Green & Healthy Homes Initiative®

Advancing Housing Quality and Health Equity in Massachusetts:

A Path Toward Addressing Lead Paint and Indoor Air Quality

Report for MACDC
October 2023

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Executive Summary of Findings

Research report prepared by GHHI for MACDC's Housing Quality and Health Equity Initiative

Documentation of Hazards

- Each of the Gateway Cities studied in this report (Brockton, Holyoke, and Springfield) have higher proportions of housing units estimated to have significantly deteriorated lead paint compared to statewide averages.
- Brockton, Holyoke, and Springfield also have **higher rates of confirmed child elevated blood lead levels** than statewide, as well as relatively **higher rates of asthma**, which can be an indicator of **poor indoor air quality.**
- There are disproportionately higher rates of child elevated blood lead levels (EBLLs) among both low-income populations and communities of color in Massachusetts.

Resources and Gaps Analysis

- Active HUD grants and Get The Lead Out loans fund lead hazard reduction in approximately **436 units per year** across Massachusetts, compared to an **estimated 1.04 million housing units** with significantly deteriorated lead-based paint.
- **More program funding is needed to address lead paint hazards at a larger scale.** In addition, local HUD lead programs did not have a waitlist in at least one Gateway City, suggesting that **community demand is not as high as expected** given the number of housing units with significantly deteriorated lead-based paint.
- In each of the Gateway Cities, there is **higher demand for more holistic home repair programs than for lead focused programs.** This could create an opportunity to integrate lead hazard reduction with other home repair programs to provide comprehensive, whole home health and safety repairs.
- Compared to lead, there are fewer programs and resources focused explicitly on indoor air quality and asthma.
- **Massachusetts' new Sanitary Code became active in May 2023.** Two new provisions could make it easier for tenants to prove indoor air quality hazards and provide greater requirements of landlords for remediation.
- **Stakeholders frequently mentioned the heavy burden of program administration**, and cities such as Springfield did not pursue new HUD lead grants. Additionally, applicants often need more individual support throughout the application process than CBOs have capacity to provide, indicating a need for more applicant support funding.

Housing Stability Analysis

- **Each of the three Gateway Cities have elevated risk factors associated with housing instability,** including frequent moves, evictions, housing cost burden, and crowding. Future surveys can relate these housing instability metrics to housing quality.

Executive Summary of Recommendations

Expanding Resources and Bridging Gaps

1) Increase Awareness of Lead Through Public Campaigns: Communications and education campaign(s) targeted to communities at the highest risk for lead-based paint hazards would help drive demand for HUD and GTLO programs.

2) Expand Reach of Financial Support: Consider adjusting parameters of existing loan products to make even more attractive to potential borrowers, e.g., forgivable loans or grants for low-income borrowers.

3) Provide Application Support to Residents: Funding for a Housing Navigator or similar positions in cities could help residents understand program requirements and secure documents as needed.

4) Alleviate Program Administrator Burden: Providing capacity building and training support to program administrators in navigating the administration of HUD lead programs would help build the ability and willingness of local program administrators to continue applying for and participating in HUD grants.

5) Bridge Workforce Development Gap: Within Gateway Cities, programs could share a common list of high performing contractors; this could alleviate issues where some programs are struggling to find contractors while other programs are not. Resources for lead training, certifications, and training for general construction areas could also help bolster contractor capacity.

6) CHIP HSI: Massachusetts could consider using a CHIP (Children's Health Insurance Program) HSI (Health Services Initiative) to fund home remediation that improves children's health, including lead and indoor air quality improvements. States like Maryland, Michigan, Ohio, and Wisconsin currently operate asthma and lead remediation programs funded by CHIP HSIs.

7) Increase Accessibility to Resources in Minority Communities: Targeted outreach to underrepresented minorities could help even disparities among GTLO borrowers and local lead programs.

8) Pursue Additional Federal and State Grants: Given the drastic funding needs to address housing quality in Gateway Cities and across Massachusetts, stakeholders should pursue new, transformational levels of funding to invest in the state's housing stock.

Linking Housing Quality and Housing Stability

9) Administer Housing Stability Survey: In order to get the most accurate data on housing stability and housing quality, administering a new survey dedicated to housing stability, or adding housing stability questions to existing survey templates, would provide more direct and targeted information than relying on existing general data surveys such as US Census data.

10) Future Research into Housing Quality + Instability: Housing-related health outcomes such as lead poisoning and asthma-related hospitalizations are disproportionately high in Gateway Cities, and future research should further examine the connection between housing quality and health.

Data Collection and Documenting Hazards

11) Housing Code Violation Data and Healthy Homes Analysis: Public access to housing code violation data in cities across the state could help identify buildings that are at the highest risk for health hazards.

12) Collect + Analyze Health Data: A potential area of further research and analysis could include structuring a study using administrative health data from CHIA to estimate impacts on health utilization and cost tied to housing quality, as well as model the health value of scaled home repair policies and programs.

Introduction

About MACDC

The Massachusetts Association of Community Development Corporations (MACDC) is a membership organization that seeks to build and sustain a high performing and adaptive community development sector that is supported by private and public investment and sound public policies. We advance racial and economic equity by creating healthy communities where everyone lives in housing they can afford, benefits from economic opportunities and can fully participate in the civic life of their community.

MACDC envisions a Commonwealth of interconnected communities where people of different incomes, ethnicities, races and backgrounds live with dignity and fulfillment. We envision communities that encourage all residents, including once disenfranchised residents, to participate in civic processes that define the physical, economic, educational and cultural characteristics that distinguish these communities. We see a Massachusetts where all people build assets and realize the benefits of a healthy economy which provides full employment at good wages, stable housing at affordable prices, and strong public supports for human needs. We see a community development movement led by a diverse and democratic leadership that is at the forefront, in both substance and process, when determining public policy and development priorities that serve the long-term interests of communities. We envision government and the private sector working in partnership with the community development movement to achieve excellence in the projects we undertake and to promote a true "common wealth" for all who live in Massachusetts.

About the Housing Quality + Health Equity Initiative

MACDC's Housing Quality and Health Equity Initiative (the "HQH Equity Initiative") is supported through a grant from the Massachusetts Community Health and Healthy Aging Funds ("MA CHHA Funds"). The HQH Equity Initiative tackles poor housing quality and associated housing instability, and addresses the corresponding racial health inequities, in Massachusetts' Gateway Cities. The root causes of poor housing quality and associated racial health inequities include racist policies and practices that limit where households of color can live and that have created income and wealth disparities that limit choices for people of color, combined with long-standing underinvestment in maintaining older properties and the high cost to rent or buy safe, healthy housing.

About Green & Healthy Homes Initiative

The Green & Healthy Homes Initiative, a 501(c)(3) non-profit organization, is the nation's largest Healthy Housing organization with over three decades of experience in the advancement of

programs, policies, and practices to eradicate childhood lead poisoning and create a healthier housing stock for all Americans. Dedicated to addressing the social determinants of health and racial disparities, GHHI was founded in Baltimore in as 1986 Parents Against Lead ("PAL") in response to the twin tragedies of an unhealthy housing stock and poisoned children. Since that time, the scope of GHHI's work has grown locally and nationally to encompasses the design, development and implementation of comprehensive and effective services and programs to create lead safe, healthy and energy efficient housing conditions for low-income communities of color across the United States. Over the course of its work, GHHI has shown a unique acumen for leveraging its stellar direct service programs into concrete policy change at the local, state, and federal level – directly contributing to the prevention of childhood lead poisoning, asthma, and injury – while creating an increasing stock of affordable, energy efficient, and sustainable homes.

Note on Report Terminology and Racial Identity

This report includes analysis of how housing and health inequities are distributed among different racial groups. Race is a social construct with a range of identities and group labels, and this report's authors are committed to using the most appropriate terminology so that the language of this report is inclusive, respectful, and free of bias.

***Group Terms**:* Racial group data used in this report is from the Center for Disease Control's Behavioral Risk Factor Surveillance System (BRFSS), a system of telephone surveys that collects health-related data at the state level.[1] The four racial group categories in the BRFSS with significant data used in this report are "Asian", "Black", "Hispanic or Latino", and "White." The authors of this report recognize that each of these categories may or may not be the same descriptors used by the actual members of different racial groups in the Gateway Cities and across Massachusetts, who may prefer other terms based on their national origins, genders, or other factors. These four racial group labels are used in this report to remain consonant with the data sources they are drawn from, while also acknowledging their limitations.

***Capitalization**:* All racial group labels (Asian, Black, Hispanic or Latino, and White) are capitalized throughout this report, in accordance with guidance from the CDC[2], APA[3], and AMA[4].

[1] https://www.mass.gov/doc/a-profile-of-health-among-massachusetts-adults-2021-0/download
[2] https://www.cdc.gov/healthcommunication/Preferred_Terms.html
[3] https://apastyle.apa.org/style-grammar-guidelines/bias-free-language/racial-ethnic-minorities
[4] https://static.primary.prod.gcms.the-infra.com/static/site/amamanualofstyle/document/CHAPTER_11_UPDATED.pdf?node=853a7354a4864bda8080

Documentation of Hazards: Data on Scale of the Problem

Lead

Background on Lead Impacts

In the United States, the CDC estimates that approximately 500,000 children aged 1-5 years have blood lead levels (BLL) higher than 3.5 µg/dL,[5,6] which is the CDC's blood lead reference value.[7] In Massachusetts, 1,836 children had an estimated confirmed BLL higher than 5 µg/dL, which is the old CDC reference level.[8]

Today and since 2021, in lieu of the "action level" terminology, CDC uses a reference value of 3.5 µg/dL to identify children who are in the 97.5th percentile of blood lead values among U.S. children ages 1-5.[9] Regardless, much of the lead surveillance data currently available uses the old action level reference point for reporting, though future reporting should make wider use of the reference value threshold.

Decades of research has established that there is no safe level of lead in the human body, and even the smallest amount of lead in a child will lead to deficits in brain development and health. Long-term effects include poor health outcomes, behavioral issues such as attention deficit hyperactivity disorder (ADHD), lower lifetime earnings, need for special education, and increased potential of criminal activity.[10]

The dangers of childhood lead poisoning are well understood but preventing lead exposure is drastically underfunded nationally. Childhood lead poisoning has far-reaching consequences for both the individual and society as a whole:

- **Education:** increased need for special education and reduced classroom productivity that results from behavioral issues,
- **Healthcare:** increased short-term (e.g., testing, provider visits, chelation) and long-term (e.g., hypertension, heart disease, stroke, kidney malfunction, elevated blood pressure, osteoporosis) health complications/cost and increased need for medical treatments,

[5] µg/dL, or micrograms per deciliter, is a measure of lead concentrated in a person's bloodstream.
[6] https://www.cdc.gov/nceh/lead/overview.html#:~:text=CDC%20uses%20a%20blood%20lead,at%20or%20above%20the%20BLRV
[7] https://www.cdc.gov/nceh/lead/docs/cbls-national-data-table-508.pdf
[8] https://www.mass.gov/doc/2021-annual-childhood-lead-poisoning-surveillance-report-0/download
[9] https://www.cdc.gov/nceh/lead/data/blood-lead-reference-value.htm
[10] Gould, E. (2009). Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. Environmental health perspectives, 117(7), 1162-1167.

- **Crime**: increased propensity to commit crime and be involved in the justice system, and
- **Wages and tax revenue**: lost earnings potential (for the individual) and tax revenue (for government) that results from reduced cognitive abilities.

In addition to these arguably quantifiable measures, there is a moral imperative to devote resources to mitigating the disproportionate and devastating impacts of this toxic substance on some of our most vulnerable residents.

Lead-based Paint in Housing

Lead-based paint is the most common form of lead found in today's environment and is the largest contributor to childhood lead exposure.[11] Table 1 below provides estimates of lead paint prevalence in housing units across the three Gateway Cities and statewide. Values in bold signify a difference that is statistically significant between city and state. The American Community Survey (ACS) provides estimates for housing age by decade, and the American Healthy Homes Survey (AHHS) provides estimates of lead paint prevalence by year built. Older homes are more likely to contain lead-based paint, and since lead paint was outlawed in 1978, homes built after that date are less likely to contain lead-based paint (though the probability of lead is not zero). AHHS estimates are based on surveys conducted between 2018 and 2019. Because the AHHS is survey-based, it accounts for homes that have received lead remediation prior to the survey being conducted. The previous AHHS report iteration was conducted between 2005 and 2006; changes in housing stock between these two reports should be captured in the most recent AHHS report. More detailed information about the survey methodology can be found in the AHHS report.[12] Appendix B contains documentation of the research methodology and data sources used in this report.

Table 1. *Estimates for Lead in Housing Units, 2021*

Lead-based Paint Measure	Brockton	Holyoke	Springfield	Mass.
Housing units (occupied)	37,554	15,061	57,808	2,759,149
Estimated housing units with lead-based paint	16,597	8,317	30,347	1,156,031
Estimated percent housing units with lead-based paint	**44.2%**	**55.2%**	**52.5%**	41.9%
Estimated housing units with significantly deteriorated lead-based paint	14,887	7,404	27,028	1,036,418
Estimated percent housing units with significantly deteriorated lead-based paint	**39.6%**	**49.2%**	**46.8%**	37.6%

[11] https://www.epa.gov/lead/what-most-significant-source-childhood-lead-exposure-residence#:~:text=Answer%3A%20The%20scientific%20literature%20suggests,may%20accumulate%20to%20unsafe%20levels

[12] https://www.hud.gov/sites/dfiles/HH/documents/AHHS_II_Lead_Findings_Report_Final_29oct21.pdf

GHHI's calculations for lead-containing units used the AHHS estimates for housing units in the Northeast region of the United States. In addition to estimates of housing units with lead-based paint generally, AHHS also estimates the number of housing units with deteriorated and significantly deteriorated lead-based paint. We included the category of "significantly deteriorated" lead-based paint in Table 1 to show the subset of homes that may have an immediate need for remediation. AHHS defines "significantly deteriorated" as lead-based paint with deterioration more than 20 sq. ft (exterior) or 2 sq. ft (interior) on walls or doors, or damage to more than 20% of the total surface area of interior small surface area components like windowsills, baseboards, and trim.

Table 1 shows that the prevalence of lead-based paint and significantly deteriorated lead-based paint in the Gateway Cities is higher than the statewide prevalence. Holyoke and Springfield have the highest rates of lead-based paint in housing, at over 50%. Similarly, Holyoke has the highest rate of significantly deteriorated lead-based paint while Springfield has the largest number of homes of the three cities.

Figure 1 below focuses on the Gateway Cities, showing the estimated number of housing units with various levels of lead paint as a portion of the total number of housing units in each city. Sections highlighted in green signify cities with relatively worse conditions (the darker the green, the worse the condition).

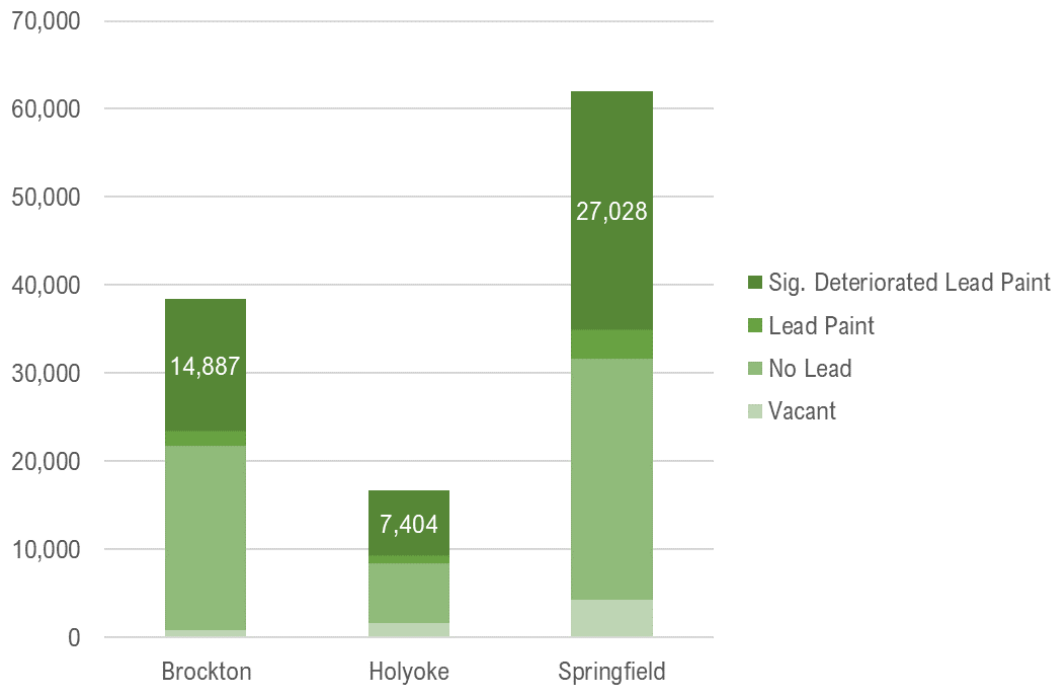


Figure 1. *Housing Units and Lead Paint in Gateway Cities*

Childhood Lead Exposure

The greatest risk of lead-based paint is childhood lead exposure and resulting elevated blood lead levels that lead to harmful individual and societal impacts outlined previously. Figure 2 shows rates of child EBLL (elevated blood lead level) above 5 µg/dL across the Gateway Cities and statewide, based on information from the Massachusetts Environmental Public Health Tracking website.[13] Interestingly, Holyoke has the lowest rates of confirmed child EBLLs among the three Gateway Cities even though it has the highest estimated percentage of housing with lead-based paint. On the other hand, Brockton has the highest rates of confirmed child EBLLs among the three Gateway Cities while it has the lowest percentage of housing with lead-based paint. Additional analysis is needed to understand the reason(s) for this discrepancy; for example, it could potentially be explained by differences in public awareness of lead-based paint or differences in household demographics.

All three Gateway Cities have a higher percentage of housing with significantly deteriorated lead paint when compared to statewide, and each city also has a higher-than-statewide-average prevalence of child EBLLs.

We note that there are differences in childhood lead screening rates between the Gateway Cities and statewide. Gateway Cities are screening at or above the state average, although there is still room to improve screening efforts statewide. The list below shows screening rates performed between 2017 and 2021:[14] According to the Massachusetts Department of Public Health (MDPH) Lead Poisoning report, screening rates statewide have increased in recent years; however, rates continue to be less than 100% even though the Massachusetts Lead Law requires lead screening of all children under the age of four.

- Brockton: 63%
- Holyoke: 54%
- Springfield: 61%
- Massachusetts: 54%

These levels of screening rates are not unique to Massachusetts; in fact, screening rates in Massachusetts are among the highest in the country despite other states' screening requirements and federal Medicaid requirements.[15] There are many barriers to lead screening, including little enforcement action by state agencies, lack of awareness capacity by healthcare providers, and lack of public knowledge about testing requirements.

[13] Massachusetts Environmental Public Health Tracking: Community Profiles
[14] https://www.mass.gov/doc/2021-annual-childhood-lead-poisoning-surveillance-report-0/download
[15] https://www.cdc.gov/nceh/lead/data/national.htm

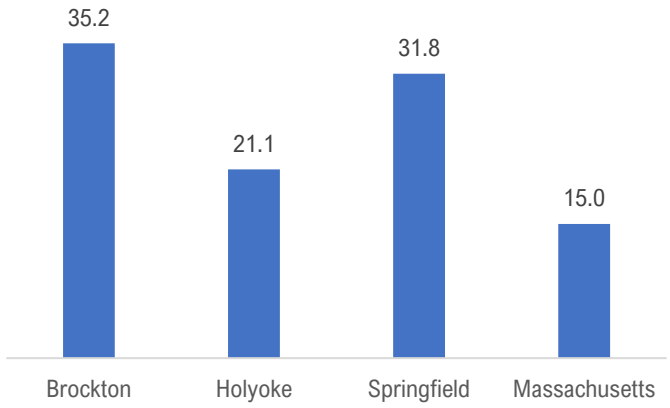


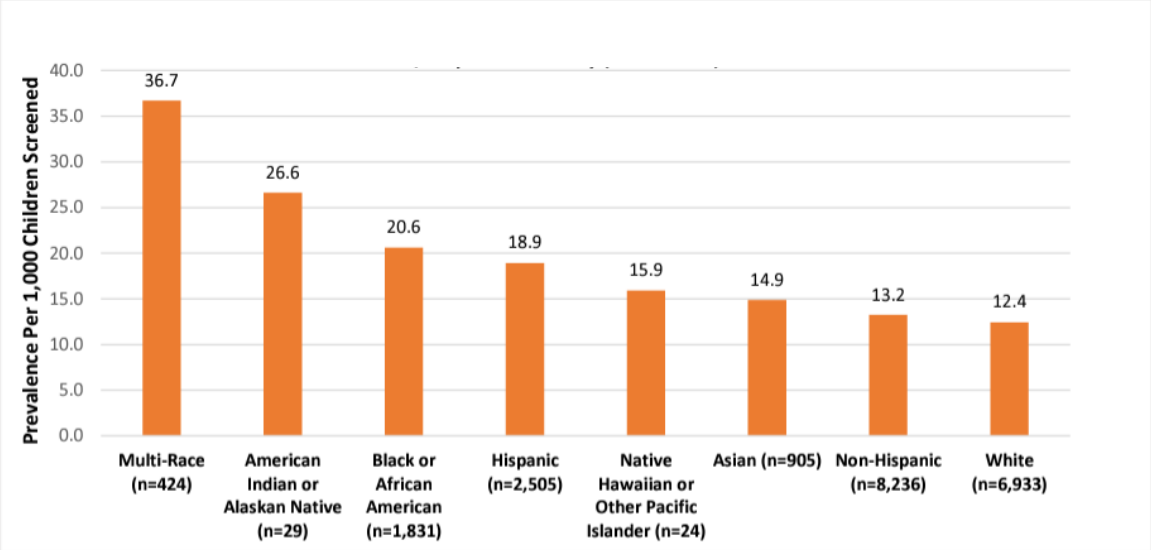
Figure 2. *Prevalence of BLL >= 5 µg/dL (Rate per 1,000 Children Screened), 2016-2020 Average*

Disparities in Childhood Lead Exposure and Residential Lead-Based Paint

Communities of color typically bear the largest burden for childhood lead poisoning and other negative health issues that result from decades of racist institutional policies, underinvestment, and disinvestment in housing, health, and other sectors.

