK - 6 NEW STAIRS TO BE INSTALLED AND INSTALL A NEW PAVER BRICK SECTION 14'X20'	R	8/7/2018 Impr-L	80114-0	$2,000.00	$190.00
109								
Raymond & Ann Greely	3207 S. Kenilworth Avenue	16-31-114-003-000	PLUMBING INSPECTION FOR FURNACE AND WATER TANK, BATHROOM FLOOR TILE AND FAUCET REPLACEMENT, DRYWALL IN 2 BEDROOMS, LIGHT FIXTURE IN CLOSET AND STORAGE ROOM, REMOVE DRYWALL IN BASEMENT, REAR DECK REPAIR, REPAIR GARAGE APRON AND SIDEWALK APPROACH, REPAIR S	R	8/7/2018 Impr-L	80115-0	$2,850.00	$515.00
110								
Darling Mendoza	1637 S. Cuyler Avenue	16-20-301-015-000	WASHING WALLS AND TUCKPOINT AND REPLACE BRICKS AS NEEDED ON HOUSE	R	8/7/2018 Impr-L	80116-0	$1,200.00	$40.00
111								
Elizabeth Canelas and Jaquin L	6238 W. Cermak Road	16-20-331-028-000	R/R GARAGE FLOOR, BACK OF GARAGE AND SIDEWALK THE WEST SIDE OF THE GARAGE.	C/R	8/7/2018 Impr-L	80117-0	$5,500.00	$240.00
112								
jered & Zachary Pruitt	1313 S. Grove Avenue	16-19-115-007-000	REMOVE AND REPLACE DECK FLOOR, RAILS AND STAIRS - ADD PERGOLA ABOVE DECK - REINFORCE STRINGERS AS NEEDED. ADDED 8/22/18. L SHAPED WOODEN BENCH TO BE ATTACHED UNTO DECK FLOORING.	R	8/7/2018 Impr-L	80118-0	$1,000.00	$140.00
113								
Margarito & Maria Soto	6534 W. 26th Street	16-30-404-088-000	INSTALL 36 VINYL WINDOW REPLACEMENTS ON 3 UNIT BLDG. - ALL WINDOWS MUST MEET EGRESS CODE	R	8/7/2018 Impr-L	80119-0	$4,800.00	$135.00
114								
Margarito & Maria Soto	6502 W. 26th Street	16-30-404-084-000	INSTALL 36 VINYL WINDOW REPLACMENTS ON 3 UNIT BLDG. - ALL WINDOWS MUST MEET EGRESS CODE	R	8/7/2018 Impr-L	80120-0	$4,800.00	$135.00
115								
Molina & Marison Rodriguez	2247 S. Clinton Avenue	16-30-102-025-000	SPOT TUCKPOINT SECTIONS OF HOUSE - REPAIR / REPLACE FENCE POST	R	8/7/2018 Impr-L	80121-0	$250.00	$40.00
116								
Alejandra Rodgriguez	2616 S. Lombard Avenue	16-29-303-028-000	KITCHEN REMODEL - NEW COUNTER TOPS, CABINETS AND SINK - NEW APPLIANCES. DISHWASHER REQUIRES DISCONNECT. INSTALL NEW 100 AMP CIRCUIT BREAKER / REMOVE FUSE BOX - INSTALL GROUND ROD	R	8/7/2018 Impr-L	80122-0	$8,000.00	$230.00
117								

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Araceli Garcia	3813 S. Scoville Avenue	16-31-423-023-000	TEAR OFF AND REROOF HOUSE AND GARAGE WITH DUMPSTER	R	8/7/2018	Roof-L	80123-0	$3,000.00	$175.00
118									
Durman Lazo	3439 S. Gunderson Avenue	16-31-406-010-000	EXCAVATE SEWER FROM THE CURB TO APPROX 12' TO REPLACE SECTION OF SEWER THAT HAD BEEN REPLACED TO THE PARKWAY, TO THE CURB. REMOVE SPOILS, BACK-FILL W/ 3/4 STONE. BERWYN PUBLIC WORKS WILL PATCH THE STREET OPENING AS AGREED W/ PW DIRECTOR AND APPROVED BY CD	R	8/8/2018	Plum-L	79590-1	$0.00	$0.00
119									
Dan Diaconie	3620 S. Harvey Avenue	16-32-310-019-000	TEAR OFF AND RR SHINGLES ARCH FELT, ICE AND WATER.	R	8/8/2018	Roof-L	80124-0	$5,690.00	$140.00
120									
Timothy J. Wyrick	3518 East Avenue	16-31-403-016-000	ROUGH IN PLUMBING WITH EJECTOR SYSTEM, ROUGH IN ELECTRIC, HVAC AND DUCTWORK. OWNER TO INSULATE, DRYWALL, MINOR FRAMING IN BASEMENT INTERIOR WALLS, LIGHT PLUMBING FIXTURES AND INSTALL A DECK. 1ST FLOOR REMODEL KITCHEN, LIVING ROOM AND DINING ROOM. BASEMENT	R	8/8/2018	Impr-L	80125-0	$38,000.00	$1,320.00
121									
Thomas & Barbara Gotski	3520 S. Scoville Avenue	16-31-404-024-000	T/O AND RESHINGLE HOUSE AND GARAGE ROOF. CALL FOR FINAL INSPECTION. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/8/2018	Roof-L	80126-0	$9,000.00	$235.00
122									
Michelle Garcia	1811 S. Grove Avenue	16-19-315-005-000	INSTALL NEW PAVER PATIO 14X14	R	8/8/2018	Impr-L	80127-0	$1,700.00	$90.00
123									
Mari Del Carmen Guerrero	1927 S. Wenonah Avenue	16-19-319-010-000	REPLACING FRONT HOME ENTRY EXISTING CONCRETE STEPS, TUCKPOINT ALL FRONT FAÇADE INCLUDING ARCHES OF FRONT PORCH, REPACE BRICKS WHERE NEEDED, AND REPLACE PILLARS OF FRONT STEPS/HOME.	R	8/8/2018	Impr-L	80128-0	$1,300.00	$165.00
124									
Kurt Reetz, Jr.	2336 S. Elmwood Avenue	16-30-214-029-000	COMPLIANCE: 1. Replace GFCI outlet in bathroom. 2. Enclose any open bulbs. ATF bathroom remodel ATF kitchen remodel . Remove elec materials from attic.	R	8/8/2018	Impr-L	80129-0	$2,000.00	$290.00
125									

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RNR Real Estate Group Inc	1447 S. Wesley Avenue	16-19-218-022-000	GARAGE ROOF REPAIR, GARAGE SIDING REPAIR, GARAGE OVERHEAD DOOR REPAIR. GARAGE WINDOW REPAIR, REPLACE MISSING CEILING LIGHT FIXTURES IN 1ST FLOOR LIVING ROOM, ALL CLOSET LIGHTS COMPLETELY ENCLOSED LAMPS, REPLACE ALL EXPOSED BX IN GARAGE WITH CONDUIT, REPLA	R	8/8/2018 Impr-L	80130-0	$1,000.00	$240.00
126								
MELISSA MOURITSEN	1447 S. Clarence Avenue	16-19-219-020-000	INSTALL NEW 152 SQ FT PATIO AT REAR OF YARD. JULIE DIG A2191228	R	8/8/2018 Impr-L	80131-0	$2,539.00	$105.00
127								
Robert & Julie Steinhaus	3705 S. Clinton Avenue	16-31-321-002-000	TUCKPOINTING VARIOUS AREAS ON HOUSE	R	8/8/2018 Impr-L	80132-0	$765.00	$40.00
128								
Reginaldo Campos	1917 S. Clarence Avenue	16-19-419-006-000	T/O AND REROOF FLAT ROOF. CALL FOR FINAL INSPECTION, DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/8/2018 Roof-L	80133-0	$12,100.00	$295.00
129								
Laura Lemus	2340 S. Lombard Avenue	16-29-111-039-000	install new shingle roof over existing 1 layer. Call for final inspection.	R	8/8/2018 Roof-L	80134-0	$5,000.00	$125.00
130								
Hector Garcia Living Trust	3630 S. Highland Avenue	16-32-309-030-000	DIG UP STREET TO LOCATE AND REPAIR SEWER VIDEO.	R	8/9/2018 Bldg-B	8937-1	$3,000.00	$105.00
131								
PRAIRIE CAVE LLC	2824 S. Highland Avenue	16-29-317-030-000	INTERIOR REMODEL - 1ST FLOOR- KITCHEN, DINING ROOM, LIVING ROOM, 2 EXISTING BEDROOM AND 1 EXISTING FULL BATHROOM. 2ND FLOOR - ADDING MASTER BATHROOM ROOM AND 1 MASTER BATHROOM. BASEMENT - EXISTING BEDROOM, EXISTING BATHROOM, LAUNDRY ROOM. MECHANICAL ROOM	R	8/9/2018 Bldg-B	9080-0	$88,000.00	$3,545.00
132								
Kathleen Harrison	3109 S. Maple Avenue	16-31-101-004-000	BATHROOM REMODEL, REPLACE 2 WINDOWS IN BATHROOM, R/R GUTTERS ON BACK PORCH.	R	8/9/2018 Impr-L	80135-0	$19,840.00	$660.00
133								
Keith W. Bielarz & Beth Bielarz	1914 S. Wenonah Avenue	16-19-318-021-000	ABOVE GROUND POOL IN YARD, IN OCTOGAN SHAPED GRASS AREA. 15 FT POOL.	R	8/9/2018 Impr-L	80136-0	$0.00	$0.00
134								
B. & D. Perfect	2744 S. Highland Avenue	16-29-309-038-000	TEAR OFF AND RESHINGLE THE HOUSE	R	8/9/2018 Roof-L	80137-0	$6,800.00	$40.00
135								

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Roberto Lopez Jr.	3345 S. Harvey Avenue	16-32-123-030-000	R/R FENCE/GATE ON SOUTH SIDE OF PROPERTY WITH 6' VINYL. JULIE DIG # A2192139	R	8/9/2018	Fence-L 80138-0	$3,020.00	$135.00
136								
Joy Overman	2802 S. Highland Avenue	16-29-317-021-000	R/R FENCE/GATE NORTH SIDE 6' VINYL, ALLEY 6' VINYL, SOUTH SIDE 5+1' OPEN LATTICE VINYL-NEIGHBOR PERMISSION ON FILE. CROSSING OVER ONTO NEIGHBORS PROPERTY. JULIE DIG AA2192132	R	8/9/2018	Fence-L 80139-0	$6,256.00	$135.00
137								
Roberto & Miriam Jaimes	3815 S. Home Avenue	16-31-328-049-000	TEAR OFF AND RESHINGLE THE HOUSE -- R/R GUTTERS AND DOWNSPOUTS DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY.	R	8/9/2018	Impr-L 80140-0	$9,302.00	$235.00
138								
Hector & Kim Garcia	2114 S. Wesley Avenue	16-19-425-014-000	R/R 29 WINDOWS INCLUDING 4 BEDROOM-CHECK FOR EGRESS, T/O AND RESHINGLE GARAGE ROOF. SPOT TUCKPOINT AS NEEDED.	R	8/9/2018	Impr-L 80141-0	$5,950.00	$150.00
139								
Terrezas	1540 S. Highland Avenue	16-20-124-035-000	RUN CONDUIT FOR A NEW CIRCUIT OUTSIDE FOR A CHAIRLIFT ---THERE IS CONDUIT IN THE BASEMENT THAT GOES FROM THE PANEL TO A 1900 BOX NEAR THE OUTSIDE WALL - DRILL OUTSIDE FROM NEAR THAT SPOT AND CONTINUE THE PIPE OUTSIDE - LB DOWN AND PIPE ALONG THE BASE OF T	R	8/9/2018	Elec-L 80142-0	$381.00	$90.00
140								
Ben & Jessica Belmares	3626 S. Harvey Avenue	16-32-310-021-000	REPAIR SEWER INSIDE THE HOUSE TO CODE.	R	8/9/2018	Plum-L 80143-0	$5,224.00	$250.00
141								
Luis A. Mena	1930 S. Clarence Avenue	16-19-418-025-000	COMPLIANCE VIOLATIONS -- DECONVERT BASEMENT KITCHEN - MUST CAPP ALL PIPES BACK AT THE SOURCE, SPOT TUCKPOINT, REPLACE MISSING VENT COVERS , REPLACE OUTLETS/SWITCH BOX COVERS, REPLACE BROKER OUTLETS, REPLACE BASEBOARD HEATER COVERS, REPLACE MISSING LIGHT F	R	8/9/2018	Impr-L 80144-0	$1,000.00	$290.00
142								

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Julio C. Cardenas	2104 S. Scoville Avenue	16-19-428-011-000	ANY OPEN LIGHT IN CLOSETS, PANTRIES AND STORAGE ROOMS ,UST BE FULLY ENCLOSED, REPAIR OR REPLACE GFCI ELECTRICAL OUTLET IN GARDEN APT BATHROOM, ALL WINDOWS FULLY OPERABLE, INSTALL GARDEN EGRESS WINDOWS, 2 PRONG OUTLET IN 1ST FLOOR KITCHEN BY FRIDGE CONVER	R	8/9/2018 Impr-L	80145-0	$500.00	$140.00
143								
U.S BANK N.A.	6535 W. 26th Place	16-30-404-029-000	COMPLETELY GUT BASEMENT REMOVE AND TREAT ALL MOLD. CALL FOR FINAL INSPECTION.	R	8/9/2018 Impr-L	80146-0	$9,300.00	$210.00
144								
Todd M. & Kathleen T. Michau	6841 W. 30th Street	16-30-319-021-000	R/R FENCE/GATE ON WEST/EAST AND NORTH SIDE OF PROPERTY WITH 4' CHAIN LINK. INSTALL FENCE/GATE ALONG DRIVEWAY WITH 4' CHAIN LINK. NEIGHBOR PERMISSION ON FILE FOR EAST SIDE OF PROPERTY TO RELOCATE FENCE. JULIE DIG # A2212009	R	8/9/2018 Fence-L	80147-0	$4,700.00	$135.00
145								
Joseph D Volpe	1503 S. Maple Avenue	16-19-124-041-000	FRONT OF BUILDING (NORTH SIDE) GRIND OUT THE BRICK END AND BED JOINTS TO A DEPTH OF APPROX. 3/4" (6 BRICK WIDE) 16 COURSES HIGH. NORTH SIDE FROM THE 1ST FL. WINDOW DOWN TO THE LIMESTONE SILL OF THE GROUND FL. APT. GRIND OUT VERTICAL SEAM BETWEEN THE FACE	R	8/9/2018 Impr-L	80148-0	$2,345.00	$130.00
146								
Edward G. & Julie Brown	1807 S. Harvey Avenue	16-20-311-003-000	ROOF AND DECK WORK.	R	8/9/2018 Impr-L	80149-0	$0.00	$40.00
147								
Shamrock Co, Inc.	6956 W. Ogden Avenue	16-31-312-001-000	INSTALL A WET CHEMICAL HOOD SYSTEM TO CODE.	C	8/9/2018 Impr-L	80150-0	$0.00	$635.00
148								
1221 S. Harlem LLC	1221 S. Harlem Avenue C	99-99-999-000-066	ROUGH FRAMING INSPECTION		8/10/2018 Bldg-B	8987-1	$0.00	$140.00
149								
Caleb J. Kimmel	6444 W. 27th Street	16-30-410-015-000	BUILD NEW GARAGE 21X22 WITH 15' HEIGHT. JULIE DIG #X2211464	R	8/10/2018 Gar-B	9081-0	$6,500.00	$300.00
150								
Miguel Avalos	1427 S. Harvey Avenue	16-20-118-011-000	CREATE 2 NEW BEDROOMS IN THE BASEMENT BY BUILDING 3 WALLS, USING EXISTING DUCT WORK IN THE CEILING -- OWNER STATES EGRESS WINDOWS EXIST - THIS WILL BE CHECK ON THE BUILDING FINAL INSPECTION.	R	8/10/2018 Bldg-B	9082-0	$200.00	$100.00
151								

