THE CASE FOR
HEALTHIER HOMES

Recommendations for the Pittsburgh Region
“The connection between health and the dwelling of the population is one of the most important that exists”

– Florence Nightingale –

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THE CASE FOR HEALTHIER HOMES

Executive Summary

For those of us who live in Allegheny County, we are lucky to be immersed in beautiful scenery and a rich history. Unfortunately the regional topography and geologic formations, as well as the above-average age and poor condition of our housing stock, can also pose health risks to our residents. This paper focuses on factors that are common in the homes of the Pittsburgh region, such as lead paint, radon, and moisture incursions that lead to mold. We start by examining efforts to address these concerns that are currently underway in the City of Pittsburgh, Allegheny County, and the regional non-profit community.

UNDERSTANDING COMMON HEALTH RISKS

**Lead** has received a lot of attention in the media of late, especially in Pittsburgh. Lead exposure is extremely detrimental to the developing brain, making children particularly vulnerable to a host of problems including developmental disorders, reduced IQ, attention deficit hyperactivity disorder (ADHD), and others. The most common type of exposure is through the ingestion of lead paint dust. Unfortunately, the bulk of Pittsburgh’s housing stock is at risk, with the majority of it having been built prior to 1978, when lead-based paint was outlawed in residential buildings.

Lead does not break down over time or go away on its own, and its damage cannot be reversed. There is no safe level of exposure to lead, and lead poisoning can result from many sources including lead paint dust (the most common source of exposure), but also lead in water and soil around the house. At the moment, much of the focus on lead remediation across the country is geared toward secondary prevention, which intervenes after a child’s blood test is confirmed to contain a certain amount of lead. More progressive approaches involved primary prevention, which seeks to eliminate lead risks before children are exposed to them.

**Mold** is a risk wherever there is moisture. Moisture can result from a variety of conditions, many of which are common in our region: groundwater seeping through foundation cracks or unfinished basement floors, rainwater leaking through improperly sealed roofs and walls, even improperly air-sealed homes that result in poor ventilation and thus condensation in walls and attics. Exposure to mold can cause a host of problems, such as asthma or obstructive lung disease or lung infections in more serious cases. If homes are weatherized or air-sealed to reduce drafts without properly addressing the factors that lead to mold, often the health hazards can be exacerbated.

**Radon** is a colorless, odorless, radioactive gas that results from the decay of uranium. The geologic makeup of Southwestern Pennsylvania puts Allegheny County in an area considered by the Environmental Protection Agency (EPA) to be Zone 1. A Zone 1 designation means the predicted average radon level is over 4 pico curies per liter (pCi/L), the level at which the EPA recommends corrective action. Long-term exposure to radon gas is harmful specifically through inhalation of the radioactive particles, which settle in the lung tissue and cause damage, leading to cancer. Any home, regardless of age or condition is at risk for the presence of radon gas. While some states have requirements for radon-
resistant construction for newly-built homes, Pennsylvania is not one of them. Radon testing and installation of mitigation systems are relatively simple and inexpensive, but the general awareness of radon’s existence and risks remain low.

Despite outreach and educational materials provided through various governmental and non-profit organizations, these risks do not appear to be a high priority in the minds of residents. Such home health risks are shown to have a disproportionate impact on low-income households. Older homes in disrepair tend to have higher risk for lead paint and mold, and their residents are likely to be focused on more immediate concerns, such as food or rent, than they are on long-term concerns, such as home efficiency or health. Unfortunately, even for households that understand the risks, not everyone has the latitude to make necessary changes or repairs. For instance, tenants who live in substandard housing may not always feel comfortable making a complaint for fear of retaliation from the landlord. To that end, there are policies in place at the federal, state, and local levels throughout the country to support stakeholder education, risk remediation, and tenant protections.

CCI’S EFFORTS THROUGH “GRASSROOTS GREEN HOMES”

As a non-profit organization focused on healthy and efficient homes, CCI has had the benefit of interacting with a large number of residents (both homeowners and renters) and seeing some of these issues first-hand. Our community outreach program called Grassroots Green Homes, which is made possible through generous funding from the R. K. Mellon Foundation, recently engaged over 500 community members in the Pittsburgh neighborhoods of Oakland and Uptown with the goal of increasing their knowledge base around energy efficiency and home health, providing them with low-cost tools and tips to make changes in their own homes, and encouraging them to coach their friends and neighbors in adopting these simple changes as well.

We gathered information from our participants about common home issues they encountered and fixed, how frequently they participated in picking up their toolkits and newsletters, and whether their knowledge and perceptions changed over the course of the year-long program. Twenty owner-occupied homes were selected from this larger group to receive full home health and energy assessments, home weatherization, and remediation of health risks, all at no cost to the homeowners.

There is more detail on our findings from these homes below, but we received quantitative and qualitative feedback from participants indicating an average reduction of energy use and a perceived increase of home health across both components of the program. It became apparent through our own interactions that lasting success requires a complex coordination of resources from multiple entities in addition to an outlet for ongoing interaction with residents, who often need to learn how to adjust their behaviors, as well as understand why it is important to do so.
CURRENT LEGISLATIVE AND PROGRAMMATIC EFFORTS IN PENNSYLVANIA

State legislation is difficult to pass because of the varied political climate in Pennsylvania, largely divided between urban and rural communities. There is some limited statewide policy for home health hazards including:

- a statewide mandate requiring disclosure of radon testing data during real estate transactions (Pennsylvania Code § 35.335a)
- civil penalties for misrepresentation of radon readings (Pennsylvania Code § 240.402)
- Senate Resolution 171, a 2002 resolution recommending the Department of Health establish a task force to investigate mold in homes and schools (Pennsylvania Legislature 2002)
- the Lead Certification Act of 1995, which requires certification and training of workers doing construction or renovation work in buildings built before 1978; this act also assigns fines and penalties to violators (Pennsylvania Legislature 1995)
- a requirement that medical laboratories report blood lead levels to the PA Department of Health (Pennsylvania Code § 27.34)
- The “Plumbing System Lead Ban and Notification Act,” a ban on the sale of leaded materials used in plumbing (Pennsylvania Legislature 1989)

Pending legislation for lead includes a call for mandated education of new parents before being discharged from the hospital, a state law adoption of federal Title X legislation for homeowner and tenant education of present lead risks, and the establishment of a superfund to remediate institutions and housing units where children are located. Recently Pennsylvania Governor Tom Wolf has called for universal blood lead testing for children under two years of age across the state.

County code does not include language for radon or mold, though water leaks, which can lead to mold, are investigated. Lead policy in the county, however, had a major win recently with the passing of universal blood lead testing for children under six years of age, which will become active on January 1, 2018. Per the health code, the County can cite landlords for lead-based paint hazards, including peeling paint, whether or not children under the age of six are living in the home.

The Allegheny County Health Department (ACHD) has been working in recent years to reduce lead risks in homes, despite the limitations on their funding. In November 2016, ACHD lowered their Elevated Blood Lead Level (EBLL) investigation threshold from 15 micrograms per deciliter (μg/dL) and above to 10 μg/dL and above (halfway to the American Academy of Pediatrics’ recommended 5 μg/dL and above). ACHD has also begun outreach to the group of homes with children confirmed at or above 5 μg/dL and below 10 μg/dL, also called the “5 to 9 group.” Additionally, they have trained 10 inspectors on their team to become lead risk assessors, expanding the department’s bandwidth. Further detail on the County’s efforts can be found in the body of this report.
City legislation in Pittsburgh is influenced by our Home Rule Charter, which allows for the shift of responsibility from the state legislature to the municipality, except where specifically limited by the state. The charter makes recommendations for a strong mayoral system, City/County collaboration or consolidation of services, and advisory boards and neighborhood community groups. There is currently no city-wide policy for mold, lead, or radon. There is, however, a piece of legislation designed to require Pittsburgh rental units to be registered, the first step in creating a rental registry that discloses information about health hazards related to a specific rental unit. The measure passed but is, at the time of writing, being strongly opposed by the business community as a gross overreach.

The City makes commitments of financial support to housing initiatives, as it did in April of 2017, providing matching funds for a Department of Housing and Urban Development (HUD) grant. Pittsburgh is also visible through efforts such as the 100 Resilient Cities project, which promotes stakeholder engagement across sectors to address air and water quality, safe infrastructure, and the building of a green economy. In July of 2017, Mayor William "Bill" Peduto signed a compact with the Green and Healthy Homes Initiative, a national organization focused on breaking the link between unhealthy housing and unhealthy kids.