According to the MDPH's 2021 Annual Childhood Lead Poisoning Surveillance Report, Black children in Massachusetts are 1.7 times more likely to have EBLLs than White children. Multi-race children are 3.0 times more likely to have EBLLs than White children.[16] A Chi Square test shows that these differences are statistically significant. Figure 3 shows an exhibit from the MDPH report that highlights these racial disparities. Appendix A provides specific rates across race. To our knowledge, MDPH's data on race and lead exposure does not control for income.

[16] https://www.mass.gov/doc/2021-annual-childhood-lead-poisoning-surveillance-report-0/download

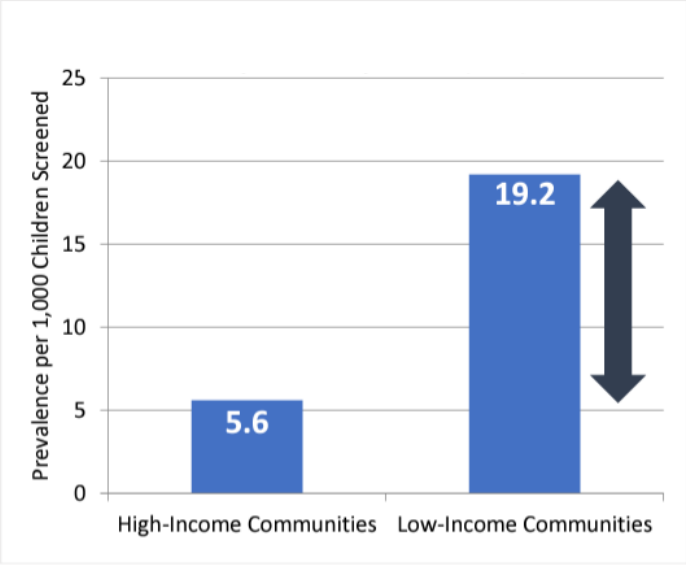


[1]Includes children between 9 and 47 months of age.
[2]Estimated confirmed BLLs ≥ 5ug/dL include both confirmed (venous and confirmed capillary tests) and a proportion of unconfirmed capillary results estimated to be truly elevated based on known capillary test reliability). Unique children with estimated confirmed BLLs are identified in each year from 2016-2020 and cases are then summed. The same child may be represented more than once in the 5-year range.
[3]Each race listed above includes Hispanic and Non-Hispanic ethnicities.
[4]MDPH acknowledges that race is a social construct which carries no biological significance in distinguishing human beings, However, many health inequities are rooted in the effects of racism experienced by people of color. MDPH collects race information to better understand these health inequities.

Figure 3. *MDPH Report: Prevalence of Children with Estimated Confirmed EBLL by Race*

Income level is also another attribute where disparity exists. The same MDPH report shows that Low-Income Communities are 3.4 times more likely to have EBLLs than children living in High-Income Communities.[17] This is shown in Figure 4 below.

[17] MDPH defines High- and Low-Income as the highest and lowest quartile of families, respectively, living at or below 200% of the federal Poverty threshold.



[1]Includes confirmed BLLs (one venous or two capillary blood tests ≥5 µg/dL within 84 days) and a proportion of unconfirmed blood lead tests (single capillary tests) for children 9-47 months of age.
[2]Lowest versus highest quartile of families living at or below 200% of the Federal Poverty threshold using poverty to income ratio data from the U.S. American Community Survey.

Figure 4. *MDPH Report: Prevalence of Children with EBLL by Community Income*

GHHI was only able to find data on race and income related to lead exposure at the state level. Figures of lead exposure by race and income were not available at the city level.

The AHHS discusses other disparities that exist nationally in lead-based paint-containing homes but finds no significant difference between the likelihood of a housing unit having lead-based paint and the race of that unit's residents. However, households with lower income are significantly more likely to have lead hazards than higher income households.[18] There is not available data in Massachusetts on housing lead-based paint hazards by race or income, but the prevalence of EBLLs does clearly show disproportionate impacts for communities of color and low-income communities.

Poor Indoor Air Quality

Background on Poor Indoor Air Quality Health Impacts (Asthma, etc.)

Americans spend about 90 percent of their time indoors[19] and according to the National Institutes of Health, poor indoor air quality can cause asthma and respiratory disease, cardiovascular disease, cognitive effects and cancer.[20] The concentration of some indoor air pollutants can be anywhere from 2 to 5 times higher than typical outdoor concentrations, posing

[18] https://www.hud.gov/sites/dfiles/HH/documents/AHHS%20II_Lead_Findings_Report_Final_29oct21.pdf
[19] https://www.epa.gov/report-environment/indoor-air-quality
[20] https://www.niehs.nih.gov/health/topics/agents/indoor-air/index.cfm

a health risk. In particular, populations who are the most vulnerable to health impacts from pollutants (e.g., young children, older adults, respiratory disease patients) tend to spend more time indoors than the average adult, thus posing an even higher risk.[21] Additionally, racial and ethnic minorities, as well as low-income residents, are more likely to live in areas with higher outdoor air pollution, which can also drive poorer indoor air quality.[22]

The sources of poor indoor air quality in the home include combustion sources, household products, building materials, as well as polluted outdoor air that enters inside. Examples of contaminants that threaten indoor air quality include mold, asbestos, carbon monoxide, secondhand smoke, allergens, and more.[23] Some indoor air quality hazards can be addressed by structural repairs, such as removing mold or asbestos in the home. In other instances, such as allergens due to pests, carpets, bedding, or furniture, home visiting services that combine resident education with environmental intervention can remediate the source of the hazard. Finally, indoor pollutants due to human actions such as secondhand smoke require behavior change to remediate. It is also important to note that some indoor air quality hazards are not readily identified and measurable. For example, mold can grow behind walls making it not readily observable. This study is primarily concerned with housing quality, and as such, will focus largely on structural and other physical sources of indoor air pollutants in the home.

People who are exposed to poor indoor air quality (especially severe and prolonged exposures) can develop asthma and other respiratory diseases, along with allergy issues and/or other harmful health impacts. Asthma is a chronic, potentially lethal disease that inhibits breathing by restricting a person's airways. Air pollution and allergens are among the most common triggers of asthma.[24] More than 26 million Americans have asthma (1 in 12 children and 1 in 13 adults), and each year asthma costs about $50 billion in healthcare costs.[25] Research also suggests that poor indoor air quality adversely affects chronic obstructive pulmonary disease (COPD) outcomes.[26] The health impacts of poor indoor air quality are far-ranging beyond respiratory and allergy issues, including cardiovascular disease, cognitive effects, and cancer risk.[27]

Measuring Indoor Air Quality

Documenting poor indoor air quality in this study requires relying on proxy and correlative data measures due to the variability and complexity of each home. Simply put, it is not feasible to monitor and report the actual levels of indoor air pollutants within every home due to the administrative, financial, and political resources required. Several existing studies have

[21] https://www.epa.gov/report-environment/indoor-air-quality#note2
[22] https://www.hsph.harvard.edu/news/press-releases/racial-ethnic-minorities-low-income-groups-u-s-air-pollution/
[23] https://www.niehs.nih.gov/health/topics/agents/indoor-air/index.cfm
[24] https://aafa.org/asthma/asthma-triggers-causes/
[25] https://www.cdc.gov/sixeighteen/asthma/index.htm
[26] https://www.jwatch.org/na54672/2022/03/09/how-does-indoor-air-quality-affect-copd
[27] https://www.niehs.nih.gov/health/topics/agents/indoor-air/index.cfm

measured indoor air quality for a subset of residences in Massachusetts.[28] More studies utilizing sensors to measure indoor air quality in Massachusetts homes would be helpful to shed light on indoor air quality trends within the Bay State. For the purposes of this study, we consolidate key data measures that serve as proxies for indoor air quality, which can be categorized as either outdoor air quality or respiratory disease related.

Research links both outdoor air quality and respiratory diseases to poor indoor air quality. Outdoor air pollution can directly infiltrate the home and therefore cause poor indoor air quality. A range of studies have established a relationship between poor outdoor air quality and poor indoor air quality.[29] Thus we include metrics like the Respiratory Hazard Index and Particulate Matter Environmental Justice Index as proxies for indoor air quality. A key limitation for relying on outdoor air quality data alone is that this study's focus is on housing quality, and outdoor air quality measures do not capture sources of pollutants within the home. There are housing quality improvements that could help overcome the relationship between outdoor and indoor air pollution, such as through air-sealing and other building envelope repairs that insulate the home from poor outdoor air quality. Nevertheless, hazards inside the home are significant drivers of poor indoor air quality, and the closest proxy data for this available at city and state levels is health care utilization related to respiratory diseases like asthma and COPD.

Indoor air pollutants impact health outcomes for both asthma and COPD patients. Environmental triggers such as mold/moisture, combustion gases, smoke, dust mites, and pests are drivers of severe asthma episodes. Studies have consistently found that in-home asthma management programs that reduce environmental triggers can likewise reduce emergency department visits and hospitalizations by between 40 to 50%. Marshall et al. (2020) found that home visits and environmental interventions for children with asthma reduced emergency department (ED) visits by 46% on average, and by 63% for children with multiple ED visits during the control period.[30] Environmental triggers are also associated with the development of asthma in children, as Lanphear et al. (2001) estimated that eliminating home-based asthma triggers would reduce up to 44% of asthma diagnoses among children and adolescents. Finally, COPD is largely linked to smoking and secondhand smoke, but other types of household air pollution is a risk factor for 20-25% of COPD cases.[31]

Table 2 contains a range of outdoor air quality and respiratory disease measures for the three Gateway Cities and the state of Massachusetts. Values in bold represent differences between city and state values that are statistically significant. The symbol * shown by some measures indicates that information was not available to determine statistical significance.

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[28] Colson et al. (2014) https://pubs.acs.org/doi/10.1021/es501489u, and Underhill (2018) https://www.proquest.com/openview/bfe875ed2b6934322dd5fdcc0212cfdf/1 are two examples of Massachusetts residential indoor air quality studies

[29] Examples of studies include: Mendoza et al. (2021) https://www.sciencedirect.com/science/article/pii/S0048969721008457, Shrestha et al. (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6801919/, and Leung et al. (2015) https://www.frontiersin.org/articles/10.3389/fenvs.2014.00069/full

[30] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7021461/pdf/PCD-17-E11.pdf

[31] https://doi.org/10.1164/rccm.202112-2822ED

Table 2. *Select Proxy Measures for Indoor Air Quality*

Dataset / Topic	Units	Source	Year	Brockton	Holyoke	Springfield	MA State
Particulate Matter Environmental Justice Index	percentile	EPA via National Scale Air Toxics Assessment	2021	60.5	26.6	40.7	25.4
Respiratory Hazard Index	Index	EPA via National Scale Air Toxics Assessment	2021	0.30	0.30	0.33	0.24
Social Vulnerability Index	percentile	CDC	2020	62.93	65.03	76.97	46.88
Cigarette smoking prevalence	% of adults	BRFSS	2020	**19.7**	**18.4**	**19.4**	12.9
% 65+ with COPD*	% 65+ population	Tufts Health Plan Foundation	2018	29.0	26.6	24.4	21.5
% 65+ with asthma*	% 65+ population	Tufts Health Plan Foundation	2018	17.7	10.8	18.9	15.0
Current asthma, adults	% of adults	CDC	2020	**12.20**	**12.00**	**12.80**	10.59
Pediatric asthma prevalence per 100 students (K-8th Grade)	Rate per 100 students	MDPH	2018	**15.2**	**20.8**	**16.9**	11.8
Annual average age adjusted rates of hospital admission for COPD	Rate per 10,000 people	MA Env Public Health Tracking	2020	**35.6**	**24.7**	16.4	14.0
Annual average age adjusted hospital admission for COPD	Case count	MA Env Public Health Tracking	2020	273	74	170	8,547.0
Annual average age adjusted rates of ED visit for COPD	Rate per 10,000 people	MA Env Public Health Tracking	2020	**69.7**	**81.5**	**64.0**	32.5
Annual average age adjusted ED visit for COPD	Case count	MA Env Public Health Tracking	2020	533	231	670	18,992.0
Annual average age adjusted rates of hospital admission for asthma	Rate per 10,000 people	MA Env Public Health Tracking	2020	**8.8**	**9.7**	**6.9**	3.5
Annual average age adjusted hospital admission for asthma	Case count	MA Env Public Health Tracking	2020	97	36	105	2,494.0
Annual average age adjusted rates of ED visits for asthma	Rate per 10,000 people	MA Env Public Health Tracking	2020	**59.4**	**128.9**	**93.5**	28.6
Annual average age adjusted ED visits for asthma	Case count	MA Env Public Health Tracking	2020	634	490	1449	19,199.0

Outdoor air pollution indices indicate higher levels of exposure in the Gateway Cities compared to state averages. Each of Brockton, Holyoke, and Springfield have higher levels of the Respiratory Hazard Index and Particulate Matter Environmental Justice Index. While the exposure of each home to outdoor air pollution will depend on a number of factors, this suggests disproportionate levels in the Gateway Cities. These figures also underscore the importance of housing quality improvements that keep outdoor air pollution out of the home, as well as the need for pollution mitigation to redress inequities in air quality.

The Gateway Cities also have higher rates of respiratory disease prevalence and utilization than state averages. The annual average age adjusted rates of both hospital admissions and emergency departments visits for asthma are two to four times as high in the three Gateway Cities than the state level. Of the three focus Gateway Cities, Holyoke has the highest rates of hospital admission and ED visits for asthma, followed by Springfield and then Brockton. Hospital admissions and ED visit rates for COPD are also 2-4 times higher in the Gateway Cities than across the state. These data points are proxy indicators that poorer indoor air quality is more pervasive within homes in Gateway Cities. In order to conclusively make these claims, more research is needed to study indoor air pollutants within homes in Massachusetts.

Analysis of Health Impacts in Communities of Color and Low-Income Communities

Data on Health Impacts in Communities

Housing and health are closely interlinked, as described in the previous Lead and Indoor Air Quality sections. Due to historical patterns such as racial segregation and redlining, communities of color have been underinvested in compared to White communities, and therefore are more likely to face problems with housing quality.[32] Additionally, by virtue of low-income communities having fewer resources to remediate housing quality issues, low-income communities also are more likely to have housing quality issues that impact health.

Figure 5 is based on the 2021 MDPH BRFFS report[33] and suggests that statewide, asthma prevalence is highest in White adults. However, the confidence intervals for White, Black, and Hispanic or Latino racial groups overlap and the differences may not be statistically significant.

The notion that Black and Hispanic or Latino adults experience more asthma is supported by recent data on severe asthma and health care utilization. Rates of hospitalizations and emergency department visits due to asthma do indeed show racial disparities, which are presented in Figures 6 and 7.

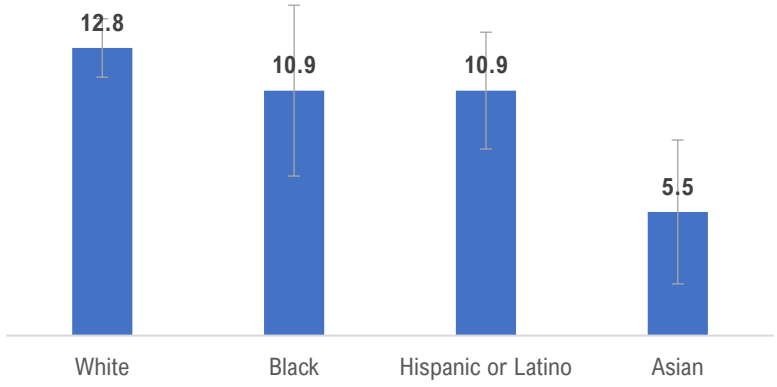

Figure 5. *Current Adult Asthma by Race - % of Adults in Massachusetts*

Figures 6 and 7 show asthma-related hospitalizations and emergency department visits by race, based on MDPH reports. Both charts show that Black and Hispanic or Latino populations have higher rates of utilization related to severe asthma, and differences between Black, Hispanic or Latino, and White racial groups are statistically significant. Figure 6 shows that for

[32] https://home.treasury.gov/news/featured-stories/racial-inequality-in-the-united-states
[33] https://www.mass.gov/doc/a-profile-of-health-among-massachusetts-adults-2021-0/download

hospitalizations due to asthma per 10,000 people, Black (18.9) and Hispanic or Latino (23.2) rates are three to four times higher than White (5.5) rates.

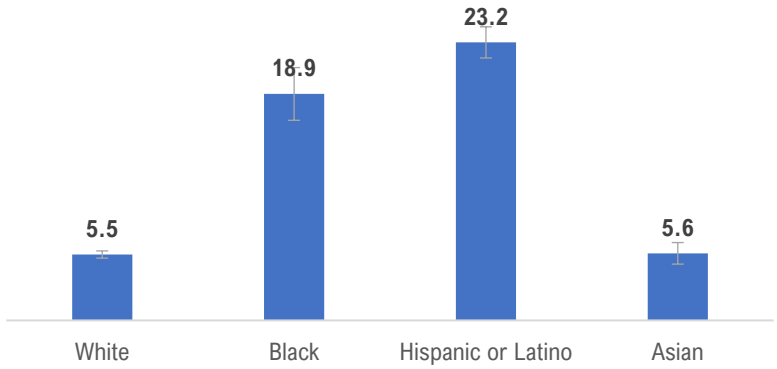

Figure 6. *Asthma-related Hospitalizations by Race – Rate per 10,000 People*

Similarly, Figure 7 shows that for emergency department visits due to asthma per 10,000 people, Black (132.8) and Hispanic or Latino (142.4) rates are around four-and-a-half times higher than White (29.5) rates. Differences in rates between all racial groups are statistically significant.

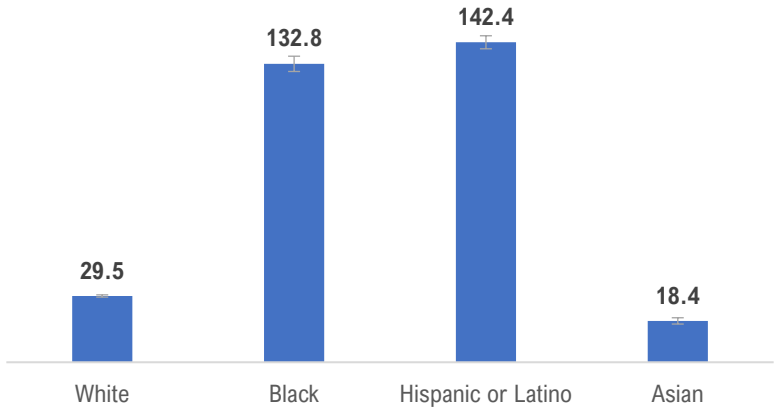

Figure 7. *Asthma-related Emergency Department Visits by Race – Rate per 10,000 People*

Visits to the emergency department and hospitalizations due to asthma are indications that a patient's asthma is severe and uncontrolled. Environmental triggers, such as poor housing quality, are one possible explanation for increased emergency department visits and hospitalizations. The MDPH data on hospitalizations and emergency department visits shows that severe asthma episodes are disproportionately experienced by Black and Hispanic or Latino communities in Massachusetts. Asthma-related hospitalizations and emergency

department visits are a potential indicator but not direct proof of poor indoor air quality, and thus studies that monitor indoor air quality in households by race in Massachusetts will be needed to make definitive claims.

Figure 8, also from the same 2021 MDPH report, shows current adult asthma rates by income. The trend shown here is clear: asthma prevalence is highest for low-income adults and steadily declines as income levels rise. Confidence intervals show significant difference in asthma prevalence between the highest and lowest income categories.