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Pete Highland Realty Ltd	2123 S. Home Avenue	16-19-328-009-000	FRAME OUT BASEMENT WITH EXISTING BATHROOM, STORAGE ROOM, LAUNDRY AND MECHANICAL ROOM, CREATE AN OPEN RECREATION SPACE, CREATE 2 BEDROOM =S IN ATTIC AND ADD 3/4 BATHROOM, 1ST FLOOR REMODEL KITCHEN AND BATHROOM, ALL NEW ELECTRIC, PLUMBING AND HVAC. NEW FURN	R	8/10/2018	Bldg-B	9083-0	$107,400.00	$2,805.00
152									
Andre & Penelope Buckles	6813 W. 31st Street	16-30-326-027-000	INSTALL GROUND ROD AT ELECTRICAL METER, INSTALL NEW GROUND WIRE FROM SERVICE PANEL STREET SIDE OF WATER METER, REMOVE CORD WIRING IN BASEMENT AND REMOVE CEILING FAN ON REAR EXTENSION PORCH.	R	8/10/2018	Impr-L	79933-1	$650.00	$90.00
153									
BYD Real Estate partners LLC	6843 W. Ogden Avenue	16-31-306-034-000	replace 1 compressor on rtv #1 and replace 2 compressors on rtv #2	C	8/10/2018	HVAC-L	80151-0	$13,452.00	$450.00
154									
Julio Avila	1643 S. Kenilworth Avenue	16-19-306-017-000	R/R SIDEWALK FROM THE CITY SIDE WALK TO THE ALLEY.	R	8/10/2018	Impr-L	80152-0	$3,860.00	$120.00
155									
Rolando Villa & Virginia Arrez	6423 W. 28th Place	16-30-413-083-000	REPLACING BEDROOM AND BASEMENT WINDOWS, REPLACE BAY WINDOW IN LIVING ROOM AND KITCHEN WINDOW. CHECK FOR EGRESS. CALL FOR FINAL INSPECTION	R	8/10/2018	Impr-L	80153-0	$1,500.00	$90.00
156									
Jose A. Lamas	1801 S. Kenilworth Avenue	16-19-314-001-000	REPAIR GARAGE SIDING AND R/R GARAGE OVERHEAD DOOR - NO SIZE CHANGES.	R	8/10/2018	Impr-L	80154-0	$600.00	$40.00
157									
Kenneth Wazsak & Theresa W	3036 S. Maple Avenue	16-30-320-033-000	REMOVE 9 BASEMENT WINDOWS AND REPLACE WITH GLASS BLOCK WINDOWS AND REMOVE AND INSTALL A GLASS BLOCK WINDOW IN THE GARAGE	R	8/10/2018	Impr-L	80155-0	$4,570.00	$85.00
158									
Thomas R. Jelinek	3131 S. Oak Park Avenue 2C	16-31-200-043-100	REMOVE AND INSTALL GLASS BLOCK WINDOWS WITH VENT IN THE BATHROOM.		8/10/2018	Impr-L	80156-0	$1,500.00	$40.00
159									
Cheryl K. Triemstra	6928 W. Pershing Road	16-31-328-048-000	R/R 2 VENTS IN 2 EXISTING GLASS BLOCK WINDOWS.	R	8/10/2018	Impr-L	80157-0	$550.00	$0.00
160									

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Agent Equity Partners, LLc	6513 W. Cermak Road	16-30-205-003-000	INSTALL A NEW ILLUMINATED CHANNEL LETTER SIGN FOR TINA'S PLACE - EXTERIOR SIGN REQUIRES AN EXTERIOR DISCONNECT.	C	8/10/2018 Sign-L	80158-0	$3,900.00	$175.00
161								
Rene Martinez Carbajal	2122 S. Scoville Avenue	16-19-428-017-000	REMOVE ALL DRYWALL MAKING (ORANGE ROOM). R/R EXISTING CONCRETE CITY WALK TO REAR OF HOUSE AND GARAGE APPROACH, GARAGE CANOPY TO CODE, R/R GARAGE EXT LIGHT FIXTURE. JULIE DIG #X2220967	R	8/10/2018 Impr-L	80159-0	$2,000.00	$240.00
162								
Cary Plettau and Laurie Plettau	1322 S. Kenilworth Avenue	16-19-113-030-000	r/r 2 living room windows	R	8/10/2018 Impr-L	80160-0	$5,820.00	$100.00
163								
Jesus & Laura Duran	1507 S. Wisconsin Avenue	16-19-126-003-000	COMPLIANCE VIOLATION - GFI OUTLETS ENTIRE KITCHEN COUNTER TOP, REPAIR STAIRS TO ATTIC, REPLACE MISSING LIGHT FIXTURES COVERS AND R/R FRONT APPROACH AND STEPS.	R	8/10/2018 Impr-L	80161-0	$3,000.00	$205.00
164								
Cibrook Ltd	2537 S. Scoville Avenue	16-30-229-013-000	INTERIOR DEMO TO THE STUDS -- NO STRUCTURAL DEMO. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/10/2018 Impr-L	80162-0	$1,500.00	$90.00
165								
Leila Othman	1925 S. East Avenue	16-19-420-010-000	ATF CHICKEN COOP	R	8/10/2018 Impr-L	80163-0	$0.00	$40.00
166								
Ebeneezer Christian Reform Pa	1300 S. Harvey Avenue	16-20-109-033-000	NEW 20AMP CIRCUIT FOR OUTSIDE ELECTRIC LED SIGN	C	8/10/2018 Elec-L	80164-0	$600.00	$100.00
167								
William J. Hudson	1447 S. Cuyler Avenue	16-20-116-020-000	TEAR OFF AND RESHINGLE THE GARAGE.	R	8/10/2018 Roof-L	80165-0	$2,122.00	$40.00
168								
David Gonzalez	6915 W. 29th Place	16-30-317-029-000	REPLACE 17 WINDOWS-1ST AND 2ND FLOOR-CHECK FOR EGRESS, WRAP SOFFIT, FASCIA AND REPLACE GUTTERS. CALL FOR FINAL INSPECTION.	R	8/10/2018 Impr-L	80166-0	$3,500.00	$120.00
169								
Blue Fin Homes LLC	1423 S. Clarence Avenue	16-19-219-010-000	INTERIOR DEMO TO THE STUDS -- NO STRUCTURAL DEMO	R	8/10/2018 Impr-L	80167-0	$2,000.00	$40.00
170								

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Mayra Garcia	7030 W. 16th Street	16-19-302-009-000	R/R A SECTION OF THE FRONT APPROACH. REMOVE THE WEST & SOUTH SIDE FENCE AND INSTALL A NEW 5FT + 1FT OPEN LATTICE VINYL FENCE THAT WILL EXTEND TO THE FRONT OF THE HOUSE - THIS FRONT FENCE MUST BE AT LEAST 15FT BACK FROM THE FRONT LOT LINE.	R	8/10/2018 Impr-L	80168-0	$1,700.00	$140.00
171								
Alicia Aguilar Santos	6953 W. 30th Street	16-30-318-019-000	paying for additional inspection - plumbing underground kitchen sink basement insulation and final plumbing reinspection	R	8/13/2018 Bldg-B	9004-2	$0.00	$165.00
172								
JAMES LYNCH	2341 S. Gunderson Avenue	16-30-214-015-000	ELECTRICAL ROUGH REINSPECTION REMODEL THE KITCHEN AND 3 EXISTING BATHROOMS - R/R CABINETS, COUNTERTOP, SINKS, VANITY. R/R THE DRYWALL IN THE EXISTING 1 BEDROOM, 1 EXISTING BATHROOM AND 1 RECREATIONAL SPACE WITH WINDOWS TO EGRESS CODE ON THE 2ND FLOOR .	R	8/13/2018 Bldg-B	9017-1	$0.00	$50.00
173								
JAMES LYNCH	1819 S. Wesley Avenue	16-19-410-008-000	electrical rough reinspection COMPLIANCE VIOLATIONS - SEVERAL ELECTRICAL OUTLETS, RECEPTACLES, AND COVER PLATES ARE MISSING ON THE 2ND FLOOR TO BE REPAIRED OR REPLACED TO CODE. ANY OPEN BULB LIGHTS IN CLOSETS, STORAGE ROOMS, STAIRWELLS AND BASEMENT CEIL!	R	8/13/2018 Elec-L	79236-1	$0.00	$50.00
174								
Marino Martinez & Nereida Mar	2811 S. Ridgeland Avenue	16-29-316-006-000	REPLACING ALL SIDING THROUGHOUT HOUSE.	R	8/13/2018 Impr-L	80169-0	$2,500.00	$90.00
175								
Jeff Lisse & Amy Harmon	3605 S. Clarence Avenue	16-33-141-001-700	GRIND AND TUCKPOINTING WHERE NEEDED.	R	8/13/2018 Impr-L	80170-0	$900.00	$40.00
176								
Steve Wallon & lisa DeMicheel	7009 W. 34th Street	16-31-123-023-000	FLOOD CONTROL SYSTEM INSTALL, REAR OF HOME.JULIE DIG # ATTACHED.	R	8/13/2018 Impr-L	80171-0	$9,300.00	$250.00
177								
U.S BANK N.A.	6535 W. 26th Place	16-30-404-029-000	FOR DEMO PERMIT ISSUED, DUMPSTER FOR DEBRIS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/13/2018 Dump-L	80172-0	$500.00	$50.00
178								

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Ryan Earl Nolan & Meghan We	3203 S. Harvey Avenue	16-32-114-029-000	138 FT ON INTERIOR DRAIN TILE, SUMP PUMP SYSTEM, 552 SQ FT WALL LINER, INSTALL DOUBLE RECEPTACLE OUTLET W/TWO DEDICATED CIRCUITS.	R	8/13/2018	Impr-L	80173-0	$13,449.00	$470.00
179									
Amy Simon & Neal Englund	1329 S. Scoville Avenue	16-19-213-015-000	PODS FOR MOVING-MAY BE USING MULTIPLE PODS FOR DELIVERY	R	8/13/2018	Dump-L	80174-0	$0.00	$50.00
180									
C Brozas	6948 W. 29th Place	16-30-318-003-000	GARAGE SIDING REPLACED W/ WOOD SIDING PANELS (T-11).	R	8/13/2018	Impr-L	80175-0	$3,300.00	$70.00
181									
6900 Ave LLC	6900 W. Ogden Avenue	16-31-313-015-000	INSTALL FIRE ALARM	C	8/13/2018	Impr-L	80176-0	$10,050.00	$375.00
182									
German G. Guerrero Gonzalez	3738 S. East Avenue	16-31-417-080-000	R/R 12 WINDOWS 1ST AND 2ND UNIT-LIVING ROOM, DINING ROOM AND KITCHEN.	R	8/13/2018	Impr-L	80177-0	$8,000.00	$130.00
183									
Ruiz & Arriaga	1936 S. Ridgeland Avenue	16-19-423-026-000	TUCKPOINTING 2-STORY BUILDING , REPLACE BRICKS WHERE NEEDED.	R	8/13/2018	Impr-L	80178-0	$600.00	$40.00
184									
Fred Lombardi	3800 S. Ridgeland Avenue	16-31-424-119-000	Relay flowerbox stone. Spot tuck-point flower box.	R	8/13/2018	Impr-L	80179-0	$375.00	$40.00
185									
Constantine & Judith Tsakonas	2822 S. Home Avenue	16-30-311-015-000	SPOT TUCKPOINTING COMMON BRICK WALLS REMOPVE/REPLACE APPROX 35-45 BAD BRICKS	R	8/13/2018	Impr-L	80180-0	$1,690.00	$40.00
186									
Elizabeth M. Krozel	2524 S. Ridgeland Avenue	16-30-231-024-000	CHOP OUT LOOSE MORTAR ON BACK WALL. REPAIR USING SPEED CRETE OR THEROSEAL . SPOT TUCKPOINT SOUTH WALL AS NEEDED.	R	8/13/2018	Impr-L	80181-0	$595.00	$40.00
187									
D & G Bedford	6826 W. 30th Street	16-30-324-010-000	GRIND/TUCK FRONT AND 2 COMMON BRICK WALLS. REMOVE/REPLACE APPROX 20-30 BRICK ON BOTTOM WALL.	R	8/13/2018	Impr-L	80182-0	$0.00	$40.00
188									
Mr. Grano	3601 S. Euclid Avenue	16-31-401-016-000	GRIND/TUCKPOINT CHIMNEY FROM ROOFLINE UP. REMOVE/REPLACE BAD BRICK RESEAL CHIMNEY CAP AND FLASHING.	R	8/13/2018	Impr-L	80183-0	$1,695.00	$40.00
189									

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Elaine A. Pagurko	2333 S. East Avenue	16-30-212-011-000	GRIND/TUCK FRONT BRICK RAILS SECTION TO LEFT AND RIGHT OF FRONT BRICK RAILS . GRIND TUCK POINT CHIMNEY FROM FLASHING UP. RESEAL CHIMNEY FLASHING. REPAIR FRONT STAIRS.	R	8/13/2018 Impr-L	80184-0	$1,695.00	$40.00
190								
Michael & Mary Frank	3801 S. Euclid Avenue	16-31-421-001-000	TEAR OFF AND REROOF ADDITION WITH MOD BIT.	R	8/13/2018 Roof-L	80185-0	$4,680.00	$125.00
191								
Tammy Christman	3417 S. Wesley Avenue	16-31-232-007-000	TEAR OFF AND RESHINGLE THE HOUSE - ICE AND WATER SHIELD TO CODE NO POWER VENTS	R	8/13/2018 Roof-L	80186-0	$10,000.00	$200.00
192								
Robin & Robin Gallagher	1228 S. Oak Park Avenue	16-19-107-030-000	REMOVE THE NORTH SIDE FENCE AND INSTALL A NEW 5FT WOOD FENCE - CURRENT FENCE IS PUSHED IN 1228 OAK PROPERTY AND WITH THIS PERMIT CONTRACTOR WILL BE INSTALLING THE NEW FENCE CLOSER TO THE LOT LINE.	R	8/13/2018 Fence-L	80187-0	$3,890.00	$135.00
193								
Jose Carmona	1900 S. Harvey Avenue	16-20-323-018-000	R/R GARAGE CONCRETE FLOOR REBAR EVERY 2', R/R SIDEWALK, R/R ALLEY FENCE WITH 4' CHAIN LINK. FENCE CAN NOT SWING OUT MORE THAN 2' INTO ALLEY.	R	8/13/2018 Impr-L	80188-0	$6,500.00	$180.00
194								
Eusebio Molina Jr	3720 S. Gunderson Avenue	16-31-418-029-000	RE-INSTALLING LATTICE FENCE INSIDE OWN LOT LINE. 6FT HIGH ALL LATTICE.	R	8/13/2018 Fence-L	80189-0	$0.00	$100.00
195								
Wayne E. & Joan Young	1809 S. Ridgeland Avenue	16-20-308-004-000	R/R CONCRETE CHIMNEY CAPP WITH THE INSTALL OF NEW CLAY TILE. MORTAR AS NEEDED.	R	8/13/2018 Impr-L	80190-0	$800.00	$40.00
196								
Jacqueline Cachola	2404 S. Clarence Avenue	16-30-218-020-000	REMOVE THE FENCES AND INSTALL ON THE NORTH SIDE OF THE PROPERTY AND INSTALL A 5FT + 1FT OPEN LATTICE WOOD FENCE, INSTALL A 6FT WOOD ALLEY FENCE AND INSTALL A 5FT + 1FT OPEN LATTICE WOOD FENCE/GATE ON THE SOUTH SIDE FROM THE HOUSE TO THE NEIGHBOR'S EXISTIN	R	8/13/2018 Fence-L	80191-0	$4,500.00	$135.00
197								
Beth L. Ford	6431 W. 26th Place	16-30-404-053-000	PRELIMINARY ELECTRICAL INSPECTION TO DETERMINE LOCATIONS OF SERVICE FOR FUTURE DECK BUILD	R	8/13/2018 Elec-L	80192-0	$0.00	$0.00
198								

