

Expanding the “Lead Safe” Ordinance in the City of Philadelphia

Evaluating Impacts on the Rental Housing Market

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I. Executive Summary..... 1

 Purpose of Report 1

 Overview of Approach 1

 Overview of Findings 2

 study scope 5

 About Anderson Economic Group 6

II. Existing Lead Safe Policies Throughout the U.S 7

 Common Lead Paint Practices in the U.S. 7

 Common Practices By State 7

III. Lead Regulation in Philadelphia 11

 Current Lead-Based Paint Regulations in the City of
 Philadelphia 11

 Recommendations on Lead Safe Policies 12

IV. Fiscal Impacts to Property Owners and Renters 13

 Types of Costs in Achieving Lead Free or Lead Safe Status 13

 Aggregate Cost of an Expanded Ordinance 14

 Long-Term Impact of Ongoing Costs 16

 Medium-Term Impact of Disrupted Housing Market 16

Appendix A. Methodology.....A-1

 Impacts on Property Owners A-1

 Impacts on the Rental Housing Market A-4

Appendix B. Detailed ExhibitsB-1

Appendix C. About AEG..... C-1

 About the Authors C-1

 Contributor C-2

I. Executive Summary

Lead-based paint was banned in the U.S. in 1978 due to its negative impact on public health. Dealing with structures that still have lead-based paint from before the ban poses a challenge for policymakers. Lead-based paint was legal at the time it was used, so there is no legal recourse to force clean-up. And since much of the nation's housing stock was built before 1978, residents of many communities have little choice but to live in structures with lead-based paint. Furthermore, it is not always known whether a property has lead-based paint, since the current owners of most contaminated property were not the owners when the paint was applied. Facing these challenges, federal, state, and local governments have many initiatives underway to either remove or contain lead-based paint contamination where it occurs.

The City of Philadelphia has a large stock of rental housing, over 80% of which was built before 1978. In 2011, Philadelphia enacted an ordinance that required all rental units with a child occupant age six and under to be certified as "lead free" or "lead safe." The term "lead free" indicates a building's interior and exterior surfaces do not contain any lead-based paint. A "lead safe" property is free of conditions that cause or may cause exposure to lead from lead-based paint or soil.

Recently, the City of Philadelphia Childhood Lead Poisoning Prevention Advisory Group released a report recommending that the Philadelphia City Council expand the city's lead-based paint ordinance to all pre-1978 rental housing.

PURPOSE OF REPORT

The Pennsylvania Apartment Association East (PAA East) and the Homeowners' Association of Philadelphia (HAPCO) retained Anderson Economic Group (AEG) to estimate the effect of this potential ordinance on costs to Philadelphia rental property owners and tenants, and determine the impact of the ordinance on Philadelphia's rental housing market. In particular, we determine whether there will be an increase in rents and/or a decrease in the housing stock, and the extent to which that impact will extend to low-income housing.

OVERVIEW OF APPROACH

Impact on costs to property owners. We constructed a model to estimate the cost of bringing the city's rental housing units into compliance with an expanded ordinance, and then estimated the subsequent impact on the rental housing market. We utilized government survey data to estimate the number of rental units in Philadelphia that would be impacted by the new ordinance, and then determined the proportion of those units that would contain lead-based paint or have a significant lead-based paint hazard. We consulted with a number of lead testing providers to estimate the average cost of a lead free or lead safe test for these units.

We reviewed empirical research to estimate the average cost of bringing a unit into compliance, and then used those cost estimates to determine the total cost to property owners of mitigating existing lead-based paint hazards.

There are circumstances where environmental factors outside the control of a property owner—such as lead-contaminated dust entering the home from outside—could also result in failure of a lead safe test. Our estimates in this study are conservative because we assume that only units that are likely to contain lead-based paint hazards will fail to pass a lead safe test and therefore be required to take actions to come into compliance.

Impact on the rental housing market. Using our estimates for the number of housing units affected and lead abatement costs, we constructed a model to estimate the effects of these costs on rent and the supply of rental housing. We relied on government survey data and other resources to estimate the distribution of costs across affected units, since the severity of the repairs would affect how property owners choose to finance these costs. We also reviewed empirical research to estimate the effect of these costs on rents and abandonment of rental properties.

Our approach considers how these recommended changes would affect the market for privately-owned rental property in two ways. First, we assume the law will be enforced, imposing costs on property owners who wish to obtain a license to rent properties that are initially found not to be lead safe or lead free. We analyze the extent and frequency of these costs. Second, we analyze the reactions of property owners and renters to these costs, accounting for the tension between the financial constraints on both parties to each rental agreement. Property owners whose properties require lead control or abatement repairs face a choice between paying for repairs or taking the property off the market. They will only make investments that can be justified by an increased economic return through boost in rental income and/or property value. This will have an adverse effect on housing supply, and in particular on the availability of housing stock for low- and moderate-income households. Renters face a choice between paying higher rents and finding other living arrangements (e.g. with roommates or in another community).

See “Appendix A. Methodology” on page A-1 for further discussion.

OVERVIEW OF FINDINGS

Our research and analysis resulted in the following major findings:

- 1. If enacted, an expanded ordinance would apply to nearly 175,000 units that are not covered under the current lead ordinance.*

Philadelphia’s current lead ordinance applies to the city’s 26,320 pre-1978 rental units with children age six and under. Expanding the lead ordinance to all

pre-1978 rental units would bring an additional 174,654 units under lead regulation. These units would be required to pass a lead free test once, or a lead safe test every two years.

See “Fiscal Impacts to Property Owners and Renters” on page 13 for more information on the number of units affected by the new ordinance.

2. The cost of bringing the new units into compliance would be nearly \$260 million.

The cost of bringing the new units under an expanded ordinance into compliance includes the cost of administering lead tests, as well as the cost of abating units that fail a test. As shown in Table 1, we estimate that the total cost of lead testing for units would be \$91.7 million, including the cost of follow-up tests for units that fail their initial test. The total cost to abate lead hazards would be \$166.8 million.

TABLE 1. Cost of Bringing Units into Compliance with new Lead Ordinance

Category	Number of Units	Cost Per Unit	Total Cost (millions)
Lead safe test administration	115,030	\$350	\$40.3
Lead free test administration	59,624	\$400	\$23.8
Abatement for failing units	78,960 ^a	\$3,200	\$166.8
Follow-up lead safe test for failed units	78,960 ^b	\$350	\$27.6
Total Cost of Compliance:			\$258.5

Source: Anderson Economic Group analysis of base data from U.S. Census Bureau American Community Survey, 2015, American Housing Survey, 2015, and City of Philadelphia Lead Report, 2017; Dewalt et al., 2015; Hartje et al., 2001; Phone conversations with lead testing firms.

- a. We estimate that 52,117 units would have abatement costs greater than \$0.
- b. We assume that these units apply for a lead safe test after abatement. The cost of a second test could be included in abatement services.

See “Fiscal Impacts to Property Owners and Renters” on page 13 for a full analysis of these costs.

3. If property owners passed on all lead abatement costs in the form of higher rents, rents would rise by between \$38 and \$400 per month for a period of several years and by \$14 per month in the long-term. We expect that rents in the medium-term would rise by up to \$60 per month, with remaining costs financed by foregoing maintenance or lower returns for property owners.

If property owners were to pass abatement costs on to tenants in the form of higher rents, they would need to raise rents anywhere between \$38 to \$400 per

month, depending on the condition of the property. This is the amount required to allow a three-year payback period, a condition consistent with a very limited ability to finance repairs through additional borrowing or existing cash flow. Under the current rental market, property owners would likely be limited to increasing rent by \$60 per month, on average. They would have to finance any remaining costs by foregoing maintenance and renovations or reducing their returns.

Once the initial set of repairs has been performed on a property to bring it into lead safe status, the property owner will face ongoing costs of recertification, which includes biannual testing. We estimate that renters will pay 95% of this cost in the long run, adding approximately \$14 per month to rents.

See “Long-Term Impact of Ongoing Costs” on page 16 and “Medium-Term Impact of Disrupted Housing Market” on page 16 for further discussion.

4. An expanded lead ordinance would cause a disruption in the market for privately-owned rental units in the city of Philadelphia, with 3,100 to 6,400 units off the market for some period of time and some off the market permanently.

We estimate that between 3,100 and 6,400 rental units would come off the market due to abatement costs exceeding the market value of the property. Some of these properties may continue to be occupied outside the licensed rental market, especially if they are sold as part of a failed property management business’s asset liquidation process or simply abandoned. Each property brought into compliance and back onto the licensed market will lower owners’ ability to charge higher rent, making it incrementally less likely that the remaining stock of unlicensed properties will be repaired. In the end, some balance will be reached between these two factors, resulting in a certain amount of properties, which we do not attempt to quantify, remaining permanently off the market.