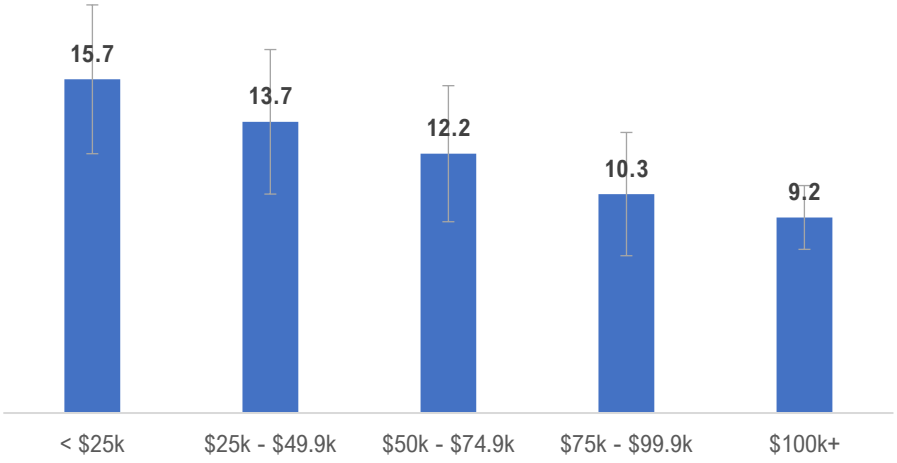

Figure 8. *Current Adult Asthma by Income - % of Adults in Massachusetts*

Resources and Gaps Analysis

Background: Methodology, Data Sources, Criteria for Assessment

Federal, state, and local programs exist to address housing quality-related hazards described in the previous sections of this report. In this section, we describe current resources that exist to remediate lead, indoor air quality, and other home hazards. GHHI performed research of publicly available information on home repair programs and also conducted interviews with key stakeholders to collect program-level data. GHHI performed 16 stakeholder interviews.

GHHI interviewed industry experts to learn about program-level capacities and gaps that exist for addressing housing quality and related health outcomes. Interviews also yielded program data that is not publicly available. Table 3 lists the stakeholders interviewed for this project.

Table 3. *Stakeholder Interview List*

	Name	Title	Organization
Brockton	Claudio Gomes	Director of Housing and Community Development	Brockton Redevelopment Authority
	Julie Lane	Director of Lending	NeighborWorks Housing Solutions (CDC)
Holyoke	Michael Moriarty	Executive Director	OneHolyoke CDC
	Steve Huntley	Executive Director	Valley Opportunity Council
Springfield	Araceli Rivera	Director of Homeownership and Financial Education	Way Finders (CDC)
	Colleen Loveless	President & CEO	Revitalize CDC
	Gerry McCafferty	Director of Housing	City of Springfield
	Sarita Hudson	Senior Director of Programs and Development	Public Health Institute of Western Massachusetts
State / Other	Dave Turcotte	Professor, Director of Healthy Homes Program	University of Massachusetts Lowell
	Deanna Ramsden	Manager of Federal and State Appropriated Mortgage Programs	MassHousing
	Katharine Robb	Senior Research Associate	Harvard University
	Marissa Hauptman	Pediatrician, Researcher	Boston Children's Hospital, Harvard University
	Michelle Warner	Director, Asthma Prevention and Control Program	Massachusetts Dept of Public Health
	Emily Jones	Senior Program Officer, Green Homes	LISC Boston
	James Collins	Director, Climate Equity & Impact Department	Action for Boston Community Development, Inc. (ABCD)

	Kathleen McCabe	Managing Director of Policy & Practice	Health Resources in Action

Resources Overview

This section focuses on the available programs, policies, and other resources statewide and in the three Gateway Cities that address housing quality. Figure 9 provides a high-level summary of all existing housing quality-related programs across jurisdiction and issue area. Appendix C provides a comprehensive table of existing home repair programs across Brockton, Holyoke, Springfield, and statewide.

Figure 9 shows the relative funding sizes of programs based on the size of each circle. In the top left, the funding level of the HUD Lead Based Paint Hazard Control grant in Brockton is labeled ($4.7 million) to provide a reference scale for the rest of the figure. Because some programs are time-limited (e.g., HUD lead programs are three years long) and others are funded on an annual basis (e.g., WAP), annually funded program budgets are multiplied by three so that comparisons between the two program types are based on a common timeframe.

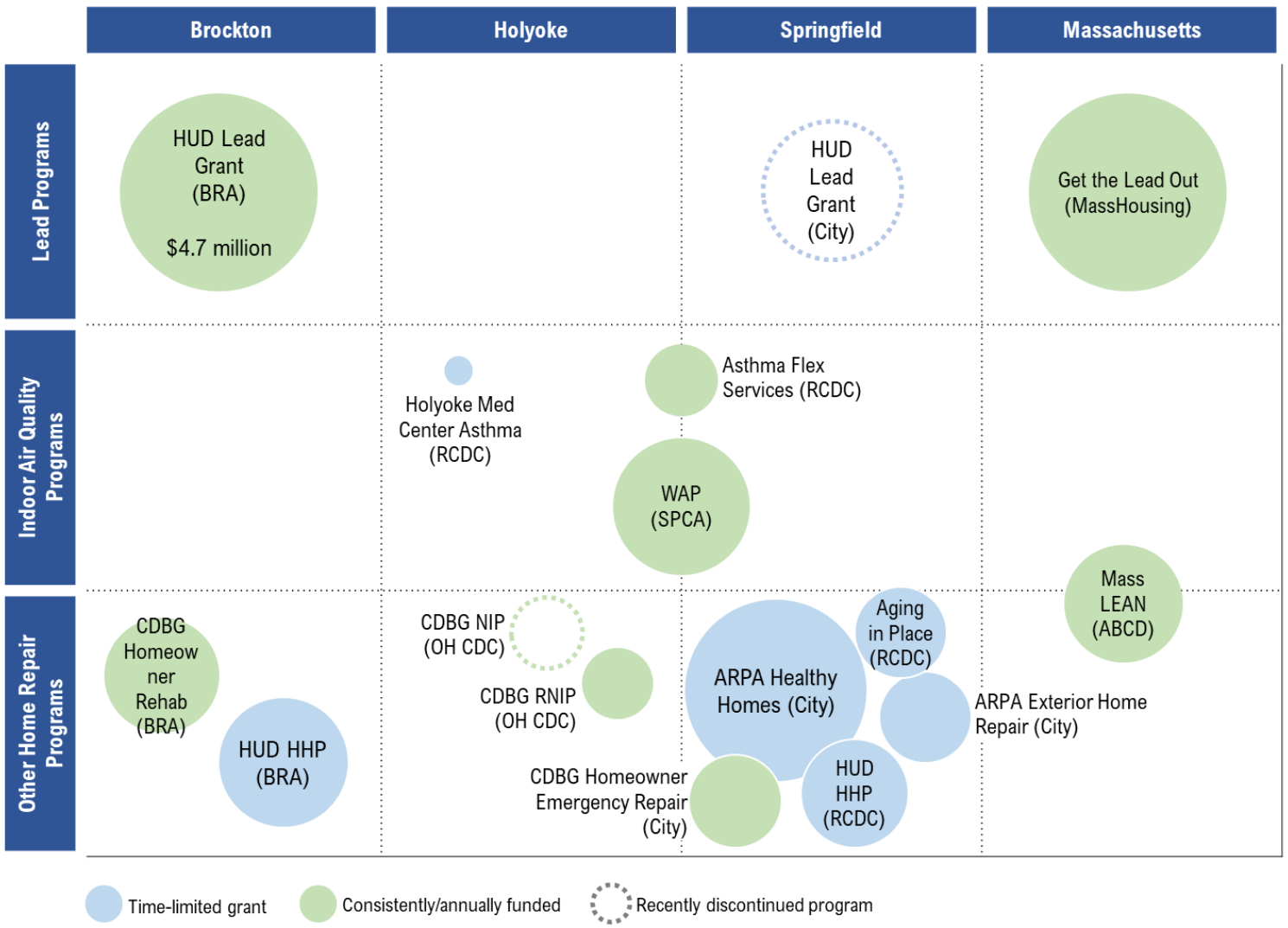

Figure 9. *Summary of Programs (full program table in Appendix C)*

Programs & Policies Focused on Lead Paint

Massachusetts Lead Law

Massachusetts became one of the first states in the nation to pass a lead poisoning prevention law in 1971. The Lead Law requires homeowners to remediate lead-based paint hazards in properties where children under six reside.[34]

The Lead Law also requires all children to be screened for lead three times before the age of three; once between the age of 9-12 months, once at age 2, and once at age 3.[35] Additionally, if children live in a city deemed high risk by the state Childhood Lead Poisoning Prevention Program, they are also required to be tested at age 4.[36] These blood lead level screenings are mandatory and are required to be covered by health insurers. Health care providers and/or laboratories that analyze or become aware of cases of childhood lead poisoning are required to report them to the state.

Under the Lead Law, homeowners and multifamily building owners are responsible for paying for the remediation of lead hazards. The Massachusetts Lead Paint Removal Tax Credit provides up to $3,000 per housing unit in tax credits for de-leading expenditures. Additional financial resources such as Get the Lead Out (GTLO) and HUD lead grants will be detailed below.

Get the Lead Out (GTLO)

GTLO is the state's program that provides no-interest, deferred payment loans to income eligible owner-occupants, 0% loans to nonprofits, and 3% loans to investor-owners, to perform lead hazard control. MassHousing administers the statewide program on behalf of the Executive Office of Housing and Livable Communities (EOHLC) – formerly the Department of Housing and Community Development (DHCD). Where the Massachusetts Lead Law can be seen as the state's "stick" for enforcing lead safe housing, GTLO could be considered the "carrot" in the form of affordable financing. Local lenders originate loans on behalf of MassHousing and sell those loans to MassHousing after origination. Local agencies can serve clients throughout the state; NeighborWorks administers GTLO in Brockton and Way Finders administers GTLO in Springfield and Holyoke.

Figure 10 shows that GTLO loan volume has fluctuated in the recent decade, and the current volume is significantly lower than in the early 2000s. Swings in the housing market and macroeconomic trends have influenced homeowner interest in GTLO; first in the late 2000s due to the Great Recession and then with the COVID-19 pandemic. It is unclear if loan volume will return to the same levels of the early 2000s, and there are several potential barriers that may all contribute to the current volume (refer to the Gaps section below).

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[34] https://www.mass.gov/doc/105-cmr-460-lead-poisoning-prevention-and-control/download

[35] https://www.mass.gov/info-details/learn-about-lead-screening-and-reporting-requirements#:~:text=The%20Massachusetts%20Lead%20Poisoning%20Prevention,and%20again%20at%20age%203

[36] Brockton, Holyoke, and Springfield are all considered high risk cities. Full list of cities is located at: https://www.mass.gov/doc/high-risk-communities-for-childhood-lead-poisoning-calendar-years-2013-2017/download

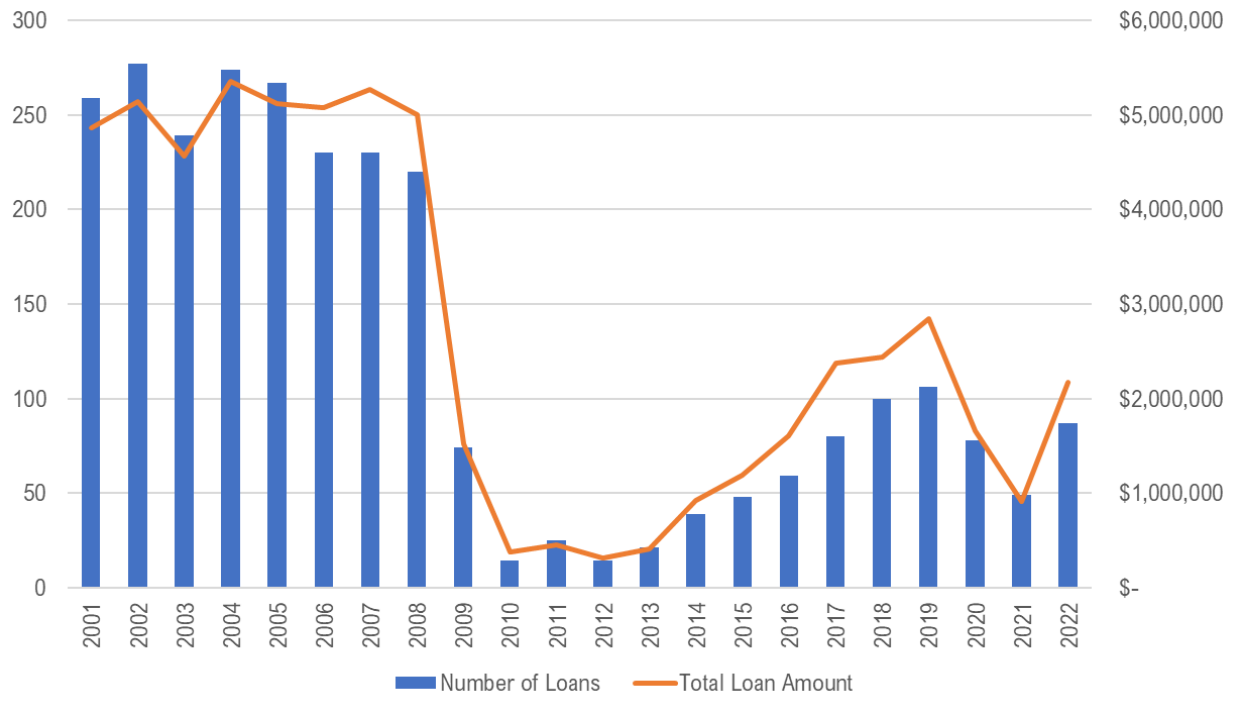

Figure 10. *GTLO Loans by Year*

CDC Lead Funding

The Massachusetts Childhood Lead Poisoning Prevention Program (CLPPP) is funded in part by a grant from the Centers for Disease Control and Prevention (CDC).[37] The Centers for Disease Control and Prevention awarded CLPPP $400,000 to conduct surveillance programmatic activities between September 2022 and September 2023. According to the CDC website, program activities include 1) Ensuring blood lead testing and reporting, 2) Enhancing blood lead surveillance, and 3) Improving linkages to recommended services.

Local Lead Resources

Figure 9 shows that there are few local programs across the three Gateway Cities dedicated exclusively to lead hazard control. A HUD lead grant program is currently active in Brockton, while the City of Springfield's 2019 HUD lead grant concluded in 2022. Springfield decided to not apply to the most recent round of HUD grants due to challenges in administering the most recent program, which are outlined below. GTLO is available to all Massachusetts residents and is locally administered in Brockton by NeighborWorks and in Springfield and Holyoke by Way Finders.

There are other local home repair programs that are not dedicated to lead but can also fund lead hazard control:

[37] https://www.cdc.gov/nceh/lead/programs/ma.htm

- Brockton: The CDBG-funded (Community Development Block Grant) **Homeowner Rehab Program**, administered by Brockton Redevelopment Authority, offers homeowners with 0% interest deferred payment loans for a wide range of home repairs including lead hazard control.

- Holyoke: The **Neighborhood Improvement Program (NIP)** and **Rental Neighborhood Improvement Program (RNIP)** are two CDBG-funded programs administered by OneHolyoke CDC. NIP is a grant program offered to property owners while RNIP is a 3% interest loan offered to owners of multifamily properties. These programs can be used for a wide range of home repairs including lead hazard control. We note that NIP will be discontinued after 2023.

- Springfield: The ARPA-funded (American Rescue Plan Act) **Healthy Homes Program**, administered by the City of Springfield, provides forgivable loans to homeowners for whole home repair. This includes lead hazard control.

Gaps in Lead-Focused Programs & Policies

Data analysis and stakeholder interviews indicate that there is a gap between the overall prevalence of residential lead-based paint and funding available for remediation. At the same time, there is also a gap between the lead resources available and demand for these resources from property owners. Figure 10 in the previous section shows the sharp decline in the number of GTLO loans, starting in 2009. Figure 11 provides a visualization of these gaps.

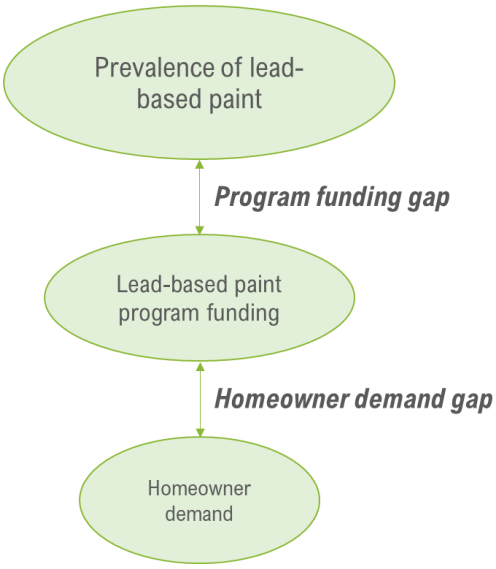

Figure 11. *Visualization of Gaps in Lead-based Paint Ecosystem*

Funding Gap

The program funding gap is evidenced by the staggering number of lead-containing properties as shown in the previous section, based on AHHS estimates. Table 4 compares housing unit estimates with the scale of existing lead programs, both at the Gateway City and state level. Note that this table only includes lead paint removal under GTLO and HUD grants, which are the only two sources of funding dedicated exclusively to lead hazard control. The table does not include other sources of funding (e.g., ARPA or HUD CDBG) that may cover a broad range of home repairs including lead. These programs with these broader scopes did not have data readily available that broke down resources spent on lead vs. non-lead home repair measures.

Table 4. *Comparison of Lead-based Paint Need and Resources*

	Brockton	Holyoke	Springfield	Mass.
Estimated housing units with significantly deteriorated lead-based paint	14,887	7,404	27,028	1,036,418
Active GTLO loans	59	22	94	1,295
Annual GTLO loans originated FY 2022 (interpolated for cities[38])	4	2	7	87
Housing Units remediated under active HUD lead and healthy homes grants (total for three-year grant period)	210	n/a	86	1,047[39]

Lead paint resources are orders of magnitude lower than the estimated number of housing units with significantly deteriorated lead-based paint. Across the state of Massachusetts, there are an estimated 1.04 million housing units with significantly deteriorated lead-based paint, yet GTLO and HUD programs funded the remediation of an estimated 436 units in 2022.[40] Based on an estimated per unit cost of $20,000,[41] at the current annual pace of assistance, it would take 2,377 years and $20.7 billion to completely de-lead all housing units in Massachusetts (funding needed to subsidize lead hazard reduction in low-income housing units only would total nearly $5 billion). In total across Brockton, Holyoke, and Springfield, there are an estimated 49,319 housing units with significantly deteriorated lead-based paint, and 112 housing units remediated in 2022 with HUD or GTLO funding. This implies it would take 441 years at the current pace and $986 million to comprehensively address lead hazards in the three Gateway Cities.

[38] Program documents show new loans originated statewide only but provides active loans by city. To calculate annual loans originated by city, each city's active loans are divided by total statewide loans and multiplied by new loans originated per year.
[39] This figure was populated by identifying cities with active HUD lead grants from usaspending.gov and then summing unit production totals reported in HUD award announcements. Appendix D lists the MA cities with active HUD lead grants.
[40] Assuming a three-year HUD grant period
[41] Estimate of $20,000 unit cost is based on interviews with lead program managers

However, this size of program funding gap is not unique to Massachusetts; sustainable funding for lead hazard control is a constant need across the country. A transformational level of new funding would be needed to fully eradicate the toxic legacy of lead at the local, state, and federal levels.

Homeowner Demand Gap

Despite the overwhelming need for additional lead hazard control funding, there is a homeowner demand gap that would need to be addressed as new significant fundraising is considered. Even though GTLO and HUD grant programs are available throughout the state and including in the Gateway Cities, there are no current waitlists. This is true for GTLO, the Brockton HUD lead grant program, and the HUD lead grant program that recently concluded in Springfield. Program managers have expressed challenges in recruiting program participants. Stakeholder interviews have revealed the following barriers to successful recruitment for these programs.

- Awareness: Despite the harmful health impacts of lead, it is an invisible and odorless hazard, and as such there can be lower public awareness about lead, lead-based paint, and the dangers of lead exposure. In addition, tenants and property owners may not be aware of their rights and responsibilities under the Massachusetts Lead Law. Program managers in Gateway Cities stated that community members are not always aware of the risks of lead, or where lead hazards are found in the home. To further raise awareness, program managers would benefit from additional funds for communications capacity.

  For communities with lower levels of English proficiency, it is critical to provide outreach, application materials, and application support resources in appropriate languages. And for all communities of color and low-income communities who have been historically underserved, centering community member participation in outreach and education will help bridge cultural, trust, and language barriers.

Recommendations

1) Awareness Campaign: Awareness campaign(s) would help drive demand for HUD and GTLO programs. Current programs have limited funding for outreach activities, so funding and resources dedicated to these activities would be valuable. Successful awareness campaigns in Maryland and other jurisdictions have included outreach events, door-to-door flyering, awareness posters at transit stations, outreach to childcare centers, billboards, TV and radio public service announcements, newspaper advertisements, school outreach, healthcare provider outreach, rental property association outreach.

- Funding type: GTLO is the most consistent funding source available to qualifying property owners throughout the state and in the Gateway Cities. However, as shown in this report, the volume of loans has drastically decreased since 2001. Although loan repayment is deferred, the funding is ultimately provided as a loan and not a grant. Loans are obviously not as attractive as grants, and so we hypothesize that homeowners are less willing to take on debt to proactively address lead-based paint unless it poses an immediate risk to occupants or is required by law.

Recommendations

2) GTLO Expansion: Consider adjusting parameters of loan products to make even more attractive to potential borrowers, e.g., forgivable loans or grants for the low-income borrowers. Funding could also be used to increase marketing and awareness of GTLO products in parallel with general lead awareness campaigns outlined in Recommendation #3. A GTLO cash balance of $7M suggests that the fund is sufficient for future years of operation at current levels of loan originations; however, administrators could also consider accelerating the rate of originations to make the case for increased future appropriations.