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P & C Shorner	1603 S. Grove Avenue	16-19-307-002-000	REPLACE GARAGE ROOF. RE-SHINGLE.	R	8/13/2018	Impr-L	80193-0	$1,400.00	$40.00
199									
Jose Luis Barrios & Maria A. B	3411 S. Oak Park Avenue	16-31-229-035-000	R/R CONCRETE FRONT APPROACH, R/R 5 WINDOWS IN LIVING ROOM ONLY FOR 5 UNIT.	R	8/13/2018	Impr-L	80194-0	$3,000.00	$105.00
200									
Barbara Russo	6536 W. 27th Place	16-30-411-065-000	CAP WINDOWS AND DOOR, WEATHER GUARD AROUND OPENINGS, HOUSE WRAP AND NEW SIDING ON HOUSE, REPAIR FRONT PORCH TO CODE.	R	8/13/2018	Impr-L	80195-0	$3,000.00	$50.00
201									
Sonia Gil	1940 S. Clinton Avenue	16-19-320-035-000	PAYING FOR UNDERGROUD INSPECTIONS ON B-1	R	8/14/2018	Bldg-B	8708-2	$0.00	$150.00
202									
Healy Renovations LLC	3747 S. Wisconsin Avenue	16-31-318-009-000	additional inspection - CHLOROLOY inspection, gas pressure test and 3 plumb underground pvc inspection	R	8/14/2018	Bldg-B	8871-2	$0.00	$250.00
203									
Darlene Tomecek	3536 S. Kenilworth Avenue	16-31-305-024-000	DEMO AND REBUILD A 19'(WIDE) X 22' X 14'(H) GARAGE.	R	8/14/2018	Gar-B	9084-0	$3,200.00	$325.00
204									
Ethel Rus	3834 S. Clinton Avenue	16-31-328-034-000	INSTALL 4 NEW SUPPLY VENTS AND RETURN VENT IN BASEMENT, REMODEL KITCHEN, FRAMES OUT BASEMENT FOR 1 BEDROOM AND RECREATIONAL AREA, COMPLETE REMODEL 2 EXISTING BATHROOMS (1ST FLOOR AND BASEMENT) ALL ELECTRIC, PLUMBING AND HVAC TO CODE. NEW ELECTRICAL SERVIC	R	8/14/2018	Bldg-B	9085-0	$35,000.00	$1,160.00
205									
Maria Guadalupe Carreno	3810 S. Ridgeland Avenue	16-31-424-062-000	INSTALL (1) NEW BATHROOM, BEDROOM, AND CLOSET IN BASEMENT. REMOVE CURRENT CLOSETS AND REPLACE WITH NEW ONES. REMOVE PANELS ON WALLS AND CEILING AND REPLACE WITH DRYWALL. INSTALL NEW FLOOR AND REFINISH BASEMENT STAIRS. BRING WINDOWS TO EGRESS CODE WHERE N	R	8/14/2018	Bldg-B	9086-0	$1,400.00	$830.00
206									
B. Filippi	1246 S. Clinton Avenue	16-19-104-049-000	MOVE SUMP PUMP FROM DRAINING INTO SEWER TO DRAIN OUTSIDE IN YARD- MUST DISCHARGE INTO BACK YARD. ATF SUMP PUMP CORRECTION.	R	8/14/2018	Plum-L	66028-1	$450.00	$90.00
207									

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Benigno Aguirre & Adriana Leo	1817 S. Clarence Avenue	16-19-411-007-000	plumbing final reinspection for unit 1 & 2.	R	8/14/2018	Impr-L	78450-1	$0.00	$100.00
208									
1221 South Harlem LLC	1221 S. Harlem Avenue	16-19-100-041-100	UNIT C ROUGH ELECTRICAL AND FINAL ELECTRICAL REINSPECTION FOR INSTALL A VANILLA BOX FIRE ALARM FOR SPACE A, B AND C AND INSTALL BUILD OUT FIRE ALARM FOR SPACE A & C.	C	8/14/2018	Impr-L	78649-1	$0.00	$100.00
209									
Lars B. & Sarah Berg	3329 S. Clarence Avenue	16-31-224-011-000	T/O AND RESHINGLE SOUTH SIDE SLOPE ONLY, POSSIBLE DORMER WALL SIDING. CALL FOR FINAL INSPECTION.	R	8/14/2018	Roof-L	80196-0	$3,750.00	$125.00
210									
Hector Hernandez	7015 W. 29th Place	16-30-316-030-000	REMOVING OLD SPLIT BREAKER PANEL AND INSTALL 1 100 AMP 24 CIRCUIT PANEL WITH BREAKERS. (Added 8/16/18) bathrooms must have GFCI outlets to code. Enclose any open bulbs in attic.	R	8/14/2018	Elec-L	80197-0	$500.00	$125.00
211									
David A. & Cindy S. Tinberg	6539 W. 28th Place	16-30-413-080-000	ROOFTOP PV INSTALLATION	R	8/14/2018	Impr-L	80198-0	$12,959.00	$305.00
212									
The Kiecker Revocable Living	6936 W. Riverside Drive	16-30-110-031-000	ROOFTOP PV INSTALLATION	R	8/14/2018	Impr-L	80199-0	$18,326.00	$395.00
213									
Angelica Alvarado	2429 S. Clarence Avenue	16-30-219-010-000	R/R CONCRETE SIDEWALK, CONCRETE PATIO 11X12, GARAGE SERVICE DOOR PAD, R/R CONCRETE BOTTOM OF BASEMENT STEPS, BASEMENT STEPS, TOP OF STEPS. TEAR OUT AND REPLACE SAME SIZE. DIG# A002152109	R	8/14/2018	Impr-L	80200-0	$5,450.00	$150.00
214									
M Muriillo & H. Romero	1333 S. Cuyler Avenue	16-20-108-012-000	R/R FURNACE AND A/C UNIT. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/14/2018	Impr-L	80201-0	$5,750.00	$280.00
215									
Eduardo Cantaseda	3011 S. Harlem Avenue	16-30-320-005-000	INSTALL A NEW LED MESSAGE CENTER SIGN TO REPLACE OLD MARQUEE SIGN FOR LALO'S	C	8/14/2018	Sign-L	80202-0	$26,780.00	$200.00
216									
Kathleen K. Winker	3810 S. Wesley Avenue	16-31-421-017-000	r/r 14 windows, living room, dining room, kitchen and bedrooms on 1st and 2nd floor	R	8/14/2018	Impr-L	80203-0	$6,800.00	$165.00
217									

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Paul & Judy Peterson	2222 S. Grove Avenue	16-30-103-028-000	POD ON THE STREET DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/14/2018 POD-L	80204-0	$0.00	$50.00
218								
Kayla M. Strejc	3415 S. Cuyler Avenue	16-32-131-017-000	R/R FURNACE AND A/C UNIT - CHIMNEY LINER EXISTS. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/14/2018 HVAC-L	80205-0	$6,750.00	$65.00
219								
Auero Albavera & Angelica Alb	2428 S. Highland Avenue	16-29-117-029-000	TUCKPOINTING FRONT APPORACH STAIRS SIDE WALL, NORTH ELEVATION, REPAIR SOUTH WALLS. IF GRINDING MUST TENT OR TARP AREA. WET GRINDING IS ALSO ALLOWED.	R	8/14/2018 Impr-L	80206-0	$1,800.00	$40.00
220								
Dennis McGrath TRUST	2422 S. Ridgeland Avenue	16-30-223-028-000	FLAT RR TO CODE.	R	8/14/2018 Roof-L	80207-0	$10,400.00	$125.00
221								
Dennis McGrath TRUST	2422 S. Ridgeland Avenue	16-30-223-028-000	DUMPSTER FOR ROOF WORK DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/14/2018 Dump-L	80208-0	$350.00	$50.00
222								
6843 Stanley LLC	6843 W. Stanley Avenue	16-31-114-007-000	INSTALLATION OF NEW ALUMINUM SIGN W/ FRAME.	C	8/14/2018 Sign-L	80209-0	$950.00	$75.00
223								
6843 Stanley LLC	6843 W. Stanley Avenue	16-31-114-007-000	1 STELL ALUM OCEAN BLUE CANOPY IN FRONT OF STORE AND 1HDU SIGN BOARD 3/4" W/ CARVED LETTERS BLUE AND WHITE. NON-ILLUMINATED LENGTH 25'. HEIGHT 7-10". 177.5 SQ FT.	C	8/14/2018 Sign-L	80210-0	$2,500.00	$325.00
224								
Brenda Beach	1628 S. Grove Avenue	16-19-306-024-000	REPLACE METER, PROPERLY GROUND SERVICE FOR COMPLIANCE	R	8/14/2018 Elec-L	80211-0	$880.00	$50.00
225								
Ricardo Alas	2228 S. Gunderson Avenue	16-30-205-029-000	T/O AND RR GARAGE ROOF ONLY.	R	8/14/2018 Roof-L	80212-0	$800.00	$40.00
226								
Jorge Pena And Victoria Pena	1521 S. Clarence Avenue	16-19-227-009-000	REPLACE WINDOWS THROUGHOUT HOME , INSTALL VINYL AND HOUSE WRAP ON HOUSE.	R	8/14/2018 Impr-L	80213-0	$2,500.00	$155.00
227								

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Richard Metzger	6930 W. 29th Street	16-30-317-008-000	replace kitchen outlets w/ (2) GCFI outlets replace (2) laundry room outlets w/ 2 gfci outlets. Pipe and wire garage for (1) gcfi outlet. (2) switches: 1 inside light/1 outside lights. Box for garage lights and new light outlet for garage door opener.	R	8/14/2018 Elec-L	80214-0	$1,500.00	$90.00
228								
Eduardo Garcia	2726 S. Wesley Avenue	16-30-407-032-000	PRELIMNARY PLUMBING AND ELECTRICAL INSPECTION TO DETERMINE CODE COMPLIANCE.	R	8/14/2018 Impr-L	80215-0	$1,800.00	$100.00
229								
George Blanas	3145 S. Euclid Avenue	16-31-201-033-000	INTERIOR DEMO ONLY. 1ST FLOOR ONLY.	R	8/14/2018 Impr-L	80216-0	$5,500.00	$40.00
230								
Jose Lopez	2231 S. Clinton Avenue	16-30-102-019-000	GARAGE DOOR FACING BACKYARD, REMOVE WINDOW IN GARAGE CONVERT INTO NEW PATIO GARAGE DOOR.	R	8/14/2018 Impr-L	80217-0	$2,000.00	$140.00
231								
Lopez & Garcia	3708 S. Wesley Avenue	16-31-416-022-000	DEMOLISH EXISTING GARAGE. SIZE OF NEW GARAGE 24 X 22 W/ 13FT HEIGHT . JULIE DIG # A2261888-00A	R	8/15/2018 Bldg-B	9087-0	$23,500.00	$325.00
232								
Garcia Homes, Inc.	2404 S. Cuyler Avenue	16-29-116-020-000	2ND FLOOR ADDITION AND INTERIOR REMODEL. - 1ST FLOOR TO INCLUDE 1 EXISTING BEDROOM AND ELIMINATE 1 BEDROOM TO INCREASE THE SIZE OF THE KITCHEN, KITCHEN, LIVING ROOM, DINING ROOM AND 1 EXISTING FULL BATHROOM. 2ND FLOOR ADDITION TO INCLUDE MASTER BEDROOM,	R	8/15/2018 Bldg-B	9088-0	$108,000.00	$3,880.00
233								
Olivia Lares	6735 W. Stanley Avenue	16-31-200-035-000	Install new fire alarm system	C	8/15/2018 Impr-L	80218-0	$7,800.00	$330.00
234								
Loyola University Health Syste	2824 S. Oak Park Avenue	16-30-412-006-000	500 SF ASPHALT REMOVE AND REPLACE. 8,000 LF CRACK SEAL. QUANTITY- 80, 374 SF. SEAL COATING. RE-STRIPE PER EXISTING LAYOUT LOT MARGIN) ATF		8/15/2018 Impr-L	80219-0	$18,688.23	$345.00
235								
Thomas & Christine Crook	6925 W. 31st Street	16-30-325-027-000	-+	R	8/15/2018 Impr-L	80220-0	$6,100.00	$190.00
236								
Robert W. Maucker	3222 S. Gunderson Avenue	16-31-213-030-000	T/O AND RESHINGLE HOUSE AND GARAGE. CALL FOR FINAL INSPECTION.	R	8/15/2018 Roof-L	80221-0	$12,123.00	$245.00
237								