See “Medium-Term Impact of Disrupted Housing Market” on page 16 for further discussion.

5. An expanded lead ordinance could cause all units with monthly rent below \$1,250 that require major remediation to come off the market. These units represent 85% of all units requiring major remediation and 10% of all units with monthly rent below \$1,250.

There will be a reduction in affordable housing following implementation of an expanded lead ordinance. We estimate that all units requiring major repairs that have rent below \$1,250 will be taken off the market. For these units, the remediation costs exceed the value of future net rental income on the property, even when assuming a three-year payback period. These 4,500 units represent over 85% of units requiring major remediation and 10% of units with a monthly rent

below \$1,250. Moreover, some of these units may become vacant and abandoned as a result of being taken off the market, contributing to blight and affecting other properties in the area.

See “Medium-Term Impact of Disrupted Housing Market” on page 16 for further discussion.

6. There may be unintended consequences for renters in Philadelphia.

In this report we have described a short-term disruption in the market for rental properties that manifests as a balance between higher rents, deferred maintenance, and lower availability of rental housing. This situation could result in negative consequences for people looking to rent in this market. When properties come off the licensed rental market, some renters may choose to rent an unlicensed property, which in some cases may create a worse health or safety environment than licensed properties.

Others may face an undesirable living environment with family or other cohabitants, difficulty finding housing located near employment opportunities, and other challenges due to lack of housing options. Renters who are willing and able to pay higher rent for the remaining licensed rental units will be doing so at the expense of other things they could spend their money on, some of which may affect their health, employment prospects, or quality of life. We do not attempt to catalog these challenges comprehensively, nor quantify their extent, nor attempt to compare their effects to the financial costs we address in this report.

See “Medium-Term Impact of Disrupted Housing Market” on page 16 for further discussion.

STUDY SCOPE

The purpose of this analysis is to inform the debate on an expanded ordinance by providing an independent assessment of the likely costs of the ordinance and its impacts on the rental housing market in Philadelphia. We do not attempt to estimate whether an expanded ordinance would be effective in reducing lead exposure. We also do not attempt to assess whether the same or better health outcomes could be achieved at lower cost with some other actions, such as more frequent and extensive cleaning of properties presenting potential lead hazards.

In addition, our analysis includes estimates of the proportion of rental units in Philadelphia with lead-based paint, and with lead-based paint hazards. These estimates are based on national survey data since there are no data available for the Philadelphia region. Our estimate for the average cost of lead abatement is based on research on lead mitigation in other metropolitan areas. Abatement in Philadelphia may be more or less costly than other regions.

**ABOUT ANDERSON
ECONOMIC GROUP**

Anderson Economic Group, LLC, is a boutique research and consulting firm, with offices in East Lansing, Michigan; Chicago, Illinois; New York, New York; and Istanbul, Turkey. The experts at AEG specialize in economics, public policy, business valuation, and industry analyses. They have conducted nationally-recognized economic and fiscal impact studies for private, public, and non-profit clients across the United States.

The Public Policy and Economic Analysis practice area at Anderson Economic Group has extensive experience in economic and fiscal impact analysis. AEG's public policy consultants have published numerous reports analyzing the impacts of housing and public health policy. For more information, please see "Appendix C: About AEG" on page C-1 or visit www.AndersonEconomic-Group.com.

II. Existing Lead Safe Policies Throughout the U.S

This section provides context for the proposed changes to lead-based paint regulation in Philadelphia, including a brief overview of common practices across the United States in combating lead poisoning. Almost all lead-based paint legislation addresses residential housing built before 1978.¹

COMMON LEAD PAINT PRACTICES IN THE U.S.

In 1992, Congress passed Title X, which required disclosure of known information on lead-based paint and lead-based paint hazards before the sale or lease of most housing built before 1978. Each landlord or seller must give an EPA-approved information pamphlet on identifying and controlling lead-based paint hazards, as well as provide any records and reports available to them on lead-based paint and/or lead-based paint hazards. Each lease and purchase contract has an attachment that includes a Lead Warning Statement and confirms that the seller or landlord has complied with all notification requirements.

Several states have complemented federal lead hazard disclosure laws by requiring property owners to disclose lead hazard information to prospective home buyers and tenants. Those states include Illinois, Massachusetts, Rhode Island, and Vermont. Many of these laws require landlords to register or license their rental properties, which allows local entities to better enforce disclosure laws.

EPA's Renovation Rule

In April 2010, the Environmental Protection Agency (EPA) changed the way we renovate homes across the United States by amending the Lead Renovation Repair and Painting (RRP) Rule. Firms performing renovation, repair and painting projects are now required to become certified by the EPA and follow specific work practices to prevent lead contamination. In addition to certification, certain supplies and equipment are necessary to perform EPA mandated work practices.

COMMON PRACTICES BY STATE

In addition to disclosure, most states entitle buyers to a separate property inspection for lead-based paint. Rarely can these inspections be completed unless it is done by a qualified inspector, usually specifically accredited in lead-based paint inspection. Neither sellers nor buyers are required to remove lead-

1. The U.S. banned the use of lead-based paint in March 1978, so most legislation presumes homes built after that time would not be at risk of lead contamination from paint. However, soil surrounding a home could contain lead coming from various sources. An example of the sources can be the chipped exteriors of older neighboring home.

based paint, although buyers may look for a right to terminate the purchase if lead-based paint abatement/removal exceeds a certain dollar threshold.

Another trend in lead-based paint law requires owners to make a rental property lead safe if a child under six resides in the unit. For example, Massachusetts has implemented a state-wide lead law, which requires landlords to remove or repair any lead paint hazards in pre-1978 homes where children under 6 reside.²

New York City's lead-based paint law imposes a number of responsibilities on property owners to mitigate lead exposure for children. For instance, owners must annually inquire about children under six to all occupants, as well as upon lease-up, lease renewal, and agreement to lease or commencement of occupancy.³

Usually, owners must include a notice about their responsibilities under the law with each lease and provide a pamphlet informing occupants about lead. Units that have children under six must be physically inspected for peeling paint, chewable surfaces, deteriorated subsurface and impact surfaces. New York City's law allows owners to perform the inspection, but also requires them to review common areas of the property.

Lead Paint Practices

Milwaukee, Wisconsin. In 1999, the Milwaukee City Council passed a 3-year pilot project to control lead based paint hazards in about 1,000 pre-1950 rental units located in two of the highest risk areas in the city. Landlords were required to secure a certificate of compliance with lead hazard ordinances. The city imposed harsh non-compliance fines, including fines up to 40% of the property's market value.⁴

Maryland. The State of Maryland's Reduction of Lead Risk in Housing Law is of similar scope to the recommendation for the City of Philadelphia, though it has more specifications about what must be done should a property fail to be certified lead safe.⁵ The law requires owners of rental properties built before 1978 to register their units with their Department of the Environment (MDE), distribute specific educational materials, and meet specific lead-based paint risk

2. Massachusetts Health and Human Services, "The Massachusetts Lead Law & Legal Document," <http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/lead/lead/>, accessed on September 8, 2017.

3. NYC Housing Preservation and Development, "Lead-based Paint," <http://www1.nyc.gov/site/hpd/owners/Lead-Based-Paint.page>, accessed on September 8, 2017.

4. National Center for Health Housing, "Milwaukee Lead Law," <http://www.nchh.org/Policy/State-and-Local-Policy/State-and-Local-Lead-Laws/Milwaukee-Lead-Law.aspx>, accessed on September 8, 2017.

reduction standards.⁶ The regulation also asserts each and every rental property constructed prior to 1978 meet one of the inspection standards to gain a certification of lead free, limited lead free, or risk reduction.

A lead free property is exempted from both annual registration fees and from risk reduction requirements, which are mandatory renovations to mitigate lead-based paint hazards. A property which has no lead-based paint on interior surfaces but does have lead-based paint on exterior surfaces may qualify for a limited lead free certificate, if an inspector determines that there is no chipping, peeling, or flaking paint on the exterior surfaces. This certificate must be renewed every two years.

If a property is not determined lead free, lessors must perform “full risk reduction treatment” at each change in occupancy and have it verified through a visual inspection or pass a lead dust test by an accredited lead inspector. If a lessor is notified that a child or pregnant woman has a blood lead level of 10 mcg/dL or more, within 30 days, she must either permanently relocate all tenants to certified housing, or perform all renovations necessary and obtain a passing modified risk reduction certificate.

Programs to Lower the Costs of Treatments For Lead Hazards

There are several programs that reduce the cost of treatment of lead-based paint hazards. We summarize some of these programs below.