Not-for-profit and non-governmental organizations are involved in the effort as well to protect homeowners and renters from these health hazards: the Urban Redevelopment Authority manages an interest-free home improvement and energy efficiency loan program; Rebuilding Together Pittsburgh and Habitat for Humanity manage construction efforts for the building and renovation of homes; ACTION Housing manages the statewide Weatherization Assistance Program; CCI manages energy efficiency programs for utility companies and advocates for healthy housing; Women for a Healthy Environment advocates and runs outreach programs for healthier homes; and so on. For those organizations in the Pittsburgh area non-profit arena, there is a great deal of enthusiasm and determination around taking action to solve problems.
EXAMPLES OF SUCCESS THROUGHOUT THE COUNTRY

Our research into benchmark programs for this report included a nationwide survey of federal, state, and municipal legislation, as well as non-governmental efforts that bolstered (or stood in the place of) any existing legislation. In addition to the empirical findings from our own program, we have included a summary of research into federal, state, and local regulations supporting healthy housing initiatives. Several cities are leading the charge with innovative and effective programs, and we have provided as much detail as possible while keeping the report to 100 pages. Some of the most notable examples of effective and innovative policies and programming from around the country include:

- Universal blood lead testing (Massachusetts)
- Enhanced and targeted home inspections for homes in “high risk” areas for lead paint exposure (Cleveland, OH; Chicago, IL)
- Tracking and posting of lead testing data and remediation history for public places, such as playgrounds (Portland, OR)
- Loan assistance for Section 8 housing improvements (Burlington, VT)
- Creating a rental registry (Montgomery County, MD; Cleveland, OH; Boulder, CO; Philadelphia, PA; Chicago, IL)
- Landlord education and engagement programs (Boulder, CO)
- Mandate disclosure of health hazards at time of sale (Chicago, IL; Cleveland, OH)
- Community partner collaboration for ongoing support and education of residents (Montgomery County, MD)
- Publishing a “score card” for the City’s efforts (Portland, OR)

RECOMMENDATIONS FOR AN ENHANCED APPROACH TO HEALTHY HOMES

Combining our research on these benchmark policies, our own experience with the Grassroots Green Homes community outreach program, and our knowledge of the policies and initiatives in place here in the Pittsburgh region, we have constructed a set of five recommendations that will serve to protect our residents, arm homeowners and renters alike with necessary knowledge, and create a more collaborative environment for the myriad organizations devoted to creating healthy, efficient, and affordable homes in the region. Please see the recommendations section of this paper, beginning on page 89, for full detail on each of our recommendations and related strategies for success, along with examples of similar programs we have found throughout the country. The following page shows a summary of these recommendations as presented on an educational poster that will be used to support CCI’s continuing work in this area.

See the recommendations poster on the following page.
THE CASE FOR HEALTHIER HOMES: RECOMMENDATIONS
FOR THE PITTSBURGH REGION

1. PROTECT CHILDREN
   - INVESTIGATE ALL Instances of Elevated Blood Lead Levels in Children.
   - DEMAND Resources for Known “Hot-Spot” Neighborhoods.
   - SAFEGUARD Places Where Children Gather.

2. PROTECT PEOPLE WHO RENT
   - ESTABLISH All Rental Units – Including Voucher-Paid Housing Units – as Healthy Homes.
   - CONFIRM Lead-Safe Construction and Demolition Practices are Being Followed.
   - ENGAGE Landlords to take a Voluntary Healthy Home Pledge.

3. DECLARE HEALTHY HOMES A PUBLIC HEALTH POLICY PRIORITY
   - FIX the Homes and Apartments that Pose Health Risks from Lead, Radon and Mold.
   - LEVERAGE Synergies Between City and County Efforts.
   - INVOLVE the Medical Community to Assist in Best Practices and Data Tracking.

4. ARM THE PUBLIC WITH ACCESS TO INFORMATION
   - POST Easy-to-Navigate Home Health Data on the County Health Department Website.
   - BOOST Disclosure of Information at Time of Sale or Lease.
   - COORDINATE Ongoing Education and Support Opportunities for Residents.

5. GUARANTEE GOALS THROUGH MONITORING AND REPORTING
   - EXPAND Support to At-Risk Homes through Cross-Functional Network.
   - CREATE County-Wide Rental Registry on Testing, Remediation, and Compliance.
   - PUBLISH an Annual Healthy Homes Scorecard.

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Get the full detail on these recommendations and download the paper here: www.getenergysmarter.org/advocacy
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Identifying the Problem: Connecting Health with Housing

The impacts of exposure to environmental toxicity in the home are often subtle and gradual.

When an individual seeks care in a clinic for a more acute stress to the system, such as food poisoning, the cause and effect relationship between symptoms and source is starkly evident. In the case of toxic exposure, the range and severity of symptoms can vary: headache, nausea, general malaise, cough, hyperactivity, skin conditions, and developmental delays. These symptoms are commonly the first ones to appear, but medical providers cannot always properly attribute the symptoms to the cause. Unfortunately, if the culprit lies somewhere within the walls or air of the individual’s home, it may be very difficult to pinpoint without deep investigation into the patient’s lifestyle and the structure of the house itself. Without proper diagnosis and intervention, many exposures result in irreparable brain damage, cancer, and even death (Drawing Detroit 2013; Sanders et al. 2009; World Health Organization 2017). Despite the indisputable evidence from the scientific community, little credence is given to the threat these toxins pose. This paper explores critical toxins prevalent in our region’s homes – lead, radon and mold – and the opportunities to proactively fix them.

Household responsibilities can easily fall into the category of “out of sight, out of mind,” especially when education and support related to these prevalent toxins are unavailable or under-utilized. Yet toxic compounds in the home, such as lead, can be found in the water supply, garden soil, windowsills, and paint on the walls. For those exposed, it is also in their bone marrow, lungs, and blood, quietly crippling children’s developing brains (Hamblin 2014). The threat of common household exposures such as lead, mold, and radon may be difficult to see, yet dismissing them costs our country billions of taxpayer dollars through lack of action (Scutti 2016).

Medical professionals and elected officials are increasingly connecting the fiscal burden of treating many chronic diseases and life-threatening toxins to poor housing conditions and therefore taking steps to protect their communities (Krieger and Higgins 2002). In the absence of comprehensive and properly-enforced consumer protection at the federal level, individual municipalities and states are leading the way in promoting healthy homes. These cities go the proverbial extra mile, taking a stand to pledge to do whatever it takes to protect their children. Pittsburgh, once a national leader in childhood health impacts tied to home conditions, has the opportunity to once again join the ranks of this vanguard effort.

This paper explores the broad strokes of federal, state, and municipal policies surrounding lead, mold, and radon exposure in the home. It seeks to inform the Allegheny County community of what is happening in our own neighborhoods, summarize Pittsburgh’s history and present state of addressing these hazards, and inspire us with the examples of how other cities have faced some of the same challenges.
The trio of toxins we cover in this paper are especially prevalent in Allegheny County and the Southwestern Pennsylvania area because of our topography, which lends itself to heavy rainfall, runoff, and flooding; our location in a radon Zone 1. (US Environmental Protection Agency 2017); and the condition of our older housing stock, which can be subject to a host of problems including mold-causing water incursions, improperly vented basements resulting high radon counts, and the presence of lead paint, which can be present in any home built before 1978, when its use was outlawed for consumer use. Given a demonstrated connection between mold and asthma, radon and lung cancer, and lead and developmental delays, it seems logical that the proper course of action would be to test homes and warn residents about the potential for such risks. However, while there are some laws in place requiring disclosure of toxins present, our current system leaves most buyers and renters unaware of the risks and what to do about them.

It should be noted that educated consumers making large investments often take such risks into account. For example, commercial banks brokering multimillion dollar commercial investment properties take environmental hazards as seriously as they ought to be taken. These banks hire professionals to pour over property deeds and study aerial photographs to ascertain where substances that are now illegal may have been spilled, mixed, or housed before they were banned. They call in specialized research scientists to take exhaustive samples of soil, dust and paint. These commercial real estate investors know that environmental hazards are real and understand the risks associated with contaminated property (Ledder 2017). However, it is not as common to see such care being taken with residential buildings. This dichotomy could indicate that while investment bankers comprehend the risks associated with these environmental hazards, the majority of homebuyers and landlords do not. Even if residential property owners understand that a risk is present, it is possible that they do not comprehend the severity of the risk or the impact on the residents. They may understand that the renovations required would cost upfront money, time and energy to fix substandard housing, but it is likely that they, as of yet, do not fully understand the savings to society primary prevention efforts produce. “Primary Prevention” is the remediation of lead hazards before exposure and lead poisoning occur, while “Secondary Prevention” refers to remediation efforts where an elevated blood lead level is found.
Fig. 2: Levels as low as 1.43 μg/dL are shown to cause significant damage to IQ levels. Reproduced with permission from the Journal Pediatrics, Vol. 138(1), Page 4, Copyright © 2016 by the AAP (Council on Environmental Health 2016).

Tax dollars are already paying a steep price for the burden of chronic disease, asthma, lowered IQ, behavioral problems from damaged brain tissues, highly correlated with crime, and developmental delays due to toxic exposures in the home (Drum 2016; Gould 2009; Scutti 2016). One study on lead paint hazard control found that an initial investment of $11 billion in lead paint hazard control resulted in dramatic savings for society. Properly completed lead hazard remediation resulted in savings of $53 billion in public healthcare costs, decreased the costs of special education and Attention Deficit Hyperactivity Disorder (ADHD) treatment by upwards of $400 million, and decreased crime related costs by approximately $1.7 billion over the lifetime of the cohort. The cohort’s increased earning potential, stemming from improved neurocognitive development, generated an approximate $25 billion in tax revenue, more than double the initial cost of remediation. Some studies have shown that for each dollar invested in lead paint hazard control, a net return of $17-$221 was garnered (Gould 2009).