- Application process: Stakeholders have expressed that the application process for both GTLO and HUD lead grants is time intensive, and applicants may take a long time to collect all required information to advance through the program. Additionally, the application process can be confusing with applicants experiencing uncertainty regarding where to start, what expense will be, what liability might be entailed, and the challenge of temporary relocation.

Administrative Burden

We note that HUD grants are administratively burdensome for program administrators. Stakeholders have said that HUD lead (and other HUD programs) grants have brought on so much red tape that back-office administrators are less than enthusiastic about participating in these grants in the future.

Recommendations

3) Application Support: GTLO and HUD lead program administrators indicate that applicants often require intensive handholding through the process to ensure that the correct documentation is collected and submitted. Some stakeholders have expressed that additional applicant support would be beneficial. Funding for a Housing Navigator(s) or similar position could help residents understand program requirements and secure documents as needed. A successful example of this model is in place in Memphis, TN.

4) Program Administrative Support: Program administrators described a bureaucratic burden and red tape that comes with administering HUD lead programs. Providing capacity building and training support to program administrators in navigating the administration of HUD lead programs would help build the ability and willingness of local program administrators to continue applying for and participating in HUD grants in the future.

GTLO Lending Capacity

One barrier cited by the GTLO program is the capacity of lending institutions participating in the program. The majority of these organizations are smaller community banks, community development financial institutions, and other smaller lenders. When the lending market is hot (e.g., when interest rates are low), lender capacity will usually be tied up in managing non-GTLO loan products and therefore the lender becomes the bottleneck in originating a GTLO loan.

Contractor Capacity

Nationally, contractor capacity has been a significant limiting factor in the success of home repair programs. Interestingly, contractor capacity is a barrier for some, but not all, home repair programs that we analyzed for this report. For example, Revitalize CDC reported adequate contractor capacity for their programs, while the City of Springfield reported that they have had significant issues recruiting contractors. The City also noted a need for continued contractor training and capacity building as they have seen recent issues in workmanship/quality. A previous grant that provided free training and certifications for contractors was well received by participants.

Recommendations

5) Contractor Capacity: Within Gateway Cities, programs could share a common list of high performing contractors; this could alleviate some issues in Springfield where some programs are struggling to find contractors while other programs are not. Resources for lead training, certifications, and training for general construction areas could also help bolster contractor capacity. Similar subsidies have been well received in the past. Workforce development initiatives should include a focus on minority- and women-owned businesses to strengthen racial equity within the contractor ecosystem.

Program Availability for Renters

Housing repair programs are generally accessible for homeowners, but not universally open to renter applicants. Grant-based programs, including HUD Healthy Homes Production Grants and Lead Based Paint Hazard Control Programs, tend to be open to both homeowners and renters. Loan-based lead programs such as Get the Lead Out (GTLO) are available only to homeowners, but because the Massachusetts Lead Law requires homeowners to pay for the reduction of dangerous lead hazards for tenants with children under 6, there should not be program barriers for renters whose children have elevated blood lead levels. While we do not have data on this, we have heard anecdotally from renters that in some cases they are reluctant to raise concerns about lead paint with their landlords, in the absence of testing that would confirm elevated blood lead levels in children.

Programs & Policies Focused on Poor Indoor Air Quality

There are few programs in the three Gateway Cities that focus exclusively on poor indoor air quality, and both are asthma programs administered by Revitalize CDC in Springfield. At this time, both programs are focused on providing home-based asthma education and supplies and have limited resources for home remediation:

MassHealth Flexible Services Asthma Program

Revitalize CDC holds contracts with three Accountable Care Organizations (ACOs) that cover Medicaid-funded asthma services such as home visiting education and supplies across Hampden, Hampshire, Franklin, and Worcester counties. Only one of the three ACOs currently provides limited funding for remediation of asthma triggers. Referrals are made by the ACO and their medical providers to Revitalize CDC.

- Baystate Be Healthy ACO: 250 members per year. No longer provides funding for asthma remediation but previously provided remediation for 40 members per year.
- Mercy Health ACO: 75 members per year. No funding for asthma remediation repairs.

- C3 ACO: 40 members per year. Currently provides funding for asthma remediation for 10 members per year.

We note that Massachusetts passed an update to its 1115 Medicaid waiver in June 2023[42] which covers asthma remediation under the Flexible Services program. The language of the approved waiver enables a broad range of asthma remediation measures and could therefore be helpful in addressing indoor air quality deficiencies. Stakeholders we interviewed noted that the transition to the new waiver is still early on and ACOs are currently transitioning ways in which they pay for certain services. This includes contractual arrangements that would reimburse for asthma remediation. We recommend that stakeholders keep track of new opportunities for home repair funding from ACOs that may arise from the waiver.

Asthma Program with Holyoke Medical Center

Holyoke Medical Center provides Revitalize CDC funding to deliver home-based asthma services to 25 patients per year. Referrals are made directly from Holyoke Medical Center to Revitalize CDC if patients have an asthma diagnosis, are age 50+, live in Holyoke, and are homeowners. The program covers asthma remediation such as mold removal, carpet replacement, and other home modifications.

New Sanitary Code

Massachusetts' new Sanitary Code[43] became active in May 2023. The Sanitary Code applies to all rental properties to cover minimum standards of habitability (whereas the Building Code applies to new construction and rehabilitation related to the safety of the building structure). A significant change from the previous version of the Sanitary Code pertains to mold. Landlords must keep properties free of "excess moisture or the appearance of mold" and environmental testing is not required to confirm the presence of mold. Another provision that is relevant to asthma is that new language requires landlords to inspect for pests prior to a new tenant moving into a rental unit. Landlords must document pest control activity and provide to their local board of health.

These new provisions, compared with the old code, a) make it less onerous for tenants to prove the presence of mold and require corrective action by the landlord and b) provide stricter requirements for pest control. Local boards of health are responsible for enforcing the new code and will receive training on the new code in coming months. Stakeholders in the focus Gateway Cities have noted that some causes of poor indoor air quality can be difficult to detect, such as mold behind drywall. While the new code may make it easier for tenants to report mold, hidden mold may remain challenging to identify unless an experienced assessor/inspector is involved.

[42] https://www.medicaid.gov/medicaid/section-1115-demonstrations/downloads/ma-masshealth-apprvl-06212023.pdf
[43] https://www.mass.gov/doc/105-cmr-410-minimum-standards-of-fitness-for-human-habitation-state-sanitary-code-chapter-ii/download

Other Home Repair Programs

Other existing home repair programs are not exclusively focused on indoor air quality but can fund repairs that address indoor air quality. For example, weatherization programs are energy-focused but home upgrade measures like air sealing, insulation, and HVAC repairs improve household indoor air quality. Similarly, CDBG- and ARPA-funded home repair programs in Brockton, Holyoke, and Springfield can address a broad range of issues including roof leaks and mold/moisture that also affect indoor air quality. These programs are shown in Figure 9 across the "Other Home Repair Programs" row.

In particular, funding for household weatherization, energy efficiency improvements, and electrification can be a resource for indoor air quality improvements in multiple ways. Mass Save is a utility and energy efficiency service provider collaboration that offers energy efficiency, weatherization, and electrification services and upgrades to Massachusetts customers. Within Mass Save, the Low-Income Energy Affordability Network (LEAN) is a program focused on providing no-cost energy improvements to owners of multifamily properties where at least 50% of the development's households have incomes at or below 60% of Area Median Income (AMI). Action for Boston Community Development, (ABCD) Inc., is the lead vendor for Eversource in the Mass Save program as well as a program manager for National Grid. In ABCD's 1–4-unit program, there is a planned $400,000 per year for pre-weatherization barriers, which could include health and safety hazards such as mold or asbestos. In practice, the annual mitigation cost for pre-weatherization barriers can be up to $2 or $2.5 million for this program. Lead hazard reduction is not included in the program, although all contractors must follow lead safe operations. Still, indoor air quality could be improved through mold and asbestos removal as pre-weatherization barriers. Thus, Mass LEAN can help income eligible families to help improve indoor air quality if hazards are posing a barrier to weatherization and energy efficiency upgrades. Through a wraparound services approach, community members that seek support from ABCD for a wide range of categories of service may be connected with housing quality improvements, broadening the reach of the Mass LEAN program. Especially as additional federal funding for home upgrades becomes available over the coming years, maintaining sufficient funding for pre-weatherization barriers in low-income homes across utility service territories can be an important pathway to improving indoor air quality.

In addition to weatherization and the remediation of pre-weatherization barriers, the electrification of household appliances such as gas stoves can improve indoor air quality by removing combustion gases such as nitrogen dioxide and carbon monoxide from the indoor environment. While the research base on electrification and residential health outcomes is still nascent, these improvements in indoor air quality could eventually be connected to reductions in respiratory disease-related emergency room visits and hospitalizations. For example, a first-of-its-kind study on stove electrification and health outcomes in Ecuador found that in locations where an additional 1% of households enrolled in a stove electrification program, hospitalizations for COPD fell by just over 2%.[44]

[44] https://www.pnas.org/doi/10.1073/pnas.2301061120

Massachusetts is facilitating major investments in electrification and other related building upgrades. The recently announced Massachusetts Community Climate Bank is funded with $50 million from the state and is likely to attract much more in both private funding and federal sources such as the EPA's Greenhouse Gas Reduction Fund.[45] In addition to a climate imperative and an energy saving program, these investments could also be seen a major opportunity to improve indoor (and outdoor) air quality across the state.

Gaps in IAQ-Focused Programs & Policies

Compared to lead, it is more difficult to estimate the gap in resources for indoor air quality due to challenges in accessing data at the household level. This report uses severe asthma as a proxy for poor indoor air quality, and one method to estimate the IAQ gap is to quantify the number of homes of severe asthma patients with environmental triggers. The rate of asthma-related hospitalizations in Massachusetts is 8.2 per 10,000 people, which equates to 5,727 for the entire state population. Based on other asthma programs GHHI has operated, we assume one hospitalization per individual, one person per household who is hospitalized, and that 50% of cases are related to environmental triggers and poor indoor air quality. With these assumptions, there could be an estimated 2,864 households in Massachusetts where poor indoor air quality is a driver of asthma-related hospitalizations. This is an estimate based on a number of assumptions, and merely intended to give a sense of scale for the gap in indoor air quality related home modification resources.

It is worth pointing out that across the three Gateway Cities, there are only two active programs providing asthma-related indoor air quality improvements, the C3 and Holyoke Medical Center programs that offer 35 home remediations per year. Given the rates in the Gateway Cities, and using the above assumptions, there would still be an outstanding 246 homes in need of home modifications across Brockton, Holyoke, and Springfield.[46]

Funding Gap

Unlike lead, there are no regular federal or state programs that dedicate funds to "unit production" for improving residential indoor air quality. Research grants can sometimes fund interventions, but these are often project-based and time limited for the purpose of addressing specific research questions. In the absence of regular unit production funding, GHHI has found that funding of asthma remediation measures (e.g., mold remediation, ventilation improvements, allergen mitigation) can be used to address many indoor air quality issues.

Sustainable funding for comprehensive asthma services has historically been a critical gap nationwide. However, state Medicaid programs have begun to put policies in place that provide more regular funding for evidence- and home-based asthma interventions. These interventions often include a combination of medical and community-based services delivered in the clinic

[45] https://www.mass.gov/news/governor-healey-announces-creation-of-massahusetts-community-climate-bank-nations-first-green-bank-dedicated-to-affordable-housing

[46] Assumptions: 561 total annual hospitalizations in Brockton, Holyoke and Springfield (MDPH Asthma Hospitalizations Report), 50% of hospitalizations related to environmental triggers, and 10 households already being served through the C3 program.

and in the home. In recent years, funding for home visiting for asthma self-management education is gaining traction nationally, and Accountable Care Organizations in Massachusetts have scaled their funding for these types of asthma programs in recent years. Revitalize CDC's asthma programs are evidence of this; they hold three contracts with ACOs that provide reimbursement for home visiting and the provision of supplies. Funding under the ACOs' Flex Services program allows Revitalize CDC to provide asthma remediation services, but this funding is extremely limited.

Massachusetts's new 1115 Demonstration Waiver could potentially unlock additional funding for services that address "Health Related Social Needs (HRSN)" including asthma remediation measures. However, in a stakeholder interview, an ACO representative shared skepticism about how the new waiver would increase funding for asthma remediation services. Despite this, we recommend tracking the implementation rollout of the waiver provisions. It is possible that some

ACOs take different approaches and invest more funding into asthma remediation and related home repair services.

Recommendations

6) Children's Health Insurance Plan (CHIP) Health Services Initiative (HSI): HSIs (a type of state plan amendment for a state's Children's Health Insurance Program) are often underutilized policy tools that states can use to leverage enhanced federal match to fund childhood asthma and lead-related programs. In FY2023 Massachusetts's enhanced Federal Match Assistance Percentage (FMAP) is 69.34% which means that for every dollar invested in their CHIP program, the federal share is 69.34 cents, and the state share is 30.66 cents.

Services covered by a CHIP HSI can include home repairs and upgrades that improve the health and safety of children. States like Maryland, Michigan, Ohio, and Wisconsin are currently using CHIP HSIs to fund remediation of lead and asthma hazards.

Massachusetts is among the few states that already utilize a good portion of their administrative CHIP dollars (see Exhibit 33 of MACStats report) for current programs which may suggest that there is limited room for new home repair-related programming. However, with any budget space that may exist, Massachusetts could consider developing a new HSI program to fund a home repair program. An investment like this through CHIP could align with other funding strategies such as the whole home repair bill currently being discussed.

Additionally, we note that states have options for funding their portion of a CHIP HSI; new appropriation is not necessarily required. For example, in 2017 GHHI worked with Maryland to develop their lead- and asthma-focused CHIP HSI. Maryland was able to take an existing budget line item related to healthy housing and move it under CHIP, thereby unlocking a significant level of federal match without making new state investment. A potential next step to advance a new CHIP HSI would be to discuss and advocate for this concept with MassHealth.

Program Availability for Renters

Healthy housing and asthma-focused programs are open to both homeowners and renters, but general home repair programs such as Homeowner Rehab and Neighborhood Improvement programs are only available to owner occupants. These general home repair programs are largely used for structural improvements such as roof and staircase repairs but can also remediate asbestos and mold and thereby address poor indoor air quality hazards. These

programs are generally difficult to extend to renters because they often are loan-based and put a lien on the property. This underscores the importance of adequate funding for Healthy Homes Production Grants and grant-based asthma programs to ensure that renters have adequate resources to address poor indoor air quality.

CDBG Entitlement Funds

We have discussed some of the home repair program not focused on lead and indoor air quality which are shown in Figure 9 under "Other Home Repair Programs." Many of these are funded by CDBG Entitlement funds; Figures 12 through 14 below show screen shots of housing-related expenditures from 2020 CDBG Entitlement Expenditure Reports.[47]

14A	HR	Rehab; Single-Unit Residential	39,185.00	2.17%
14G	HR	Acquisition for Rehabilitation	674.07	0.04%
14H	HR	Rehabilitation Administration	144,435.05	8.00%
14I	HR	Lead-Based/Lead Hazard Test/Abate	55,946.00	3.10%
Subtotal for : Housing			**240,240.12**	**13.31%**

Figure 12. *Brockton CDBG Expenditures for Housing*

14A	HR	Rehab; Single-Unit Residential	67,927.50	6.03%
14B	HR	Rehab; Multi-Unit Residential	61,765.73	5.49%
14H	HR	Rehabilitation Administration	850.00	0.08%
15	HR	Code Enforcement	200.00	0.02%
Subtotal for : Housing			**130,743.23**	**11.62%**

Figure 13. *Holyoke CDBG Expenditures for Housing*

13B	HR	Homeownership Assistance-excluding Housing Counseling under 24 CFR 5.100	108,720.19	3.07%
14A	HR	Rehab; Single-Unit Residential	343,240.00	9.68%
14F	HR	Energy Efficiency Improvements	175,000.00	4.94%
14H	HR	Rehabilitation Administration	97,311.07	2.75%
14I	HR	Lead-Based/Lead Hazard Test/Abate	13,856.78	0.39%
15	HR	Code Enforcement	33,576.71	0.95%
16A	HR	Residential Historic Preservation	83,000.00	2.34%
Subtotal for : Housing			**854,704.75**	**24.12%**

Figure 14. *Springfield CDBG Expenditures for Housing*

[47] Brockton: https://files.hudexchange.info/reports/published/CDBG_Expend_Grantee_BROC-MA_MA_2020.pdf
Holyoke: https://files.hudexchange.info/reports/published/CDBG_Expend_Grantee_HOLY-MA_MA_2020.pdf
Springfield: https://files.hudexchange.info/reports/published/CDBG_Expend_Grantee_SPRF-MA_MA_2020.pdf

Equity Lens

Programs may collect race and income data, but this data is not consistently accessible at an aggregate level. GTLO was able to provide data on loans originated to date based on race (minority vs. non-minority) and income level. Figure 15 compares data from GTLO to the same racial break-out of children who have elevated blood level at or above 5 µg/dL based on data from the MDPH 2021 Annual Childhood Lead Poisoning Surveillance Report.[48] GTLO data represents all loans originated over the life of the fund. In order to convert EBLL rates from the report (EBLL rate per 1,000 children screened) to EBLLs as a proportion of total children in each racial group, our calculations incorporated the number of total children by race in Massachusetts.[49] Child population data was only available statewide, and for children under age 18. Because EBLL data is only available for children under six, we assume that the proportion of children under 18 is equal to that of children under six for the purposes of our calculations.

The two pie charts in Figure 15 suggest that minority borrowers may be underrepresented when compared to minority children who make up a larger proportion of total children with EBLL at or above 5 µg/dL. We performed a two sample Z-test for Proportions to confirm statistical significance between the proportion of GTLO loans held by minority borrowers versus proportion of minority children with elevated blood level.

Recommendations

7) GTLO outreach to minority communities: Targeted outreach to underrepresented minorities could help even disparities among GTLO borrowers. The same is true for local lead programs to ensure equitable uptake. The most effective outreach would likely come from members of those communities who already share social, language, and cultural connections with populations in need of home repair resources.

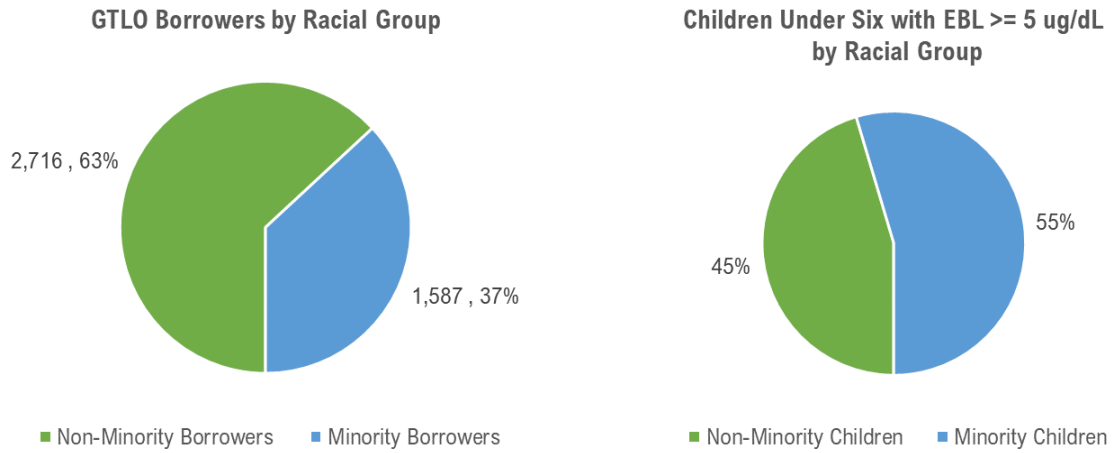

Figure 15. *GTLO Loans Compared to EBLL by Racial Groups, Statewide*

[48] https://www.mass.gov/doc/2021-annual-childhood-lead-poisoning-surveillance-report-0/download
[49] https://datacenter.aecf.org/data/tables/103-child-population-by-race-and-ethnicity#detailed/2/23/false/1095/68,69,67,12,70,66,71,72/423,424

Figure 16 shows GTLO loans originated by income level of borrower. Limitations in the MDPH data on childhood lead exposure by income prevented us from performing a comparison of GTLO to income based EBLL data similar to the comparison we performed by race. However, the GTLO data in isolation does show that borrowers tend have incomes well below the income limits of the program ($127,700 for 1-2 person households and $146,800 for 3+ person households in Brockton, Holyoke, and Springfield).[50]

It is interesting to note that based on income, a large portion of borrowers would likely be eligible for HUD lead grants (income limit of 80% area median income) if available in their jurisdictions.[51] Figure 16 highlights the income levels that fall under the 80% AMI threshold for single-person households (< $25,000 and $25,000 - $49,999). Households above these levels may also fall under this threshold based on household size.

This suggests income-eligible residents may not have access to HUD grant funding for lead hazard control in their localities, and instead must use GTLO to finance lead hazard control.

Recommendations

8) Pursue Federal and State grants. Given the drastic funding needs to address housing quality in Gateway Cities and across Massachusetts, stakeholders should pursue new, transformational levels of funding to invest in the state's housing stock. We note that the rollout of the Inflation Reduction Act and Bipartisan Infrastructure Bill will provide significant new funding for electrification and weatherization, respectively. A portion of this funding can be used for enabling activities and pre-weatherization measures that can address indoor air quality and lead. In Massachusetts, MACDC should work with partners to ensure that this new federal funding will be effectively leveraged with existing lead hazard control and home repair programs. Moreover, with local agencies and service providers focused on ramping up to implement new funding, program administrators must be careful that capacity diverted to new programs is not to the detriment of existing HUD lead and GTLO programs.