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Donald & Virginia Kviz	2216 S. Lombard Avenue	16-29-103-023-000	rr from city sidewalk to the alley (125x21") rr back of the house 25x3 and rr the patio 13x6 and 12 x6. julie dig # 2271440.	R	8/15/2018	Impr-L	80222-0	$5,500.00	$150.00
238									
RDK Ventures LLC	6400 W. Ogden Avenue	16-31-407-031-000	reface circle k shop sign	C	8/15/2018	Sign-L	80223-0	$2,500.00	$100.00
239									
RDK Ventures LLC	6400 W. Ogden Avenue	16-31-407-031-000	reface free standing sign and replace 2 canopy signs	C	8/15/2018	Sign-L	80224-0	$1,000.00	$380.00
240									
Richard Dale Cannedy	6238 W. 26th Street 502	16-29-302-038-100	R/R FURNACE AND A/C UNIT AND HOT WATER HEATER. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.		8/15/2018	Impr-L	80225-0	$8,606.00	$260.00
241									
Eugene Bryant & Philip Matsika	3615 S. Maple Avenue	16-31-309-005-000	R/R FURNACE - CHIMNEY LINER EXISTS.	R	8/15/2018	HVAC-L	80226-0	$2,371.10	$115.00
242									
SOMETHING MADE NEW LLC	2630 S. Oak Park Avenue	16-30-306-029-000	PRE-POUR SIDEWALK FEE ONLY. HEATHER RIDGE	R	8/16/2018	Bldg-B	9027-4	$0.00	$50.00
243									
Maria Radjevic	6446 W. 27th Place	16-30-411-013-000	DEMO THE GARAGE.	R	8/16/2018	Gar-B	9089-0	$0.00	$40.00
244									
Carmen Bruno	2722 S. Euclid Avenue	16-30-406-027-000	REMOVE AND REPLACE (9) WONDOWS. NO SIZE CHANGES. LIVING ROOM AND DINING ROOM. BEDROOM/EGRESS SIGNED.	R	8/16/2018	Impr-L	80227-0	$6,816.38	$165.00
245									
Samuel Riseman	3627 S. Grove Avenue	16-31-315-036-000	TEAR OFF AND RESHINGLE THE HOUSE - NO POWER VENTS ICE AND WATER SHIELD TO CODE	R	8/16/2018	Roof-L	80228-0	$6,200.00	$155.00
246									
Timothy Cybulski	6427 W. 27th Place	16-30-410-046-000	EAST SOUTH FACE BRICK, TAKE OUT OUTSIDE BRICK, CLEAN OFF AND RESET FROM ROOF DOWN TO STONE SILL, FRONT OF THE HOUSE AND WEST SIDE OF HOUSE FACE BRICK FROM ROD DOWN TO SILL GRIND OUT AND TUCKPOINT, SPOT POINT 2 SIDES OF COMMON BRICKS	R	8/16/2018	Impr-L	80229-0	$5,950.00	$175.00
247									
Timothy Jones, Celeste Jones	3143-45 S. Clinton Avenue	16-31-105-032-000	INSTALL ALUM SOFFIT AND FASCIA ON THE ENTIRE 2ND FLOOR AND INSTALL RAINTRAP GUTTER COVER ON 2ND FLOOR.	R	8/16/2018	Impr-L	80230-0	$5,050.00	$100.00
248									

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Diane C. Wisniewski	2419 S. Kenilworth Avenue	16-30-111-015-000	INSTALL A 80 SQ FT OF PAVER BRICK SECTION NEXT TO THE GARAGE	R	8/16/2018 Impr-L	80231-0	$22,990.00	$105.00
249								
Corey & Keisha Smith	1917 S. East Avenue	16-19-420-007-000	INSTALL A 5FT VINYL FENCE ON THE SOUTH SIDE OF THE PROPERTY. R/R ALLEY FENCE WITH 6FT VINYL FENCE AND R/R A 5FT VINYL FENCE/GATE RETURN SECTION AT THE END OF THE HOUSE ON THE NORTH SIDE.	R	8/16/2018 Fence-L	80232-0	$4,500.00	$135.00
250								
David Lopez	3702 S. Elmwood Avenue	16-31-419-056-000	FRAME AND INSTALL 8X7 GARAGE PARTY DOOR IN REAR YARD TO FACE INSIDE YARD. EXTEND EXISTING CONCRETE PAD ON NORTH 25 X 10. JULIE DIG A2281514 (added 8/23/18) replacing existing concrete walkway on south side of home.	R	8/16/2018 Impr-L	80233-0	$750.00	$140.00
251								
Kathleen M. Derel	1943 S. Gunderson Avenue	16-19-422-014-000	R/R FRONT STEPS AND SIDEWALKS.	R	8/16/2018 Impr-L	80234-0	$3,500.00	$40.00
252								
Ramon Leon & Isedora Alejo	1217 S. Oak Park Avenue	16-19-200-052-000	R/R 1 FIRST FLOOR LIVING ROOM WINDOW - NO SIZE CHANGES.	R	8/16/2018 Impr-L	80235-0	$1,650.00	$40.00
253								
Angel Sanchez & Elena Villafin	1900 S. Wesley Avenue	16-19-417-016-000	TEAR OFF AND RESHINGLE THE HOUSE AND GARAGE, R/R GUTTER AND DOWNSPOUTS ON THE HOUSE DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY. REMOVE AND REPLACE SIDING ON THE HOUSE, INSTALL TYVEK AND NEW VINYL SIDING.	R	8/16/2018 Impr-L	80236-0	$22,378.00	$430.00
254								
Ericka Pino & Predrag Milic	3526 S. Ridgeland Avenue	16-31-409-042-000	WATER LINE REPLACEMENT - OLD DRAIN REPAIR FOR KITCHEN.	R	8/16/2018 Plum-L	80237-0	$1,000.00	$50.00
255								
Lino & Guillermina Martinez	1836 S. Elmwood Avenue	16-19-414-062-000	COMPLIANCE: hvac final and plumbing final for compliance atf rr furnace and laundry room water tank.	R	8/16/2018 Impr-L	80238-0	$0.00	$0.00
256								
Ricardo Rosales	1626 S. Ridgeland Avenue	16-19-407-019-000	COMPLIANCE: REPLACE FRONT APPROACH WALKWAY ON BOTH NORTH/SOUTH ENDS OF FRONT OF HOME LEADING TO FRONT APPROACH. FROM HOUSE TO SIDEWALK. REPLACE BLANKS ON CIRCUIT BREAKER PANEL. REPLACE MISSING OUTLET/SWITCH COVERS. FLEX WATER SUPPLY ON SINKS/TOILET TO BE	R	8/16/2018 Impr-L	80239-0	$1,600.00	$190.00
257								

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Roberto Ramirez	2116 S. Grove Avenue	16-19-330-017-000	SPOT TUCKPOINT. REPLACE BRICKS WHERE NEEDED. IF GRINDING MUST TENT OR TARP AREA. WET GRINDING IS ALSO ALLOWED.	R	8/16/2018	Impr-L	80240-0	$800.00	$40.00
258									
The Miranda Family Trust	3620 S. Cuyler Avenue	16-32-308-043-000	spot tuck-pointing throughout building where needed.	R	8/16/2018	Impr-L	80241-0	$1,800.00	$40.00
259									
Geralyn M. Fitzgerald	3708 S. Grove Avenue	16-31-322-018-000	REPLACE EXISTING CONCRETE WALKWAY SOUTH SIDE OF HOME.	R	8/16/2018	Impr-L	80242-0	$4,500.00	$135.00
260									
Windsor Properties, Inc.	6924-36 W. Windsor Avenue	16-31-124-004-000	INSTALLING LINEAR AWNING 23FTX 2FT NON ILLUMINATED	C	8/16/2018	Sign-L	80243-0	$1,840.00	$100.00
261									
Terese Villalobos	3624 S. Clarence Avenue	16-31-410-053-000	COMPLIANCE VIOLATION – INSTALL EGRESS IN THE BASEMENT RECREATIONAL SPACE, INSTALL EXHAUST FAN IN THE BASEMENT BATHROOM, GARAGE PERIMETER OUTLETS TO ME GFCI PROTECTED, AND KITCHEN OUTLETS TO CODE.	R	8/16/2018	Impr-L	80244-0	$500.00	$190.00
262									
Pedro Rodriguez	3646 S. Harvey Avenue	16-32-310-027-000	REMOVE OLD PANELING IN THE BASEMENT AND REPLACE WITH DRYWALL. INSULATING WALLS. INSTALL WINDOWS TO EGRESS CODE. INSTALL STEPS UNDER THE WINDOWS , ALL WATER SUPPLY HOSES TO BE NON-PLASTIC, FURNACE ROOM MUST HAVE A LOUVERED DOOR, AND A/C UNIT MUST BE RELOCA	R	8/16/2018	Impr-L	80245-0	$340.00	$450.00
263									
Bodhi Brand, LLC	6235 W. Roosevelt Road	16-20-102-006-000	ATF - INSTALL OF SPRINKLER SYSTEM FOR THE WHOLE BUILDING.	C/R	8/16/2018	Impr-L	80246-0	$15,000.00	$435.00
264									
Ilda Numanaj & Thimi Sinjari	1840 S. Kenilworth Avenue	16-19-313-035-000	COMPLIANCE: 1. ALL BEDROOMS TO EGRESS WHERE NEEDED (EGRESS SIGNED). 2) BATHROOM OUTLETS TO HAVE GCFI CANCEL ANY 2 PRONG OUTLETS. 3) ANY KITCHEN COUTER OUTLETS MUST BE GCFI. 4) LAUNDRY ELEC OUTLET TO HAVE GCFI. 5) ANY GARAGE PERMIMETER OUTLETS MUST BE GCFI	R	8/17/2018	Impr-L	80247-0	$3,200.00	$570.00
265									

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MARTIN & NANCY SANDOVA	6430 W. Fairfield Avenue	16-31-220-037-000	R/R FURNACE AND A/C UNIT – R/R 60 AMP DISCONNECT. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/17/2018	HVAC-L	80248-0	$10,980.00	$240.00
266									
Jovan E. Tovar	1314 S. Wisconsin Avenue	16-19-030-025-000	DECONVERT NON-PERMITTED KITCHEN IN BMST.ALL RELATED PLUMBING/GAS SOURCES MUST BE COMPLETELY CAPPED AND RETURNED TO SOURCE.		8/17/2018	Impr-L	80249-0	$400.00	$140.00
267									
LA VIVIENDA # 4 LLC	6543 W. Cermak Road	16-30-204-003-000	REMOVE EXISTING FRONT FAÇADE SIDING FROM COMM BUILDING TO EXPOSE PLYWOOD/BRICK. WILL REMAIN EXPOSED FOR APPROX 7-9 BUSINESS DAYS MAX. INSTALLING A TEMP. 24 X 24 SCAFFOLD TO RMOVE SIDING. MUST HAVE PROTECTED OVERHEAD FOR PEDESTRIAN TRAFFIC AND/OR APPROPRIA	C	8/17/2018	Impr-L	80250-0	$1,600.00	$40.00
268									
Alfredo Murillo	3504 S. Gunderson Avenue	16-31-405-031-000	interior demo only: and roof tear down of house and garage. Dumpster on street fro republic. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/17/2018	Impr-L	80251-0	$2,000.00	$90.00
269									
Mario & Maria Peralta	3814 S. Home Avenue	16-31-327-018-000	PRE-POUR INSP FEE ONLY.	R	8/20/2018	Impr-L	80114-1	$0.00	$50.00
270									
U.S. Bank, N.A.	6402 W. 18th Street	16-19-415-021-000	REMOVE AND REPLACE CEMENT EXISTING SIDEWALK SOUTH SIDE OF THE BUILDING.	R	8/20/2018	Impr-L	80252-0	$2,000.00	$90.00
271									
Jose Armenta	3223 S. Home Avenue	16-31-112-008-000	134' TRADITONAL LAYERED 6 HIGH. CORNER LOT. JULIE DIG #: A2192152	R	8/20/2018	Fence-L	80253-0	$5,240.00	$135.00
272									
	1828 S. Oak Park Avenue	16-19-315-033-000	REMOVE AND REPLACE WOOD/WIRE FENCE ON SOUTH SIDE BETWEEN 1830 OAK PARK (NEIGHBOR PERMISSION OBTAINED) . 5 + 1 FT LATTICE JULIE DIG # A2320866	R	8/20/2018	Fence-L	80254-0	$3,000.00	$135.00
273									

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ZORAN SRBINDVSKI	2709 S. Ridgeland Avenue	16-29-308-005-000	BUSINESS BUILD OUT: (4) ROOMS; (2) OFFICES, UTILITY ROOM AND OPEN KITCHEN. INSULATE/DRYWALL ROOMS, CREATE OFFICE PARTITIONS, INSTALL ELECTRICAL FIXTURES. ENLARGE AND COMPLETE BATHROOM REMODEL. USE EXISTING DUCT WORK FOR BATHROOM REMODEL. INSTALL (3) COMPA	C	8/20/2018 Impr-L	80255-0	$12,507.00	$1,255.00
274								
Efrain Salazar	1811 S. Elmwood Avenue	16-19-415-045-000	NEW WATER SERVICE FROM MAIN TO HOUSE 1 1/2. PUBLIC WORKS WILL BE REPAIRING STREET. JULIE DIG ATTACHED.	R	8/20/2018 Plum-L	80256-0	$8,900.00	$150.00
275								
Lillian K.Stamas	1830 Clarence Avenue	16-19-410-033-000	T/O RR FLAT ROOF BITUMIN ANC COATING TO CODE.	R	8/20/2018 Roof-L	80257-0	$1,800.00	$40.00
276								
Carlos & Herminia Ardila	3533 S. Harvey Avenue	16-32-303-019-000	REPLACE WINDOWS UPPER LEVEL (1ST FL.) TOTAL (10) WINDOWS. LIVING ROOM, KITCHEN, (2) BEDROOMS. EGRESS SOGNED.	R	8/20/2018 Impr-L	80258-0	$300.00	$90.00
277								
Elizabeth Kougias	3833 S. Oak Park Avenue	16-31-420-012-000	NEW ELEC PANEL AND (1) EGRESS WINDOW 24X34 3/4. EGRESS SIGNED.	R	8/20/2018 Impr-L	80259-0	$1,500.00	$100.00
278								
Jose Armenta	3223 S. Home Avenue	16-31-112-008-000	REMOVE/REPLACE EXISTING PATIOI APPROX 12'X 38'	R	8/20/2018 Impr-L	80260-0	$4,500.00	$135.00
279								
Ignacio Nunez	2219 S. Ridgeland Avenue	16-29-100-009-000	T/O AND RR SHINGLES. TO CODE. REMOVE AND REPLACE SIDING	R	8/20/2018 Roof-L	80261-0	$18,632.00	$405.00
280								
Wilfredo Gautier & Jose Montal	1800 S. Grove Avenue	16-19-314-023-000	ATF GRAGE ROOF AND SOFFIT/FASCIA	R	8/20/2018 Roof-L	80262-0	$5,662.93	$100.00
281								
JBP Berwyn Property, LLC	6301 W. Cermak Road	16-29-101-004-000	PATCH REPAIR IN EXISTING ASPHALT PARKING LOT. REMOVE/REPLACE 4 INCH DEPTH. APPLY 2 INCHES OF BINDER AND 2 INCHES OF SURFACE HOT MIX.	C	8/20/2018 Impr-L	80263-0	$3,500.00	$170.00
282								
Matthew G. Thorsen	1436 S. Scoville Avenue	16-19-220-035-000	MOVING POD ON STREET DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/20/2018 POD-L	80264-0	$130.00	$50.00
283								
GUSTAVO LEON	3638 S. Harvey Avenue	16-32-310-038-000	REPLACEMENT OF SHINGLES. REPLACING OF 2 WALLS AND SIDING	R	8/20/2018 Roof-L	80265-0	$11,789.65	$230.00
284								