The high cost of social inaction can only be fully appreciated when one understands both how profoundly the health of an individual is tied to the health of his indoor environment and the staggering proportions of the problem (Adamkiewicz et al. 2011). According to the American Healthy Homes Survey, an exhaustive national study on the environmental condition of American housing stock, 37.1 million homes (34.9%) contain lead-based paint, of which 23.2 million (21.9%) have one or more clear lead hazards. Of these homes with lead hazards, an estimated 3.6 million house our citizens most vulnerable to permanent brain damage from lead exposure: children under the age of six (Cox et al. 2011).

As would be expected, the highest concentration of homes with lead-based paint hazards regionally is in the aging housing stock of the Atlantic Northeast and the post-industrial Midwest. The older the home becomes, the more prone it is to develop a hazardous condition for lead-based paint, as well as a variety of deteriorations that lead to increased asthma triggers, mold toxicity, thermal dysregulation, and conditions that do not support human well-being (Chintalapalli 2017). Compounding matters, the very programs designed to combat this abysmal state of affairs and help its victims are continually stripped of funding. At present, only 29 states participate in the Center for Disease Control (CDC)’s minimal Childhood Lead Prevention Program and voluntary data surveillance system, making it difficult to know where to direct federal funding for the neediest communities (Lurie 2016).
THE CASE FOR HEALTHIER HOMES

HOW LEAD IS HARMFUL

Lead, and above all lead dust, remains the indoor health hazard that poses the greatest threat to health and highest cost to society in both children and adults (Gould 2009; Sanders et al. 2009).

The vast majority of lead dust exposure results from ingestion, particularly when it settles on surfaces, and children carry it to their mouths on their hands or toys. It can also be inhaled when mobilized through repeated wear on friction surfaces such as doors and windows, or through renovation work, specifically through sanding or demolition. Most recognize the toxicity of other poisons, such as arsenic, and know to avoid them, yet many do not realize that as a natural metal, lead left in one location does not decay and will continue to cause harm for however long it is there. There are many types of exposure to lead, and any level, by any method of exposure is toxic: particles in air, dust, dissolved ions in corrosive water, old paint beneath recent fresh coats, and toxic soil around the house or in the playground, exposed through years of leaded gasoline exhaust, or demolition from pre-1978 buildings nearby (World Health Organization 2016; Centers for Disease Control 2017).

Fig. 3: Relationship between vector and blood lead level From AAP Lead Policy report – equal quantity of lead exposure from different sources results in varied increases in blood lead level. Reproduced with permission from the Journal Pediatrics, Vol. 138(1), Page 6, Copyright © 2016 by the AAP (Council on Environmental Health 2016)

The ability for lead to act on a molecular level explains why even one microgram, the equivalent of three granules of sugar, is enough to cause lead poisoning in a child (Green & Healthy Homes Initiative 2014). While arsenic closely resembles carbon in shape and electrical charge, a lead ion closely resembles that of calcium and iron. These two vital elements play a primary role in oxygen transport, bone growth, muscle coordination, nerve function, and neurocognitive development (Simons 1988) (Abbaspour et al. 2014). If one thinks of red blood cells as the body’s pack horse for carrying oxygen, then iron is the saddle. When biological machinery confuses lead for iron, red blood cells strapped with a nonfunctional “saddle” hinder cells’ ability to breathe across all tissues in the body (Aub and Reznikoff 1924).

Unfortunately, the damage does not stop there. Lead wreaks further havoc on systems that depend on calcium ions as well (Simons 1988). Although the importance of calcium in bone development is common knowledge, the typical consumer may not know that many peripheral nerves and brain tissues depend on signals from calcium ions in order
to function, develop, and coordinate activities with other organs (Braet 2004). When lead enters into these signaling pathways, they are not only disrupted, but they are also continually assailed by toxic metal accumulation in the body (Sharma et al. 2014). Due to its similarities with calcium, lead is easily deposited in bone and teeth throughout a person’s lifecycle, which can cause internal re-exposure as osseous tissues demineralize with age, and/or with pregnancy, years after leaving the toxic environment (Centers for Disease Control 2017). The complex interrelationships of different organ systems are thrown out of balance as they compensate for compromised vital functions. Adult lead poisoning results in increased risk of high blood pressure, kidney damage, decreased fertility, peripheral nerve damage, loss of motor coordination, malaise, anemia, and a broad spectrum neurological dysfunction including coma. Lead is a naturally occurring toxic metal found in the Earth’s crust, but its widespread use has resulted in extensive environmental contamination, human exposure, and significant public health problems in many parts of the world (World Health Organization 2016). Far worse are its impacts on children.

Fig. 4: Risks of lead exposure in the home. Reprinted with Permission from American Academy of Pediatrics. (American Academy of Pediatrics 2017)
It is important to stress that there is no safe level of lead exposure. The Centers for Disease Control set the upper limit for blood lead levels at 5 micrograms per deciliter of blood (μg/dL) for children (2015a), but this value is not an “action level” or a “level of concern.” Rather, it is a reference level, set at the 97.5th percentile of the population blood lead level in children ages one through five. Furthermore the Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) recommends that the reference value be updated by the CDC every four years based on the most recent population based blood lead surveys among children (Centers for Disease Control 2012).

Even with these low thresholds, the Centers for Disease Control has established that no amount of lead in the bloodstream is considered safe (Council on Environmental Health 2016). Children's elevated metabolic rates enable them to absorb up to four or five times as much lead as adults. Lead exposure in children poses a particular threat to their rapidly developing brain tissue and is responsible for nearly 10% of all intellectual disabilities worldwide (World Health Organization 2016). Children who survive severe lead poisoning episodes are often left with permanent mental retardation and behavioral disorders. Even relatively small exposures result in an increase of antisocial behavior, hypertension, renal impairment, and immunotoxicity as well as reduced IQ scores, attention spans, fertility, and educational attainment, depending on the severity of exposure (World Health Organization 2016).

Correspondingly, lead exposure during pregnancy poses particular dangers as it is capable of crossing the placental barrier (Gundacker and Hengstschläger 2012). Babies exposed to lead in the womb show impaired neurocognitive development as early as three months of age and are more likely to have a low birth weight. Mothers who are exposed to lead during pregnancy or are internally re-exposed due to demineralization of their bones during pregnancy are more likely to be unable to carry their pregnancies to term or to suffer from dangerous preeclampsia (American College of Obstetrics and Gynecologists 2012).

As sobering as the well-studied health impacts of lead exposure are today, emerging research in epigenetics reveals that they are yet worse than previously imagined (Senut et al. 2012). Medical science has proved that our genome is not a static entity passed from parent to child but rather a dynamic code that is continually interacting and responding to its environment. Different environmental triggers cause expression of genetic traits to be altered in ways that can impact up to three generations in the future (Daxinger and Whitelaw 2010). Lead exposure has been shown to downregulate – or decrease the quantity of a cellular component in response to an external variable – the expression of factors crucial to synapse development and synthesis of new neurons, while upregulating known precursors of adult onset neurological diseases such as Alzheimer’s (Senut et al. 2012). Groundbreaking studies show support for true transgenerational transmission of epigenetic modifications, suggesting that the decisions we make today impact not only ourselves, but also our great grandchildren and possibly even their descendants (National Center for Healthy Housing 2017).
LEAD AND ASTHMA IMPACTS ON LOWER-INCOME HOUSEHOLDS

Although lead is an “equal opportunity toxin” it disproportionately impacts low income children (Brooks-Gunn and Duncan 1997).

It is imperative to this study that we avoid the pitfalls of single-issue thinking and neglect many of the factors that act in concert to heighten the grievous harm of lead poisoning on developing bodies. Of chief note, the American Academy of Pediatrics issued a landmark statement linking the chronic stress of poverty to negative impacts on brain development, specifically noting steroid hormone levels so elevated in their subjects’ blood that the impact on developing brain tissue was comparable to cocaine exposure (Lende 2012).

The toxic properties of lead combined with conditions of poverty in substandard housing cannot be overstated. Substandard housing can cause the slow, progressive, yet highly effective poisoning of children through lead exposure, but the other culprit is the air quality in these buildings, causing respiratory issues for its young residents (Miriam Stewart 2016). In one socioeconomic racial distribution curve, minority and lower socioeconomic status households tended to have a higher concentration of pollutants and asthma triggers in their homes (Adamkiewicz et al. 2011). At present, an African-American child is four times more likely to die from asthma-related triggers than a Caucasian child.

Nearly half of all Native American children have asthma, nearly 600% higher than the prevalence in Caucasian children (American Lung Association 2013).