The state should also administer a campaign to encourage Gateway Cities to apply for HUD lead grants. This initiative should include technical assistance to first-time applicants and cities that need support in generating competitive applications. TA should also include ongoing administrative support should cities be awarded HUD lead grants. Separately, lead stakeholders in Massachusetts could advocate to HUD to reduce the administrative burden of their grants, making it easier for program administrators to manage.

Additionally, MACDC and partners should continue advocating for the Massachusetts Healthy Homes program, a bill that would bring state funding to whole home retrofits. Such a program would play an integral role in bridging gaps for health and safety needs that arise in electrification programs.

[50] https://www.masshousing.com/-/media/Files/Home-Ownership/LeadPaintLimits.ashx
[51] DHCD document provides tables for 80% AMI thresholds for MA cities: https://www.mass.gov/doc/erma-area-median-income-information/download

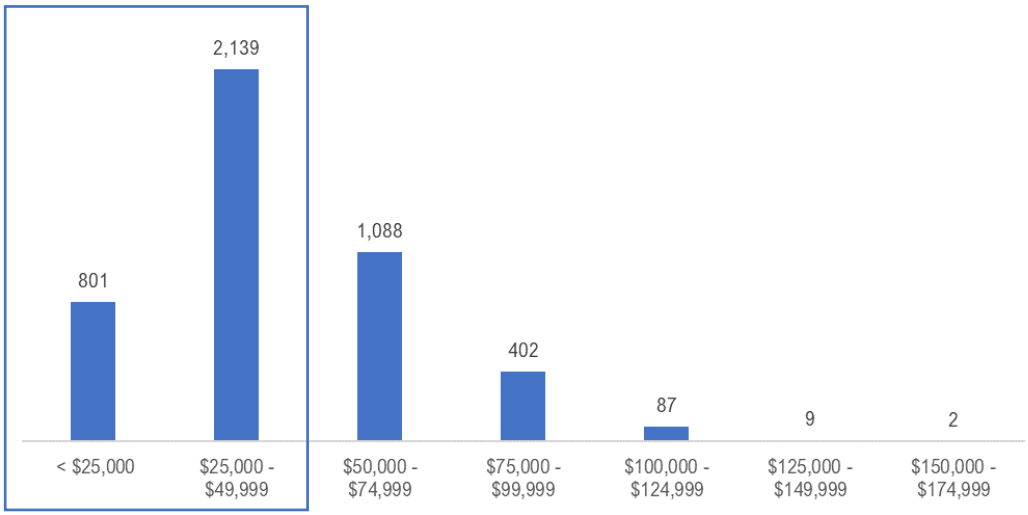

Figure 16. *GTLO Loans by Income Level, Statewide*

To address this gap, there is an opportunity statewide for jurisdictions to apply for additional HUD funding. In fact, the MA State Department of Health just received $2.5 million to build capacity and further develop a pipeline of demand for lead hazard reduction.

Housing Stability Analysis

Having documented various housing quality problems, resources, and gaps, this report also seeks to analyze the relationship between housing quality and housing stability. Housing stability is considered being able to find and maintain stable, safe, and affordable housing. As such, housing stability is a driver of physical and mental wellbeing, as well as financial security.

Housing stability can be defined and measured in a range of ways, so this section begins with defining housing stability for the purposes of this report. Causes of housing stability are then explored, followed by an analysis of the link between housing instability and poor housing quality.

Definition and Causes of Housing Stability/Instability

Housing stability has been defined differently by various researchers operating in a range of contexts, and thus a specific definition of housing stability is necessary for the purposes of this report. As one research paper notes, a "likely reason the field has lacked a cogent measure of housing instability is that there is no standard definition of the construct" (Farero et al. 2022).

To lay the foundation for defining housing stability, GHHI performed a literature review of housing and health related studies. Researchers typically analyze housing stability using one of three methods: single-item measures, multi-item measures, and an index of measures. Examples of single-item measures include having continuous housing for six months, having two or more moves in the prior year, having a lease violation, or having been evicted once or multiple times; using the single-item approach, a researcher would define one key metric as representative of housing stability, and then apply it to a population to determine a proportion who are housing unstable. An alternative version of this approach is a multi-item measure, which would link together multiple items such as being behind on rent and having moved more than twice in the prior year as conditions for housing instability. Finally, many researchers have also proposed indices to measure housing instability, such as Frederick et al. (2014), whose eight-item index includes housing type, recent housing history, current housing tenure, financial status, involvement with the legal system, education level and employment status, harmful substance use, and subjective assessments of housing satisfaction and stability. A 10-item index by Routhier (2019) focuses on four main dimensions: unaffordability, crowding, poor physical conditions, and forced moves.

GHHI also searched for Massachusetts-focused studies on housing stability to see what metrics have been utilized in the Bay State. In 2021, a research group led by the UMass Donahue Institute published a study on housing issues in the Greater Springfield region.[52] The Donahue Institute's study looked at housing instability through metrics such as foreclosures, vacancy rates, and homelessness. It found a disproportionately high rate of foreclosures in Springfield

[52] https://donahue.umass.edu/documents/Greater_Springfield_Regional_Housing_Analysis_Report.pdf

and increasing homelessness in Hampden County. Also in 2021, the Boston Foundation published a study through its Health Starts at Home Initiative focused on housing stability and health outcomes.[53] This study sought to improve families' housing stability through the provision of housing subsidies, rental assistance, and other resources, and found that improvements in housing stability were correlated with improvements in children's health. The framework used to define and measure housing instability for this report was based on Routhier (2019)'s four-dimensional index, referred to in the study as: homeless or unstable housing, unaffordable housing, poor quality housing, and crowded housing.

This report utilizes Professor Giselle Routhier's framework for measuring housing instability published in 2019, both because it is oft cited and generally accepted in the literature, and due to its usage by the Boston Foundation's 2021 study, showing its applicability in Massachusetts. Routhier's paper, titled *Beyond Worst Case Needs: Measuring the Breadth and Severity of Housing Insecurity Among Urban Renters,* outlines the four key dimensions of housing instability as: 1) Affordability, 2) Crowding, 3) Poor Physical Conditions, and 4) Forced moves/instability. Figure 17 below outlines common operationalizations for each of these dimensions, as well as limitations.

	Common operationalizations	References	Limitations
Affordability	- Rent/income ratio - Housing-induced poverty/ residual income - Subjective measure of difficulty	Burgard et al. (2012); Joint Center for Housing Studies (2016); Kutty (2005); Matlack and Vigdor (2008); Pollack et al. (2010); Stone (2006); Warren & Font (2015)	- Doesn't take into account consumption choices or life cycle of housing costs - Ratio may not really reflect housing risk at the higher end of income scale - Typical measurement ignores out-of-pocket rent
Crowding	- More than one person per room; more than 1.5 persons per room - A continuous measure of persons per room - Square footage per person	Blake et al. (2007); Burr et al. (2010); Evans et al. (2010); Solari & Mare (2012)	- Doesn't take into account consumption choices or role of social supports - Problems with accurate measurement and reporting
Poor physical conditions	- Structural deterioration, lack of heat, environmental hazards such as mold, pests, and broken windows, walls, or appliances - Having one or more serious problems related to heating, plumbing, and electrical systems or maintenance	Wheelock & Eggers (2015); Evans et al. (2000); Nriagu et al. (2011); Steffen et al. (2015); Suglia et al. (2011)	- Extremely wide variety of definitions - Difficulty measuring conditions and assigning severity - A lack of critical examination of which factors are most important
Forced moves/ instability	- Frequency measure of moving - Eviction	Burgard et al. (2012); Desmond et al. (2015); Rollins et al. (2012); Shinn et al. (1998); Tsemberis et al. (2007)	- Mobility can be positive or negative - Lack of detailed and consistent national data - Likely underreported

Figure 17. *From Routhier (2019) – Dimensions of Housing Stability*

Using Routhier's framework as a foundation, this report will now detail the particular connection between housing quality and housing instability, select specific metrics for housing instability in

[53] https://www.tbf.org/-/media/tbf/reports-and-covers/2021/hsah-may-2021-report527_v4.pdf?la=en

this report, and analyze housing instability statewide as well as in each of the three Gateway Cities.

Link Between Housing Instability and Poor Housing Quality

This report is focused on housing quality – the physical condition of the home – and thus will adapt Routhier's multi-dimensional framework for measuring housing instability to that focus. One of the four dimensions is already titled "Poor Physical Conditions", which is clearly relevant to this report. As will be noted below, the conditions typically included in this dimension have partial, but not complete, overlap with the lead and indoor air quality hazards examined in this study. The other three dimensions of housing instability – unaffordability, crowding, and forced moves/instability – also have connection to housing quality and will be expanded upon further.

Poor Physical Conditions

The first dimension of housing instability is poor physical conditions. Poor physical conditions can include structural deterioration, lack of heat, lack of privacy, and environmental hazards such as mold and pests, among other issues.[54] Since this data can be difficult to gather and access, especially at scale, two proxy metrics recorded in the American Community Survey are whether housing units lack complete plumbing facilities and kitchen facilities. While lead and indoor air quality are not frequently included in the housing instability literature, the interviews for this study yielded various anecdotes of residents on the verge of leaving their home unless a health and safety hazard can be remediated. GHHI was unable to obtain building code violation data at the city-level to include in this report, but that would be an important dataset to examine the relationship between physical conditions and housing stability in the future.

Unaffordability

According to the literature, unaffordability is "the most commonly studied housing problem among renters."[55] Housing cost burden can be linked with housing quality in that residents who are severely housing cost burdened – spending more than 50% of their income on housing – will (by definition) have fewer resources to address housing quality issues. It may follow that health and safety hazards could be more pervasive in homes of residents who are more cost-burdened, depending on whether there are programs and resources available to low-income residents. Even when public resources are available, severely housing cost burdened residents may be unwilling or unable to access financial instruments such as loans. Additionally, since residents with housing cost burden typically have fewer resources, it may also result in these households being less able to escape housing units in poor condition for higher quality housing. For these reasons, although housing affordability is a financial dimension, it can be linked to physical housing quality and help identify where populations are the most at risk of housing

[54] Routhier (2019)
[55] Ibid.

instability, and also where residents may be most in need of support to remediate physical housing issues.

Crowding

The definition of crowding is when occupied housing units have more than one occupant per room (excluding bathrooms and kitchens). Crowding can be a precursor to or an early sign of homelessness, for individuals or families exploring alternative accommodation after losing their home. It may also be a manifestation of unaffordability, where low-income households must live together in order to share the housing cost burden. However, there may also be other reasons behind crowding that do not relate to instability; some households may choose to live together, and/or live in inter-generational households that contain a higher density of individuals. Thus, crowding is not an objective standard of unstable housing, nor does it give insight into physical housing condition on its own, but nevertheless is a metric worth including for its possible correlative properties to identify populations that may concurrently be experiencing poor housing quality. Crowding can be connected to health in that residents in overcrowded homes may be at higher risk of poor mental health, food insecurity, and infectious diseases.[56]

Forced Moves and Instability

Households who undergo forced or unwanted moves, and/or frequent moves, are often considered to be housing unstable. While moving is often a voluntary decision, researchers have considered frequent recent moves (such as twice in the past 6 months) as constituting housing instability.[57] Poor housing quality can be the cause of frequent moves. For example, if a family renting a housing unit encounters a severe health and safety problem that jeopardizes the home's habitability, they may elect to move or seek alternative accommodations rather than pursue a potentially lengthy and tenuous repair process with a landlord. While forced moves are not necessarily a sign of poor housing quality, they can also be considered a related metric and thus are included in our analysis.

The metrics selected for housing stability in this report correspond to the methodological limitations of relying on existing datasets. It is not in the scope of this report to administer a survey to residents to assess their housing stability, and this rules out the use of more complex, multi-item indices proposed by other researchers. With the metrics detailed in Table 5, the next section includes data for each of Brockton, Holyoke, and Springfield, as well as Massachusetts as a whole.

Recommendations

9) Housing stability survey: In order to get the most accurate data on housing stability and housing quality, administering a new survey dedicated to housing stability, or adding housing stability questions to existing survey templates, would provide more direct and targeted information than relying on existing general data surveys such as US Census data.

[56] https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/quality-housing
[57] Ibid.

Table 5. *Overview of Housing Stability Metrics for this Report*

Metrics	Definition	Source
Forced Moves / Unstable Housing		
Moved Within County in Past Year	Percent of residents 1 year and older who moved into current residence from within the same county in the past year.	American Community Survey (ACS)
Eviction Rate	Percentage of renter-occupied housing units with an eviction over the past year. An eviction happens when a landlord expels people from property he or she owns. Evictions are landlord-initiated involuntary moves that happen to renters. This is based on available eviction records and estimates for missing data and does not include voluntary move-outs or evictions that take place outside of the legal system. A high eviction rate could be based on a high number of evictions, a very low number of renter-occupied units, or both.	The Eviction Lab
Rental Assistance Priority Index	The index estimates the level of need in a census tract by measuring the prevalence of low-income renters who are at risk of experiencing housing instability and homelessness. To do this, it examines neighborhood conditions and demographics. The index is intended to reflect the housing instability risk that has resulted from historical and COVID-19 risk factors and is designed to prioritize the distribution of resources among populations in need during the pandemic in a way that promotes equity. Higher values represent a greater need for rental assistance.	Urban Institute (based on ACS)
Unaffordability		
Housing Cost Burden / Severe Housing Cost Burden	Households spending more than 30% of income on housing are considered housing cost-burdened, and more than 50% are considered severely housing cost burdened. Includes both renters (rent) and owners (mortgage and other owner costs). Measured in % of occupied housing units.	ACS
Poor Physical Conditions		
Percent of Housing Units lacking complete plumbing	Percentage of occupied housing units without complete plumbing facilities, meaning both hot & cold running water, and a bathtub or shower, located indoors.	ACS
Percent of Housing Units lacking complete kitchen facilities	Percentage of occupied housing units without complete kitchen facilities	ACS
Crowding		

Crowded Housing	Percent of occupied housing units with more than one occupant per room (e.g., three occupants in a one-bedroom apartment)	ACS

Overview of Housing Instability

Table 6 below shows data for the Gateway Cities, Massachusetts, and the United States for each of the four dimensions of the housing instability index. Shaded in red are values where the Gateway Cities exceed the Massachusetts level, or where Massachusetts exceeds the US level. We performed Chi Square tests to determine if differences between city- and state-level figures for certain measures are considered statistically significant. Figures in bold represent statistically significant differences between city and state values. We note that the statistical comparison between city and state values assumes that the city-level value has a negligible effect on the state-level value due to the shear difference in scale between Gateway City population and Massachusetts population (each city is no more than ~2% of the state population).

Table 6. *Housing Instability Metrics for Key Geographies*

Housing Instability Metrics	**Time**	**Brockton**	**Holyoke**	**Springfield**	**Mass-achusetts**	**United States**
Forced Moves / Unstable Housing						
Moved Within County in Past Year	2021	**6.77%**	6.07%	**8.12%**	6.26%	6.66%
Eviction Rate	2018	**4.19%**	**1.38%**	**2.17%**	1.62%	2.12%
Rental Assistance Priority Index (measures need for low-income renters at risk for housing stability, higher values represent greater need for rental assistance)	2020	0.31	-0.14	0.61		
Unaffordability						
Housing Cost Burden	2021	**45.38%**	**39.5%**	**43.2%**	34.54%	30.85%
Severe Housing Cost Burden	2021	**20.68%**	**19.58%**	**23.58%**	16.37%	14.56%
Poor Physical Conditions						
Percent of Housing Units lacking complete plumbing	2021	.33%	**.23%**	**.19%**	.35%	.41%
Percent of Housing lacking kitchen facilities	2021	**.14%**	.76%	**.68%**	.77%	.81%
Crowding						
Crowded Housing	2021	**4.19%**	**3.34%**	**1.43%**	2.18%	3.39%

Analysis of Communities of Color and Low-Income Communities and Housing Stability

The data on housing stability in Table 6 is only available at a city level and is not broken down by race or income. Thus, this report's analysis will focus on the three Gateway Cities of Brockton, Holyoke, and Springfield, and compare their metrics with state averages from across Massachusetts.

The three Gateway Cities of Brockton, Holyoke, and Springfield are characterized by higher levels of moves/evictions, unaffordability, and crowding, and thus appear to have higher levels of housing instability than statewide averages. In terms of forced moves and unstable housing, Brockton's eviction rate is over twice the state level, and both Brockton and Springfield have relatively higher rates of moves within the county in the past year and the rental assistance priority index. Holyoke's metrics in the forced moves and unstable housing are below state averages.

Each city has a relatively high proportion of households that are cost burdened and severely cost burdened. In other words, each of the three Gateway Cities has higher levels of housing unaffordability and the associated risks of housing stability. Brockton has the highest rate of household cost burden (45.38%) whereas Springfield has the highest severe housing cost burden (23.58%). For crowded housing metrics, Brockton (4.19%) has twice the percentage of crowded households than statewide (2.18%), and Holyoke (3.34%) has an elevated level as well. In sum, each of Brockton, Holyoke, and Springfield show more severe indicators and higher risk factors for housing instability compared to statewide levels in Massachusetts.

Analysis of Link Between Poor Housing Quality and Housing Stability

As discussed earlier in this section, housing quality intersects the four dimensions of housing instability included in this analysis. In particular, housing unaffordability can be a proxy of as well as a contributor to poor housing quality, as residents who are severely cost burdened will be the least able to afford health and safety repairs in their homes. Additionally, forced and frequent moves can be an associated risk factor with housing quality for renters who are more vulnerable in the reporting of health and safety hazards. The 'Poor Physical Condition' dimension is directly connected to housing quality, although this report indicates that housing-related health outcome data should be considered alongside other housing structure-related data.

The Gateway City data in the physical condition dimension of the housing stability index raises questions over how health and safety hazards are incorporated into housing stability assessments. Poor physical condition, measured by a lack of complete plumbing or kitchen facilities, is the only dimension where each Gateway City fares better than the state level. However, as this report has shown, the Gateway Cities experience higher levels of housing quality-related health impacts such as lead poisoning and asthma. Whether home health hazards cause housing instability in Gateway Cities can only be answered by directly surveying residents. Nevertheless, further research should also examine whether data on health outcomes could be included alongside structural/plumbing data from the AHS to give a fuller picture of the relationship between housing quality and housing stability.

Recommendations

10) Future research into housing quality + instability: Future research should further examine the connection between housing quality and health, to potentially a) include housing-related health data as an indicator of poor physical conditions or b) add health as a fifth dimension to the four-dimension housing instability index.

Several existing studies that make important strides toward clarifying the link between housing stability and housing quality can be built upon in the future. One example is Boch et al. (2020)'s study that utilizes US Census Survey of Income and Program Participation (SIPP) data to establish a link between housing quality and adult health outcomes.[58] The authors found that each additional poor housing characteristic for adults in the survey was associated with poorer health status, higher medical utilization, and a higher likelihood of hospitalization. A future study could perform similar analysis on the link between housing quality and health while also analyzing data on housing stability. Another important study was conducted by the Community Innovation and Action Center at the University of Missouri-St. Louis in May 2023, focused on the need and effectiveness of home repairs for older adults in St. Lous.[59] Based on a survey and in-depth interviews to assess the impact of subsidized home repairs for older homeowners, over 7 in 10 homeowners reported that they were "a lot more likely" to stay in their homes after receiving home repairs. These are examples of surveys and studies that, if conducted in Massachusetts, could provide valuable data on the connection between housing quality and housing stability.

[58] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7024670/
[59] https://www.umsl.edu/ciac/files/pdfs/umsl-home-repair-study-report-final-may-2023.pdf

Conclusion

Summary of Key Findings

The findings of this study are summarized across sections.

Documentation of Hazards

- Overall, Massachusetts has an estimated 1.16 million housing units with lead paint, and of these 1.16 million, 1.04 million housing units have significantly deteriorated lead paint.
- Each of the Gateway Cities studied in this report (Brockton, Holyoke, and Springfield) have higher proportions of housing units estimated to have significantly deteriorated lead paint compared to statewide averages.
- Brockton, Holyoke, and Springfield also have higher rates of confirmed child EBLLs (BLL >= 5 µg/dL) than statewide. Overall, in Massachusetts, there is a prevalence of 15.0 children with EBLLs per 1,000 tested. The rates in Brockton (35.2) and Springfield (31.8) are more than double the state level, and Holyoke's (21.1) is also higher than statewide.
- There are disproportionately higher rates of child EBLLs among both low-income populations and communities of color.
- Data on indoor air quality hazards is more difficult to find due to challenges in monitoring and measuring indoor air quality in households at scale. Data tracking health outcomes of poor indoor air quality nevertheless shows disparities in Gateway Cities.
- Brockton, Holyoke, and Springfield each have higher rates of asthma than state averages. Rates of adult asthma, pediatric asthma, asthma-related hospitalizations, and asthma-related emergency department visits are all higher in these three Gateway Cities.
- The three Gateway Cities also have higher levels of COPD, both in terms of current rates as well as medical outcomes (hospitalizations and emergency department visits).
- Based on the significantly higher levels of asthma and other respiratory diseases in the Gateway Cities of Brockton, Holyoke, and Springfield, it is fair to expect that poorer indoor air quality conditions exist in those cities. Field studies involving direct measurement would be required to make definitive claims about IAQ differences in Massachusetts.
- More data is needed to document the problems of lead and indoor air quality in the Gateway Cities as well as overall in Massachusetts. In particular, data on race and income at the city level would enhance the current information landscape, as presently data is only available for the state level in Massachusetts.