New Jersey. New Jersey’s Lead Hazard Control Assistance Fund give homeowners two options to reduce costs of renovations associated with lead-based paint hazards.⁷ The first is a deferred payable loan, which does not need to be repaid until the owner refinances, transfers, sells the property or the loan term expires (up to 20 years).⁸ The other option is a deferred forgivable interest loan, where the owner must meet certain annual conditions and a portion of the loan will be forgiven each year. This continues until the loan is completely forgiven or repaid in full.

5. The Maryland Department of the Environment, “Facts About Maryland’s ‘Lead Law,’” <http://www.mde.state.md.us/programs/Land/Documents/LeadFactSheets/LeadfsStandardOfCare.pdf>, accessed on September 7, 2017.

6. An amendment took effect on January 1, 2015 which expanded the application of the legislation from pre-1950 residential rental dwelling units to all residential rental units built prior to 1978.

7. State of New Jersey Department of Community Affairs, “Oct-24-2010 DCA’s Lead Hazard Control Assistance Program to Assist More New Jersey Households,” <http://www.nj.gov/dca/news/news/2010/approved/102510.html>, accessed on September 6, 2017.

8. The interest rate for the loan is 3%.

In New Jersey, only lead-based paint that is deteriorated and/or identified as a lead-based paint hazard by a licensed lead evaluation firm must be treated. The average cost of lead abatement is \$47,100 per single family unit, and the scope of work must be approved by the local board of health prior to renovation.⁹ Alternatively, property owners can elect to perform some less expensive measures, such as interim controls or hybrid treatments which requires only window replacement with controls of other lead-based paint hazards.

Massachusetts. To encourage lead abatement, Massachusetts provides income tax credits to property owners. For the past 20 years, the tax program has allowed individuals to deduct abatement costs up to \$1,500 per residential unit on their tax returns.¹⁰

Rhode Island. In Rhode Island, all Medicaid eligible children are entitled to receive Medicaid funding for replacement of lead-contaminated windows and spot removal.¹¹

Milwaukee, Wisconsin. Milwaukee has assisted property owners of pre-1950 units in covering \$370 of their window replacement costs through national Housing and Urban Development grants.¹² The program targets areas in the city where the majority of elevated blood lead level incidences are reported.

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9. New Jersey Department of Community Affairs, "Lead Hazard Control Assistance Fund Proposed Amendments," New Jersey Register, December 7, 2009.
New Jersey Administrative Code, "Title 5. Community Affairs; Chapter 48. Lead Hazard Control Assistance Fund, Subchapter 2." <http://www.lexisnexis.com/hottopics/njcode/>, accessed on September 26, 2017.
 10. Massachusetts Department of Revenue, "830 CMR 62.6.3 Lead Paint Removal Credit," <http://www.mass.gov/dor/businesses/help-and-resources/legal-library/regulations/62-00-income-tax/830-cmr-6263-lead-paint-removal-credit.html>, accessed on September 6, 2017.
 11. Center for Child and Family Health, "Comprehensive Lead Centers Certification Standards," *State of Rhode Island Department of Human Services*, November 2006.
 12. Milwaukee Health Department, "Childhood Lead Poisoning Primary Prevention Program," <http://city.milwaukee.gov/health/lead-Poisoning/health/primary-Prevention-Program#.Wck-ubnKGOCg>, accessed on September 6, 2017.

III. Lead Regulation in Philadelphia

In this chapter, we provide an overview of the City of Philadelphia’s existing ordinance and initiatives intended to address lead-based paint hazards in residential units. Since the release of our last report in 2011, Philadelphia has imposed a lead safe certification process for rental units with children aged six and under.

CURRENT LEAD-BASED PAINT REGULATIONS IN THE CITY OF PHILADELPHIA

Prior to December 2011, the Philadelphia Code Chapter 6-800 obligated lessors of residential housing constructed before 1978 to disclose to the lessees any knowledge the lessors might have related to lead-based paint or lead-based paint hazards in the properties. While a comprehensive lead inspection and risk assessment was not mandatory, landlords were required to provide pamphlets to their tenants on lead safety along with a lead warning statement.

Lead Paint Disclosure and Certification

In December 2011, the City of Philadelphia passed Bill No. 100011-A amending Chapter 6-800 of the Philadelphia Code to impose stricter disclosure and certification requirements on targeted rental housing. Targeted housing includes pre-1978 rental units where children aged six and under reside. The rule does not apply to student housing, and it further exempts public housing as well as any other federal- and state-assisted housing from the requirement, as they are subject to federal inspection and control.

According to the Philadelphia Department of Public Health, most housing units constructed prior to 1978 contain lead-based paint.¹³ Under the new *Lead Paint Disclosure and Certification* ordinance, landlords must certify that a property is “lead safe” or “lead free” before children six years old and younger can move in.

In order to become certified, the landlords need to hire a certified lead inspector to check for lead-based paint and assess any potential lead dust hazard in the units. The process usually involves a visual inspection and a lab test on lead wipe samples. The lead safe standard is met if no deterioration of the surface paint or a dangerous level of lead-contaminated dust are detected. A lead *safe* certificate is valid for 24 months before another inspection is required. Alternatively, a lead *free* certificate requires the inspection to indicate no trace of lead-based paint on the interior and exterior surfaces of a property, and once approved, is valid indefinitely.

13. City of Philadelphia, “Bill No. 100011-A: An Ordinance,” http://www.phila.gov/health/pdfs/Phila_Lead_Disclosure_and_Certification_Law_12_21_11.pdf, accessed on September 8, 2017.

City of Philadelphia granted landlords one year of time to comply with the new requirement, and the law took effect on December 21, 2012. The amendment imposes a penalty of \$2,000 on each day of non-compliance. However, the compliance rate has been low. The Philadelphia Department of Public Health (PDPH) estimated there would be over 18,000 rental housing licenses in the city that serve units renting to families with children aged six and under; yet, during the period from December 2012 to May 2017, only 2,000 certificates were received, 11.1% of its initial projection.¹⁴

In response to the low compliance rate, beginning February 2017, landlords are required to answer questions about child residents in their units before they can proceed to apply or renew their rental licenses. Nevertheless, the effort has had little impact on the collection outcome, as the answer is not easily verifiable.¹⁵ On the one hand, landlords may have incentives to submit false information to avoid the inspection and compliance costs. On the other hand, landlords may lack adequate information from their tenants about child residence. Given the concerns with these additional questions and attestations, PDPH is considering to increase outreach to landlords who do not submit certificates as required. A new database is also under way, which will track landlords' responses and disqualify non-complaint landlords from renewing their licenses.

RECOMMENDATIONS ON LEAD SAFE POLICIES

As part of the recent *Final Report and Recommendations* prepared by the Philadelphia Childhood Lead Poisoning Prevention Advisory Group, a number of recommendations are provided to prevent lead poisoning at home.¹⁶ One of the main recommendations is to expand the current inspection and certification ordinance to all pre-1978 rental units in the city, regardless of child residence. In the following section, we will examine the potential rental market effects of the recommendation.

14. City of Philadelphia, "Philadelphia Childhood Lead Poisoning Prevention Advisory Group: Final Report and Recommendations," June 20, 2017.

According to the report, the total number of units that have a child age 6 or under may be higher than 18,000 "because rental licenses may each cover up to 10 units in a single property".

15. *Ibid.*

16. *Ibid.*

IV. Fiscal Impacts to Property Owners and Renters

An expanded ordinance to require lead safe status in all residential rental property would affect both rental property owners and renters. Under the new ordinance, owners of approximately 175,000 additional properties would face testing and abatement costs. Some of these costs will be passed along to renters in the form of higher rent. In this section, we outline the costs of bringing units into compliance under an expanded ordinance, and discuss the impacts of these costs on the Philadelphia rental market.

TYPES OF COSTS IN ACHIEVING LEAD FREE OR LEAD SAFE STATUS

Under an expanded ordinance, rental property would face two types of costs—testing and abatement. The first is the cost of testing a unit for lead-based paint compliance. The ordinance would apply to all owners of residential rental properties built before 1978. Property owners would be required to pass a lead free or lead safe test. Lead free certification indicates that no lead-based paint is present in the unit, while lead safe certification indicates that a unit has lead-based paint, but the paint is not a hazard to occupants.

Units passing a lead free certification would require one test for the lifetime of a unit, while units with lead-based paint would be required to pass a lead safe dust wipe test every two years. After two years, the unit would need to be certified lead safe again. We estimate that, including cleaning and preparation costs, a lead free certification test costs approximately \$400 per unit, while a lead safe certification test costs \$350 per unit.¹⁷

Under an expanded ordinance, if a property fails a lead safe certification, the lead-based paint risk must be abated before the unit can be rented. The costs of abating lead-based paint risks vary significantly. Some units would require minor abatement with negligible costs, such as painting over surfaces that were previously covered with lead-based paint. Other units could require major abatement, including complete removal of lead-painted surfaces or replacement of objects that present a lead-based paint hazard, such as windows or interior/exterior trim. The abatement process is delicate, and must be conducted carefully in order to avoid exposure to lead dust.