At present, an African-American child is four times more likely to die from asthma-related triggers than a Caucasian child.

Fig. 5: Impacts of poor air quality on children’s lungs. Reprinted from FaceTheFactsUSA.org.
Housing conditions are directly responsible for generating asthma triggers because poor ventilation, water intrusion, pests, and deteriorated carpets work together to fill indoor air with noxious particulate matter (Krieger 2010). Among these triggers, mold is a public health menace whose reproductive spores and toxic metabolic byproducts act not only as a respiratory irritant but, depending on the species present, a biotoxin as well. Despite the fact that toxicity, individual sensitivities, and allergic responses to mold vary, mold spores themselves are an essentially uniform asthma trigger (Mayo Clinic 2017; Richen 2017). It has been proven that home interventions aimed at remediating mold, eliminating water intrusion that feeds mold, and optimizing ventilation reduce child asthma symptoms greatly (Kercsmar et al. 2006).

The principles of healthy homes, as published by the National Center for Healthy Housing, stipulate that homes should be dry, clean, pest free, safe, contaminant free, ventilated, maintained and thermally controlled (National Center for Healthy Housing 2017). These principles that do so much to improve the health of asthmatic children, however, reflect simple conformity with common components of municipal building codes (Cummins and Jackson, 2001). The fact that these simple practices for maintaining home health are not honored by property owners reflects a peculiar blind spot in American public health practice. Some critics question why is it that restaurants are required to undergo rigorous scrutiny to protect the health of their customers while property owners are overwhelmingly not. The home, they say – whether rented or owned – is arguably as great if not greater potential source of disease and public health risk (Tanguay 2017).
RADON: THE HIDDEN KILLER

As a capstone to our tour of these three common and deadly household exposures, we must highlight the far under-recognized lethal potential of radon, a Class A carcinogen and the second leading cause of lung cancer in the United States (US Environmental Protection Agency 2015b).

Unbeknownst to most, radon is the number one cause for home-related death (Centers for Disease Control 2013a). Because it is an odorless, colorless and slow-acting killer, it is frequently dismissed or simply not acknowledged even though it is found at dangerous levels in one out of every 15 homes (Kevin Stewart 2017).

Radon is caused by the decomposition of naturally occurring uranium that accumulates in home environments. It bathes sensitive lung tissue in a steady stream of radiation through the breath. This toxic gas is released from the soil and seeps into basements through small openings in the foundation. Radon tends to have higher concentrations in basements, but it can move freely enough to impact all areas of the home (Dooley 2017). As a pervasive environmental threat, radon claims 20,000 lives through terminal lung cancer annually, significantly more than annual drunk driving related mortalities (Centers for Disease Control 2013a).

Fig. 7: Annual deaths from radon exposure vs. other sources. Reprinted with permission. (US Environmental Protection Agency 2017d)

Fig. 8: Radon zones in Pennsylvania. Reprinted with permission. (US Environmental Protection Agency 2017c)
In contrast to other household exposures discussed this far, radon can be present in any home, irrespective of the home’s age and the occupants’ socioeconomic status (Colditz 2015). While higher-income, higher-educated homebuyers may be more aware of the issue and thus more likely to test for radon and spend money on remediation, any home in any neighborhood may be at risk. Long-term residential exposure to this airborne carcinogen in both newer and older housing stock alike is the root cause of most all radon related cancer (Field et al. 2006). At present, one in 15 American homes contains radon levels above the Environmental Protection Agency (EPA) action level of 4 picocuries per liter (pCi/L) (US Environmental Protection Agency 2011).

The Surgeon General, EPA, and CDC all urge testing for radon levels in the home and taking preventative action where necessary (Centers for Disease Control 2013b; Office of the Surgeon General 2009). Such preventative action requires installing a simple ventilation system – performed by a certified professional – and thoroughly sealing the home’s foundation from the ground below. This method of mitigation is significantly less expensive than many common household repairs, including lead remediation, at an average of $1200 per unit (Dooley 2017).

Radon Resistant New Construction methods which, when installed with the house during the building process, cost as little as $400 (Reddinger 2017). Improperly installed systems and testing by uncertified contractors often result in false results and may even worsen radon exposure. Similarly, uninformed energy efficiency efforts may seal the home’s envelope and concentrate indoor pollutants to dangerous levels (US Environmental Protection Agency 2014a), which is why radon testing should be part and parcel of energy efficiency efforts. Despite its high-profile as a Class A carcinogen, testing for radon during real estate transactions and disclosures of elevated radon levels by landlords are far from commonplace (Geltman 2016; Robertson 2013).

Through CCI’s research for this paper, training in building science, and interaction with low-income communities, it has become apparent that solving one issue alone is not enough, if it is even possible to touch just one alone. In our work we see that the many different issues tied to energy efficiency, air quality, resident health, and sound practices on the part of the residents and/or property owner are inextricably connected. Therefore, our approach in remediating homes and educating families in our region is a holistic one, pulling support from multiple stakeholders to create more positive and lasting impacts.
II. Lessons Learned from “Grassroots Green Homes”

In addition to exploring the current state of Pittsburgh housing through historical research and interviews, CCI has the benefit of being able to examine the state of our local housing stock first-hand through the normal course of the services we provide. In the course of fulfilling our mission of promoting responsible resource use and healthy homes, we manage a community-based outreach and education program called Grassroots Green Homes (GGH), which is made possible through generous funding from the R. K. Mellon Foundation. GGH leverages a peer-to-peer education model to engage community members in learning about home health and performance, thus catalyzing them to take voluntary actions to improve the health, comfort, and performance of their homes. It is inspired by the notion of grassroots education being an effective community-level tool and placing focused, intense effort into a compact geographic area.

CREATING AWARENESS AND SHAPING BEHAVIOR: THE “ENERGY EFFICIENCY CHALLENGE”

Over the course of one year, neighborhood volunteers from the Pittsburgh neighborhoods of Oakland and Uptown were trained in a variety of outreach techniques to support and grow the program, as well as in energy efficiency and home health tools and techniques to support education of program participants.

More than 300 households in both neighborhoods participated in a year-long “Energy Efficiency Challenge.” Participating homes received a free tool and tip for each month of the year, and the residents pledged to do their best to incorporate these new tools and practices into their daily routines.

This program was open to both renters and homeowners. Participants with access to their utility bills shared their usage data for the term of the program and the year prior to help CCI determine the level of impact this program had on their energy usage. At the time of this report, CCI was engaging in exit surveys with participants to determine if and how their perceptions, awareness, and attitudes have changed toward home health. Information available is included below.

Housing Stock – Age and Condition

While Pittsburgh has some of the oldest housing stock in the nation, the neighborhoods participating in Grassroots Green Homes had particularly old homes. Based on data available in the Allegheny County property database for 285 of our participating homes, 89.82% were built before 1950, with a median construction date of 1912.

The County property database also listed the condition of the homes, which is a slightly more subjective ranking. Our understanding of these categories, as described by a representative from the Office of Property Assessments is as follows:
THE CASE FOR HEALTHIER HOMES

“Physical condition of a building means how well it has been maintained throughout the years. Most existing buildings are considered to be in Average condition for their ages. If there have been no updates (kitchen or bath) or few repairs over time, foundation problems, etc., a building condition could be brought down to Fair with an inspection or other proof, such as photos. CDU (Condition, Desirability and Utility) is also a condition factor of a building. These range from Excellent to Unsound. This takes into account not only the building itself, but the quality of the neighborhood. This is another area were value uniformity is attempted to be maintained throughout the neighborhood. Usually an AVERAGE CDU means that the value does not increase as much OVER TIME, as would happen with a GOOD CDU, which also takes into consideration the year built.” (Allegheny County Office of Property Assessments 2017)

Fig. 9: Year of home construction for Grassroots Green Homes participants.

Fig. 10: Condition of homes among Grassroots Green Homes participants, per County Property Assessment.
Almost all (98.25%) of participating GGH homes that were listed in the County property database were considered to be “Average” or below, with more than half (53.33%) falling below Average: “Fair,” “Poor,” or “Very Poor”.

The intersection of old homes and sub-standard conditions creates an increased risk for health hazards, particularly that of lead paint, as any pre-1978 home has the potential to contain it. The chart below represents self-selected data from each of our program participants. When registering for GGH, a participant was asked to complete an Intake Survey and report on demographic information, behavior trends, perceptions and beliefs about energy efficiency, and issues noticed in his/her home.

The list of home issues contained ten common problems related to home condition, and the participant was asked to respond with a Yes, No, or Not Sure. The full list of issues is included here:

- Mold or Mildew
- Damp walls or windows
- Leaks from roof
- Leaks in basement or from pipes
- Peeling paint or lead paint
- Inconsistent temperatures
- High utility bills
- Drafts
- Rotting wood
- High radon

It is important to highlight that this data set is more subjective than the first graph above listing “Year of Construction,” as these responses are based on the resident’s awareness or perception of the issue. For example, a participant may have responded “No” to having high utility bills if the participant’s landlord pays the utility bills, making the tenant unaware of the bill. In analyzing this data, we noticed a slight correlation between female participants and damp windows or walls, while there was a slight correlation between male participants and leaks in the roof or basement. While it is not reasonable to conclude that home repair issues appear based on the gender of the resident, we considered it more likely that traditional gender roles tied to household tasks may have an influence on what issues are observed by a participant. To that end, we considered a “Yes” response to be a confirmed issue, but we did not consider a “No” response to be a confirmed absence of issue.