Resources and Gaps Analysis

- Between local HUD programs and statewide Get the Lead Out (GTLO) loans, Massachusetts is annually supporting hundreds of low-income residents in lead hazard reduction.

- Nevertheless, there is a gap of orders of magnitude between the estimated number of housing units with significantly deteriorated lead-based paint and the active loans and grants to remediate lead hazards. State GTLO and local HUD programs fund lead hazard reduction in approximately 436 units per year, compared to an estimated 1.04 million housing units with significantly deteriorated lead-based paint. At a pace of 436 units a year, it would take over 2,377 years to fully abate lead hazards in the state of Massachusetts.
- The three Gateway Cities of Brockton, Holyoke, and Springfield also have tens of thousands of housing units with significantly deteriorated lead-based paint, but only several hundred active HUD and GTLO funded projects.
- While more program funding would certainly help, an additional issue observed in Gateway Cities is a seeming lack of demand. For example, Brockton's HUD lead program does not have a waiting list, although there are an estimated ~15,000 housing units in Brockton with significantly deteriorated lead-based paint. This could be the result of application barriers or program administration requirements, as well as public awareness. More resources are needed to bridge education and application gaps to ensure that populations in need of home repair programs are able to access them.
- The mismatch between need and demand for lead hazard reduction programs is due to a number of factors, including awareness, terms of assistance, administrative burden, along with limited lender and contracting capacity.
- An additional dip in demand also occurred during the onset of the Covid-19 pandemic, where annual GTLO loan volume fell from nearly 150 to under 50 in two years' time.
- In each of the Gateway Cities, there is higher demand for more holistic home repair programs than lead focused programs. This could create an opportunity to integrate lead hazard reduction with other home repair programs to provide comprehensive, whole home health and safety repairs. Already, cities such as Brockton are requiring homeowners going through the Homeowner Rehab program to also go through their HUD lead program. Further streamlining in other cities and statewide could drive substantially higher demand for lead hazard reduction.
- Compared to lead, there are fewer programs and resources focused explicitly on indoor air quality and asthma.
- Revitalize CDC holds three contracts with ACOs to provide home education and supplies for asthma treatment. Only one of these contracts, with Community Care Cooperative, currently funds home repairs for asthma trigger remediation. Revitalize CDC also has a contract with Holyoke Medical Center to receive funding to deliver home-based asthma services to 25 patients per year. The program covers asthma remediation such as mold removal, carpet replacement, and other home modifications.
- Massachusetts could consider using a Children's Health Insurance Program (CHIP) Health Services Initiative (HSI) to bring in new funding for statewide home repair. States like Michigan, Maryland, Ohio, and Wisconsin are already using this policy tool to fund lead and asthma remediation. One benefit of using a CHIP HSI is that it leverages an enhanced federal match which is greater than the standard 1:1 matching rate of Medicaid.

- Massachusetts passed an updated 1115 Medicaid waiver in June 2023 which covers asthma remediation under the Flexible Services program. The language of the approved waiver enables a broad range of asthma remediation measures and could therefore be helpful in addressing indoor air quality deficiencies.
- Massachusetts' new Sanitary Code became active in May 2023. The Sanitary Code applies to all rental properties (whereas the Building Code applies to new construction and some rehabilitation). Two new provisions could make it easier for tenants to prove indoor air quality hazards and provide greater requirements of landlords for remediation:
    - Landlords must keep properties free of "excess moisture or the appearance of mold" and environmental testing is not required to confirm the presence of mold.
    - Landlords are required to inspect for pests prior to a new tenant moving into a rental unit. Landlords must document pest control activity and provide to their local board of health.
- One barrier named by stakeholders is a heavy burden of program administration. Program managers described extensive red tape in administering programs, and cities such as Springfield did not pursue new HUD lead grants. Additionally, applicants often need more individual support throughout the application process than CBOs have capacity to provide.
- Renters have less access to general home repair programs in each of the Gateway Cities. Ensuring adequate funding through HUD Healthy Homes Production grants and state and local asthma programs will be critical to provide renters with equal levels of resources to address poor indoor air quality.
- CBOs reported mixed issues with contractors and staffing capacity. Although some entities had no issues finding contractors, others have trouble finding enough skilled and licensed contractors to do the work. In western and central Massachusetts, there are occasional instances of only one or two contractors showing up for a walkthrough, and a struggle to get sufficient competitive bids for a project. Some contractors do not want to work on small jobs, and/or government-grant involved jobs that require a greater burden of administration and documentation.

Housing Stability Analysis

- This report seeks to analyze the connection between housing quality and housing stability in the three Gateway Cities and Massachusetts statewide.
- After performing a literature review of housing stability measures, this report uses a four-dimensional framework of 1) forced moves / unstable housing, 2) unaffordability, 3) physical condition and 4) crowding.
- Each of the three Gateway Cities have elevated risk factors associated with housing instability, including frequent moves, evictions, housing cost burden, and crowding. Interestingly, Brockton, Holyoke and Springfield all perform better than state averages on the physical condition measures which include housing units with complete plumbing and kitchen facilities. This raises the question of whether lead and indoor air quality measures, and perhaps other measures, should also be included in physical condition assessments of housing stability.

- While the link between housing stability and housing quality can only be definitively proven by speaking directly with residents, there are associative links between housing quality and the dimensions of housing instability examined in this study that warrant further surveys and research.

Please note that in this report, we were charged with documenting hazards statewide and in 3 Gateway Cities (Brockton, Holyoke and Springfield), as these cities are the focus of MACDC's initial local community engagement. We make no assertion that these 3 cities are representative of the 26 cities in Massachusetts that are categorized as Gateway Cities. Nevertheless, there is evidence that the higher prevalence of poor housing quality in these 3 Gateway Cities is consistent with the higher prevalence of poor housing quality in Gateway Cities overall, compared to statewide.

Summary of Recommendations

Expanding Resources and Bridging Gaps

1) Increase Awareness of Lead Through Public Campaigns: Awareness campaign(s) would help drive demand for HUD and GTLO programs. Current programs have limited funding for outreach activities, so funding and resources dedicated to these activities would be valuable. Successful awareness campaigns in Maryland and other jurisdictions have included outreach events, door-to-door flyering, awareness posters at transit stations, outreach to childcare centers, billboards, TV and radio public service announcements, newspaper advertisements and more.

2) Expand Reach of Financial Support: Consider adjusting parameters of existing loan products to make even more attractive to potential borrowers, e.g., forgivable loans or grants for the low-income borrowers. Funding could also be used to increase marketing and awareness of GTLO products in parallel with general lead awareness campaigns outlined in Recommendation #1. Administrators could also consider accelerating the rate or originations to make the case for increased future appropriations.

3) Provide Application Support to Residents: GTLO and HUD lead program administrators indicate that applicants often require intensive handholding through the process to ensure that the correct documentation is collected and submitted. Some stakeholders have expressed that additional applicant support would be beneficial. Funding for a Housing Navigator or similar position could help residents understand program requirements and secure documents as needed. A successful example of this model is in place in Memphis, TN.

4) Alleviate Program Administrator Burden: Program administrators described a bureaucratic burden and red tape that comes with administering HUD lead programs. Providing capacity building and training support to program administrators in navigating the administration of HUD lead programs would help build the ability and willingness of local program administrators to continue applying for and participating in HUD grants in the future.

5) Bridge Workforce Development Gap: Within Gateway Cities, programs could share a common list of high performing contractors; this could alleviate some issues in Springfield where some programs are struggling to find contractors while other programs are not. Resources for lead training, certifications, and training for general construction areas could also help bolster contractor capacity. Similar subsidies have been well received in the past.

6) CHIP HSI: Massachusetts could consider using a CHIP HSI to fund home remediation that improves children's health, including lead and indoor air quality improvements. States like Maryland, Michigan, Ohio, and Wisconsin currently operate asthma and lead remediation programs funded by CHIP HSIs.

7) Increase Accessibility to Resources in Minority Communities: Targeted outreach to underrepresented minorities could help even disparities among GTLO borrowers. The same is true for local lead programs to ensure equitable uptake. The most effective outreach would likely come from members of those communities who already share social, language, and cultural connections with populations in need of home repair resources.

Expanding Resources and Bridging Gaps (cont'd.)

8) Pursue Additional Federal and State Grants: Given the drastic funding needs to address housing quality in Gateway Cities and across Massachusetts, stakeholders should pursue new, transformational levels of funding to invest in the state's housing stock. We note that the rollout of the Inflation Reduction Act and Bipartisan Infrastructure Bill will provide significant new funding for electrification and weatherization, respectively. A portion of this funding can be used for enabling activities and pre-weatherization measures that can address indoor air quality and lead. In Massachusetts, MACDC should work with partners to ensure that this new federal funding will be effectively leveraged with existing lead hazard control and home repair programs. Moreover, with local agencies and service providers focused on ramping up to implement new funding, program administrators must be careful that capacity diverted to new programs is not to the detriment of existing HUD lead and GTLO programs.

The state should also administer a campaign to encourage Gateway Cities to apply for HUD lead grants. This initiative should include technical assistance to first-time applicants and cities that need support in generating competitive applications. TA should also include ongoing administrative support should cities be awarded HUD lead grants. Separately, lead stakeholders in Massachusetts could advocate to HUD to reduce the administrative burden of their grants, making it easier for program administrators to manage.

Additionally, MACDC and partners should continue advocating for the Massachusetts Healthy Homes program, a bill that would bring state funding to whole home retrofits. Such a program would play an integral role in bridging gaps for health and safety needs that arise in electrification programs.

Linking Housing Quality and Housing Stability

9) Administer Housing Stability Survey: In order to get the most accurate data on housing stability and housing quality, administering a new survey dedicated to housing stability, or adding housing stability questions to existing survey templates, would provide more direct and targeted information than relying on existing general data surveys such as US Census data.

10) Future Research into Housing Quality + Instability: Housing-related health outcomes such as lead poisoning and asthma-related hospitalizations are disproportionately high in Gateway Cities, yet this type of health data is not typically considered an indicator "Poor Physical Conditions" to measure housing instability, which instead focuses on structural issues like kitchen and plumbing facilities. Future research should further examine the connection between housing quality and health, to potentially a) include housing-related health data as an indicator of poor physical conditions or b) add health as a fifth dimension to this housing instability index.

Data Collection and Documenting Hazards (Appendix B)

11) Incorporate Housing Code Violation Data into Healthy Homes Analysis: Public access to housing code violation data in cities across the state of Massachusetts could help identify buildings that are at the highest risk for health hazards. Harvard researcher Katharine Robb has analyzed the link between housing code violations and health outcomes in Chelsea, MA. Similar research could be conducted across MA and Gateway Cities if data becomes available.

12) Collect + Analyze Health Data: A potential area of further research and analysis could include structuring a study using administrative health data from CHIA to estimate impacts on health utilization and cost tied to housing quality, as well as model the health value of scaled home repair policies and programs.

Appendix

Appendix A: Full Table of Data Measures

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Category	Topic	Units	Source	Time Period	Brockton	Holyoke	Springfield	Massachusetts
Demographics	Median household income	Index	ACS	2021	$68,581	$45,045	$42,498	$89,645
	Gini index of income inequality	Index	ACS	2021	0.477	0.488	0.473	0.489
	Food stamps (SNAP)	% of households	ACS	2021	31.43	36.02	37.59	14.60
	Poverty rate	% of residents	ACS	2021	12.31	26.48	27.93	10.37
	Prevalence of Housing Choice Vouchers	% of renter-occupied un	HUD	2022	15.28	14.95	18.26	7.81
	Population	Residents	ACS	2021	105,455	38,480	154,788	6,984,723
	Population density	residents/mi^2	ACS	2021	4,885.32	1,818.11	4,887.70	896.28
	Race/Ethnicity of 65+ population - % White	% of population	MA Healthy Aging Collaboration	2018	66.7	92.7	72.2	90.0
	Race/Ethnicity of 65+ population - % African American	% of population	MA Healthy Aging Collaboration	2018	25.4	2.5	18.8	4.3
	Race/Ethnicity of 65+ population - % Asian	% of population	MA Healthy Aging Collaboration	2018	1.5	0.2	2.5	3.2
	Race/Ethnicity of 65+ population - % Other	% of population	MA Healthy Aging Collaboration	2018	6.4	4.7	6.5	2.5
	Race/Ethnicity of 65+ population - % Hispanic/Latino	% of population	MA Healthy Aging Collaboration	2018	5.6	22.0	19.6	3.8
	Total population 60 years or older	Number of individuals	MA Healthy Aging Collaboration	2018	17,637	7,391	25,788	1,428,144
	Population 60 years or older as % of total population	% of total population	MA Healthy Aging Collaboration	2018	18.6	18.3	16.7	21.2
	Total population 65 years or older	Number of individuals	MA Healthy Aging Collaboration	2018	12,317	5,497	17,908	1,016,679
	Population 65 years or older as % of total population	% of total population	MA Healthy Aging Collaboration	2018	13.0	13.6	11.6	15.1
	White	% of population	ACS	2021	33.7	72.8	52.9	74.5
	Black or African American	% of population	ACS	2021	41.0	4.0	20.8	7.3
	American Indian and Alaska Native	% of population	ACS	2021	0.2	0.3	0.5	0.2
	Asian	% of population	ACS	2021	1.9	1.0	2.8	6.9
	Native Hawaiian and Other Pacific Islander	% of population	ACS	2021	0.1	0.0	0.0	0.0
	Other Race	% of population	ACS	2021	10.9	4.8	10.1	4.6
	Two or More Races	% of population	ACS	2021	12.2	17.1	13.0	6.5
	Hispanic or Latinx (of any race)	% of population	ACS	2021	12.1	53.3	47.5	12.4
	Not Hispanic or Latinx	% of population	ACS	2021	87.9	46.7	52.5	87.6
Housing stock	Housing units	housing units	ACS	2021	38,391	16,731	62,032	3,017,772
	Housing unit density	units/mi^2	ACS	2021	1,728.91	790.51	1,982.41	381.96
	Built before 1978, housing units	housing units	ACS (calc)	2021	30,678	13,984	52,001	2,047,558
	Bult before 1978, percentage	% of housing units	ACS (calc)	2021	79.9%	83.6%	83.8%	67.9%
	Built 1939 or earlier (pre-war)	% of housing units	ACS	2021	31.78	44.72	38.24	30.13
	Built 1940-1949	% of housing units	ACS	2021	5.49	5.99	8.54	5.25
	Built 1950-1959	% of housing units	ACS	2021	11.58	13.71	15.97	10.98
	Built 1960-1969	% of housing units	ACS	2021	15.93	10.70	10.94	10.21
	Built 1970-1979	% of housing units	ACS	2021	15.13	8.46	10.14	11.28
	Built after 1979	% of housing units	ACS	2021	20.09	16.42	16.17	32.15
	Built 1980-1989	% of housing units	ACS	2021	10.46	9.11	5.33	10.94
	Built 1990-1999	% of housing units	ACS	2021	2.96	3.62	6.17	7.38
	Built 2000-2009	% of housing units	ACS	2021	2.69	2.30	2.10	7.25
	Built 2010-2019	% of housing units	ACS	2021	3.62	1.31	2.34	6.16
	Built 2020 and later	% of housing units	ACS	2021	0.36	0.10	0.23	0.41
	Single housing unit	% of housing units	ACS	2021	56.75	35.80	49.20	57.70
	2-4 housing units in building	% of housing units	ACS	2021	20.74	24.55	27.76	19.94
	5-9 housing units in building	% of housing units	ACS	2021	8.15	15.16	8.20	5.67
	10-19 housing units in building	% of housing units	ACS	2021	6.18	11.74	1.23	3.95
	20+ housing units in building	% of housing units	ACS	2021	8.18	12.66	12.41	12.02
	Mobile homes	% of housing units	ACS	2021	0.00	0.10	1.18	0.73
	Owner occupied	% of occupied housing u	ACS	2021	59.29	39.58	48.46	63.15
	Renter occupied	% of occupied housing u	ACS	2021	40.71	60.42	51.54	36.85
	Occupied	% of housing units	ACS	2021	97.82	90.02	93.19	91.43

Category	Topic	Units	Source	Time Period	Brockton	Holyoke	Springfield	Massachusetts
	Vacant	% of housing units	ACS	2021	2.18	9.98	6.81	8.57
	Utility gas heat	% of occupied housing u	ACS	2021	56.00	46.83	56.24	51.17
	Electric heat	% of occupied housing u	ACS	2021	15.12	33.04	19.83	17.84
	Combustion fuel heat	% of occupied housing u	ACS	2021	25.79	17.52	15.58	24.68
	No heat	% of occupied housing u	ACS	2021	0.66	0.50	3.52	0.61
	Other heat sources	% of occupied housing u	ACS	2021	2.43	2.11	4.83	5.69
Housing quality	Household has at least 1 of 4 housing problems	Number of households	HUD CHAS/ACS	2015-2019	13,335	6,200	25,875	887,150
	Percent of households with at least 1 of 4 housing prol	% households	HUD CHAS/ACS (calculated)	2015-2019	0.42	0.41	0.46	0.34
	% 60+ injured in a fall within last 12 months	% of 60+ population	MA Healthy Aging Collaboration	2018	14.6	8.5	18.1	10.6
	Lacking complete plumbing	% of occupied housing u	ACS	2021	0.33	0.23	0.19	0.35
	Lacking kitchen facilities	% of occupied housing u	ACS	2021	0.14	0.76	0.68	0.77
	Crowded housing	% of occupied housing u	ACS	2021	4.19	3.34	1.43	2.18
Lead	Lead screening rate for children 9-47 months in 2020	% of children	MA Env Public Health Tracking	2020	66	61	60	65
	Lead screening rate for children 9-47 months in 2021	% of children	2021 MA Annual Childhood Lead Poisoning	2021	70	67	64	68
	Children screened, 9-47 months in 2021	Number of children	2021 MA Annual Childhood Lead Poisoning	2021	3288	1034	4154	158462
	Prevalence of blood lead levels >= 5 ug/dl, 5-year annu	Rate per 1,000 children	MA Env Public Health Tracking	2016-2020	35.2	21.1	31.8	15
	Percentage of houses built before 1978	% houses	2021 MA Annual Childhood Lead Poisoning	2021	81	81	84	68
	Lead paint Environmental Justice Index	percentile	EPA via ACS	2021	57.4	70.7	71.8	49.5
	Estimated confirmed BLL >= 5 ug/dL	Number of children	2021 MA Annual Childhood Lead Poisoning	2021	140	22	100	1836
	Percent confirmed BLL >= 5 ug/dL	% of children screened	2021 MA Annual Childhood Lead Poisoning	2021	4.3	2.1	2.4	1.2
	Estimated confirmed BLL >= 10 ug/dL	Number of children	2021 MA Annual Childhood Lead Poisoning	2021	26	NS	25	448
	Percent confirmed BLL >= 10 ug/dL	% of children screened	2021 MA Annual Childhood Lead Poisoning	2021	0.8	NS	0.6	0.3
	Estimated housing units with lead based paint	Number of houses	ACS, AHHS, GHHI calc	2021	16,966	9,239	32,565	1,264,389
	Estimated percent housing units with lead based paint	% houses	ACS, AHHS, GHHI calc	2021	44.2	55.2	52.5	41.9
	Estimated housing units with significantly deteriorated	Number of houses	ACS, AHHS, GHHI calc	2021	14,887	7,404	27,028	1,036,418
	Estimated percent housing units with significantly deter	% houses	ACS, AHHS, GHHI calc	2021	39.6	49.2	46.8	37.6
	Prevalence of children with elevated blood lead by com	Prevalence per 1,000 ch	2021 MA Annual Childhood Lead Poisoning	2021				5.6
	Prevalence of children with elevated blood lead by com	Prevalence per 1,000 ch	2021 MA Annual Childhood Lead Poisoning	2021				19.2
	Multi-race children with estimated confirmed EBLL >=	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				36.7
	American Indian or Alaskan Native children with estima	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				26.6
	Black or African American children with estimated conf	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				20.6
	Hispanic children with estimated confirmed EBLL >= 5	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				18.9
	Native Hawaiian children with estimated confirmed EBL	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				15.9
	Asian children with estimated confirmed EBLL >= 5 ug/	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				14.9
	Non-Hispanic children with estimated confirmed EBLL	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				13.2
	White children with estimated confirmed EBLL >= 5 ug/	per 1,000 children scree	2021 MA Annual Childhood Lead Poisoning	2016-2020				12.4
	Environmental burden index	Index	CDC	2022	21.60	52.50	52.00	46.03
	Proximity to roads, railways, and airports index	Index	CDC	2022	33.69	78.43	45.54	46.37
	Diesel particulate matter concentration	µg/m3	EPA via National Scale Air Toxics Assessm	2021	0.228	0.230	0.289	0.144
	Traffic Environmental Justice Index	percentile	EPA via DOT	2021	51.7	76.1	50.1	22.6
	Ozone Environmental Justice Index	percentile	EPA	2021	80.5	76.5	89.7	49.3
	Particulate matter Environmental Justice Index	percentile	EPA	2021	60.5	26.6	40.7	25.4
	Diesel PM Environmental Justice Index	percentile	EPA	2021	48.9	54.7	63.7	49.5
	Inhalation cancer risk Environmental Justice Index	percentile	EPA via National Scale Air Toxics Assessm	2021	56.0	99.0	99.0	74.3
	Respiratory hazard Environmental Justice Index	percentile	EPA via National Scale Air Toxics Assessm	2021	81.0	81.0	85.2	71.0
	Lifetime inhalation cancer risk	lifetime risk per million	EPA via National Scale Air Toxics Assessm	2021	20.0	30.0	30.0	20.7
	Ozone days	days per year	Public Health Air Surveillance Evaluation	2011				2
	Particulate matter (PM 2.5) concentration	µg/m3	EPA	2021	7.050	6.337	6.597	6.234
	Particulate matter (PM) days	% of days	Public Health Air Surveillance Evaluation	2011				0.3