We estimate that the average per-unit cost of abating lead-based paint to meet lead safe or lead free standards is approximately \$3,200 based on empirical research of abatement costs in other metropolitan areas. In some instances, abatement costs can be as low as \$0 and as high as \$12,000. Table 2 shows the

17. We contacted several environmental services firms in Philadelphia to inquire about test costs. Costs may vary depending on unit type and size. Larger property management firms may be able to negotiate a discount for purchasing testing services in bulk.

costs of addressing lead hazards.

TABLE 2. Cost of Addressing Lead Hazards

Category	Action	Frequency	Estimated Average Cost Per Incident
Inspection and risk assessment	<ul style="list-style-type: none"> • Prepare unit for lead-based paint test • Lead paint inspection and risk assessment 	<ul style="list-style-type: none"> • Lead safe units must pass certification once every two years • Lead free units must pass certification once 	<p>Lead Safe: \$350 per test, including test preparation</p> <p>Lead Free: \$400 per test, including test preparation</p>
	Control and Abatement	<ul style="list-style-type: none"> • Stabilize interior/exterior paint • Stabilize/replace windows • Stabilize/replace doors • Remove contaminated soil 	<p>As needed</p> <p>\$3,200</p>

Source: Anderson Economic Group professional judgment based on conversations with lead testing contractors and HAPCO/PAA East members; Center for Government Research, 2008; Hartje et al. 2001.

AGGREGATE COST OF AN EXPANDED ORDINANCE

According to the U.S. Census Bureau, there are over 228,000 rental properties in Philadelphia built before 1978. Of these units, an estimated 26,320¹⁸ are subject to the current city lead ordinance, and nearly 27,000¹⁹ are subject to federal lead regulation. An expanded lead-based paint ordinance would apply to 175,000 housing units not subject to the current ordinance.²⁰ All of these additional units would face lead free or lead safe testing costs. Some would fail testing and require spending on abatement and additional testing.

The prevalence of lead-based paint in housing units correlates with unit age. Older units are more likely to contain lead-based paint, and are also more likely to have a significant lead-based paint hazard that would lead to a failed test.²¹ Given the age characteristics of Philadelphia’s rental housing stock, we estimate that 115,030 of the 174,654 rental units falling under the new ordinance would contain lead-based paint, and that 78,960 of these units would have a significant lead-based paint hazard that would lead to a positive dust wipe test.

18. City of Philadelphia Childhood Lead Poisoning Prevention Advisory Group Final Report and Recommendations, 2017.

19. Anderson Economic Group analysis of 2015 U.S. Census Bureau American Housing Survey data.

20. *et al.*

21. Gary Dewalt *et al.*, “Prevalence of Lead Hazards and Soil Arsenic in U.S. Housing,” *Journal of Environmental Health* 78 no. 5 (2015):22-29.

A portion of failing units could be brought into compliance at little to no cost, only requiring spot painting or other minor abatement. We estimate this will be the case for 34% of these units.²² The remaining 66% of units (52,117) would face measurable abatement costs to be brought into compliance with the new ordinance. On average, it would cost \$3,200 per unit to bring a failing unit into compliance.²³

We estimate that the total cost of bringing newly regulated rental units into compliance is \$258.5 million, as shown in Table 3. This includes initial testing costs for all units, plus abatement costs for units failing lead-based paint tests, and the cost of follow up testing for those units.

TABLE 3. City of Philadelphia Cost of Testing and Abatement for Rental Housing Units that would be Covered Under new Lead Ordinance

Category	Number of Units	Cost Per Unit	Total Cost (millions)
Lead safe test administration	115,030	\$350	\$40.3
Lead free test administration	59,624	\$400	\$23.8
Abatement for failing units	78,960 ^a	\$3,200	\$166.8
Follow-up lead safe test for failed units	78,960 ^b	\$350	\$27.6
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Source: Anderson Economic Group analysis of base data from U.S. Census Bureau American Community Survey, 2015, American Housing Survey, 2015, and City of Philadelphia Lead Report, 2017; Dewalt et al., 2015; Hartje et al., 2001; Phone conversations with lead testing firms.

- a. We estimate that 52,117 units will have abatement costs greater than \$0.
- b. We assume that these units apply for a lead safe test after abatement. The cost of a second test could be included in abatement services.

See “Appendix A. Methodology” on page 1 for a detailed description of our housing and cost analysis.

The costs of property owners bringing their properties into compliance with an expanded lead-based paint ordinance will affect both owners and renters to varying degrees and at different times. The degree to which each group bears

22. Center for Governmental Research, “An Evaluation of the City of Rochester’s Lead Law: 2006-2008,” 2008.

23. Center for Government Research, 2008; and Sandra Hartje., “Twin Tragedies in the Twin Cities: Childhood Lead Poisoning and the Loss of Affordable Rental Housing,” *Family and Consumer Sciences Research Journal* 29, no. 3 (2001):230-251.

the burden is an important aspect of this analysis that is discussed in this section.

We split our analysis into “long-term” and “medium-term” impacts. Long-term impacts account for ongoing costs that will remain in the market long after the rental market has worked through the initial set of repairs needed to provide licensed rental units to most renters. Medium-term impacts account for challenges that will be faced by property owners who have difficulty funding all of the required repairs at once, and renters who will face significantly reduced supply and higher rents as the affected rental housing stock is brought into compliance with the lead-safe requirement.

LONG-TERM IMPACT OF ONGOING COSTS

We estimate that renters will absorb 95% of the ongoing costs of licensing and ongoing lead hazard containment costs, which will become part of the routine cost of operating units that would be newly covered by the expanded lead ordinance and initially fail a dust swipe test. We estimate that these costs will average \$350 per re-certification, which includes biannual inspection costs. We estimate that this will add approximately \$14 per month, on average, to rental costs for affected units.

This is a conservative estimate because it does not include the costs of any follow-up repairs or the effects these costs might have on the rental market. We also do not estimate the amount of housing that will remain off the market permanently, but there will likely be some units for which this is the case. For some units in the worst condition or in the weakest areas of the market, the cost of bringing the property into compliance may be too high compared to attainable rent to justify bringing the property back on the market.

See “Impacts on Rent” on page A-5 for a discussion of our methodology.

MEDIUM-TERM IMPACT OF DISRUPTED HOUSING MARKET

We segment the units that would face measurable abatement costs into three categories, based on the lead condition: little action needed, moderate action needed, and major action needed. We present estimates for the distribution of units and average abatement costs per unit by lead condition in Table 4 on page 17.

We estimate that about three-quarters of units would require \$1,351, on average, to bring the unit into lead safe compliance. About 13% of units would require \$5,418, on average, in lead abatement costs, and the remaining 10% of units would require \$14,449, on average.

TABLE 4. City of Philadelphia Affected Units and Abatement Costs by Lead Condition

Lead Condition	Number of Units	Share of Units	Average Abatement Cost Per Unit
Little action needed	39,954	77%	\$1,351
Moderate action needed	6,948	13%	\$5,418
Major action needed	5,211	10%	\$14,449
Total	52,114	100%	

Source: Anderson Economic Group analysis of base data from U.S. Census Bureau American Community Survey, 2015, American Housing Survey, 2015, and City of Philadelphia Lead Report, 2017; Dewalt et al., 2015; Hartje et al., 2001; Phone conversations with lead testing firms; Center for Government Research, 2008.

The \$5,400 to \$14,500 per unit required to bring nearly a quarter of units into lead-safe compliance represents a significant cost relative to rents. Both property owners and renters in this market can be constrained in their abilities to absorb these costs.

Property owners must first assess whether it makes sense to continue to rent the unit at all in the face of significant mandatory repair costs. In extreme cases, the cost of required repairs would exceed the market value of the unit, making it a losing proposition to ever rent it out again. In most cases the unit would continue to be a viable rental property, but the owner may face obstacles to returning it to the market quickly.

See “Impacts on Rent” on page A-5 for a discussion of our methodology.

Impact on Rent

Property owners have several options for financing the abatement costs for bringing units into compliance with an expanded lead ordinance:

- Pass on the costs to tenants in the form of higher rents;
- Forego maintenance or renovations;
- Reduce their profits.

Based on conversations with owners of rental property in Philadelphia, the availability of other options, such as having cash on-hand from other properties or additional bank financing, are limited.

If property owners were able to pass on 100% of the remediation costs onto tenants in the form of higher rents, this would lead to an increase of between \$38 and \$401 per month in rent, depending on the condition of the property. These estimates assume that the property owner would set rents in order to recover the cost of repairs within three years.