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Richmond Station Condominiu	3833 S. Harlem Avenue	16-31-324-016-000	ISTALL LOW VOLT FIRE ALARM SYSTEM.	C	8/20/2018	Impr-L	80266-0	$10,000.00	$360.00
285									
Gloria L. Balice Trust	1522 S. Wesley Avenue	16-19-225-024-000	R/R WATER HEATER	R	8/20/2018	Impr-L	80267-0	$1,319.00	$50.00
286									
6312 W. Cermak Inc	6312-14 W. Cermak Road	16-20-330-023-000	INERIOR DEMO ONLY NEW TENANT, WEST ELEVATION	C	8/20/2018	Impr-L	80268-0	$0.00	$0.00
287									
Jacqueline Pereda	3648 S. Clarence Avenue	16-31-410-015-000	REMOVE EXISTING FENCE ON NORTH SIDE OF PROPERTY. REINSTALL INSIDE OWN LOT LINE W/ 5FT + 1 FT LATTICE. JULIE DIG # X2322143 NEW POSTS. WILL NOT HINGE ON NEIGHBOR PROPERTY.	R	8/20/2018	Fence-L	80269-0	$700.00	$40.00
288									
YOUTH CROSSROADS INC	6501 W. Stanley Avenue	16-31-205-016-000	INSTALL (2) HVAC UNITS AND VENTS . DEMO OF NON-BEARING WALLS, FIXTURES, WIRES, PIPING.	C	8/20/2018	Impr-L	80270-0	$0.00	$0.00
289									
Jesus Beltran	2612 S. East Avenue	16-30-403-025-000	INSTALL 12' X 18' ROOFED (SHINGLES) OUTDOOR PERGULA ON EXISTING CONCRETE PAD * PER DIRECTOR MUST HAVE PERGULA REINFORCED WITH PIERS . REMOVE/REPAIR EXISTING FRAME PORCH W/ SAME LAYOUT INSTALL PAVERS BENEATH DECK. JULIE DIG # X2260863 (added 8/27/18) Remov	R	8/20/2018	Impr-L	80271-0	$5,000.00	$235.00
290									
Lisa DiPoerro	1628 S. Kenilworth Avenue	16-19-305-030-000	REPLACE EXIISTING FRONT APPROACH CONCRETE PAD AND REPLACE EXISTING WALKWAY ON NORTH SIDE OF PROPERTY.	R	8/20/2018	Impr-L	80272-0	$1,500.00	$90.00
291									
JAVIER MARTINEZ	1940 S. Clinton Avenue	16-19-320-035-000	INSTALL AC CONDENSER IN BACK YARD HOOK INTO EXISTING FURNACE. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/20/2018	Impr-L	80273-0	$2,000.00	$155.00
292									
Thelma M. Rodriguez	2219 S. East Avenue	16-30-204-013-000	REPAIRING ROOF SHINGLES REPLACING ON PORCHED ROOF (FRONT OF HOME) REPLACING ANY DAMAGED MEMEBRS UNDER PORCHED ROOF AS NEEDED.	R	8/20/2018	Impr-L	80274-0	$850.00	$90.00
293									
Mohammed Essa	1348 S. Wisconsin Avenue	16-19-109-037-000	EMERGENCY REPAIR - REPAIR EXISTING 3 METER SERVICE, REPLACE 100 AMP DISCONNECT AND WIRING.	R	8/21/2018	Elec-L	80275-0	$775.00	$90.00
294									

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James J. Salvatore Trust	7024 W.44 16th Street	99-99-999-000-064	INSTALL A FIRE ALARM TO CODE.		8/21/2018	Impr-L	80276-0	$1,900.00	$240.00
295									
ELIAS LANDEROS	1916 S. Home Avenue	16-19-319-022-000	T/O RR HOUSE ONLY TPO FLAT ROOF TO CODE.	R	8/21/2018	Roof-L	80277-0	$7,600.00	$40.00
296									
Eloise Kafka Peters	2709 S. Clinton Avenue	16-30-312-089-000	TEAR OFF AND RESHINGLE THE HOUSE AND COAT THE FLAT ROOF SECTION.	R	8/21/2018	Roof-L	80278-0	$4,500.00	$125.00
297									
Otis Willams	1822 S. Elmwood Avenue	16-19-414-061-000	REMOVE/REPLACE EXISTING GUTTERS/FASCIA/ ON HOUSE AND GARAGE. DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY.	R	8/21/2018	Impr-L	80279-0	$1,100.00	$90.00
298									
Juanita Rivera	3635 S. Highland Avenue	16-32-310-035-000	R/R FRONT APPROACH AND STAIRS AND INSTALL NEW HANDRAIL TO CODE.	R	8/21/2018	Impr-L	80280-0	$1,000.00	$90.00
299									
Daniel J. & Jeanie L. Brown	2246 S. Cuyler Avenue	16-29-100-032-000	TEAR OFF AND RESHINGLE THE GARAGE.	R	8/21/2018	Roof-L	80281-0	$1,000.00	$40.00
300									
Ginelle Sanchez	7007 W. 26th Street	16-30-113-011-000	GRINDING CRACK REPARATIONS AND TUCK POITING OF THE BRICK ABOVE THE LINTELS ON THE EAST SIDE OF THE GARAGE AND THE BRICK ABOVE THE I-BEAM ONB THE NORTH SIDE OF THE GARAGE (ALONG W/ CLEANING UP THE STAINED BRICK AS MUCH AS POSSIBLE). DEMO AND REBUILD THE BR	R	8/21/2018	Impr-L	80282-0	$3,100.00	$145.00
301									
JVS Leasing	7101 W. Roosevelt Road	16-19-101-039-000	INSTALL EMERGENCY LIGHTS IN BATHROOM REMOVE REAR EXIT SIGN IN DINING AREA.	C	8/21/2018	Impr-L	80283-0	$500.00	$140.00
302									
Joseph Pav Trust #800236999	1319 S. Oak Park Avenue	16-19-208-007-000	T/O AND RR HOUSE ONLY TO CODE. CALL FOR FINAL ROOF INSPECTION.	R	8/21/2018	Roof-L	80284-0	$4,620.00	$125.00
303									
Roy Thomas Benson	6240 W. Cermak Road	16-20-331-025-000	ONE (1) "I" SHAPED AWNING RECOVER, FRONT BUIKLDING, SIDE, ABD REAR ENTRANCE WEST SIDE. ONE BULL NOSED SHAPED AWNING. ALL ELEC EXISTING	C	8/21/2018	Sign-L	80285-0	$45,000.00	$90.00
304									
Finkley & Gunty	1852 S. Kenilworth Avenue	16-19-313-040-000	R/R SOUTH SIDE FENCE AND GATES - INSTALL A 6FT SOLID WOOD FENCE	R	8/21/2018	Fence-L	80286-0	$2,100.00	$135.00
305									

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Christopher Finkley & Gregory	1902 S. Wisconsin Avenue	16-19-317-018-000	REMOVE BUSHES AND INSTALL A 6FT WOOD FENCE ON THE NORTH SIDE OF THE PROPERTY, R/R FENCE ALONG THE ALLEY AND INSTALL A 6FT WOOD FENCE BETWEEN THE 2 GARAGE, REMOVE THE BETWEEN THE 2 HOUSES ON THE SOUTH SIDE OF THE PROPERTY AND INSTALL A 5FT WOOD FENCE BETWE	R	8/21/2018	Fence-L	80287-0	$2,700.00	$135.00
306									
S & S Kenilworth Ave	1941 S. Kenilworth Avenue	16-19-322-014-000	REPAIR OF SMALL ROOFS AROUND THE BUILDING . REPAIR THE BAD WOOD. NEW ROOFS W/ ARCH SHINGLES . INSTALL SOFFIT AND FASCIA ON ALL OVERHABGS. REPLACE DAMAGED DOWNSPOUTS ON MAIN ROOF REMOVE ALL CABLES AND CLEAN ALL DEBRIS. PATCH ROOF W/ ROOFING CEMENT . CALL F	R	8/21/2018	Roof-L	80288-0	$0.00	$155.00
307									
Keith W. Bielarz & Beth Bielarz	1914 S. Wenonah Avenue	16-19-318-021-000	INSTALL 15 FT ROUND ABOVE GROUND POOL ===JULIE # X2310029	R	8/21/2018	Impr-L	80289-0	$3,600.00	$125.00
308									
ERIC & MICHELLE HAWLEY	1826 S. Euclid Avenue	16-19-408-031-000	EMERGENCY LIGHTING - GFI GARAGE, BSMT LAUNDRY, BSMT KITCHEN, BSMT BATH - 10 ENCLOSED LIGHT FIXTURES - INSTALL GROUND ROD - SIMPLEX FOR SUMP PUMP	R	8/21/2018	Elec-L	80290-0	$2,005.00	$155.00
309									
Hector Garcia Living Trust	3630 S. Highland Avenue	16-32-309-030-000	REINSPECTION PRE-POUR STREET	R	8/22/2018	Bldg-B	8937-2	$0.00	$50.00
310									
Getsemani Nava	2443 S. Clinton Avenue	16-30-110-014-000	INSTALL NEW BATHROOM USING EXISTING TOILET FIXTURE(EXISTING TOILET AND EXHAUST FAN) IN BASMENT. FRAME, ADD LIGHT , FIXTURES, CABINETS, SINK, HEAT TO CODE. RELOCATE AND REPLACE WATER HEATER. INSTALL NEW COPPER PIPING THROUGHOUT HOUSE. RELOCATED LAUNDRY UNI	R	8/22/2018	Bldg-B	9090-0	$10,500.00	$735.00
311									
Alan Garcia & Maria Garcia	1840 S. Gunderson Avenue	16-19-413-033-000	2 UNIT. MAKE ILLEGAL BEDROOMS IN BASEMENT LEGAL, INSTALL EGRESS WINDOWS AND INSTALL PERMANENT HEAT SOURCE. INSTALL EXHAUST FANS IN 2 BATHROOM AND 2 KITCHENS-RDV CHECK FOR ELECTRICAL HOOK UP FOR EXHAUST FAN IN BATHROOMS. DECONVERT BASEMENT KITCHEN-CAP ALL	R	8/22/2018	Bldg-B	9091-0	$1,700.00	$140.00
312									

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Hector & Sylvia Trujillo	3824 S. Highland Avenue	16-32-325-008-000	ATF ATTIC WALLS INSULATE AND DRYWALL FOR STORAGE, ATF BASEMENT BATHROOM, DECONVERT BASEMENT KITCHEN. CHECK FOR EGRESS.	R	8/22/2018 Bldg-B	9092-0	$1,500.00	$540.00
313								
Triwin Investments Internationa	2538 S. Ridgeland Avenue	16-30-231-031-000	PLUMBING FINAL FEE ONLY FOR REINSPECTION ON 8/22/18	R	8/22/2018 Impr-L	78218-2	$0.00	$50.00
314								
Stephen Lancsak & Janet Lans	1246 S. Home Avenue	16-19-103-044-000	PAYING FOR ADDITIONAL CHLOROLOY INSPECTION.	R	8/22/2018 Impr-L	79414-1	$0.00	$50.00
315								
Marjorie A. Nocco & Marjorie D	3647 S. Clarence Avenue	16-31-410-038-000	moving pod on the street DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/22/2018 POD-L	80291-0	$0.00	$50.00
316								
1900 Cuyler LLc	1900 S. Cuyler Avenue	16-20-321-016-000	replace existing garage concrete pad and apron.	R	8/22/2018 Impr-L	80292-0	$6,500.00	$180.00
317								
Tim Ariza And Amanda Stetzer	1229 S. Maple Avenue	16-19-101-016-000	R/R CONCRETE STEPS AND FRONT LANDING, R/R CONCRETE ON SOUTH SIDE OF PROPERTY FROM CITY WALK TO REAR OF HOUSE. FIX ALL FOUNDATION CRACKS, SEAL COAT FRONT STAIRS, SIDEWALK AND PATIO.	R	8/22/2018 Impr-L	80293-0	$5,000.00	$135.00
318								
Laura Lemus	2340 S. Lombard Avenue	16-29-111-039-000	RR EXISTIING SOUTHWEST GATE ADJECENT TO GARAGE WITH 6FT SOLID PRIVACY GATE. JULIE DIG #X2340865	R	8/22/2018 Fence-L	80294-0	$300.00	$135.00
319								
Joseph Carrasquillo	1312 S. Euclid Avenue	16-19-208-026-000	TUB TO SHOWER CONVERSION	R	8/22/2018 Impr-L	80295-0	$6,583.00	$315.00
320								
Brian J. Gnutel	1641 S. Wesley Avenue	16-19-402-011-000	R/R 6 WINDOWS BEDROOMS-CHECK FOR EGRESS	R	8/22/2018 Impr-L	80296-0	$4,000.00	$120.00
321								
Robert J. Pletsch, Sr. & Beverl	2219 S. Clinton Avenue	16-30-102-014-000	R/R 6 WINDOWS IN KITCHEN, DINING ROOM, PANTRY, CLOSET AND BEDROOM-CHECK FOR EGRESS	R	8/22/2018 Impr-L	80297-0	$4,793.00	$135.00
322								
Andres & Perla Hernandez	3856 S. Kenilworth Avenue	16-31-329-035-000	R/R 7 WINDOWS IN KITCHEN, STAIRS AND BEDROOMS-CHECK FOR EGRESS	R	8/22/2018 Impr-L	80298-0	$6,381.00	$165.00
323								
Morton West High School	2400 S. Home Avenue	99-99-999-000-024	INSTALL OF ANSUL SYSTEM TO CODE.	C	8/22/2018 Impr-L	80299-0	$4,900.00	$185.00
324								

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Ronald & Christine Czerwinski	3811 S. Wesley Avenue	16-31-422-061-000	A/C REPL 13SEER 2.5TON 3FT FROM PROPERTY LINE. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/22/2018 HVAC-L	80300-0	$4,890.00	$140.00
325								
Linda M. Kacirek	3025 S. Oak Park Avenue	16-30-415-011-000	R/R FENCE ON SOUTH SIDE OF PROPERTY AT FRONT (SET BACK MIN 15' FROM FRONT LOT LINE) AND REAR AT ALLEY WITH 5' WOOD. JULIE DIG X002331130	R	8/22/2018 Fence-L	80301-0	$1,957.00	$135.00
326								
Emigdia & Mariah Torres	2629 S. Euclid Avenue	16-30-401-017-000	PRELIMINARY ELECTRICAL INSPECTION TO WALK THRU PROPERTY TO DETERMINE WHAT NEEDS TO BE BROUGHT TO CODE	R	8/22/2018 Elec-L	80302-0	$0.00	$50.00
327								
Nikolay G. Vladimirov	1843 S. Grove Avenue	16-19-315-019-000	INTERIOR DEMO OF THE 1ST AND 2ND UNIT TO THE STUDS - NO STRUCTURAL DEMO -- PRELIMINARY PLUMBING INSPECTION TO DETERMINE CODE COMPLIANCE, SPOT TUCKPOINT THE BUILDING. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/22/2018 Impr-L	80303-0	$800.00	$140.00
328								
Peter & Karen DeCraene	1837 S. Harvey Avenue	16-20-311-015-000	ROOFTOP PV INSTALLATION	R	8/22/2018 Impr-L	80304-0	$18,438.00	$345.00
329								
Daniel Rodriguez & Gloria Roja	1501 S. Wesley Avenue	16-19-226-001-000	POUR NEW CONCRETE UNDER PORCH, REMOVE AND REPAIR SIDEWALK, RUN NEW ELECTRICAL CONDUIT AND 2 RECEPTACLES FOR 3 EXTERIOR LIGHTS, INSTALL DOOR, WINDOWS, ROOF REPAIR, SOFFIT, FASCIA, GUTTER, SIDING REPAIR. RELOCATE A/C UNIT TO CODE, FLOOR TILES, REPLACE TWO 2	R	8/22/2018 Impr-L	80305-0	$20,000.00	$560.00
330								
LUIS TORRES & MARGARITA	2112 S. Highland Avenue	16-20-330-014-000	TUCKPOINT ABOUT 3' UP FROM GROUND	R	8/22/2018 Impr-L	80306-0	$300.00	$40.00
331								
Felix Delgado	2831 S. Ridgeland Avenue	16-29-316-016-000	INSTALL EGRESS IN BASEMENT	R	8/22/2018 Impr-L	80307-0	$200.00	$90.00
332								
Chicago Title Trust No. 800234	6923-25 W. 34th Street	16-31-124-026-000	REPAIR FRONT STEPS, REPLACE 3 SQUARES ON PRIVATE WALK, TUCKPOINT BUILDING AS NEEDED, REBUILD PARTS OF PARAPET WALL, INSTALL NEW PARKING PAD	C	8/22/2018 Impr-L	80308-0	$4,000.00	$195.00
333								