Of particular note, 1% of participants listed high radon as being an issue in their homes, and 48% said they were not sure of their radon levels. We cannot conclude from this data that half of our participants did not have high radon because when engaged in further discussion about their responses, many participants who initially responded “No” were unaware of what radon is and that it is harmful.
The chart below shows instances of each self-reported issue among the 444 GGH participants who shared home characteristic data.

![Self-Reported Home Issues](image)

**Fig. 11**: Instances of common home issues, as identified by Grassroots Green Homes participants.

Additional home issues that were mentioned in an “Other” space provided on the sheet included:

- Sewer pipe trap broken / plumbing problems / pipes
- Storm door broken / back door missing
- Flooding in basement / water damage
- Chimney needs pointing / mortar broken
- No insulation
- Fire damage
- Down spouts missing or misaligned / ice buildup / gutter leaks or problems
- Mice
- Front steps broken
Participant Engagement – Perceptions and Participation

As part of our intake process, we asked a series of questions to get a sense of participants’ awareness and value of energy efficiency as a baseline for beginning the program. We also checked correlation with different demographic factors to see if there were clues to behavior trends. The questions were presented on a Likert scale with 1 being “disagree strongly” and 5 being “agree strongly.” The questions and their average responses are listed below:

<table>
<thead>
<tr>
<th>Statement about Energy Efficiency perception</th>
<th>Average Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>I wish I knew more about Energy Efficiency</td>
<td>4.1</td>
</tr>
<tr>
<td>I do not have time to research Energy Efficiency</td>
<td>3.3</td>
</tr>
<tr>
<td>Energy Efficiency measures are more expensive than standard measures</td>
<td>3.4</td>
</tr>
<tr>
<td>I often see Energy Efficiency branding (e.g. ENERGY STAR) on products</td>
<td>3.7</td>
</tr>
<tr>
<td>I make purchasing decisions based on the Energy Efficiency of the products</td>
<td>3.7</td>
</tr>
<tr>
<td>Energy Efficiency influenced my decision in choosing my home</td>
<td>2.5</td>
</tr>
<tr>
<td>I make behavior decisions to improve the Energy Efficiency of my home</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Fig. 12: Common perceptions around Energy Efficiency among Grassroots Green Homes participants.

As mentioned above, these responses were cross-checked against basic demographic information including gender, age, education level, employment status, and home owner vs. renter status. It is worth noting at this point that among GGH participants, the renter to home owner ratio was approximately two-to-one. Any correlations revealed were not strong, nor were they surprising, but the most notable were:

- Homeowners were more likely than renters to pay attention to energy efficiency branding on appliances or make purchasing decisions based on a product’s energy efficiency
- Homeowners were also more likely than renters to express an interest in learning more about energy efficiency
- Older participants were more likely to believe that energy efficient measures or products (e.g. LED bulbs) were more expensive than standard measures or products (e.g. incandescent bulbs)
- Higher educated participants were more likely to have time to research energy efficiency and were less likely to believe that energy efficient measures/products cost more than standard measures/products
Starting from this point, GGH participants took a voluntary pledge to use the tools and tips they received over the course of the program year to improve their home efficiency, health, and comfort. The tools and tips were designed to correlate with seasonal conditions or events, such as furnace filter checks in the fall, cleaning the house in spring, sealing drafts in winter, and reducing air conditioning use in the summer. A full list of tools and tips for the program year is as follows:

<table>
<thead>
<tr>
<th>Month</th>
<th>Tool</th>
<th>Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>Refrigerator coil cleaning brush</td>
<td>Keep fridge at 2/3 full and set temperature between 35°F and 38°F</td>
</tr>
<tr>
<td>June</td>
<td>Kitchen and bathroom faucet aerators</td>
<td>Wash laundry in cold water and run full loads for laundry and dishes</td>
</tr>
<tr>
<td>July</td>
<td>Combination thermometer and hygrometer</td>
<td>Use AC/dehumidifier/vent fans to keep humidity between 50% and 60%</td>
</tr>
<tr>
<td>August</td>
<td>Outlet gaskets &amp; safety caps</td>
<td>Set thermostat to 78°F or higher in summer and use fans instead of AC</td>
</tr>
<tr>
<td>September</td>
<td>Furnace filter whistle</td>
<td>Keep air vents unblocked by furniture and drapes; close vents and doors in rooms not regularly used</td>
</tr>
<tr>
<td>October</td>
<td>Plastic and metal door sweeps</td>
<td>Open blinds/drapes to warm with sunlight during day; close drapes to insulate at night</td>
</tr>
<tr>
<td>November</td>
<td>Plastic window sealing kit</td>
<td>Set thermostat to 68°F degrees or lower in winter</td>
</tr>
</tbody>
</table>

Fig. 13: Correlations between Energy Efficiency perceptions and demographics among Grassroots Green Homes participants.
Fig. 14: Monthly Tools and Tips distributed throughout the Energy Efficiency Challenge.

Not all participants picked up all of their toolkits. In fact, it was a small subset that participated for the entire span of the program’s twelve months. However, we accepted new registrants throughout the year as word of mouth promoted GGH, so we were able to distribute a relatively consistent number of toolkits throughout the year (the highest being 180 in August and the lowest being 121 in April).

For each toolkit distributed, we followed up with the participant and administered a survey asking four standard questions for each tool and tip:

1. Have you used it?
2. Have you noticed a difference?
3. Did you find it easy to do?
4. Do you intend to continue?

The highest overall adoption rates for tools were for the easier to install items, such as lightbulbs, a plug-in nightlight, and a suction cup hourglass shower timer. However, the highest perceived impact came from the more difficult to install items, such as the silicone caulk, weatherstrip tape, door sweeps, and window sealing kit. The vast majority to all participants who adopted a given tool or tip said they intended to continue with it in the future.

The highest overall adoption rate for any of the tips was keeping the refrigerator full to maximize thermal mass and keep the temperature steady. Many responses for the other tips had some affirmative responses, but more participants confirmed that the tip was already in practice in that household. Such was the case with keeping air vents unblocked by furniture and drapes, unplugging unused electronic devices to reduce phantom power drain, checking for roof leaks and missing insulation in winter by examining snow cover, checking for signs of air leakage by looking for spider webs, and using natural daylight instead of electric lights when possible. The rates of greatest perceived difference were tied to keeping vents unblocked, opening blinds during the day for passive solar heating, and lowering the hot water tank temperature to 120°F.

<table>
<thead>
<tr>
<th>Month</th>
<th>Tool</th>
<th>Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>December</td>
<td>Five-minute shower timer</td>
<td>Lower hot water tank temperature setting to 120°F</td>
</tr>
<tr>
<td>January</td>
<td>Foam weather strip tape</td>
<td>Check roof for signs of air leakage or missing insulation by looking for uneven snow coverage and icicles</td>
</tr>
<tr>
<td>February</td>
<td>CFL light bulbs</td>
<td>Unplug electronic devices when not using them to reduce phantom power drain</td>
</tr>
<tr>
<td>March</td>
<td>Silicone caulking tube</td>
<td>Check home for signs of air leakage by looking for spider webs</td>
</tr>
<tr>
<td>April</td>
<td>LED night light</td>
<td>Use natural daylight instead of electric lights</td>
</tr>
</tbody>
</table>
Fig. 15: Adoption rates of tools, as reported by Energy Efficiency Challenge participants.

Fig. 16: Adoption rates of Tips, as reported by Energy Efficiency Challenge participants.
ACHIEVING DEEP HEALTH AND ENERGY IMPROVEMENTS: “WEATHERIZATION PLUS”

A small group of 20 homes within this group received “Weatherization Plus” services, including a full energy and home health audit, installation of recommended measures, and pre- and post-weatherization monitoring of home health hazards, such as mold, radon, and lead paint, all at no cost to the homeowners.

The broad data set from the Energy Efficiency Challenge participants, as well as the deep dive into the 20 Weatherization Plus homes have provided unique insight into the specific issues faced by residents of these Pittsburgh neighborhoods.

These twenty homes were chosen from a subset of the Energy Efficiency Challenge participants. The only requirements to opt-in to the Weatherization Plus applicant pool were 1) participation in the Energy Efficiency Challenge, 2) owner-occupancy in the home, and 3) non-smoking status in the household. Homes were prioritized by several factors including low-income status, senior citizen status, number of health or safety issues reported within the home, and the ability to stack funding sources from a variety of local assistance programs. Ten of the twenty opted in to additional air quality monitoring before and after the weatherization work was complete.