Under the current rental market, it is unlikely that property owners of units requiring moderate or major action could pass 100% of the remediation costs in the form of higher rents. These owners would likely finance these costs either by foregoing maintenance and renovation or by taking a temporary reduction in their profits. We estimate that, on average, property owners would be limited to raising rents by \$60 per month, which is equivalent to about 7% of the contract rents in the city of Philadelphia in 2016.

See “Impacts on Rent” on page A-5 for a discussion of our methodology.

Impact on Supply of Rental Housing

There are several factors that could cause an individual privately-owned rental unit to stay off the market due to an expanded ordinance, including:

- *A shortage of contractors certified to perform lead safe work.* This may be alleviated in a matter of months or a year if local contractors pursue the certifications needed to do lead safe renovations.
- *Limits on the availability of loans to finance expensive repairs.* Banks lending to commercial ventures have requirements about collateral and profitability, both of which are negatively affected by the costs imposed by an expanded ordinance. Property owners who are not able to finance required repairs through higher rents, instead relying on the cash flow from their other properties, may be forced to keep their properties off the market until the capital becomes available to comply with the lead safe requirement. Over time this factor may be reduced somewhat as rents stabilize at a higher level and as property owners work through the back log of lead safe renovations with current cash flow.
- *Limits on the ability of property owners to finance repairs through higher rent.* Renters have some ability to avoid paying higher rent by cohabitation with others or renting in nearby markets at a similar price point. This limits the ability of property owners to raise rents. As a result, some properties requiring the most expensive set of renovations may never be able to garner the level of rent that allows them to stay on the market.

We estimate that anywhere between 3,100 and 6,400 rental units could come off the market in the short- to medium-term. These units represent between 6% and 12% of units that would require measurable abatement costs, and between about 2% and 4% of units that would be newly-covered under the expanded lead ordinance.

Some of these properties may continue to be occupied outside the licensed rental market, especially if they are sold as part of a failed property management business’s asset liquidation process or simply abandoned. Each property brought into compliance and back onto the licensed market will lower owners’ ability to charge higher rent, making it incrementally less likely that the remaining stock of unlicensed properties would be repaired. In the end some balance will be reached between these two factors, resulting in a certain amount of properties, which we do not attempt to quantify, remaining permanently off the mar-

ket. These vacant and abandoned properties will contribute to the urban blight problem in the city.

We also estimate that an expanded lead ordinance could cause all units with monthly rent under \$1,250 requiring major remediation to come off the market, representing 10% of all units at this rent level. We define a major remediation as a remediation that costs approximately \$15,000 or more. For these units, the remediation costs exceed the value of net future rental income from the property, even after assuming a three-year payback period. This would apply to nearly 4,500 units. 85% of all units requiring major remediation have monthly rent below \$1,250.

See “Impacts on Rental Housing Supply” on page A-6 for a discussion of our methodology.

Additional Consequences for Renters

In this report we have described a short-term disruption in the market for rental properties that manifests as a balance between higher rents and lower availability of rental housing. This situation will in some cases have negative consequences for people looking to rent in this market. When properties come off the licensed rental market, some renters may choose to rent an unlicensed property, which in some cases may offer a worse health or safety environment than licensed properties. Others may face an undesirable living environment with family or other cohabitants, difficulty finding housing located near employment opportunities, and other challenges that would otherwise be helped if more housing options were available.

Renters who are willing and able to pay higher rent for the remaining licensed rental units will be doing so at the expense of other things they could spend their money on, some of which may affect their health, employment prospects, or quality of life. We do not attempt to catalog these challenges comprehensively, nor quantify their extent, nor attempt to compare their affects to the financial costs we address in this report.

Appendix A. Methodology

In this section we provide a detailed description of our methodology for estimating the aggregate costs of lead-based paint abatement.

IMPACTS ON PROPERTY OWNERS

In order to estimate the cost of bringing additional units into compliance with an expanded ordinance, we first identified the number of units for which the new ordinance would apply, and calculated the total cost for testing those units, including second-round tests for failing units. We then estimated the number of those units that would contain lead-based paint, and then the number of units that would fail a lead-based paint test and require abatement. Our estimates for the number of units with lead-based paint and the number of units failing a lead dust wipe test come largely from data reported in the 2005-2006 American Healthy Homes Survey (AHHS), which identifies the frequency of lead-based paint and lead-based paint hazard in housing stock across the country, and 2015 American Housing and American Community Surveys.

Affected Units

In order to estimate the number of units newly affected by an expanded ordinance, we first determined the total number of housing units built before 1978 in Philadelphia. We then subtracted out units with government subsidies, since subsidized units are already subject to federal lead regulation. We also subtracted out the number of units with children age six and under, because these units are already subject to the current lead compliance ordinance.

We estimated that there are 26,858 pre-1978 subsidized units in Philadelphia based on data from the American Community Survey and American Housing Survey. We also estimated that there are 26,320 units that have a child age six or under based on the Philadelphia Childhood Lead Poisoning Prevention Advisory Group's recent report. Subtracting these units from our pre-1978 total resulted in 174,654 units that would be newly subject to lead regulations.

TABLE 5. Philadelphia Housing Unit Characteristics

Year Built	Total Pre-1978 Units	Subsidized Units	Units with Child Under Age 6	Units Affected by Expanded Ordinance
1970 to 1978	21,239	3,114	2,454	15,672
1960 to 1969	31,294	5,053	3,615	22,626
1950 to 1959	40,442	4,142	4,672	31,628
1940 to 1949	37,577	6,381	4,341	26,855
1939 or earlier	97,280	8,168	11,238	77,874
Total:	227,832	26,858	26,320	174,654

Sources: Anderson Economic Group analysis of base data from U.S. Census Bureau American Housing Survey, 2015, and American Community Survey, 2015; Philadelphia Childhood Lead Poisoning Prevention Advisory Group Final Report and Recommendations, 2017.

We used data from the AHHS to estimate the proportion of units under the new ordinance that would have lead-based paint, and the proportion of units that would have lead-based paint issues that would lead to a failed wipe test. The HHS provides estimates on the proportion of homes with lead-based paint and lead-based paint issues by year built. Table 6 shows our estimates for the number of units in the city with lead-based paint and lead-based paint hazards.

TABLE 6. City of Philadelphia Rental Units Subject to New Ordinance

Year Built	Total Units Affected by Expanded Ordinance	Percent of Units Nationwide with Lead Based Paint	Percent of Units Nationwide with Lead Based Paint Hazards	Philadelphia Affected Units with Lead Based Paint	Philadelphia Affected Units with Lead Based Paint Hazard
1970 to 1978	15,672	24.6%	11.4%	3,855	1,787
1960 to 1969	22,626	24.6%	11.4%	5,567	2,579
1950 to 1959	31,628	65.8%	38.6%	20,811	12,208
1940 to 1949	26,855	65.8%	38.6%	17,671	10,366
1939 or earlier	77,874	86.2%	66.8%	67,127	52,020
Total:	174,654			115,030	78,960

Source: Anderson Economic Group analysis of base data from U.S. Census Bureau American Community Survey, 2015, and American Housing Survey, 2015; Dewalt et al., 2015.

Cost of Testing

All of these new units would be subject to a lead free or lead safe test. We called several lead-based paint testers in the Philadelphia area, and estimate that the cost of a lead free and lead safe test would be \$400 and \$350, respectively. This includes the cost of preparing for and administering the test. We estimate that landlords would spend an average of \$50 on preparation activities, which could include cleaning a unit and/or spot painting surfaces in the unit.

The average cost of administering a test could be lower for firms that manage multiple properties. Two of the three property management firms we interviewed noted that they had an employee complete a lead test certification program that allowed the employee to administer lead-based paint tests in the company’s units at a lower cost than a single lead-based paint test conducted by a contractor. It is also possible that larger property management firms would negotiate a lower-cost contract with a lead tester.

Units that pass a lead free test would only face a one-time cost under an expanded ordinance. Units that pass a lead safe test would be required to test every two years. We assumed that units failing a lead safe test would have to pay for two tests—one initial failed test, plus one additional test after abatement. We assumed that all lead free units subject to the new ordinance (59,624) would purchase a lead free certification test, and that all units containing lead-based paint would purchase a lead safe certification test. We also assumed that units that fail their first lead safe test would be brought into compliance and pass a second test. Based on our conversations with landlords, we assumed that all units that fail a lead safe test would be abated to become lead safe, not lead free.