Category	Topic	Units	Source	Time Period	Brockton	Holyoke	Springfield	Massachusetts
	Respiratory hazard index	Index	EPA via National Scale Air Toxics Assessm	2021	0.30	0.30	0.33	0.24
	Social Vulnerability Index	percentile	CDC	2020	62.93	65.03	76.97	46.88
	Cigarette smoking prevalence	% of adults	BRFSS	2020	19.7	18.4	19.4	12.9
	% 65+ with COPD	% 65+ population	MA Healthy Aging Collaboration	2018	29.0	26.6	24.4	21.5
	% 65+ with asthma	% 65+ population	MA Healthy Aging Collaboration	2018	17.7	10.8	18.9	15.0
	Current asthma, adults	% of adults	CDC	2020	12.20	12.00	12.80	10.59
	Current asthma, children	% of children	BRFSS	2020				7.8
	Pediatric asthma prevalence per 100 students (K-8th G	Rate per 100 students	MDPH	2018	15.2	20.8	16.9	11.8
	Current asthma, White children	% of children	BRFSS	2020				8.6
	Current asthma, Black children	% of children	BRFSS	2020				NR
	Current asthma, children of Other race	% of children	BRFSS	2020				5.7
	Current asthma, White Adults	% of adults	BRFSS	2021				12.8
	Current asthma, Black Adults	% of adults	BRFSS	2021				10.9
	Current asthma, Hispanic or Latino Adults	% of adults	BRFSS	2021				10.9
	Current asthma, Asian Adults	% of adults	BRFSS	2021				5.5
	Lifetime asthma, White Adults	% of adults	BRFSS	2021				17.6
	Lifetime asthma, Black Adults	% of adults	BRFSS	2021				16.8
	Lifetime asthma, Hispanic or Latino Adults	% of adults	BRFSS	2021				16.0
	Lifetime asthma, Asian Adults	% of adults	BRFSS	2021				9.0
	Rates of asthma-related hospitalizations, Black, Non-Hi	Rate per 10,000 people	MDPH Asthma-Related Hospitalizations Re	2018				18.9
	Rates of asthma-related hospitalizations, Hispanic	Rate per 10,000 people	MDPH Asthma-Related Hospitalizations Re	2018				23.2
	Rates of asthma-related hospitalizations, White, Non-Hi	Rate per 10,000 people	MDPH Asthma-Related Hospitalizations Re	2018				5.5
	Rates of asthma-related hospitalizations, Asian/Pacific I	Rate per 10,000 people	MDPH Asthma-Related Hospitalizations Re	2018				5.6
Indoor air quality	Rates of asthma-related ED visits, Black, Non-Hispanic	Rate per 10,000 people	MDPH Asthma-Related ED Visits Report	2018				132.8
	Rates of asthma-related ED visits, Hispanic	Rate per 10,000 people	MDPH Asthma-Related ED Visits Report	2018				142.4
	Rates of asthma-related ED visits, White, Non-Hispanic	Rate per 10,000 people	MDPH Asthma-Related ED Visits Report	2018				29.5
	Rates of asthma-related ED visits, Asian/Pacific Islande	Rate per 10,000 people	MDPH Asthma-Related ED Visits Report	2018				18.4
	Adult current asthma by income - <$25k	% of adults	BRFSS	2021				15.7
	Adult current asthma by income - <$25k-$49.9k	% of adults	BRFSS	2021				13.7
	Adult current asthma by income - <$50k-$74.9k	% of adults	BRFSS	2021				12.2
	Adult current asthma by income - <$75k-$99.9k	% of adults	BRFSS	2021				10.3
	Adult current asthma by income - $100k+	% of adults	BRFSS	2021				9.2
	Adult COPD by race - White	% of adults	BRFSS	2021				6.7
	Adult COPD by race - Black	% of adults	BRFSS	2021				4.6
	Adult COPD by race - Hispanic or Latino	% of adults	BRFSS	2021				4.4
	Adult COPD by race - Asian	% of adults	BRFSS	2021				NR
	Adult COPD by income - <$25k	% of adults	BRFSS	2021				13.7
	Adult COPD by income - <$25k-$49.9k	% of adults	BRFSS	2021				7.3
	Adult COPD by income - <$50k-$74.9k	% of adults	BRFSS	2021				7.9
	Adult COPD by income - <$75k-$99.9k	% of adults	BRFSS	2021				3.1
	Adult COPD by income - $100k+	% of adults	BRFSS	2021				2.1
	Annual average age adjusted rates of hospital admissio	Rate per 10,000 people	MA Env Public Health Tracking	2015-2017	64.4	62	43.9	29.5
	Annual average age adjusted hospital admission for CO	Case count	MA Env Public Health Tracking	2015-2017	442	185	445	16317.0
	Annual average age adjusted rates of ED visit for COPD	Rate per 10,000 people	MA Env Public Health Tracking	2015-2017	147.1	146.5	132.5	66.0
	Annual average age adjusted ED visit for COPD	Case count	MA Env Public Health Tracking	2015-2017	996	412	1316	35117.0
	Annual average age adjusted rates of ED visit for heat s	Rate per 10,000 people	MA Env Public Health Tracking	2015-2017	21.4	20	11.4	10.0
	Annual average age adjusted ED visits for heat stress	Case count	MA Env Public Health Tracking	2015-2017	20	7	17	702.0
	Annual average age adjusted rates of hospital admissio	Rate per 10,000 people	MA Env Public Health Tracking	2015-2017	18	28.2	20.4	8.9
	Annual average age adjusted hospital admission for ast	Case count	MA Env Public Health Tracking	2015-2017	174	112	310	5869.0

Category	Topic	Units	Source	Time Period	Brockton	Holyoke	Springfield	Massachusetts
	Annual average age adjusted rates of ED visits for asth	Rate per 10,000 people	MA Env Public Health Tracking	2015-2017	119.2	240.2	189	61.9
	Annual average age adjusted ED visits for asthma	Case count	MA Env Public Health Tracking	2015-2017	1138	950	2885	39589.0
	Adult current asthma by race - White	% of adults	BRFSS	2021				12.8
	Adult current asthma by race - Black	% of adults	BRFSS	2021				10.9
	Adult current asthma by race - Hispanic or Latino	% of adults	BRFSS	2021				10.9
	Adult current asthma by race - Asian	% of adults	BRFSS	2021				5.5
	Adult current asthma by income - <$25k	% of adults	BRFSS	2021				15.7
	Adult current asthma by income - <$25k-$49.9k	% of adults	BRFSS	2021				13.7
	Adult current asthma by income - <$50k-$74.9k	% of adults	BRFSS	2021				12.2
	Adult current asthma by income - <$75k-$99.9k	% of adults	BRFSS	2021				10.3
	Adult current asthma by income - $100k+	% of adults	BRFSS	2021				9.2
Housing stability	Eviction rate	% of renter-occupied ho	Eviction Lab at Princeton	2018	4.19	1.38	2.17	1.62
	Eviction filing rate	filings per 100 renter-oc	Eviction Lab at Princeton	2018	6.39	4.91	7.59	3.23
	Evictions	evictions	Eviction Lab at Princeton	2018	572	151	654	16,042
	Moved within county in past year	% of residents	ACS	2021	6.77	6.07	8.12	6.26
	(65+ population) who moved within same county in pas	% of 65+ population	MA Healthy Aging Collaboration	2018	4.7	2.4	5.7	3.6
	(65+ population) who moved from different MA county	% of 65+ population	MA Healthy Aging Collaboration	2018	1.5	0.9	0.7	1.1
	(65+ population) who moved from different state in pas	% of 65+ population	MA Healthy Aging Collaboration	2018	0.4	0.3	0.9	0.8
	People experiencing homelessness	individuals	HUD	2022				15,507
	Rate of people experiencing homelessness	individuals per 100,000	HUD	2022				228.23
	Rental Assistance Priority Index	Index	Urban Institute (ACS, Urban Institute COVI	2020	0.31	-0.14	0.61	
	Eviction filing rate	Number of filings per 10	Mass Housing Partnership	11/13/2021	38.71	8.72	13.57	18.6
	Eviction filings	Number of filings YTD (	Mass Housing Partnership	11/13/2021	554	79	408	18,189.0
	Moved into current home in 2010 or later	% of occupied housing u	ACS	2021	58.43	55.57	59.78	59.21
	Moved into current home in 2000-2009	% of occupied housing u	ACS	2021	21.36	22.18	19.22	16.87
	Moved into current home in 1990-1999	% of occupied housing u	ACS	2021	7.26	8.94	10.40	11.22
	Moved into current home in 1989 or earlier	% of occupied housing u	ACS	2021	12.94	13.31	10.60	12.69
	Moved from abroad in past year	% of residents	ACS	2021	0.68	0.72	0.81	0.74
	Moved across states in past year	% of residents	ACS	2021	0.75	1.56	1.41	2.29
	Moved across counties in past year	% of residents	ACS	2021	3.49	1.71	1.25	3.33
	Did not move in past year	% of residents	ACS	2021	88.31	89.94	88.41	87.39
	% 65+ households spend > 35% of income on housing	% of 65+ population	MA Healthy Aging Collaboration	2018	12.8	20.9	15.2	11.6
	% 65+ households spend > 35% of income on housing	% of 65+ population	MA Healthy Aging Collaboration	2018	21.6	13.9	19.1	20.4
	Housing cost burden	% of occupied housing u	ACS	2021	45.38	39.50	43.20	34.54
	Severe housing cost burden	% of occupied housing u	ACS	2021	20.68	19.58	23.58	16.37

Description of Data Sources

Data Source	Description	Link
American Community Survey (ACS)	The American Community Survey (ACS) is an ongoing survey of U.S. households and residents that provides a wide variety of information. It replaces the long-form Census questionnaire and is administered to 1 in 38 U.S. households each year. Responses from multiple years can be aggregated to provide information about very small geographies.	https://www.census.gov/programs-surveys/acs
Behavioral Risk Factor Surveillance System (BRFSS)	The Behavioral Risk Factor Surveillance System (BRFSS) is the nation's premier system of health-related telephone surveys that collect state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services. Established in 1984 with 15 states, BRFSS now collects data in all 50 states as well as the District of Columbia and three U.S. territories. BRFSS completes more than 400,000 adult interviews each year, making it the largest continuously conducted health survey system in the world.	https://www.cdc.gov/brfss/about/index.htm
Centers for Disease Control and Prevention (CDC)	The Centers for Disease Control and Prevention (CDC) is the national public health agency of the United States. It is a United States federal agency, under the Department of Health and Human Services. The agency's main goal is the protection of public health and safety through the control and prevention of disease, injury, and disability in the US and worldwide. The Environmental Justice Index uses data from the U.S. Census Bureau, the U.S. Environmental Protection Agency, the U.S. Mine Safety and Health Administration, and the U.S. Centers for Disease Control and Prevention to rank the cumulative impacts of environmental injustice on health for every census tract. Census tracts are subdivisions of counties for which the Census collects statistical data. The EJI ranks each tract on 36 environmental, social, and health factors and groups them into three overarching modules and ten different domains.	https://www.cdc.gov/
Department of Housing and Urban Development (HUD)	Each year, the U.S. Department of Housing and Urban Development (HUD) receives custom tabulations of American Community Survey (ACS) data from the U.S. Census Bureau. These data, known as the "CHAS" data (Comprehensive Housing Affordability Strategy), demonstrate the extent of housing problems and housing needs, particularly for low-income households. The CHAS data is used by	https://www.huduser.gov/portal/datasets/cp.html

	local governments to plan how to spend HUD funds and may also be used by HUD to distribute grant funds.	
Environmental Protection Agency (EPA)	The Environmental Protection Agency's EJScreen tool provides data on measures of environmental justice.	https://www.epa.gov/ejscreen/download-ejscreen-data
Eviction Lab at Princeton	The Eviction Lab at Princeton University has built the first nationwide database of evictions. Data are collected from jurisdictions around the country, including court records collected directly from 13 states. Data availability varies widely by jurisdiction and eviction data are not available or not complete in many places in the country. For these jurisdictions, The Eviction Lab imputes the missing data or flags the data as possibly too low or too high.	https://evictionlab.org/
MA Dept of Public Health	2021 Annual Childhood Lead Poisoning Surveillance Report	https://www.mass.gov/doc/2021-annual-childhood-lead-poisoning-surveillance-report-0/download
MA Env. Public Health Tracking	The Massachusetts Department of Public Health EPHT program has created these profiles to provide a snapshot of environmental health for Massachusetts communities.	https://dphanalytics.hhs.mass.gov/ibmcognos/bi/?perspective=authoring&pathRef=.public_folders%2FMEPHTN%2Fcommunity%2Fcommunity-profile&id=i9442702EC3434151B67F71E0E7A77F5E&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&objRef=i9442702EC3434151B67F71E0E7A77F5E&action=run&format=HTML&cmPropStr=%7B%22id%22%3A%22i9442702EC3434151B67F71E0

		E7A77F5E%22%2C%22type%22%3A%22report%22%2C%22defaultName%22%3A%22community-profile%22%2C%22permissions%22%3A%5B%22execute%22%2C%22read%22%2C%22traverse%22%5D%7D
MA Healthy Aging Collab.	The Massachusetts Healthy Aging Data Report is designed to help residents, agencies, providers and governments understand the older adults who live in their cities and towns – their ages, living arrangements, health status, strengths and vulnerabilities. The report was first released in January 2014 and updated in March 2015 and most recently in December 2018.	https://mahealthyagingcollaborative.org/data-report/explore-the-profiles/
MA Housing Partnership	Analysis of Massachusetts evictions	https://www.mhp.net/news/2021/housing-stability-brief2
Public Health Air Surveillance Evaluation Project (PHASE)	The Centers for Disease Control and Prevention (CDC) is working with the Environmental Protection Agency (EPA), state, academic, and other partners to develop a National Environmental Public Health Tracking (EPHT) Network. The EPA is developing routinely available air quality information and forecasting tools as well as indicators that can be used to help measure the success of its programs in terms of public health outcomes. The National EPHT Network is a possible mechanism for achieving these mutual goals of relating health surveillance data to environmental exposures.	https://www.cdc.gov/nceh/tracking/phase.htm
Urban Institute	The Urban Institute research team created the index using data from three sources: American Community Survey (ACS) five-year estimates, the Urban Institute's "Where Low-Income Jobs Are Being Lost to COVID-19" data tool, and the US Department of Housing and Urban Development's Comprehensive Housing Affordability Strategy (CHAS) dataset. For each source, they used the most recent data available at publication time: the 2014–18 estimates for the ACS, the July 2020 update of Urban's job-loss data tool, and the 2012–16 CHAS data.	https://www.urban.org/sites/default/files/2020/08/24/where_to_prioritize_emergency_rental_assistance_to_keep_renters_in_their_homes_technical_appendix.pdf

Appendix B: Research Methodology and Data Sources

Publicly Available Data

GHHI's research of housing quality and its impact on health outcomes in Massachusetts overall and in three Gateway Cities uses two primary methods of data gathering. First, GHHI assessed publicly available data through local, state, and national databases. Second, GHHI interviewed industry experts, municipal and state officials, and other stakeholders. Some data is based on survey responses while others are based on administrative records. Data measures from all data sources are also grouped by category, as shown in Table 7 below.

Table 7. *Overview of Data Categories and Sources*

	General Topics			HQH Focus Topics		
	Demo-graphics	**Housing Stock**	**Housing Quality**	**Lead**	**Indoor Air Qual.**	**Housing Stability**
American Community Survey (ACS)	X	X				X
Behavioral Risk Factor Surveillance System (BRFSS)					X	
Centers for Disease Control and Prevention (CDC)					X	
Department of Housing and Urban Development (HUD)	X		X			X
Environmental Protection Agency (EPA)				X	X	
Eviction Lab at Princeton						X
MA Dept of Public Health				X		
MA Env. Public Health Tracking				X	X	
MA Healthy Aging Collab.	X		X		X	X
MA Housing Partnership						X
Public Health Air Surv. Eval.					X	
Urban Institute						X

Table 8 below provides a summary of data availability across the sources identified in Table 7 and shows where gaps currently exist as they relate to the HQH focus topics of lead, indoor air quality, and housing stability. While there are some datasets that contain information about health and housing disparities between race and income level, large gaps do exist in these areas. In particular, more data is needed on lead, indoor air quality, and housing stability metrics

by race and income level at both the city and state level. At an overall population level, data is generally available for these metrics.

Table 8. *Summary of Data Availability*

		HQH Focus Topics		
		Lead	**Indoor Air Quality**	**Housing Stability**
State level	*State-level:* **Population**	√ Lead screening √ Elevated Blood Lead Level (EBLL) prevalence √ Houses with lead	√ Outdoor air quality (AQ) proxies √ Asthma/Chronic obstructive pulmonary disease (COPD) burden	√ Evictions √ Moving √ Housing cost burden
	State-level: **By race**	X Lead screening √ EBLL prevalence X Houses with lead	- Outdoor AQ proxies √ Asthma/COPD burden	X Evictions X Moving X Housing cost burden
	State-level: **By income**	X Lead screening X EBLL prevalence X Houses with lead	- Outdoor AQ proxies √ Asthma/COPD burden	X Evictions X Moving X Housing cost burden
Gateway City level	*City-level:* **Population**	√ Lead screening √ EBLL prevalence √ Houses with lead	√ Outdoor AQ proxies √ Asthma/COPD burden	√ Evictions √ Moving √ Housing cost burden
	City-level: **By race**	X Lead screening X EBLL prevalence X Houses with lead	- Outdoor AQ proxies X Asthma/COPD burden	X Evictions X Moving X Housing cost burden
	City-level: **By income**	X Lead screening X EBLL prevalence X Houses with lead	- Outdoor AQ proxies X Asthma/COPD burden	X Evictions X Moving X Housing cost burden

√ Data is available
X Data is not available
- Not applicable

Limitations & Barriers

GHHI's review and analysis of available data is affected by the following limitations:

- As discussed later in this report, there are significant gaps in data sources to describe racial and income disparities related to housing quality, lead-based paint exposure, and indoor air quality. This is especially true for data at the local level.

- Housing code violation data may potentially provide useful information about housing quality deficiencies at the local level. While there is no standard way in which jurisdictions report on violations, it is possible that there is enough commonality to draw insights about housing quality across Gateway Cities. GHHI was not able to access this information for this report and therefore could not confirm the potential usefulness of this housing code violation data.

- Publicly available health data related to housing quality is limited to data on prevalence of specific health conditions (e.g., asthma, COPD) and medical utilization (e.g., ED visits, hospitalizations). Data on healthcare costs related to these same conditions would be helpful in quantifying the value of housing quality improvement to the healthcare sector. The Center for Health Information and Analysis (CHIA) is a state agency that holds administrative datasets that could inform healthcare cost analysis. Access to this data requires a formal data request process and fee. Alternatively, administrative data could also be obtained directly from healthcare entities such as hospital systems and health plans. Data would be limited to the entity's specific members and patients.

Recommendations

11) Housing code violation data: Harvard researcher Katharine Robb has analyzed the link between housing code violations and health outcomes in Chelsea, MA. Similar research could be conducted across MA and Gateway Cities if data becomes available.

12) Health data analysis: A potential area of further research and analysis could include structuring a study using administrative health data from CHIA or healthcare entities to estimate impacts on health utilization and cost tied to housing quality, as well as model the health value of scaled home repair policies and programs.

- As will be explored further in the "Housing Stability Analysis" section, there is no objective measure of housing stability. This report utilizes proxy measures from existing surveys and census data, which can yield helpful albeit indirect indicators of housing stability. The most accurate and targeted way to measure housing stability in communities, and to analyze the relationship between housing stability and housing quality, would be administering a survey that asks residents direct questions about their ability to stay in their home and the impact that housing quality has on their housing stability.

- The measurement of indoor air quality is challenging due to the heterogeneity of households and lack of systematic air quality monitoring in homes. There are no publicly available data sources that provide data on indoor air quality pollutants and maintaining something like this at scale would likely require extensive research capacity and funding. Dave Turcotte, Research Professor at UMass Lowell and Director of the Healthy Homes Program, is currently leading research studies related to indoor air quality including measurement of nitrogen dioxide and particulate matter from gas stoves; however, research studies like this are highly specific to the study's target population and may not be representative of a jurisdiction.