The results from the various toxin tests are shown below:

- For each of the homes, if mold was visible, we conducted a swab test that was sent to a laboratory for further analysis. If mold was present, that was taken into account as first priority as our team developed the remediation and weatherization plan for the house. Mold results are listed below by the counts detected in lab samples, consisting of “Rare” (1-10), “Low” (11-100), “Medium” (101-1000), and “High” (>1000). Four of the twenty had high mold levels, and another four had medium or low.

- All twenty homes received a lead investigation with an x-ray fluorescence (XRF) analyzer, which can identify lead paint, even if it is below surface layers of paint. Sixteen of the twenty homes had some level of lead paint, whether in paint on walls of the home or in the trim on doors and windows. For most of the homes with lead paint present, the paint was either intact (not chipping or flaking) or it was encapsulated with other layers of paint. In two homes, the paint was located in friction surfaces (doors and windows) and was deteriorating. We notified the homeowners of the risk, proper techniques to maintain the paint, and –for the home with children under age six – connected them with the County lead abatement program.

- We used an electronic radon monitor (not an official test) to obtain an indication of radon levels in each of the twenty homes prior to the start of any weatherization work. If the monitor showed an elevated value, we followed up with an official test from a certified radon mitigation company and proceeded with the installation of a radon mitigation system for the two homes that had an official test value above 4 pCi/L.
• We used the same electronic monitors to measure the radon levels in the homes after the weatherization work was complete. Over half of the radon levels decreased, and only one increased above 4 pCi/L. That home was receiving official testing as of the writing of this paper. Of the two mitigation systems installed, one system was working properly, and one was not. The ineffective system was being examined and adjusted.

<table>
<thead>
<tr>
<th>[Names Removed]</th>
<th>Mold Test Results (Aspergillus/Penicillium)</th>
<th>Lead XRF Test Results</th>
<th>Pre-Weatherization Radon</th>
<th>Post-Weatherization Radon</th>
<th>Radon Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not detected</td>
<td>No</td>
<td>0.05</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Not detected</td>
<td>Yes (mostly free)</td>
<td>0.67</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><em>High</em></td>
<td>Yes (few)</td>
<td>1.91</td>
<td>1.62</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><em>High</em></td>
<td>Yes (very few)</td>
<td>3.05</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Not detected</td>
<td>No</td>
<td>0.91</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Low</td>
<td>Yes (windows and doors, intact)</td>
<td>2.26</td>
<td>3.05</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Rare</td>
<td>Yes (all trim, intact)</td>
<td>4.43</td>
<td>3.24</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Not detected</td>
<td>Yes (walls and door frames, intact)</td>
<td>4.27</td>
<td>1.43</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Not detected</td>
<td>No</td>
<td>0.29</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><em>High</em></td>
<td>Yes (most trim, intact)</td>
<td>19.97</td>
<td>18.02</td>
<td>Mitigation system adjustments in progress</td>
</tr>
<tr>
<td>11</td>
<td>Not detected</td>
<td>Yes (trace amounts, intact)</td>
<td>2.45</td>
<td>1.43</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Not detected</td>
<td>Yes (doors - friction surfaces)</td>
<td>8.29</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Not detected</td>
<td>Yes (windows and doors, intact)</td>
<td>1.32</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Not detected</td>
<td>Yes (trim, intact)</td>
<td>1.00</td>
<td>7.45</td>
<td>Official test results pending</td>
</tr>
<tr>
<td>15</td>
<td>Medium</td>
<td>Yes (windows and doors, intact)</td>
<td>2.27</td>
<td>1.35</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Not detected</td>
<td>Yes (trim, intact)</td>
<td>2.75</td>
<td>3.30</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Medium</td>
<td>Yes (trim, intact)</td>
<td>8.18</td>
<td>2.72</td>
<td>Mitigation system working properly</td>
</tr>
<tr>
<td>18</td>
<td>Not detected</td>
<td>Yes (windows, doors, paneling - mostly intact)</td>
<td>4.72</td>
<td>2.78</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td><em>High</em></td>
<td>Yes (very few)</td>
<td>2.10</td>
<td>1.86</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Not detected</td>
<td>No</td>
<td>3.59</td>
<td>3.62</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 17: Findings from home health assessments in Weatherization Plus homes.
Ten of the Weatherization Plus homes opted in to air quality monitoring for two weeks before and after the weatherization work was performed. A trio of particulate monitors set in the participant’s living room, bedroom, and outside, respectively, measured the quantity of small (0.5 micron) and large (2.5 micron) particles in the air. There is no way of determining what the particles are simply from examining the readings from the monitors; they record count only.

The goal was to decrease the intrusion of outdoor air, which can contain pollutants on poor air quality days, from entering the home through gaps in the building envelope. However, if the home is particularly dusty or sees a lot of activity, the monitors could pick up that data as well, and sealing up a home where the resident does not run an air filter or vacuum regularly could result in an increase of particulate counts. Below is information on six of the participants and the associated change in average particulate counts for a two week period before and after the construction work. Four of these participants saw decreases in large and small particulate counts, while two of these participants saw increases in both. It is difficult to attribute a direct correlation between weatherization work and change in particulate counts based solely on these counts. Keeping the limitations of the data in mind, interviews with the participants can provide insight into what the numbers indicate. We were in the process of conducting exit interviews with participants during the writing of this paper.

<table>
<thead>
<tr>
<th>[Names Removed]</th>
<th>Small Particle % Change</th>
<th>Large Particle % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-79%</td>
<td>-64%</td>
</tr>
<tr>
<td>2</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>5</td>
<td>-22%</td>
<td>-44%</td>
</tr>
<tr>
<td>9</td>
<td>-55%</td>
<td>-79%</td>
</tr>
<tr>
<td>10</td>
<td>35%</td>
<td>80%</td>
</tr>
<tr>
<td>15</td>
<td>-57%</td>
<td>-56%</td>
</tr>
</tbody>
</table>

Fig. 18: Changes in particle counts among Weatherization Plus participants who opted into air quality monitoring.

One correlation of note that we did see during the course of the Weatherization Plus work was that the ten participants who opted in for air quality monitoring tended to be more involved with participation in the Energy Efficiency Challenge than the ten who did not. This connection could be due to the fact that those who were more interested in the program in general wanted to be involved, take action in their own homes, and learn as much as they could. It is also possible that the opportunity for real-time monitoring of conditions in their homes, as well as the opportunity to interact with a program representative on a more regular basis (when monitors were being delivered and picked up) provided the opportunity for increased, long-term engagement on the subject of health factors and behavior in the home.
PROGRAM IMPACTS ON EFFICIENCY AND HEALTH:

Participants in the Energy Efficiency Challenge were asked to share their utility usage data for the program year and the year prior, if they had the ability to do so.

Our partnership with local utility companies in this program allowed us to develop a release form that the account holder would sign. In some rental cases, the participant did not receive the utility bill and could not get the landlord to sign the release form. In other cases, the participant was not the account holder, and a parent or spouse was not willing to sign the release form. Releasing utility usage data was not a requirement for participation, but it did help provide greater insight into the impact that GGH had on participants’ homes.

Information provided by both gas and electric utility companies was broken down by month for the full “Program Year” (May 2016 to April 2017) and the year prior, the “Baseline Year” (May 2015 – April 2016). Based on the number of heating degree days in the Baseline Winter (November 2015 to March 2016) and the Program Winter (November 2016 to March 2017), the Program Winter months were colder and should have required greater energy consumption for heating. Normalizing the MCF usage by the number of heating degree days (at 65 degrees F) in the winter months, we observed an average of 8% less gas use during the Program Winter compared to the Baseline Winter. Also, normalizing the kWh usage by the number of heating degree days in the winter months, we observed an average of 4% less electric use during the Program Winter compared to the Baseline Winter.

Based on the number of cooling degree days in the Baseline Summer (May to September 2015) and Program Summer (May to September 2016), the Program Summer months were hotter and should have required greater energy for cooling. Normalizing the MCF usage by the number of cooling degree days (at 72 degrees F) in the summer months, we observed an average of 17% less gas use during the Program Summer compared to the Baseline Summer. Also, normalizing the kWh usage by the number of cooling degree days in the summer months, we observed an average of 16% less electric use during the Program Summer compared to the Baseline Summer. A small number of outliers (who exhibited changes in usage of 100% or greater in either direction, in summer or winter months) were temporarily removed from both data sets and at the time of this paper’s writing were being contacted to determine what factors may have impacted their usage.

<table>
<thead>
<tr>
<th></th>
<th>Gas (MCF)</th>
<th>Electric (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Change, Summer</td>
<td>-17%</td>
<td>-16%</td>
</tr>
<tr>
<td>% Change, Winter</td>
<td>-8%</td>
<td>-4%</td>
</tr>
</tbody>
</table>

Fig. 19: Energy savings (gas and electric) among Energy Efficiency Challenge participants.