The total cost of testing 59,624 lead free units is \$23.8 million. The remaining 115,030 units would take a lead safe test, at a total cost of \$40.3 million. As we discuss in “Cost of Bringing Units Into Compliance” on page 3, a portion of these units would fail their first test, and would be required to take a second test after abatement. We estimate that this situation would apply to 78,960 units based on our analysis below. The total cost for a second lead dust wipe test for these units would be \$27.6 million.

TABLE 7. Estimated Cost of Lead Free and Lead Safe Testing by Test Type

Type of Test	Units	Cost Per Test	Total Cost (millions)
Lead Free	59,624	\$400	\$23.8
Lead Safe	115,030	\$350	\$40.3
Lead Safe (After Abatement)	78,960	\$350	\$27.6
Total:			\$91.7

Source: Anderson Economic Group analysis of base data from U.S. Census Bureau American Housing Survey, 2015, and American Community Survey, 2015; City of Philadelphia Lead Advisory Group, 2017; Dewalt et al., 2015; Phone calls with Philadelphia lead testing providers.

Cost of Bringing Units Into Compliance

Not all of the units newly subject to the lead ordinance would contain lead-based paint, since some have already been fully abated. Older units are more likely to have lead-based paint in them, and are also more likely to have a lead-

based hazard that would lead to a positive dust wipe test. Using data from the AHHS and age characteristics of the city's housing stock, we estimated that 115,030 of the city's units falling under the new ordinance would actually contain lead-based paint, and that two-thirds of these units (78,960) would have lead-based paint issues that would lead to a failed wipe test.²⁴

All units that fail a wipe test would require abatement; however, not all units would incur measurable abatement costs. We estimate that 34% of units would incur no cost in abating lead-based paint based on empirical research on compliance costs in the city of Rochester, New York.²⁵ Instances in which landlords would incur no abatement costs include spot repainting of trim or other surfaces that would be re-painted regardless of whether or not the trim contained lead-based paint. A total of 52,114 units would incur measurable abatement costs.

We estimate the cost of abatement to be approximately \$3,200 based on empirical analysis conducted in Rochester, New York and St. Paul, Minnesota.²⁶ This estimate was corroborated by two HAPCO/PAA East members we interviewed who had experience in lead-based paint abatement. Both members estimated the cost of lead abatement at \$1,500 to \$2,000 per unit. The total cost of abatement for 52,114 units at an average cost of \$3,200 would be \$166.8 million.

IMPACTS ON THE RENTAL HOUSING MARKET

We estimated the impact of bringing additional units into compliance under an expanded ordinance based on two measures: the impact on rents and the impact on the rental housing supply. We first estimated the distribution of lead remediation costs per unit. We then estimated the impacts of these costs based on the level of lead remediation required. Finally, we estimated the impacts of these costs on the supply of rental housing by level of remediation.

Distribution of Remediation Costs

The impact of bringing a unit into compliance on rents would vary depending on the level of remediation required. In order to begin our analysis, we estimated the distribution of the lead abatement costs based on empirical analysis conducted in Rochester, New York.²⁷ We then segmented the affected units that would require measurable abatement costs into three categories based on the level of remediation required: little action needed, moderate action needed, and major action needed. See Table B-1 on page B-2 for further details on our anal-

24. Gary Dewalt *et al.*, "Prevalence of Lead Hazards and Soil Arsenic in U.S. Housing," *Journal of Environmental Health* 78 no. 5 (2015):22-29.

25. Center for Governmental Research, "An Evaluation of the City of Rochester's Lead Law: 2006-2008," 2008.

26. Center for Government Research, 2008, and Sandra Hartje *et al.*

27. Center for Government Research, 2008.

ysis.

Impacts on Rent

Medium-term costs. Property owners have several options for financing the remediation costs for bringing units into compliance with an expanded ordinance:

- Pass on the costs to tenants in the form of higher rents;
- Forego maintenance or renovations;
- Reduce their profits.

Based on conversations with owners of rental property in Philadelphia, the availability of other options, such as having cash on-hand from other properties or additional bank financing, are limited.

The strategies that property owners choose to adopt depend on several factors, such as the existing condition of the affected units, the nature of the rental market, and the level of remediation required. All of the property owners that we interviewed indicated that their ability to raise rents to finance remediation costs would be limited due to the competitive nature of the current rental market. Two owners indicated that they could raise monthly rents by between \$50 and \$100.

Empirical research on the effects of lead abatement policies on rents is limited. Research on the effects of adopting a lead safe ordinance in St. Paul, Minnesota, found that rents for units in which lead orders were issued increased by between 3.7% and 6.7%, depending on the size of the unit.²⁸ However, this observation does not indicate the impact of the ordinance on rents since the authors' analysis does not measure how rents would have changed in the absence of the policy.

A working paper that evaluated the impact of state-level lead abatement mandates indicated that these policies did not have an effect on rents for old rental homes, in aggregate.²⁹ However, the study did indicate that rents increased by between 6.4% and 7.4% for old rental homes with two or more bedrooms. The author suggested this might be due to the fact that lead mandates typically apply to rental units with young children.

To conduct our analysis, we first estimated the effects of initial lead remediation costs on rents assuming that property owners would be able to finance 100% of these costs by raising rents. We then considered the empirical research and our interviews with property owners to estimate the extent to which this would be

28. Sandra Hartje et al., 2001.

29. Ludovica Gasse, "The Price and Allocation Effects of Targeted Lead Abatement Mandates," April 16, 2017.

feasible. We assumed that property owners would likely be able to raise rents to cover the full costs for units that would require little action, or an average of \$1,351 in remediation costs. However, we assumed that for other levels of lead remediation, property owners would be limited to raising rents by about \$60 per month, on average, which represents about 7% of the median contract rent in Philadelphia in 2016. The remaining costs would be financed by foregoing maintenance and renovation or reducing profits for property owners. See Table B-2 on page B-3 for further details of our analysis.

Long-term costs. Property owners who own units that pass a lead safe test would incur long-term costs for recertification, which would require retesting every two years. We estimate that 95% of these costs would be passed onto the tenant in the form of higher rents, increasing rent by about \$14 per month.

Our estimates for the long-term costs do not consider the costs of bringing a failed unit back into compliance. See Table B-3 on page B-4 for further details of our analysis.

Impacts on Rental Housing Supply

There are several factors that could cause an individual privately-owned rental unit to stay off the market due to an expanded ordinance, including:

- A shortage of contractors certified to perform lead safe work;
- Limits on the availability of loans to finance expensive repairs; and
- Limits on the ability of property owners to finance repairs through higher rent.

Two property owners we interviewed indicate that, in general, they would not take a rental unit off the market due to lead remediation. However, one of these owners noted that they would consider this option if remediation costs were significant.

Empirical research on the effects of lead abatement policies on rental housing supply is limited and the magnitude of the effects vary by study. Survey research on the effects of adopting a lead safe ordinance in St. Paul, Minnesota, indicates that about 8% of units requiring a lead order were either temporarily or permanently abandoned. However, the sample size is small, and the study did not indicate how abandonment is measured or defined.³⁰

One study on the effect of lead-based paint abatement laws in Baltimore indicated that the abatement mandate did not have an effect on rental property abandonment after one-year of implementation.³¹ However, this does not capture the medium-term effects on the housing supply.

30. Sandra Hartje, et al., 2001.

Another study on the effects of adopting a lead abatement mandate in Rochester, New York reported that 23% of survey respondents would sell their property to offset the costs of repairs.³² Note that these sales could still allow the property to be available for rent.

We estimated the impact of an expanded ordinance on abandonment based on our review of empirical research and our interviews with property owners. Since the existing empirical research on the effects of lead abatement mandates on housing supply is inconclusive, we provide a range of estimates. We estimate that none of the units requiring little remediation action would be taken off the market since property owners are likely able to finance the repairs for these units. We estimate that anywhere between 15% and 25% of units requiring moderate remediation action would be taken off the market, while anywhere between 40% and 90% of units requiring major action would be taken off the market. See Table B-4 on page B-5 for further details on our analysis.

These estimates are informed by two approaches for estimating the share of units that would be abandoned. Under the first approach, we consider that property owners who own relatively few units (e.g., a handful of single-family homes) are more likely to be limited in financing the costs to bring units into compliance since they have a smaller pool of units to rely on for their cash flow. Using data from the U.S. Census American Housing Survey and American Community Survey, we estimate the share of units in properties in which there are 10 or fewer units. This measure serves as a proxy for the number of units to which this situation might apply. We then estimate the rate of abandonment among these units, assuming that 20% of units with moderate action needed would be taken off the market and 50% of units with major action needed would be taken off the market. See Table B-5 on page B-6 for further details on our analysis.