- There is limited lead data at the city-level that is broken down by either race or income. At the state level, there is some data available for lead and indoor air quality-related measures. Table 8 in this report summarizes the data gaps that exist for race and income:

- Available data by race and income:
    - State level elevated blood lead prevalence
    - State level asthma burden

  - State level COPD burden

- Unavailable data by race and income:
  - City level EBLL prevalence
  - City level asthma burden
  - City level COPD burden

Appendix C: Home Repair Program Chart

(Table appears on next page. The rest of this page left intentionally blank.)

		PROGRAM	AVAILABLE GEOGRAPHY	ADMINISTRATOR	HOUSING QUALITY FOCUS AREA	FUNDING SOURCE	PROGRAM BUDGET (ALL-IN)	FUNDING PER UNIT	# OF UNITS FUNDED	ANNUAL # OF UNITS (APPROX. BASED ON GRANT PERIODS)	ELIGIBILTY REQUIREMENTS (DEMO, INCOME, GEO, ETC.)
Healthy Housing (Lead & IAQ)	ARPA	**Healthy Homes Program**	Springfield	City of Springfield	Health & Safety Home Repairs (Lead, IAQ included)	ARPA	$5,000,000	Estimate of $30,000+	120 per year	120	Income ; also only availably in certain census tracts
	HUD	**Healthy Homes Production Grant**	Brockton	Brockton Redevelopment Authority	IAQ, Lead, and Health & Safety Home Repairs	HUD	$2,000,000	Average of $10,000	120 over three years	40	Owner or renter occupied single or multi-family home; LMI requirements
		Healthy Homes Production Grant	Hampden County	Revitalize CDC	Health & Safety Home Repairs (Lead, IAQ included)	HUD	$1,400,000	Average of $14,000	70 over 42 months	20	Owner-occupied. Tied to health condition. Primarily asthma, COPD. Additional eligibility conditions may be added as program develops.
Lead	City-Level HUD	**Lead Based Paint Hazard Control Program**	Brockton	Brockton Redevelopment Authority	Lead (IAQ included)	HUD	$4,700,000	Max of $20,000 in lead paint removal and additional $5,000 healthy homes funding per unit	210 over three years	70	Owner or renter-occupied single or two-family home; LMI requirements
		Lead Based Paint Hazard Reduction Program	Springfield	City of Springfield	Lead (IAQ included)	HUD	$2,300,000	Max of $13,000	86 over three years	29	Unit occupied by income-eligible household, child under six or pregnant woman, current mortgage payments, property taxes current, property owner must have history of compliance with state sanitary code
	State Programs	**Get The Lead Out**	Statewide	MassHousing (state admin), Neighborworks (Brockton), Way Finders (Springfield)	Lead	DHCD	Varies year to year, $2M in 2022	Single-family ($30,000), 2-family ($35,000), 3-family ($40,000), 4-family ($45,000)	Varies year to year, 87 in 2022	75-100	Owner-occupied 1-4 unit homes; MassHousing income limits
		Massachusetts Lead Paint Removal Tax Credit	Statewide	Massachusetts Department of Revenue	Lead	N/A	N/A	$1,500	*(missing information)*	*(missing information)*	Owner or renter-occupied, but credit can only be claimed by homeowners who pay for deleading repairs
	Exterior Repair	**Exterior Home Repair Program**	Springfield	City of Springfield	Exterior Home Repairs (Exterior lead included)	ARPA - $4M for HH, $1M for this program. City wide.	$1,000,000	Max of $40,000	110	110	Homeowners who meet program income limits, are current on mortgage, have property insurance, and have no outstanding debts to the City
Indoor Air Quality (IAQ)	Asthma	**MassHealth Flexible Services Asthma Program**	Hampden, Hampshire, Franklin and Worcester Counties	Revitalize CDC	Asthma (IAQ included)	ACO's / MassHealth Flexible Services Program through BeHealthy ACO, Mercy/BMC ACO and C3 ACO (Community Care Cooperative)	$622,166 though funding is strict on what can fund home repairs	Max of $1,667	- Baystate Be Healthy: 250 per year (home repairs cut, was 40) - Mercy: 75 per year - C3: 60 per year (home repair funding for 10 members per year)	10 (home repairs)	Members of: Caring Health Center, Baystate Brightwood, Baystate High Street-Adults, Baystate Mason Square, Baystate High Street-Pediatrics, ACO sites for Mercy and C3 across four counties. Asthma diagnosis (no ervs + has needed). 64 and younger. Owner or renter-occupied
		Holyoke Medical Center asthma	Holyoke	Revitalize / Holyoke Medical Center	Asthma (IAQ included)	ARPA	$100,000	Average of $4,000	25 per year	25	Asthma diagnosis, low income, can self refer. Owner or renter-occupied
		Doorway to an Accessible, Safe and Healthy Home (DASHH)	Holyoke, Springfield	Revitalize CDC	Health & Safety Home Repairs (IAQ included)	Asthma, AIP, Nutrition Rx from combination streams	$2,000,000	Average of $3,000	600 per year	600	Owner or renter-occupied. Children and adults with high risk asthma, older adults on Medicaid, renters and homeowners, Nutrition 64 and younger all low income
	Pre-Weatherization Barriers: Electrification, Weatherization	**Weatherization Assistance Program (WAP)**	Springfield, Holyoke, Berkshire, Hampden County, other cities	Springfield Partners for Community Action	Weatherization (IAQ included)	WAP	$742,615	*(missing information)*	69 per year	69	60% AMI
		Mass Save	Springfield, West Springfield, Pittsfield	City of Springfield, / Energ-y-Save	Weatherization, Energy Efficiency, and Electrification (IAQ included)	*(missing information)*	*(missing information)*	*(missing information)*	*(missing information)*	*(missing information)*	*(missing information)*
	Heating System Repairs/Replacements	**Heating Emergency Assistance Retrofit Tasks Weatherization Assistance Program (HEARTWAP)**	Springfield	City of Springfield	Heating System (IAQ improved if heating electrified)	City funds heating repair and replacement. Fuel assistance from Valley Opportunity Council	*(missing information)*	*(missing information)*	Over 100 per year	100	Homeowners with <60% AMI
		Heating Emergency Assistance Retrofit Tasks Weatherization Assistance Program (HEARTWAP)	Holyoke, Hampden County except Springfield	Valley Opportunity Council	Heating System (IAQ improved if heating electrified)	LIHEAP	*(missing information)*	$ 7,500	80 per year	80	Must be eligible for fuel assistance; homeowners are eligible, for renters there must be a multi-year lease and commitment to not evict
Other Home Repair	Local Repair Programs	**Homeowner Rehab Program**	Brockton	Brockton Redevelopment Authority	Critical Home Repairs (Prioritizing Emergency Health & Safety Repairs)	HUD, CDBG	$530,000	Average of $30,000 to $60,000	10-15 per year (18 in current year)	10-15	Owner-occupied single or two-family home; LMI requirements
		Rental Neighborhood Improvement Program	Holyoke	OneHolyoke CDC	Critical Home Repairs (Lead, IAQ allowable)	HUD, CDBG	Currently $250,000 available	Max of $21,500	Varies, fewer than 10 per year, currently 18 properties in repayment	10	Multifamily housing with 3+ units; at project completion, 51% of tenants must meet Section 8 income limits
		Neighborhood Improvement Program	Holyoke	OneHolyoke CDC	Critical Home Repairs (Lead, IAQ included)	HUD, CDBG	Varies year to year, but around $200,000	Max of $10,000	25-30 per year	25-30	Property owners of one-to-four unit, owner-occupied properties; income qualified; must be current on city property taxes and utilities
		#GreenNFit Neighborhood Rebuild	Springfield, Holyoke and Chicopee	Revitalize CDC	Critical Home Repairs (IAQ included)	HUD	$250,000	Average of $12,500	20 per year	20	Low income owner-occupied.
		Homeowner Emergency Repair	Springfield	City of Springfield, Office of Housing	Critical Home Repairs (IAQ included)	HUD CDBG	$300,000 - $400,000 per year	Estimate of $10,000-$15,000	20-25 per year	20-25	Income limits 1 person $52,750 2 person $60,250 3 person $67,800 4 person $75,300 5 person $81,350 6 person $87,350 7 person $93,400 8 person $99,400
	State Repair Programs	**HUD Veterans' Home Modification and Critical Repairs**	Statewide	Revitalize CDC	Critical Home Repairs (IAQ included)	HUD	$730,000	Average of $12,000	51 per year	51	Veteran status either low-income or with a disability. Owner or renter-occupied.
		Home Improvement Loan Program	Statewide	MassHousing	Critical Home Repairs (IAQ included)	*(missing information)*	*(missing information)*	50,000	*(missing information)*	*(missing information)*	Homeowners who have lived in home for at least one year, meet income limits; 1-4 family properties

		PROGRAM	AVAILABLE GEOGRAPHY	FUNDING TYPE	FUNDING TERM(S) START	FUNDING TERM(S) END, RENEWAL OPPORTUNITIES	PROGRAM INTERVENTIONS / MENU OF SERVICES	WAITLIST STATUS (AS OF SUMMER 2023)
Healthy Housing (Lead & IAQ)	ARPA	**Healthy Homes Program**	Springfield	0% interest deferred payment loan, forgiven over five years if owner continues to occupy the home	2022-2023 for current program year	ARPA funds to be spent by 2026	Lead hazard remediation, asthma triggers	n/a - closed to new applications
	HUD	**Healthy Homes Production Grant**	Brockton	Amortization grant; 5-year lien decreases by 20% each year.	2023	2026	Asbestos, air quality, mercury, asthma, mold, mildew	N/A
		Healthy Homes Production Grant	Hampden County	Grant	1-Jul-22	31-Dec-25	Lead, radon, and healthy homes assessments; then healthy homes repairs following from assessments	Always
Lead	City-Level HUD	**Lead Based Paint Hazard Control Program**	Brockton	0% interest forgivable loan; 5-year lien that decreases by 20% each year. Balance is payable when property is sold, transferred, or refinanced	2021	2024	Remediation of lead based paint hazards. Healthy housing supplemental funding can address broader health and safety hazards.	No waitlist
		Lead Based Paint Hazard Reduction Program	Springfield	0% interest forgivable loans (75% forgivable after 3 years and balance due at sale or transfer)	2019	2022; City did not pursue new grant	Remediation of lead based paint hazards. Healthy housing supplemental funding can address broader health and safety hazards.	Did not have waitlist; challenges with recruitment
	State Programs	**Get The Lead Out**	Statewide	0% interest deferred-payment loans for owner occupants who meet income guidelines; payment due at sale, transfer, or refinancing of property	Annual allocation	n/a	Remediation of lead based paint hazards.	No waitlist
		Massachusetts Lead Paint Removal Tax Credit	Statewide	State tax credit equal to cost of deleading expenses, or 1,500, whichever is less	1987	Ongoing	Lead hazard remediation (requires initial inspection finding dangerous level of lead, and then after repairs, an inspection certifying deleading compliance)	N/A
	Exterior Repair	**Exterior Home Repair Program**	Springfield	0% interest deferred payment loan, forgiven over five years if owner continues to occupy the home	2022-2023 for current program year	ARPA funds to be spent by 2026	Roofs, windows, porches, siding, and painting for residences with 1-4 units	Currently not accepting new applications; no waitlist
Indoor Air Quality (IAQ)	Asthma	**MassHealth Flexible Services Asthma Program**	Hampden, Hampshire, Franklin and Worcester Counties	Contract with 3 ACOs to provide covered services to members. FFS model. Lots of other orgs can't reimburse like this. Money upfront was a little confusing. Medical supplies mostly.	Annual allocation since 2020. Two new contracts started April 1, 2023 from C3 and Mercy. Renewable depending upon MassHealth	Ongoing, Renewal Opportunities Available	Education (how to use asthma medication, how to reduce home triggers, how to reduce doctors visits / home hospitalization), Virtual Home Assessment from CHW, Free Supplies (Green cleaning spray, microfiber clothes, mattress protectors, pillow protectors, food containers, covered trash cans, mop & bucket, other supplies)	No waitlist
		Holyoke Medical Center asthma	Holyoke	Grant	Completed, however there is another ARPA Holyoke grant pending for $200,000	All ARPA to be spent by 12/24	Asthma-focused	Always
		Doorway to an Accessible, Safe and Healthy Home (DASHH)	Holyoke, Springfield	Grant for recipients. Flex Services are delivered under contracts with ACOs.	Started in 2015. Nutrition Rx started in 2021	Ongoing	Home assessment, education, home repair, IPM, supplies	Always
	Pre-Weatherization Barriers; Electrification, Weatherization	**Weatherization Assistance Program (WAP)**	Springfield, Holyoke, Berkshire, Hampden County, other cities	Grant	*(missing information)*	*(missing information)*	Typical weatherization measures include mechanical measures, building shell measures, electric and water measures, health and safety measures, and client education activities	*(missing information)*
		Mass Save	Springfield, West Springfield, Pittsfield	Grant	*(missing information)*	*(missing information)*	*(missing information)*	*(missing information)*
	Heating System Repairs/Replacements	**Heating Emergency Assistance Retrofit Tasks Weatherization Assistance Program (HEARTWAP)**	Springfield	Grant	*(missing information)*	*(missing information)*	Emergency heating system repair; pays for the cost of an annual inspection of a fuel burning system; or pays for the replacement of the system, if needed	*(missing information)*
		Heating Emergency Assistance Retrofit Tasks Weatherization Assistance Program (HEARTWAP)	Holyoke, Hampden County except Springfield	Grant	*(missing information)*	*(missing information)*	Heating system cleanings and replacements	Yes
Other Home Repair	Local Repair Programs	**Homeowner Rehab Program**	Brockton	0% interest, deferred payment loan; loan is payable when property is sold, transferred or refinanced	Annual allocation	n/a	Roofing, chimney, electrical, plumbing, floors, windows/doors, foundation, general carpentry, structure, lead (up to $10K match for lead program), more	Currently BRA is prioritizing emergency repairs with health/safety hazards. Homeowners with non-emergency repairs will be placed on waitlist. 52 on waitlist as of Summer 2023
		Rental Neighborhood Improvement Program	Holyoke	3% interest loan (20 year term)	Annual allocation	n/a	HVAC, windows/doors, painting, roof, safety lighting, interior rehab, masonry, code violation corrections	No
		Neighborhood Improvement Program	Holyoke	Grant	Annual allocation	Ending this year	New siding, new wiring, new plumbing, insulation, storm windows and doors, new driveways, lead-based paint removal, asbestos removal, roof repair, chimney repair, porch replacement, ceiling replacement, foundation repair, bathroom expansion for ADA accessibility, gutter and downspout replacements, aging in place modifications and smoke/heat detection systems.	Had a large waitlist over 100 but cleared it in recent years. Never reopened application process after waitlist was cleared.
		#GreenNFit Neighborhood Rebuild	Springfield, Holyoke and Chicopee	Grant	July 1, 2023	December 31, 2024	Critical home repairs	Always
		Homeowner Emergency Repair	Springfield	Single-item emergency repair: 0% interest deferred-payment loan, forgiven over five years if the owner continues to occupy the home as their principal residence. One-fifth of loan is forgiven each year. Payment of remaining loan balance (pro-rated) due at time of sale or moving	Annual allocation	N/A	Single-item emergency repair: Eligible items include, but are not limited to, repair or replacement of all or a portion of the following: roofs; heating systems; electrical or mechanical systems; dangerous steps, landings, and/or porches; handrails or guardrails; plumbing; inadequate flooring; foundation walls or crawl space piers; sump pumps; handicap accessibility; or other urgent code enforcement conditions. (roofs are common)	n/a - closed to new applications
	State Repair Programs	**HUD Veterans' Home Modification and Critical Repairs**	Statewide	Grant	Feb-19	February 2024; Will not apply again because there is $0 for project management and requires a 100% match	Home modifications focused on aging veterans	Always
		Home Improvement Loan Program	Statewide	5% loan for 5-15 year period. Can complement "Get the lead out program" by funding work that exceeds GTLO loan	*(missing information)*	*(missing information)*	General, non-luxury improvements to the home	N/A

		PROGRAM	AVAILABLE GEOGRAPHY	LINK
Healthy Housing (Lead & IAQ)	ARPA	**Healthy Homes Program**	Springfield	https://www.springfield-ma.gov/housing/home/housing-rehab-repairs/healthy-homes-program
	HUD	**Healthy Homes Production Grant**	Brockton	https://brocktonredevelopmentauthority.com/2023/07/26/healthy-homes-production-hhp-is-a-grant-for-2000000-the-city-received-towards-the-end-of-2022-and-beginning-of-2023-to-provide-financial-assistance-to-homeowners-and-tenants-to-mitigate-the-issues
		Healthy Homes Production Grant	Hampden County	https://www.revitalizecdc.com/dashhprogram
Lead	City-Level HUD	**Lead Based Paint Hazard Control Program**	Brockton	https://brocktonredevelopmentauthority.com/home/programs/leadprogram
		Lead Based Paint Hazard Reduction Program	Springfield	n/a
	State Programs	**Get The Lead Out**	Statewide	https://www.masshousing.com/home-ownership/lender-second-mortgage-forms
		Massachusetts Lead Paint Removal Tax Credit	Statewide	https://www.mass.gov/info-details/learn-about-financial-assistance-for-deleading
	Exterior Repair	**Exterior Home Repair Program**	Springfield	https://www.springfield-ma.gov/housing/home/housing-rehab-repairs/exterior-home-repair-program-1
Indoor Air Quality (IAQ)	Asthma	**MassHealth Flexible Services Asthma Program**	Hampden, Hampshire, Franklin and Worcester Counties	https://www.revitalizecdc.com/dashhprogram
		Holyoke Medical Center asthma	Holyoke	https://www.revitalizecdc.com/dashhprogram
		Doorway to an Accessible, Safe and Healthy Home (DASHH)	Holyoke, Springfield	https://www.revitalizecdc.com/dashhprogram
	Pre-Weatherization Barriers, Electrification, Weatherization	**Weatherization Assistance Program (WAP)**	Springfield, Holyoke, Berkshire, Hampden County, other cities	https://www.springfieldpartnersinc.com/services/housing-energy-services/weatherization/
		Mass Save	Springfield, West Springfield, Pittsfield	https://www.masssave.com/community-first/pittsfield-springfield-west-springfield
	Heating System Repairs/Replacements	**Heating Emergency Assistance Retrofit Tasks Weatherization Assistance Program (HEARTWAP)**	Springfield	https://www.springfield-ma.gov/housing/home/housing-rehab-repairs/home-heating-energy-assistance
		Heating Emergency Assistance Retrofit Tasks Weatherization Assistance Program (HEARTWAP)	Holyoke, Hampden County except Springfield	https://www.valleyopp.com/energy-assistance/heating-system-repair
Other Home Repair	Local Repair Programs	**Homeowner Rehab Program**	Brockton	https://brocktonredevelopmentauthority.com/home/programs/home-program/homeowner-rehab-program
		Rental Neighborhood Improvement Program	Holyoke	https://www.holyoke.org/community-development-community-resources-faqs/
		Neighborhood Improvement Program	Holyoke	https://www.holyoke.org/community-development-community-resources-faqs/
		#GreenNFit Neighborhood Rebuild	Springfield, Holyoke and Chicopee	https://www.revitalizecdc.com/greennfit
		Homeowner Emergency Repair	Springfield	https://www.springfield-ma.gov/housing/home/housing-rehab-repairs/emergency-home-repair
	State Repair Programs	**HUD Veterans' Home Modification and Critical Repairs**	Statewide	https://www.revitalizecdc.com/joinedforces
		Home Improvement Loan Program	Statewide	https://www.masshousing.com/en/home-ownership/homeowners

Appendix D: MA Cities with Active HUD Lead and Healthy Homes Grants

City	County	Program Type	Award Year	Period of Performance Start	Period of Performance End	Total Funding	Unit Production
LAWRENCE	ESSEX	Lead Based Paint Hazard Reduction	2020	1/1/2021	6/30/2024	$ 101,026	incl
LAWRENCE	ESSEX	Lead Based Paint Hazard Reduction	2020	1/1/2021	6/30/2024	$ 4,903,894	220
BROCKTON	PLYMOUTH	Lead Based Paint Hazard Reduction	2020	1/1/2021	6/30/2024	$ 4,700,000	210
NEW BEDFORD	BRISTOL	Lead Based Paint Hazard Reduction	2020	1/1/2021	6/30/2024	$ 2,400,000	110
MALDEN	MIDDLESEX	Lead Based Paint Hazard Reduction	2021	11/1/2021	5/30/2025	$ 3,100,715	142
QUINCY	NORFOLK	Lead Based Paint Hazard Reduction	2021	11/1/2021	5/30/2025	$ 2,915,000	80
MALDEN	MIDDLESEX	Healthy Homes Production	2022	4/1/2022	10/1/2025	$ 1,678,177	95
SPRINGFIELD	HAMPDEN	Healthy Homes Production	2022	5/1/2022	11/2/2025	$ 1,400,164	70
BROCKTON	PLYMOUTH	Healthy Homes Production	2023	3/15/2023	9/1/2026	$ 2,000,000	120
Total						$ 23,198,976	1,047

Reference Links:

- https://archives.hud.gov/news/2020/ProjectSummary_LBPHC_LHRD_Applicants2020.pdf
- https://archives.hud.gov/news/2021/pr21-126.cfm
- https://www.hud.gov/press/press_releases_media_advisories/hud_no_22_004
- https://www.hud.gov/sites/dfiles/PA/documents/Project-Summary-HHPA.pdf