Homes participating in the Weatherization Plus component of GGH had not yet undergone the retrofit work during the Program Summer. Work on these homes was completed between September and December 2016, so comparison data is only available for the Program Winter. The average usage reduction for Weatherization Plus homes was 6% for
electricity from Baseline to Program Winter (not surprising, as none of these homes was primarily heated with electricity) and 22% for gas. For comparison, the set of participants that had signed up for the Energy Efficiency Challenge but never picked up any program toolkits (effectively making themselves a control group), showed an increase in gas usage of 18% from Baseline to Program Winter.

In addition to utility usage, we included information on “blower door” scores from the initial audit (pre-construction) and quality assurance tests (post-construction) for the participating homes. A blower door test is a standard measure in the course of an energy assessment that depressurizes the home to determine the prevalence of air leaks. The value determined in a blower door test is the number of cubic feet per minute (CFM) leaving/entering the house. A lower score is correlated with increased energy efficiency, which commonly occurs after weatherization measures seal leaks in the structure. The average improvement of blower door score in the Weatherization Plus homes was 23% reduction in airflow.

<table>
<thead>
<tr>
<th>[Names Removed]</th>
<th>Blower Door Pre-Weatherization (CFM)</th>
<th>Blower Door Post-Weatherization (CFM)</th>
<th>Blower Door % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1621</td>
<td>757</td>
<td>-53%</td>
</tr>
<tr>
<td>2</td>
<td>8729</td>
<td>6631</td>
<td>-24%</td>
</tr>
<tr>
<td>4</td>
<td>6062</td>
<td>5349</td>
<td>-12%</td>
</tr>
<tr>
<td>5</td>
<td>2118</td>
<td>1744</td>
<td>-18%</td>
</tr>
<tr>
<td>6</td>
<td>3953</td>
<td>1683</td>
<td>-57%</td>
</tr>
<tr>
<td>7</td>
<td>3634</td>
<td>3219</td>
<td>-11%</td>
</tr>
<tr>
<td>9</td>
<td>2852</td>
<td>2166</td>
<td>-24%</td>
</tr>
<tr>
<td>10</td>
<td>4227</td>
<td>3848</td>
<td>-9%</td>
</tr>
<tr>
<td>11</td>
<td>4577</td>
<td>3819</td>
<td>-17%</td>
</tr>
<tr>
<td>12</td>
<td>3927</td>
<td>3073</td>
<td>-22%</td>
</tr>
<tr>
<td>13</td>
<td>4548</td>
<td>2979</td>
<td>-34%</td>
</tr>
<tr>
<td>14</td>
<td>5093</td>
<td>4935</td>
<td>-3%</td>
</tr>
<tr>
<td>15</td>
<td>3090</td>
<td>2206</td>
<td>-29%</td>
</tr>
<tr>
<td>16</td>
<td>3048</td>
<td>2286</td>
<td>-25%</td>
</tr>
<tr>
<td>17</td>
<td>3220</td>
<td>2521</td>
<td>-22%</td>
</tr>
<tr>
<td>18</td>
<td>8703</td>
<td>6773</td>
<td>-22%</td>
</tr>
<tr>
<td>19</td>
<td>5036</td>
<td>4405</td>
<td>-13%</td>
</tr>
<tr>
<td>20</td>
<td>4116</td>
<td>3058</td>
<td>-26%</td>
</tr>
</tbody>
</table>

Fig. 20: Changes in blower door score among Weatherization Plus participants.
After obtaining the quantitative information from our utility partners, we reached out to our participants to conduct exit surveys and gather qualitative information. Questions covered any changes related to occupants in the home (change in the number of residents, of work schedules, etc.) and to appliances (new or additional appliances, something breaking and not being replaced, etc.). We also asked which tools and tips were still in use, and followed up with three perception questions on a Likert scale addressing any perceived changes in the home. The survey ended with the opportunity to provide feedback, some of which is shared here.

Unsurprisingly, there were more tools still in use than there were tips. We believed that the tangible tools would create a greater impression on our participants than the abstract tips. Although we provided a newsletter each month that detailed the process and benefits of each tip, many participants noted that they did not read the newsletter. Hands-on demonstration and discussion of the tips with participants when they receive their toolkits would likely improve their adoption and retention in future rounds. A list of the tools and tips that are still in use in participants homes is found below:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFL light bulbs</td>
<td>Keep refrigerator full</td>
</tr>
<tr>
<td>LED night light</td>
<td>Use fans instead of air conditioning</td>
</tr>
<tr>
<td>Coil cleaning brush</td>
<td>Use cold water for washing laundry</td>
</tr>
<tr>
<td>Weather stripping</td>
<td>Open blinds for passive solar heating</td>
</tr>
<tr>
<td>Shower timer</td>
<td>How to reduce humidity through ventilation</td>
</tr>
<tr>
<td>Window sealing kit</td>
<td>Use daylight instead of electric lights</td>
</tr>
<tr>
<td>Door sweeps</td>
<td></td>
</tr>
<tr>
<td>Outlet insulating kit</td>
<td></td>
</tr>
<tr>
<td>Combination thermometer / hygrometer</td>
<td></td>
</tr>
<tr>
<td>Faucet aerators</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 21: Tools and Tips still in use after conclusion of Energy Efficiency Challenge, as reported by participants.
The three perception questions we asked of the participants were on a Likert scale of 1 (disagree strongly) to 5 (agree strongly), and we saw on average a positive shift on all fronts of energy efficiency, home health, and outreach to neighbors:

<table>
<thead>
<tr>
<th>Statement regarding perceived benefit of Grassroots Green Homes</th>
<th>Average Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe my home is more energy efficient since participating in GGH.</td>
<td>4.38</td>
</tr>
<tr>
<td>I believe my home is healthier since participating in GGH.</td>
<td>3.75</td>
</tr>
<tr>
<td>I feel more comfortable coaching my friends and neighbors about things they can do to improve their homes since participating in GGH.</td>
<td>3.75</td>
</tr>
</tbody>
</table>

Fig. 22: Perceived benefit of participation in Grassroots Green Homes, as reported by participants.

Finally, we had participants share some of the following feedback on their experiences with Grassroots Green Homes:

- I can breathe a little bit better. I have COPD.
- I think it’s a good program, and it makes people more aware.
- I’m glad that I got to participate and learn some new things.
- I learned about the presence of lead in my home.
- The program validated my belief that I need to control the moisture for my mold problems.
- I think the program is great. We need to get out there more.
- I gave applications to my neighbors. I think GGH is a great program. There were things I know I couldn’t afford to do that GGH did. I would recommend it to anyone!
Pittsburgh: History to Present

AN EARLY LEADER DRIFTED OFF TRACK

Pittsburgh has been in the news lately for issues related to lead poisoning and water. Indeed, the deluge of articles and the increasing sharpness of public dialogue around this issue have been difficult to miss. What hasn’t made the news is Pittsburgh’s history of taking leadership to respond to environmental threats.

Pittsburgh lies at the confluence of the mighty Allegheny and Monongahela Rivers, and residents from the earliest of times have understood the intimate connection between the environment, their lives and livelihoods (Tarr 2004):

- This legacy of respect for water was apparent when Pennsylvania passed its own Safe Drinking Water Act in 1905, decades before the EPA was even founded (Pennsylvania Legislature 1905; US EPA 1991).
- Over three decades before the EPA’s Clean Water Act was passed, residents supported the 1937 Pennsylvania Clean Streams Act, protecting water quality and its relationship to human life (Pennsylvania Legislature 1937).
- Sitting in the Pittsburgh Water and Sewer Authority is an archive of water testing records that date back to the previous turn-of-the-century, well before any comprehensive legislation required such due diligence (Gorsch 2017).
- Pittsburgh’s star pediatrician, Dr. Herbert Needleman, changed the national discourse around lead and pediatric brain damage and contributed to protecting millions of our nations’ children (Segarra 2016).

Dr. Needleman had a strong influence on Pittsburghers’ awareness of and response to substandard housing. Even as residents look at Philadelphia’s lead court – established in 2003 – as an example to follow, they forget that Pittsburgh founded its own Housing Court in 1967 (Campbell 2013; Penkower 1979). This court was charged with tackling the epidemic of substandard housing in order to “act as an indispensable component of an effective comprehensive housing Code Enforcement system, and, of greater importance, as a fundamental catalyst in the development of such a system.” This court was not established out of the generosity of elected officials, but rather the dedication and grit of committed Pittsburghers working together in aggressive grassroots coalitions, such as the Citizens Against Slum Housing group (O’Neill 2002).

The citizens demanded a targeted Housing Court and worked with City Council to pass an ordinance in August 1967 establishing a single magistrate court to adjudicate violations of health and housing code. In order to empower the Housing Court with sufficient jurisdictional authority, the Second Class City Code 9 was amended by the Pennsylvania legislature – as the Housing Court ordinance simultaneously passed City Council. As part of the deal, Allegheny County Health
A Divided Issue: The Revival of Pittsburgh’s Housing Court

Pittsburgh’s Housing Court was established in 1967 for the purpose of addressing the growing number of substandard homes in Pittsburgh. Its existence proved useful in providing consistency and holding repeat offenders accountable. By 1979, 20,000 prosecutions had been filed in the court (Penkower 1979). The court was abolished in 2007, and the responsibility of handling absentee landlords and poor home maintenance has since fallen to 12 district judges throughout the City. Mayor Peduto is in favor of resurrecting the housing court, but that decision hinges on the adoption of a rental registry bill, which was passed in 2016 but is being contested in court, and approval from state and County courts.