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John & Corazon Tripp	1525 S. Wenonah Avenue	16-19-127-011-000	TUCKPOINTING REPAIRS.	R	8/22/2018	Impr-L	80309-0	$350.00	$40.00
334									
Ismael Lopez	2122 S. Clarence Avenue	16-19-426-018-000	T/O AND RESHINGLE HOUSE AND GARAGE. CALL FOR FINAL INSPECITON.	R	8/22/2018	Roof-L	80310-0	$8,000.00	$170.00
335									
Noe Casimiro	3705 S. Highland Avenue	16-32-318-029-000	COMPLAINCE: 1. EACH BEDROOM TO HAVE WINDOW EGRESS. 2. INSTALL FRONT/REAR STAIRWELLS W/T EMERGENCY LIGHTING W/T BATH BACK UP. 3. DECONVERT GAS SPACE HEATER IN BMST. 4. BMST BATHROOM AND FAMILY ROOM TO HAVE PERMENANT CONTROLLABLE HEAT SOURCE 5. HOT WATER TA	R	8/22/2018	Impr-L	80311-0	$3,800.00	$485.00
336									
Thirteen Investment Company	3634 S. Euclid Avenue	16-31-400-044-000	INTERIOR DEMO DUE TO FIRE – NO STRUCTURAL DEMO. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/22/2018	Impr-L	80312-0	$4,000.00	$120.00
337									
Amy Bowne	2339 S. Elmwood Avenue	16-30-215-012-000	INSTALL FENCE/GATE NORTH AND SOUTH SIDE OF PROPERTY 5'+1' VINYL-NEIGHBOR PERMISSION ON FILE.	R	8/22/2018	Fence-L	80313-0	$2,350.00	$135.00
338									
Daniel Cooper	2324 S. Clinton Avenue	16-30-105-029-000	T/O AND RESHINGLE HOUSE ROOF	R	8/22/2018	Roof-L	80314-0	$7,900.00	$170.00
339									
Elias Lopez Vazquez	2640 S. Lombard Avenue	16-29-303-037-000	RADIATORS TO FORCED AIR-INSTALL ATTIC FURNACE AND VENTS IN EACH ROOM	R	8/23/2018	Bldg-B	9093-0	$3,500.00	$350.00
340									
Berwyn Bottega Co	6712 W. Cermak Road	16-19-425-025-000	fees only: electric service / rpz test/ddca valve	C	8/23/2018	Impr-L	79058-1	$0.00	$100.00
341									
Christine Smith	2315 S. Wesley Avenue	16-30-210-005-000	R/R GARAGE OVERHEAD DOOR	R	8/23/2018	Impr-L	80315-0	$1,000.00	$40.00
342									
Novak Property Holdings, LLC	2244 S. Oak Park Avenue	16-30-104-038-000	replace shower valve	C	8/23/2018	Plum-L	80316-0	$350.00	$50.00
343									
Sonia Lopez & Carlos Rivero	1817 S. Gunderson Avenue	16-19-414-007-000	1ST FLOOR REMODEL KITCHEN AND BATHROOM. CALL FOR FINAL INSPECTION	R	8/23/2018	Impr-L	80317-0	$23,500.00	$420.00
344									

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SONIA GARCIA	2816 S. Highland Avenue	16-29-317-027-000	COMPLIANCE: 1. ANY OPEN BULB IN BASEMENT TO BE FULLY ENCLOSED. 2. COPPER FELX PIPES AT HOT WATER TANK TO BE RIGID PIPE TO CODE. 3. REMOVE WATER FILTER IN BMST TO CODE. 4. ELECTRICAL PANEL FILL IN BLANKS. 5. INSTALL DISHWASHER.	R	8/23/2018	Impr-L	80318-0	$60.00	$240.00
345									
Richard A. Lusk	2403 S. Home Avenue	16-30-109-002-000	ALUM CLADDING OVER CHIMNEY FLASH. RE-FLASH COUNTER FLASHING OVER SIDE ENTRY.	R	8/23/2018	Impr-L	80319-0	$2,000.00	$40.00
346									
Thinh Bui	1842 S. Elmwood Avenue	16-19-414-037-000	PRELIMINARY ELECTRICAL INSPECTION TO DETERMINE WHAT NEEDS TO BE BROUGHT TO CODE THROUGHOUT HOUSE	R	8/23/2018	Elec-L	80320-0	$0.00	$50.00
347									
J. Ramirez & K. Kalinski	3115 S. Clarence Avenue	16-31-203-006-000	INSTALL BATH FITTER LINER SYSTEM. NO PLUMBING.	R	8/23/2018	Impr-L	80321-0	$1,699.00	$90.00
348									
George Blanas	3145 S. Euclid Avenue	16-31-201-033-000	1ST FLOOR FIX CARPENTRY, WALL INSULATION AND DRYWALL, PAINTING, INSTALL KITCHEN CABINETS, INSTALL BATHROOM CERAMIC TILE AND SAND WOOD FLOORS. ELECTRIC AND PLUMBING	R	8/23/2018	Impr-L	80322-0	$35,000.00	$1,110.00
349									
P. Williams & K. Kesselring	3701 S. Grove Avenue	16-31-323-001-000	COMPLIANCE: (ATF'S) INSTALL EGRESS WINDOW TO CODE IN ATTIC BEDROOM. UPGRADE ELECTRICAL METER SOCKET (IN BACKYARD). PROVIDE GFCI PROTECTION FOR LIGHT/FAN IN PERMIETER OF SHOWER. ATTIC REMODEL: DRYWALL, HVAC, MODE POWDER ROOM. INTO 3/4 BATH ADDED SHOWER, SK	R	8/23/2018	Impr-L	80323-0	$0.00	$245.00
350									
SIP Management	1901 S. Harlem Avenue	16-19-316-046-000	T/O AND RESHINGLE HOUSE, R/R GUTTERS AND DOWNSPOUTS ON HOUSE DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY. ICE AND WATER SHIELD TO CODE NO POWER VENTS	R	8/23/2018	Impr-L	80324-0	$6,850.00	$240.00
351									
Roger & Julia Bauers	3618 S. Maple Avenue	16-31-308-031-000	INSTALL PV SOLAR SYSTEM	R	8/23/2018	Impr-L	80325-0	$36,482.00	$615.00
352									

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Pamela H. Zachritz	1340 S. Wenonah Avenue	16-19-110-035-000	BY OWNER WORK PARTIAL BATHROOM AND PARTIAL KITCHEN DEMO ALSO REMODEL KITCHEN AND EXISTING BATHROOM AND LAUNDRY AREA, T/O AND REROOF GARAGE ROOF, PLUMBING SCOPE TO INCLUDE REPLACEMENT OF GALVANIZED WATER LINES FROM METER ALL THE WAY TO THE FIRST FLOOR, INS	R	8/23/2018	Impr-L	80326-0	$26,500.00	$925.00
353									
BRENT HANNIGAN & ELIZAB	3015 S. Clarence Avenue	16-30-418-008-000	INSTALL 5' WOOD FENCE/GATE AT ALLEY AND 1/2 WAY UP TO GARAGE, REMOVE GATE AT REAR OF HOUSE, INSTALL A 5' WOOD FRONT GATE ON NORTH SIDE OF PROPERTY AND INSTALL 5' WOOD FENCE ON SOUTH SIDE OF PROPERTY -MUST BE AT LEAST 15' SET BACK FROM FRONT LOT LINE	R	8/23/2018	Fence-L	80327-0	$1,580.00	$135.00
354									
Healy Renovations LLC	3747 S. Wisconsin Avenue	16-31-318-009-000	FEES ONLY: FRAMING/ HVAC/ BUILDING	R	8/24/2018	Bldg-B	8871-3	$0.00	$195.00
355									
Hector Garcia Living Trust	3630 S. Highland Avenue	16-32-309-030-000	reinspection fee only for failed prepour street on 8/23/18	R	8/24/2018	Bldg-B	8937-3	$0.00	$50.00
356									
Gus Santiago	3803 S. Ridgeland Avenue	16-32-324-002-000	ATF: KITCHEN REMODEL W/T CAN LIGHTS ENLARGED LIVING ROOM (PARTION WALL REMOVED) BASEMENT FINISHED W/T BATHROOM INSTALL. INSTALL EGRESS WINDOW. EGRESS SIGNED. REMOVAL OF OLD RER DECK AND INSTALLATION OF NEW LAYERED DECK . NEW STAMPED PATIO IN YARD. COMPLE	R	8/24/2018	Bldg-B	9094-0	$5,000.00	$705.00
357									
Melissa Ramirez & Marcos Her	6439 W. 32nd Street	16-31-210-011-000	R/R KITCHEN SINK ONLY- NO CABINETS, REPAIR WHOLE IN THE DRYWALL ON THE 1ST FL. 3 PROXY GROUNDED OUTLETS, ALL CLOSETS AND STORAGE LIGHTS REPLACE, GFCI OUTLETS, KTICHEN COUNTERS, BATHROOM ENTIRE BASEMENT, REPLACE MISSING AND BROKEN LIGHTS FIXTURES, CLEAN UP	R	8/24/2018	Impr-L	80328-0	$5,000.00	$235.00
358									
Jaime Galindo	1312 S. Ridgeland Avenue	16-19-215-029-000	DEMO ONLY 1ST FL AND 2ND FL TO STUDS, NO LOAD BEARING WALLS.. DUMPSTER FOR CLEAN OUT. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/24/2018	Impr-L	80329-0	$0.00	$90.00
359									

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Lizabeth Meg Hannegan	1503 S. Wenonah Avenue	16-19-127-002-000	REBUILD THE TOP OF THE NORTH CHIMNEY 6' W/ NEW BRICKS , NEW CAPSTONE, NEW FLASHING . SAME SIZE	R	8/24/2018	Impr-L	80330-0	$2,840.00	$55.00
360									
D & G Bedford	6826 W. 30th Street	16-30-324-010-000	REPLACE AND REINSTALL USING SAME POST AND HEIGHT ON SOUTH SIDE OF HOME, REAR YARD. 5FT SOLID WOOD.	R	8/24/2018	Fence-L	80331-0	$700.00	$135.00
361									
Yaron Cohen-Saban & Arielle	2313 S. Clinton Avenue	16-30-106-006-000	REMOVE AND REPLACE FRONT STEPS LANDING RR FRONT SERVICE WALK	R	8/24/2018	Impr-L	80332-0	$4,500.00	$135.00
362									
James B Gillispie & Mary Lee	1506 S. Lombard Avenue	16-20-126-024-000	RR GARAGE APRON 20 X 6 AND RR APPROX. 12 X 3 SIDE WALK.	R	8/24/2018	Impr-L	80333-0	$1,900.00	$90.00
363									
James & Faith Hutchinson	1627 S. Grove Avenue	16-19-307-011-000	REMOVE AND REPAIR THE REAR GATES AT ALLEY WITH SAME POST HOLES AND SIZE (6FT SOLID) REPAIR FLOOR IN REAR YARD (DECKING ONLY).	R	8/24/2018	Impr-L	80334-0	$60.00	$90.00
364									
Ryan & Julie Collins	1639 S. Elmwood Avenue	16-19-407-047-000	TUCKPOINTING AND BRICK SEALING. IF GRINDING MUST TENT OR TARP AREA. WET GRINDING IS ALSO ALLOWED.	R	8/24/2018	Impr-L	80335-0	$200.00	$40.00
365									
Lissette Y & Juan G Dejesus	3631 S. Harvey Avenue	16-32-311-037-000	REMOVE ALL OLD KITCHEN CABINETS AND REPLACE THEM WITH NEW ONES. PLUMBING IS STAYING AS IS. REMOVE OLD FLOOR CERAMIC TILE AND REPLACE W/ NEW ONES.	R	8/24/2018	Impr-L	80336-0	$3,000.00	$50.00
366									
TRAN H. YOUNG	3825 S. Wesley Avenue	16-31-422-066-000	INSTALL CANLIGHTS IN CEILING AFTER REMOVING AND REPLACING. INSTALL DRYWALL IN BMST CEILING AND ENCLOSE OPEN LIGHT BULBS. INSTALL PAVER PATIO IN REAR W/ 165 SQ FT.	R	8/24/2018	Impr-L	80337-0	$1,500.00	$290.00
367									
Jose Diaz Amezcua	3524 S. Scoville Avenue	16-31-404-036-000	REMOVE AND REPLACE BMST BEDROOM WINDOWS INSTALL EGRESS IN BMST REC AREA (6 WINDOWS) EGRESS WHERE NEEDED. REPAIR GCFI OUTLET ON MAIN FL. BATHROOM INSTALL GCFI GARAGE EXTERIOR OUTLET.	R	8/24/2018	Impr-L	80338-0	$1,800.00	$140.00
368									

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Henry Lopez	3613 S. Wesley Avenue	16-31-410-085-000	1ST FLOOR ONLY REPLACE 1 PICTURE WINDOW AND 2 DOUBLE HUNG CLEAR GLASS SAME SIZE AS EXISTING WINDOWS. IN LIVING ROOM 1ST FL.	R	8/24/2018	Impr-L	80339-0	$1,000.00	$40.00
369									
Daniel & Kim Leali	6826 W. 29th Place	16-30-319-010-000	GARAGE DEMO IN 2017. ERECT NEW (2) CAR GARAGE (19 X 23') W/ HEIGHT OF 14'.	R	8/27/2018	Bldg-B	9095-0	$18,500.00	$300.00
370									
Hector Zicczrelli	2319 S. Home Avenue	16-30-105-009-000	COMPLIANCE ELECTRIC, REMOVE ALL BX WIRING IN GARAGE, ADD PLATES FOR OUTLETS AND SWITCHES, GLOBE LIGHTS IN CLOSETS GFCI OUTSIDE LIGHT, ELECTRIC DOOR OPENER.	R	8/27/2018	Elec-L	80340-0	$2,150.00	$105.00
371									
Chicago Title Land Trust Comp	2411 S. Kenilworth Avenue	16-30-111-013-000	t/o and rr house and garage and cap window frame w/ alum on 3 dormers.	R	8/27/2018	Roof-L	80341-0	$13,400.00	$260.00
372									
Steven & Milka Torbuk	3714 S. Euclid Avenue	16-31-415-025-000	T/O RR AND HOUSE AND GARAGE.	R	8/27/2018	Roof-L	80342-0	$3,010.00	$150.00
373									
Berwyn Animal Hospital	2845-47 S. Harlem Avenue	16-30-308-027-000	5 interior foundation crack repairs	C	8/27/2018	Impr-L	80343-0	$3,082.00	$40.00
374									
Jose & Beatrice Carriedo	1522 S. Wisconsin Avenue	16-19-125-024-000	REPLACE (7) WINDOWS IN BASEMENT . BMST FINISHED (DRYWALL) W/T NO BEDROOMS. EGRESS SIGNED.	R	8/27/2018	Impr-L	80344-0	$2,000.00	$90.00
375									
Mario Villegas & Luis A. Pinto	1415 S. East Avenue	16-19-220-007-000	REPLACE ALL WINDOWS THROUGHOUT HOME. BMST UNFINISHED. EGRESS SIGNED.	R	8/27/2018	Impr-L	80345-0	$3,000.00	$105.00
376									
Roberto & Delia Gamboa	3519 S. Harvey Avenue	16-32-303-014-000	T/O AND RR GARAGE ONLY.	R	8/27/2018	Roof-L	80346-0	$700.00	$40.00
377									
Nicolas Ramirez	2323 S. Harvey Avenue	16-29-111-010-000	DUMPSTER TO REMOVE DEBRIS IN HOUSE. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/27/2018	Dump-L	80347-0	$300.00	$50.00
378									
Reynaldo Perez	6520 W. 28th Place	16-30-414-008-000	R/R WINDOWS ON MAIN FLOOR, FRONT, 2 BEDROOMS, DINING ROOM AND KITCHEN. CALL FOR FINAL INSPECTION. CHECK FOR EGRESS	R	8/27/2018	Impr-L	80348-0	$2,500.00	$105.00
379									