Under the second approach, we consider that property owners would weigh the remediation costs for bringing a unit into compliance against their net income from renting out the unit. Using data from the U.S. American Housing Survey, we estimate the distribution of rents for units built before 1978. We then estimate the increased rent by remediation action required. From these estimates, we estimate the net present value of bringing a unit into lead safe compliance. We use a discount rate of 5% and assume that rental property owners have a profit margin of 29.2%, based on the 2015 Almanac of Business and Financial Ratios.³³ For any unit in which the net present value is less than \$0, we assume

31. Deborah Ann Ford and Michele Gilligan, "The Effect of Lead Paint Abatement Laws on Rental Property," *AREUEA Journal*, Vol. 16, No. 1, Spring 1988, pp. 84-94.

32. Center for Government Research, 2008.

33. The 2015 Almanac of Business and Industrial Financial Ratios indicates that businesses in the "Lessors of Buildings" industry have a return on equity of 7.5%.

that a property owner would take the unit off the rental market. From this analysis, we estimate that 15% of units requiring moderate action would be taken off the market and 91% of units requiring major action would be taken off the market. Our analysis provides conservative estimates for the amount of units that might be taken offline since we assume that the distribution of units by lead remediation required does not vary by rent. However, it is likely that properties with lower value would be in worse condition and require more repairs to bring into compliance. See Table B-5 on page B-6 for further details on our analysis.

Appendix B. Detailed Exhibits

This appendix contains the following tables:

- Table B-1, “Remediation Costs for Units Failing Lead Test,” on page B-2
- Table B-2, “Medium-Term Impact on Property Values by Lead Condition,” on page B-3
- Table B-3, “Long-Term Impact on Property Values by Lead Condition,” on page B-4
- Table B-4, “Abandonment of Rental Properties by Lead Condition,” on page B-5
- Table B-5, “Abandonment of Rental Units Based on Small Properties,” on page B-6
- Table B-6, “Abandonment of Rental Units Based on Remediation Costs Relative to Rental Income,” on page B-7

TABLE B-1. Remediation Costs for Units Failing Lead Test

<i>Remediation Costs by Average Costs of Repairs</i>				
Average Remediation Cost Per Unit (2006\$) (a)		Number of Affected Units (b)		
			Total Costs (2006\$)	Total Costs (2017\$)
\$0		26,846		
\$200	x	10,857	= \$2,171,400	\$2,614,604
\$850	x	18,240	= \$15,503,796	\$18,668,276
\$2,500	x	10,857	= \$27,142,500	\$32,682,556
\$4,500	x	6,948	= \$31,268,160	\$37,650,304
\$12,000	x	5,211	= \$62,536,320	\$75,300,608
Total		78,960	\$138,622,176	\$166,916,348

<i>Remediation Costs by Lead Condition</i>			
Lead Condition	Number of Affected Units With Abatement Costs	Share of Units	Average Repair Cost (2017\$)
(c) Little action needed	39,954	77%	\$1,351
(d) Moderate action needed	6,948	13%	\$5,418
(e) Major action needed	5,211	10%	\$14,449
Total	52,114		\$3,203

Source: AEG analysis using base data from the Center for Government Research (2008), U.S. Bureau of Labor Statistics, Consumer Price Index

- (a) Cost categories are based on data from the Center for Government Research (2008).
- (b) We estimate that 78,960 units would have lead paint issues that would lead to a failed swipe test. Of these units, we estimate that 52,114 units would face measurable abatement costs. We estimate the distribution of these units by average abatement cost using data from the Center for Government Research (2008).
- (c) "Little action needed" category includes units requiring up to an average of \$2,500 (in 2006 dollars) in lead remediation.
- (d) "Moderate action needed" category includes units requiring \$4,500 (in 2006 dollars) in lead remediation.
- (e) "Little action needed" category includes units requiring up \$12,000 (in 2006 dollars) in lead remediation.

TABLE B-2. Medium-Term Impact on Property Values by Lead Condition

Lead Condition	Initial Cost to Become Lead-Safe Compliant (a)	Average Medium-term Monthly Rent Increase If Costs Passed onto Tenants (b)	Projected Average Medium-term Monthly Rent Increase (c)	Monthly Value of Foregone Maintenance or Reduction in Profits (d)
Little action needed	\$1,351	\$38	\$38	\$0
Moderate action needed	\$5,418	\$151	\$60	\$91
Major action needed	\$14,449	\$401	\$60	\$341

Source: AEG analysis using base data from the Center for Government Research (2008); U.S. Bureau of Labor Statistics, Consumer Price Index

Notes:

- (a) Cost estimates include inspection and initial repairs based on AEG judgment. Estimates are based on data on lead abatement repair costs in Rochester, New York, and St. Paul, Minnesota.
- (b) If property owners are able to pass on initial costs to become lead-safe compliant to tenants, this is the estimate for the average increase in monthly rent based on a three-year payback period.
- (c) Based on AEG discussions with owners of privately-owned rental properties in Philadelphia, it would be difficult to pass on the costs to tenants for units that require costly repairs under the current rental market. We estimate that, on average, property owners would be limited to increasing rents by \$60 monthly. This is equivalent to about 7% of the median contract rent for all rental properties in the city of Philadelphia.
- (d) Property owners would finance lead abatement costs that are not passed onto tenants either by foregoing maintenance and renovations or reducing the profitability of these units. These estimates represent the monthly value of foregone maintenance or lost profits due to uncovered costs to bring a unit into lead-safe compliance.

TABLE B-3. Long-Term Impact on Property Values by Lead Condition

Lead Condition	Cost per Re-certification (a)	Proportion Re-Certification Cost and Future Repairs Made up in Higher Rent (b)	Long-term Monthly Rent Increase (c)
Little action needed	\$350	95%	\$14
Moderate action needed	\$350	95%	\$14
Major action needed	\$350	95%	\$14

Source: AEG analysis using base data from conversations with Philadelphia property owners

Notes:

- (a) *Assumes each re-certification results in \$350 in costs for testing.*
- (b) *Estimate based on discussions with owners of privately-owned rental properties, recognizing that recertification costs raise the marginal cost of providing rental housing.*
- (c) *Cost per recertification times times proportion of costs passed on to renters. Assumes re-certification takes places every two years.*

TABLE B-4. Abandonment of Rental Properties by Lead Condition

Lead Condition	Number of Newly Covered Units Failing Lead Test	Share of Units Taken Off the Market (a)	Number of Units Off the Market
<i>Low Estimate</i>			
Little action needed	39,954	0%	0
Moderate action needed	6,948	15%	1,042
Major action needed	5,211	40%	2,085
Total	52,114		3,127
<i>Memo: Total Units Taken Off the Market as a Share of Units Requiring Remediation Costs</i>			6.0%
<i>Memo: Total Units Taken Off the Market as a Share of Units Newly-Covered by Lead Regulation</i>			1.8%
<i>High Estimate</i>			
Little action needed	39,954	0%	0
Moderate action needed	6,948	25%	1,737
Major action needed	5,211	90%	4,690
Total	52,114		6,427
<i>Memo: Total Units Taken Off the Market as a Share of Units Requiring Remediation Costs</i>			12.3%
<i>Memo: Total Units Taken Off the Market as a Share of Units Newly-Covered by Lead Regulation</i>			3.7%

Source: AEG analysis using base data from the Center for Government Research (2008); U.S Bureau of Labor Statistics, Consumer Price Index; American Housing Survey (2015); American Community Survey (2016)

Notes:

- (a) Assumptions on the share of units taken off the rental market are based on AEG analysis of data from the Center for Government Research, U.S. Bureau of Labor Statistics, the American Housing Survey, and American Community Survey. The assumptions are also informed by discussions with owners of privately-owned rental properties in Philadelphia, as well as existing research on the effects of lead abatement policies on housing.

TABLE B-5. Abandonment of Rental Units Based on Small Properties

Lead Condition	Initial Cost to Become Lead-Safe Compliant	Number of Newly Covered Units	Share of Units in Small Properties (a)	Number of Units in Small Properties	Share of Units Taken Off the Market (b)	Number of Units Taken Off the Market	Units Taken Off the Market as a Share of Units Failing Lead Test
Little action needed	\$1,351	39,954	75%	29,956	0%	0	0.0%
Moderate action needed	\$5,418	6,948	75%	5,210	20%	1,042	15.0%
Major action needed	\$14,449	5,211	75%	3,907	50%	1,954	37.5%
Total		52,114		39,074		2,996	5.7%

Source: AEG analysis using base data from the Center for Government Research (2008); U.S Bureau of Labor Statistics, Consumer Price Index; American Housing Survey (2015); American Community Survey (2016)

Notes:

- (a) We assume that rental units in properties with fewer than 10 units are more likely to be taken off the rental market than properties with a larger number of units. Property owners of larger properties have the ability to spread the costs of compliance across these units. Estimate of the share of units in properties with fewer than 10 units is based on 2015 data from the American Housing Survey for the Philadelphia metropolitan area and 2016 data from the American Community Survey for the city of Philadelphia.
- (b) We assume that about 20% of units requiring moderate action would be taken off the rental market and about 50% of units requiring major action would be taken off the rental market. Based on a discussion with a property owner of privately-owned single-family and small multi-family rental properties in Philadelphia, compliance costs of about \$5,000 would force the owner to take a unit off the rental market due to limited availability of cash on hand and additional bank financing. Our assumptions reflect that not all owners of such properties would make this decision, especially if they own a large volume of properties.