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Crystal & Leonel Abrego	2836 S. Lombard Avenue	16-29-319-034-000	DIG NORTH SIDE OF HOUSE TO FIX FOUNDATION CRACKS, REPAIR DAMAGED DRYWALL IN BASEMENT. R/R 5 WINDOWS IN 1ST FLOOR-3 KITCHEN, 1 BEDROOM-CHECK FOR EGRESS- 1 LIVING ROOM.	R	8/27/2018 Impr-L	80349-0	$600.00	$90.00
380								
Russell Sier	2645 S. Grove Avenue	16-30-306-022-000	CLEAN OUT INTERIOR HOUSE.	R	8/27/2018 Dump-L	80350-0	$300.00	$50.00
381								
Black Square Midwest , LLC	3323 S. Ridgeland Avenue	16-32-118-006-000	REPLACE SOME DOORS , PAINT, REFINISH HARDWOOD, NEW VYNIL ON TILES IN BMST, NEW FENCE.	R	8/27/2018 Impr-L	80351-0	$0.00	$335.00
382								
Jose M. Torres	2438 S. Highland Avenue	16-29-117-033-000	TUCKPOINT HOME, FRONT FAÇADE AND SIDES AS NEEDED. IF GRINDING MUST TENT OR TARP AREA. WET GRINDING IS ALSO ALLOWED.	R	8/27/2018 Impr-L	80352-0	$300.00	$40.00
383								
Delia D. Castaneda	1646 S. Highland Avenue	16-20-301-037-000	REMOVE AND REPLACE EXISTING CONCRETE WALKWAYS AT NORTH SIDE OF HOME FROM FRONT OF SIDEWALK LEADING TO REAR OF HOME. ON SOUTH SIDE FROM FRONT OF SIDEWALK TO ALLEY. AT YARD ADJECENT TO GARAGE SMALL WALKWAY RR. (ADDED 8/28/18) REMOVE AND REPLACE EXISTING CON	R	8/27/2018 Impr-L	80353-0	$6,000.00	$150.00
384								
Martin & Lois Graham- McHugh	3307 S. Ridgeland Avenue	16-32-118-002-000	REPLACE BACK DOOR NO SIZE CHANGES. ALUM SOFFIT AND REPAIR (2) STEPS WOOD, AT FRONT OF HOME.	R	8/27/2018 Impr-L	80354-0	$5,300.00	$200.00
385								
Salvador Medina & Margarita M	2217 S. Harvey Avenue	16-29-103-010-000	R/R CONCRETE AT REAR OF GARAGE 25X6 AND FRONT OF HOUSE 19X3 TO CITY WALK.	R	8/27/2018 Impr-L	80355-0	$1,500.00	$90.00
386								
Raymundo & Micaela Carlos	1515 S. Scoville Avenue	16-19-229-047-000	REMOVE AND REPLACE EXISTING FENCE/GATE AT REAR ALLEY W/ 6FT SOLID PRIVACY GATES. USING SAME POST HOLES ON CONCRETE. REPLACE REAR HEATED PORCH WINDOWS. INSTALL NEW SIDING W/T HOUSE WRAP ON REAR PORCH. REMOVE AND REPLACE EXISTING CONCRETE WALKWAY ON SOUTH S	R	8/27/2018 Impr-L	80356-0	$2,000.00	$190.00
387								
Renee Evans & Donna M & Me	1817 S. Wesley Avenue	16-19-410-007-000	WINDOW INSTALLATION THROUHGOUT HOUSE. EGRESS SIGNED.	R	8/27/2018 Impr-L	80357-0	$13,000.00	$255.00
388								

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Jorge Diaz	3121 S. Scoville Avenue 2	16-31-205-019-700	DECPONVERT ILLIGAL KITCHEN IN MASTER BEDROOM. REMOVE ALL CABINETS AND FIXTURES ASSOCIATED W/ KITCHEN AND CAP AT SOURCE. ALL WALLS TO BE REPAIRED TO A SMOOTH SURFACE AND FINISHED (AFTER PLUMBING INSPECTOR CLEARS WORK).		8/27/2018	Impr-L	80358-0	$0.00	$140.00
389									
Richard Plaza	1326 S. Scoville Avenue	16-19-212-034-000	ADD NEW CONTROLLABLE PERMANENT HEAT SOURCE IN LAUNDRY ROOM, BEDROOM, REC ROOM AND BATHROOM, EXTERIOR WALLS WERE DRYWALL AND INSTALLED RECESSED LIGHTING, INSTALL EGRESS WINDOW TO BEDROOM AND REC ROOM IN BASEMENT, RENOVATED THE MAIN FLOOR BATHROOM WITH TUB,	R	8/28/2018	Bldg-B	9096-0	$2,500.00	$500.00
390									
Alfonse & Margarita Amaya	2332 S. Gunderson Avenue	16-30-213-030-000	INSTALL (2) NEW POSTS AT ALLEY WEST SIDE (REAR HOME) GATES, W/ 6FT WOOD ALLEY WRUGHT IRON GATE.	R	8/28/2018	Impr-L	79783-1	$0.00	$100.00
391									
Kevin Bryant & Carmen Boada	3742 S. Wenonah Avenue	16-31-318-021-000	R/R GARAGE OVERHEAD DOOR - NO SIZE CHANGES - HOOKING UP TO EXISTING ELECTRIC.	R	8/28/2018	Impr-L	80359-0	$1,019.00	$40.00
392									
Omar Gutierrez	6932 W. 30th Street	16-30-323-008-000	TUCKPOINTING AS NEEDED ON STAIRS AND SIDES OF HOUSE. CALL FOR FINAL INSPECTION.	R	8/28/2018	Impr-L	80360-0	$3,000.00	$130.00
393									
Shivani Anand	2224 S. Highland Avenue	16-29-101-031-000	INSTALL 6" CLEAN OUT ON PRIVATE PROPERTY.	R	8/28/2018	Plum-L	80361-0	$2,800.00	$105.00
394									
Berwyn Petroleum LLC	3845 S. Harlem Avenue	16-31-324-045-000	REPLACE ONE CONCRETE FUEL DISPENSER ISLAND AND ADJUST FUEL PIPE LINES.	C	8/28/2018	Impr-L	80362-0	$18,125.00	$485.00
395									
Barbara Kasper	1533 S. Elmwood Avenue	16-19-231-014-000	COMPLIANCE: 1. BATHROOM MUST HAVE GCFI OUTLET TO CODE. 2. LAUNDRY OUTLETS TO BE GCFI PROTECTED. 3. HOT WATER TANK COPPER FLEX LINES TO BE MADE RIGID PIPE. 4. GARAGE PERIMETER OUTLET TO BE GCFI. ALL WORK COMPLETE.	R	8/28/2018	Impr-L	80363-0	$425.00	$0.00
396									
Kimberley Freeland	1926 S. Euclid Avenue	16-19-416-036-000	INSTALL OF 3 CASEMENT WINDOWS IN 1ST FLOOR BEDROOM AND BASEMENT. CHECK FOR EGRESS.	R	8/28/2018	Impr-L	80364-0	$2,825.00	$105.00
397									

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William & Susan Bronkema	3704 S. East Avenue	16-31-417-028-000	INSTALL HANDRAILS TO CODE ON THE FRONT PORCH TO CODE.	R	8/28/2018 Impr-L	80365-0	$1,800.00	$40.00
398								
Jose & Maria Rivera	3411 S. Cuyler Avenue	16-32-131-016-000	TEAR OFF AND RESHINGLE THE HOUSE AND GARAGE - R/R GUTTERS & DOWNSPOUTS TO CODE. DOWNSPOUTS MUST DISBURSE ONTO PRIVATE PROPERTY. NO POWER VENTS ICE AND WATER SHIELD TO CODE	R	8/28/2018 Roof-L	80366-0	$8,058.96	$220.00
399								
Mercedes Herrera	1412 S. Lombard Avenue	16-20-118-025-000	REMOVE AND REPLACE GARAGE VINYL SIDING.	R	8/28/2018 Impr-L	80367-0	$2,500.00	$55.00
400								
Loyola University Health Syste	3249 S. Oak Park Avenue	16-31-215-016-000	INSTALLATION OF FIBER OPTIC CABLES TO VARIOUS CLOSETS WITHIN THE SOUTH, NORTH AND EAST PROFESSIONAL BUILDING	C	8/28/2018 Impr-L	80368-0	$250,000.00	$3,760.00
401								
Laddie Vetrovec	2715-17 S. Ridgeland Avenue	99-99-999-000-007	NEW 1 1/2" WATER SERVICE, DECONVERT THE WATER SERVICE AT 2719 RIDGELAND AND CONNECT TO EXISTING PIPES AT 2719 RIDGELAND	C	8/28/2018 Impr-L	80369-0	$15,000.00	$2,435.00
402								
Theodore Polashek	2114 S. Elmwood Avenue	16-19-430-014-000	TEAR OFF EXISTING ROOF, ISOLATION 2' INSTALLTION, LIBERTY BASE INSTALLATION, LIBERTY ABS MEMBRANE INSTALLATION, NEW GUTTERS AND DOWNSPOUTS INSTALLATION, CHIMNEYS FLASHINGINSTALLATION. DEBRIS REMOVAL USING CITYWIDE ON PRIVATE DRIVEWAY.	R	8/28/2018 Roof-L	80370-0	$12,900.00	$295.00
403								
Robert J. Karsa	1823 S. Wisconsin Avenue	16-19-310-010-000	r/r water heater	R	8/28/2018 Plum-L	80371-0	$1,484.00	$85.00
404								
Jessica Galvez	2519 S. Ridgeland Avenue	16-29-124-009-000	ATF: REMOVE AND REPLACE SERVICE DOOR, NO SIZE CHANGES. REPLACING ALL ROTTED WOOD ON GARAGE EXTERIOR.	R	8/28/2018 Impr-L	80372-0	$0.00	$40.00
405								
Francisco J. Peralta	2320 S. Euclid Avenue	16-30-208-024-000	INSTALL EMERGENCY LIGHTING WITH BATTERY BACK UP - INSTALL ENCLOSED LIGHT FIXTURES - INSTALL BATHROOM LIGHT / HEATER COMBO - INSTALL EGRESS WINDOW IN BSMT - TUCKPOINT FRONT STAIRS - PATCH FOUNDATION	R	8/28/2018 Impr-L	80373-0	$3,000.00	$205.00
406								

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Jose Correa & Jesus M. Salga	3525 S. East Avenue	16-31-404-042-000	INSTALL EGRESS WINDOWS IN 2ND FLOOR BEDROOM AND 1ST FL BEDROOM - INSTALL VINYL WINDOW REPLACEMENTS IN LIVING ROOM AND KITCHEN.	R	8/28/2018	Impr-L	80374-0	$1,400.00	$90.00
407									
Robert Patterson Jr & Amy Ob	1435 S. Maple Avenue	16-19-117-014-000	INSTALL 11 VINYL REPLACEMENT WINDOWS - INSTALL 4 WINDOWS AT REAR OF HOUSE AND 7 WINDOWS IN ATTIC - ATTIC WINDOW TO MEET EGRESS CODE	R	8/28/2018	Impr-L	80375-0	$7,644.00	$135.00
408									
FP BUCKTHORN LTD	2625 S. Clarence Avenue	16-30-403-015-000	BUILD OFFICE IN BASEMENT, ADDING 1 BEDROOM AND 1 BATHROOM IN ATTIC, ALL NEW ELECTRIC, PLUMBING AND HVAC TO CURRENT CODE, R/R EXISTING KITCHEN AND BATHROOMS, SIDING ON GARAGE. A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND E	R	8/29/2018	Bldg-B	9097-0	$75,000.00	$665.00
409									
Viviana M. Mazzarri	1851 S. Scoville Avenue	16-19-413-017-000	chimney liner rough and final insp fees.	R	8/29/2018	Impr-L	79274-1	$0.00	$100.00
410									
STRATA INVESTMENTS LLC	2532 S. Kenilworth Avenue	16-30-115-026-000	plumbing rough reinsepction fee only FOR FAILED INSP ON 8/29/18	R	8/29/2018	Plum-L	80088-1	$0.00	$50.00
411									
Richard Smith	2313 S. Cuyler Avenue	16-29-109-006-000	R/R 5 WINDOWS ON THE 1ST FLOOR - 3 LIVING ROOM, 1 KITCHEN AND 1 BATHROOM WINDOW.	R	8/29/2018	Impr-L	80376-0	$3,515.00	$70.00
412									
Peter Burdi	1417 S. Clinton Avenue	16-19-121-007-000	INTERIOR DEMO 1ST AND 2ND FLOOR. CALL FOR FINAL INSPECTION.	R	8/29/2018	Impr-L	80377-0	$2,000.00	$40.00
413									
Louis Mendicino	6525 W. 34th Street	16-31-227-022-000	INSTALL 127' L X 6' H & 5' X 1' H PRIVACY FENCE WITH LATTICE AND 6' H AT REAR, INSTALL 2 GATE AND 12' L X 6' H CANTILEVER GATE IN ALLEY.	R	8/29/2018	Fence-L	80378-0	$6,600.00	$35.00
414									
William L. Peiler & Lisa McKam	6828 W. 34th Street	16-31-134-004-000	t/o and rr garage only.	R	8/29/2018	Impr-L	80379-0	$1,800.00	$40.00
415									
Victor & Lisa Valadez	3729 S. Euclid Avenue	16-31-416-011-000	R/R FURNACE AND A/C UNIT A/C CONDENSERS MUST BE LOCATED BEHIND THE HOUSE 3' FROM PROPERTY LOT LINE AND ELECTRICAL METER.	R	8/29/2018	HVAC-L	80380-0	$5,500.00	$0.00
416									