TABLE B-6. Abandonment of Rental Units Based on Remediation Costs Relative to Rental Income*Distribution of Units by Average Rent and Lead Condition*

Monthly Rent	Total	Little action needed	Moderate action needed	Major action needed
Total	100%	77%	13%	10%
Less than \$250	7%	6%	1%	1%
\$250 to \$499	8%	6%	1%	1%
\$500 to \$749	24%	19%	3%	2%
\$750 to \$999	30%	23%	4%	3%
\$1,000 to 1,249	15%	12%	2%	2%
\$1,250 to \$1,499	6%	5%	1%	1%
\$1,500 to \$1,749	4%	3%	1%	0%
\$1,750 to \$1,999	2%	1%	0%	0%
\$2,000 to \$2,249	1%	1%	0%	0%
\$2,250 to \$2,499	1%	1%	0%	0%
\$2,500 to \$2,999	1%	0%	0%	0%
\$3,000 or more	1%	0%	0%	0%

Increased Rent by Average Monthly Rent and Lead Condition

Monthly Rent	Average Rent	Little action needed	Moderate action needed	Major action needed
Less than \$250	\$200	\$238	\$260	\$260
\$250 to \$499	\$375	\$413	\$435	\$435
\$500 to \$749	\$625	\$663	\$685	\$685
\$750 to \$999	\$875	\$913	\$935	\$935
\$1,000 to 1,249	\$1,125	\$1,163	\$1,185	\$1,185
\$1,250 to \$1,499	\$1,375	\$1,413	\$1,435	\$1,435
\$1,500 to \$1,749	\$1,625	\$1,663	\$1,685	\$1,685
\$1,750 to \$1,999	\$1,875	\$1,913	\$1,935	\$1,935
\$2,000 to \$2,249	\$2,125	\$2,163	\$2,185	\$2,185
\$2,250 to \$2,499	\$2,375	\$2,413	\$2,435	\$2,435
\$2,500 to \$2,999	\$2,750	\$2,788	\$2,810	\$2,810
\$3,000 or more	\$3,500	\$3,538	\$3,560	\$3,560

TABLE CONTINUED.

Net Present Value of Bringing Unit into Lead Safe Compliance By Average Rent and Lead Condition

(a)	Assumed rate of return	5%			
(b)	Profit margin (after income tax)	29.2%			
	Monthly Rent		Little action needed	Moderate action needed	Major action needed
	Repair Costs		<i>\$1,351</i>	<i>\$5,418</i>	<i>\$14,449</i>
	Less than \$250		\$872	-\$2,798	-\$11,398
	\$250 to \$499		\$2,463	-\$1,207	-\$9,808
	\$500 to \$749		\$4,735	\$1,065	-\$7,536
	\$750 to \$999		\$7,006	\$3,337	-\$5,264
	\$1,000 to 1,249		\$9,278	\$5,609	-\$2,992
	\$1,250 to \$1,499		\$11,550	\$7,881	-\$720
	\$1,500 to \$1,749		\$13,822	\$10,153	\$1,552
	\$1,750 to \$1,999		\$16,094	\$12,425	\$3,824
	\$2,000 to \$2,249		\$18,366	\$14,697	\$6,096
	\$2,250 to \$2,499		\$20,638	\$16,968	\$8,368
	\$2,500 to \$2,999		\$24,046	\$20,376	\$11,776
	\$3,000 or more		\$30,862	\$27,192	\$18,592

Share of Units that Would Be Abandoned by Average Rent and Lead Condition

	Monthly Rent		Little action needed	Moderate action needed	Major action needed
	Total				
	Total	11%	0%	2%	9%
	Less than \$250	2%	0%	1%	1%
	\$250 to \$499	2%	0%	1%	1%
	\$500 to \$749	2%	0%	0%	2%
	\$750 to \$999	3%	0%	0%	3%
	\$1,000 to 1,249	2%	0%	0%	2%
	\$1,250 to \$1,499	1%	0%	0%	1%
	\$1,500 to \$1,749	0%	0%	0%	0%
	\$1,750 to \$1,999	0%	0%	0%	0%
	\$2,000 to \$2,249	0%	0%	0%	0%
	\$2,250 to \$2,499	0%	0%	0%	0%
	\$2,500 to \$2,999	0%	0%	0%	0%
	\$3,000 or more	0%	0%	0%	0%
	<i>Memo: Abandoned Units as a Share of Lead Condition</i>				
	<i>Total</i>		<i>0%</i>	<i>15%</i>	<i>91%</i>

Source: AEG analysis using source data from the American Housing Survey (2015); American Community Survey (2016)

Notes:

- (a) Based on AEG professional judgment. According to the 2015 Almanac of Business and Industrial Financial Ratios, businesses in the "Lessors of Buildings" industry have a return on equity of 7.5%
- (b) According to the 2015 Almanac of Business and Industrial Financial Ratios, businesses in the "Lessors of Buildings" industry have an profit margin of 29.2%.

Appendix C. About AEG

Anderson Economic Group, LLC is a boutique consulting firm founded in 1996, with offices in East Lansing, Chicago, New York, and Istanbul. Our team has a deep understanding of advanced economic modeling techniques and extensive experience in analyzing the impacts of housing and public health policies. Some of our past works include:

- *Economic Impact of Proposed “Lead Safe” Legislation in the City of Philadelphia*, published in 2011.
- *Fiscal Analysis of Senate Bill 76, Proposed Reform of School Funding; Analysis on Stability of State Revenues; Comparison with Rates in Neighboring States*, published in 2013.
- *Governor Wolf’s FY 2016 Budget Proposal and the Pennsylvania Market for Homes*, published in 2015.

Past clients of Anderson Economic Group include:

- *Governments*: The government of Canada; the states of Michigan, North Carolina, Kentucky, Tennessee, and Wisconsin; the cities of Detroit, Cincinnati, and Sandusky; counties such as Oakland and St. Clair Counties in Michigan, and Collier County in Florida.
- *Nonprofit organizations*: Higher education institutions including Michigan State University, the University of Michigan, and University of Chicago; trade associations such as the National Association of Realtors, Pennsylvania Association of Realtors, Michigan Chamber of Commerce, Service Employees International Union, and Business Leaders for Michigan.

Please visit www.AndersonEconomicGroup.com for more information.

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Mr. Horwitz is a Senior Consultant at Anderson Economic Group, serving as the Director of the Public Policy and Economic Analysis practice area. Mr. Horwitz has extensive expertise in state and local economic conditions and the economic and fiscal impacts of public policy. He has provided research, analysis, and expert testimony on policy in a range of fields, including state and local taxes, retirement benefits, business incentives, energy policy, and economic development.

Mr. Horwitz has advised governments, trade organizations, and corporations across the country on economic issues and the impacts of policy. His work also includes economic impact studies on universities, hospitals, museums, retailers, and large-scale events. His work has been featured in Bloomberg Businessweek, NPR Marketplace, Chicago Sun-Times, Detroit News, Crain’s Chicago Business, and on WBEZ Radio.

Prior to joining AEG, Mr. Horwitz was the Coordinator of Distribution for the Community Center of St. Bernard near New Orleans, where he oversaw the distribution of donated food, clothes, and household supplies to low-income residents of St. Bernard Parish and New Orleans' Lower Ninth Ward.

Mr. Horwitz holds a Master of Public Policy from the Harris School of Public Policy at the University of Chicago and a Bachelor of Arts in Physics and Philosophy from Swarthmore College. He is a board member at the Civic Federation.

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Ms. Taylor is a Consultant with Anderson Economic Group, working in the Public Policy and Economic Analysis practice area. Her background is in applied economics.

While at AEG, Ms. Taylor has performed research and analysis for a wide range of clients, including universities, trade associations, and businesses. Her recent work includes multi-scenario analysis of pending energy regulation; economic and fiscal impact analyses of major investments; analyses of new tourism activity due to policy changes as well as special events; benchmarking studies; and analyses of tax reform proposals.

Prior to joining AEG, she worked as an engineer in the petrochemicals industry in Louisiana and as an AmeriCorps VISTA at a non-profit organization in New Orleans. She has also served as a graduate research assistant at Michigan State University.

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