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NORTH SHORE HOLDING LT	2523 S. Clarence Avenue	16-30-227-009-000	re-roof shingles, house only to code. Call for final inspection.	R	8/29/2018 Roof-L	80381-0	$3,000.00	$125.00
417								
Good Shepherd Lutheran Chur	1844 S. Grove Avenue	99-99-999-000-026	DUMPSTER. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/29/2018 Dump-L	80382-0	$300.00	$50.00
418								
6700 W 26th Street	6700 W. 26th Street 0	99-99-999-000-061	WOW-ST-511 - INSTALLATION OF FIVER OPTIC CONDUIT VIA OPEN CUT TRENCH AND DIRECTIONAL BORE 400 OF 1-1.5" HDPE CONDUIT.		8/29/2018 Impr-L	80383-0	$30,000.00	$835.00
419								
6700 W 26th Street	6700 W. 26th Street 0	99-99-999-000-061	WOW-ST-530 INSTALL OF FIBER OPTIC CONDUIT AND (1) ONE HAND-HOLE VIA OPEN CUT TRENCH AND DIRECTIONAL BORE; 2000' OF 1-1.5" HDPE CONDUIT.		8/29/2018 Impr-L	80384-0	$50,000.00	$1,220.00
420								
6700 W 26th Street	6700 W. 26th Street 0	99-99-999-000-061	WOW-AA-172 - INSTALL OF FIBER OPTIC CABLE ON EXISTING COMED POWER POLES - FIBER 7164' OF FIBER OPTIC CABLE/7124' OF 0.25" STRAND.		8/29/2018 Impr-L	80385-0	$30,000.00	$510.00
421								
6700 W 26th Street	6700 W. 26th Street 0	99-99-999-000-061	WOW-AA-172 - INSTALL OF FIBER OPTIC CABLE ON EXISTING COMED POWER POLES.		8/29/2018 Impr-L	80386-0	$20,000.00	$360.00
422								
R&R Trategic Properties LLC	1516 S. Kenilworth Avenue	16-19-129-028-000	DUMPSTER ON THE STREET TO REMOVE UNWANTED ITEMS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/29/2018 Impr-L	80387-0	$700.00	$90.00
423								
Ramon Bello	2727 S. Oak Park Avenue	16-30-406-010-000	INSTALL A EGRESS WINDOW IN THE BASEMENT FAMILY ROOM AND BASEMENT BEDROOM TO CODE, INSTALL A FULLY ENCLOSED LIGHT IN THE BASEMENT STORAGE ROOM.	R	8/29/2018 Impr-L	80388-0	$200.00	$140.00
424								
Morton West High School	2400 S. Home Avenue	99-99-999-000-024	elevators: freight car #3-pit ladder-pit switch, passenger car #2-pit ladder and passenger car#1- shim out existing ladder- apply non-slip tape. Call EIS for inspections.	C	8/29/2018 Impr-L	80389-0	$12,243.00	$375.00
425								
T.Ellis	2214 S. Elmwood Avenue	16-30-206-024-000	INSTALL 4 EMERGENCY LIGHTS IN FRONT AND BACK HALLWAY	R	8/29/2018 Elec-L	80390-0	$550.00	$90.00
426								

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Shivani Anand	2224 S. Highland Avenue	16-29-101-031-000	PLUMBING FINAL AND WATER PRESSURE TEST REINSPECTION	R	8/30/2018	Bldg-B	8743-3	$0.00	$100.00
427									
Avila Real estate LLC	2527 S. Scoville Avenue	16-30-229-010-000	MISSING WATER METER FEE	R	8/30/2018	Plum-L	76421-1	$0.00	$350.00
428									
Marino Martinez & Nereida Mar	2811 S. Ridgeland Avenue	16-29-316-006-000	FRAMING ROUGH REINSPECTION FEE ONLY	R	8/30/2018	Impr-L	76484-1	$0.00	$65.00
429									
Francisco & Martha Resendiz	3739 S. Clinton Avenue	16-31-321-013-000	INSTALLED A NON-INSULATED 10FT WIDE PARTITION WALL AT REAR (BACK OF HOUSE) HEATED PORCH. INSTALLED DOOR FROM EXISTING WALL AND NEW PARTITION WALL.	R	8/30/2018	Impr-L	79774-1	$200.00	$0.00
430									
JBP Berwyn Property, LLC	6301 W. Cermak Road	16-29-101-004-000	PRE-POUR REINSPECTION	C	8/30/2018	Impr-L	80263-1	$0.00	$50.00
431									
Cruz Hernandez	2212 S. Lombard Avenue	16-29-103-021-000	T/O AND RESHINGLE HOUSE ROOF. CALL FOR FINAL INSPECTION DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC. NO POWER VENTS ICE AND WATER SHIELD TO CODE	R	8/30/2018	Roof-L	80391-0	$5,350.00	$190.00
432									
Margo St. Julien	1419 S. Gunderson Avenue	16-19-222-009-000	siding with house wrap. Please be sure to call for the house wrap inspection prior to installing siding.	R	8/30/2018	Impr-L	80392-0	$16,731.00	$315.00
433									
Garcia & Zimmerman	3545 S. Clinton Avenue	16-31-305-041-000	R/R 10 WINDOWS-3 IN LIVING ROOM, 1 KITCHEN, 6 IN BEDROOMS. CHECK FOR EGRESS. CALL FOR FINAL INSPECTION.	R	8/30/2018	Impr-L	80393-0	$6,876.00	$165.00
434									
Cibrook Ltd	1331 S. Oak Park Avenue	16-19-208-012-000	INTERIOR DEMO DOWN TO STUDS. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/30/2018	Impr-L	80394-0	$1,500.00	$90.00
435									
DANIEL GARCIA	3805-07 S. Clarence Avenue	16-31-422-093-000	REAR YARD GATE AT NORTH END OF HOME, YEAR AT BEGINNING OF BACKYARD. JULIE DIG #X2420941	R	8/30/2018	Fence-L	80395-0	$0.00	$0.00
436									
Jesus & Mayra Santiago	1332 S. Clinton Avenue	16-19-112-039-000	Replace existing fence panels and (1) post at North side of home. Neighbor permission obtained from 1332 Clinton. No Julie dig req.	R	8/30/2018	Fence-L	80396-0	$500.00	$85.00
437									

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Nancy A Pudil	2241 S. Elmwood Avenue	16-30-207-020-000	REMOVE FLASHING ON THE UPPER WEST INSIDE COPPING WALL AND ADJ NORTH AND SOUTH SECTIONS. REMOVE 500-550 COMMON BRICK AND REST NEW COMMON BRICK WITH MORTAR, INSTALL NEW COPING STONE, GRIND OUT LIMESTONE ON SOUTH WALL, INSTALL LIMESTONE AS NEEDED, INSTALL MO	R	8/30/2018 Impr-L	80397-0	$7,760.00	$130.00
438								
Juan & Angela Reyes	1320 S. Maple Avenue	16-19-108-028-000	COMPLIANCE VIOLATION - FRONT STAIR WELL MUST HAVE EMERGENCY LIGHTS WITH BATTERY BACK UP INSTALLED TO CODE, ELECTRICAL SERVICE REQUIRED 200 AMP UPGRADE TO CODE, EACH BEDROOM IS REQUIRED TO HAVE AT LEAST 2 SEPARATE AND REMOTE ELECTRICAL OUTLETS TO CODE, 1ST	R	8/30/2018 Impr-L	80398-0	$20,000.00	$805.00
439								
Miguel Zamudio	3437 S. Highland Avenue	16-32-132-059-000	INSTALL EGRESS WINDOWS IN THE BEDROOM AND BASEMENT TO CODE, TEAR OFF AND RESHINGLE THE GARAGE AND BRING ELECTRIC TO CODE- REPLACE OUTLETS, SWITCHES AND LIGHTS, REPLACE 2 LIGHT IN CLOSETS AND GARAGE, REPLACE OUTLETS IN KITCHEN, BATHROOM AND GARAGE TO GFCI,	R	8/30/2018 Impr-L	80399-0	$5,750.00	$250.00
440								
Francisco J. Martinez	6533 W. 38th Street	16-31-418-052-000	ATF KITCHEN REMODEL, ATF BATHROOM REMODEL, ATF RECESSED LIGHTS IN LIVING ROOM, KITCHEN AND BASEMENT, ATF FOR BASEMENT REMODEL, REMOVED PANELING AND FRAMED FURNACE ROOM AND LAUNDRY AREA, INSTALLED DRYWALL AND LIGHTS, ATF FOR HWH REPLACEMENT, REPAIR KITCHEN	R	8/30/2018 Impr-L	80400-0	$8,000.00	$555.00
441								
MELISSA MOURITSEN	1447 S. Clarence Avenue	16-19-219-020-000	REMOVE FENCE ON THE SOUTH SIDE OF THE PROPERTY AND INSTALL A 4FT WOOD FENCE.	R	8/30/2018 Fence-L	80401-0	$1,549.00	$135.00
442								
Rodney Knox & Sarah Vogel	3445 S. Euclid Avenue	16-31-231-025-000	INSTALLATION OF 20' OF 4' HIGH CHAIN LINK , INSTALLTION OF 13' OF 5+1 WOOD FENCE AND REPAIR OF EXISTING FENCE. JULKIE DIG # X002290691	R	8/30/2018 Fence-L	80402-0	$1,732.00	$135.00
443								

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Bernardita Jamesson	2825 S. Harvey Avenue	16-29-319-011-000	INSTALL FENCE 5 + 1 FT LATTICE ON BOTH SIDE OF HOME W/T SOUTH SIDE GATE R/R	R	8/30/2018	Fence-L	80403-0	$0.00	$0.00
444									
Philip Ayala	2247 S. Scoville Avenue	16-30-205-020-000	36' traditional cedar: (1) gate : take down and haul away from existing fence.	R	8/30/2018	Fence-L	80404-0	$2,236.00	$135.00
445									
P. Williams & K. Kesselring	3701 S. Grove Avenue	16-31-323-001-000	DUMPTERS FOR INTERIOR CLEAN OUT. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/30/2018	Dump-L	80405-0	$300.00	$50.00
446									
Ann Nowak & Benjamin Frinfro	2332 S. Clinton Avenue	16-30-105-032-000	DEMO AND REBUILD GARAGE - 24' X 25.6' X 15'(H).	R	8/31/2018	Gar-B	9098-0	$18,350.00	$350.00
447									
Kayla T. Fauria	1217 S. Home Avenue	16-19-104-011-000	OPEN MIDDLE BEDROOM DOORWAY TO CREATE OPEN OFFICE AREA - REMOVING BEDROOMS....COMPLIANCE REPAIRS - MIDDLE BEDROOM MUST HAVE A CONTROLLABLE PERMANENT HEAT SOURCE, ANY OPEN LIGHTS IN CLOSETS, STORAGE ROOMS, STAIRWELLS AND BASEMENT CEILING TO BE MADE FULLY ENC	R	8/31/2018	Bldg-B	9099-0	$5,000.00	$285.00
448									
J Pass LLC	1411 S. Highland Avenue	16-20-117-005-000	NEW CONSTRUCTION OF A SINGLE FAMILY HOUSE. 5 BEDROOMS- 4 BATHROOMS - 1ST FLOOR WILL CONSIST OF KITCHEN, 1 BEDROOM, 1 BATHROOM, LIVING ROOM AND DINING ROOM. 2ND FLOOR WILL CONSIST OF 3 BEDROOMS, 2 BATHROOMS AND LAUNDRY ROOM, BASEMENT WILL CONSIST OF 1 BEDR	R	8/31/2018	Bldg-B	9100-0	$200,000.00	$5,935.00
449									
Daniel Cooper	2324 S. Clinton Avenue	16-30-105-029-000	INTERIOD DEMO OF 1ST FL/2 AND FL KITCHEN AND BATHROOM, BMST DEMO TO STUDS. 2ND FL BATHROOM TO HAVE CONTROLLABLE PERMANENT HEAT SOURCE INSTALLED. INSTALL EGRESS 2ND FL BEDROOM. KITCHEN COUNTERS TO HAVE GFCI OUTLETS INSTALLED. BATHROOMS TO HAVE GFCI OUTLETS	R	8/31/2018	Bldg-B	9101-0	$34,950.00	$585.00
450									
Bruce Lenoch	7033 W. 13th Street	16-19-102-045-000	r/r hot water heater	R	8/31/2018	Plum-L	80406-0	$900.00	$85.00
451									

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Maria De Los Santos & Lucia B	1633 S. Clarence Avenue	16-19-403-015-000	R/R FENCE/GATES ON SOUTH SIDE, NORTH SIDE AND AT ALLEY WITH 6' IRON FENCE-NEIGHBOR PERMISSION ON FILE.	R	8/31/2018	Fence-L	80408-0	$1,000.00	$135.00
452									
William D. Richter	1326 S. Kenilworth Avenue	16-19-113-032-000	REPAIR AND REPLACE PORCH. INSTALL POSTS , FRAME, TO CODE.	R	8/31/2018	Impr-L	80409-0	$800.00	$190.00
453									
Stuart Weg & Judith Roth	2714 S. Wesley Avenue	16-30-407-027-000	REMOVE AND REPLACE BATHROOM VANITY ON 2ND FL.	R	8/31/2018	Plum-L	80410-0	$900.00	$50.00
454									
Predrag Ungureanu & Raquel	1342 S. Grove Avenue	16-19-114-041-000	R/R SIDEWALK AND FRONT APPROACH FROM THE FRONT OF THE PROPERTY TO THE ALLEY - ALL SAME SIZE. DUMPSTERS/PODS REQUIRE A FLASHING BARRICADE ON THE SIDE OF INCOMMING TRAFFIC.	R	8/31/2018	Impr-L	80411-0	$1,000.00	$190.00
455									
Hector Espinoza	6430 W. 27th Place	16-30-411-020-000	REMOVE AND REPLACE EXISTING WALKWAY ON EAST SIDE OF HOME FROM FRONT OF HOME LEADING TO REAR YARD.	R	8/31/2018	Impr-L	80412-0	$1,500.00	$90.00
456									
T & L 3246 WSICONSIN AVEN	3246 S. Wisconsin Avenue	16-31-109-047-000	Upgrade (1) meter el service and circuit panel. Install gfi outlets and single grounded outlet.	R	8/31/2018	Impr-L	80413-0	$1,975.00	$125.00
457									
Leslie B. Dunner	3537 S. Home Avenue	16-31-304-011-000	GARAGE SHINGLES/ T/O / SOFFIT REP[AIR	R	8/31/2018	Impr-L	80414-0	$5,950.00	$40.00
458									
First Rate Properties	6405 W. 34th Street B	99-99-999-000-069	INSTALL NEW NON ILLUMINATED SIGN WIDTH:14'.4" HEIGHT: 46" " ATTORNEY AT LAW 708-317-5506 ABOGADOS" W: 14'.4" H: 14". "SOLUCIONES LEGALES". ALUM SIGN. NO ELEC		8/31/2018	Sign-L	80415-0	$0.00	$50.00
459									
Sanjeev Kumar	3533 S. Gunderson Avenue	16-31-408-012-000	REPAIR SHINGLES ON GARAGE	R	8/31/2018	Impr-L	80416-0	$0.00	$40.00
460									

460 Building and Local Improvement Permits Issued During Period — Totals $15,865,530.85 $115,625.00

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