Pros:
- Stronger and more consistent enforcement of building codes
- Better equipped to track repeat offenders and hold them accountable
- Associated clinic would educate owners on ways to improve properties

Cons:
- Concerns that this arrangement could penalize property owners instead of working with them to address the problems
- Less context for the case than if it were addressed in the neighborhood where it occurred
- Less time to address problems in a high-volume central court

(TribLive 2016)

Department was empowered to take cases before the court magistrate, giving simultaneous jurisdiction of the court over both health and building code violations (Penkower 1979).

Yet with the passage of time, the Pennsylvania Clean Streams Act enforcement mechanisms were repealed, and the Pittsburgh Housing Court was dissolved, leaving enforcement mechanisms to one of multiple district magisterial offices. If anything is to be learned from the story, it is that Pittsburgh is more than capable of organizing an effective response to substandard housing conditions. Nevertheless, good legislation is always one generation away from being lost (Schneider 2017).

Fig. 23: Average year of construction for Pittsburgh homes. Reprinted with permission. (University of Pittsburgh Center for Social & Urban Research 2011)

Today there are fewer news stories praising Pittsburgh as a leader in home and environmental health. While there are still organizations performing crucial work in these areas, negative publicity over public health is taking a front seat. Pittsburgh’s iconic natural resource, its water supply, has shown signs of mismanagement and elevated lead (Schneider 2017). This most recent public outcry is not due to contamination of lead in the original water supply because
lead, like most metals, is not soluble in natural water conditions. If one were to drop a piece of metal in a glass of water it would not dissolve unless that water was sufficiently acidic or hot (Ledder 2017; US Environmental Protection Agency 2016b). In like fashion, lead would not commonly dissolve in a natural water source. Rather, it would become corrosive through man-made influence and acquire lead from aging water systems that do not properly neutralize corrosivity.

Under the advice of Veolia, the same consulting firm that managed the Flint Michigan water system, Pittsburgh Water and Sewer Authority cut costs in its corrosion control system (Schneider 2017). Following that change, 17 out of the 100 water samples tested with lead levels were well above the EPA threshold of 15 parts per billion (ppb) last year (Pittsburgh Water and Sewer Authority 2016). The City, in tandem with non-profit groups, rushed to distribute water filters, and the EPA standard protocol for exceedances began mandating public education, improved corrosion control, and a plan for gradual lead service line replacement (Krauss 2016; Ledder 2017).

<table>
<thead>
<tr>
<th>Year</th>
<th>90th Percentile</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>22 ppb</td>
<td>(PWSA 2016)</td>
</tr>
<tr>
<td>2015</td>
<td>14.8 ppb</td>
<td>(PWSA 2015)</td>
</tr>
<tr>
<td>2014</td>
<td>14.7 ppb</td>
<td>(PWSA 2014)</td>
</tr>
<tr>
<td>2013</td>
<td>14.7 ppb</td>
<td>(PWSA 2013)</td>
</tr>
<tr>
<td>2012</td>
<td>10 ppb</td>
<td>(PWSA 2012)</td>
</tr>
<tr>
<td>2010</td>
<td>10 ppb</td>
<td>(PWSA 2016)</td>
</tr>
<tr>
<td>2007</td>
<td>9.0 ppb</td>
<td>(PWSA 2016)</td>
</tr>
<tr>
<td>2004</td>
<td>9.5 ppb</td>
<td>(PWSA 2016)</td>
</tr>
<tr>
<td>2001</td>
<td>6 ppb</td>
<td>(PWSA 2016)</td>
</tr>
</tbody>
</table>

Fig. 24: 90th percentile values from the annual set of randomly-tested homes have been trending upward in previous years, with the 2016 results crossing the EPA threshold (Pittsburgh Water and Sewer Authority 2012, 2013, 2014, 2015, 2016)

Adding to the confusion, conflicting information was given from various sources about steps to minimize the amount of lead in water taken from the faucet. The Pittsburgh Water and Sewer Authority advised flushing water that has sat in a lead service line overnight, but those instructions nearly matched guidance from the Pennsylvania code for acquiring a sample of water with the highest likely concentration of lead (Lurie 2016b; Roberts 2016).
The news doesn’t stop at that issue: further controversy has recently arisen out of recent muckraking exposés about the lack of testing for lead and radon in public school districts (Marusic 2016). Parents report shock and outrage at finding out that their children’s schools do not require basic standards of health and safety testing for two of the greatest building-related health hazards facing their children (Naccarati-Chapkis 2017). Of the surveyed school districts that responded to an inquest performed by Women for a Healthy Environment, approximately 20% had tested for radon, 11% had tested for lead paint, and 35% had tested for lead in water (Natalie Stewart 2017).

These recent revelations and the public clamor that surrounds them has helped to re-focus attention on lead exposure as a critical public health risk, with a specific focus on the risk of the old lead paint and dust saturating Pittsburgh’s aging housing stock. According to the most recent 2017 “Low Down on Lead” report from the Allegheny Health Department: “5 year estimates show that more than 80% of the county’s housing stock was built before 1978 and 41% of homes were built before 1950, when lead-based paint was used more frequently. In Pittsburgh, >60% of homes were built prior to 1950.”

While lead in drinking water is a serious and legitimate health concern, lead exposure from aging paint and its associated dust (through ingestion or inhalation) is more prevalent than any other source. It is important to stress that any lead exposure is toxic, whether from drinking water, paint dust, contaminated soil, toys, dishes, or makeup – all cause serious lasting health impacts and deserve urgent attention (Centers for Disease Control 2004; Goldstein and Berry 2017). Lead does not deteriorate with time; it does not go away from the aging housing stock or any of the 27,000 dusty and blighted lots of the city (Holsopple 2017). It certainly has not left the substandard housing units wherein thousands of Allegheny County children under the age of six live. In order to fix this problem, the regions leaders will need to make it a top priority.
WHERE RUBBER MEETS THE ROAD: STATE, COUNTY AND CITY LEGAL INTERACTIONS

Before endeavoring to understand local applications of environmental laws and programs in Allegheny County, one must pause and take a panoramic view of some unique attributes of the state, county, and municipal legal arrangement.

Pennsylvania is a Commonwealth state, which is a form of governance that places greater responsibilities and emphasis on its 67 county-level and local government structures (Chambers 2016). Allegheny County contains 130 municipalities, each with different legislation, building codes, and many with home rule charters of their own, over which the County does not necessarily preside. While some counties may have large tracts of unincorporated land over which they have total jurisdiction, Allegheny County is a patchwork of complex independent cities (Stockdale 2017).

Although public health was originally the sole purview of the state of Pennsylvania, since the passage of Act 315 in the 1950s, Allegheny County has had its own local, semi-autonomous health department. The state leaves much responsibility around health, safety, and immunization in the hands of local officials (Namey 2017). Building codes, for instance, are partially under County Health Department and partially under City authority, depending on the area they cover (Chintalapalli 2017). This divide complicates comprehensive home inspections in a way that works against the design of the previously operational Pittsburgh Housing Court, which acted to unify enforcement of both building and health codes (Penkower 1979). The complexity of overlap, authority, and roles in such a system is worthy of an in-depth review of its own and is often the source of great confusion. There has been pressure on multiple occasions, from multiple sources to clarify and streamline the operation of these different entities. Attached to the home rule charter published on the City of Pittsburgh website is one such a recommendation dating back to the 1970s (Pittsburgh Home Rule Government Study Commission 1972).

Adding to this labyrinthine legal conundrum is the peculiar legal vernacular developed in the state of Pennsylvania about “cities of the first class” (which pertains to cities having over one million residents, and therefore exclusively pertains to Philadelphia), “cities of the second-class” (which exclusively pertains to Pittsburgh), one “second class A” city (because Scranton wanted to separate itself from Pittsburgh), and the remaining 53 “cities of the third class” (Chintalapalli 2017; Keystone Crossroads 2016). Under this system, state laws are passed which only apply to certain cities. Presumably this custom began when municipal affairs were governed at the state before the home rule movement had truly taken root and granted cities the right to a measure of self-determination. The antiquated custom is still in effect and causes layers of unnecessary complexity and regionalism to what would otherwise be straightforward state law. Almost all interviewed as part of the study referenced the highly confusing nature of this political outlay and need for clarification.
UNDERSTANDING PENNSYLVANIA AND ITS LACK OF UNIFIED RESPONSE

The political terrain of every aspect of Pennsylvania is highly regional. Two massive cities, largely left-leaning, on either end of the state are separated by vast tracts of rural right-leaning country.

As opposed to states that are more politically and socio-culturally homogenous, this political outlay creates added tensions to the process of passing comprehensive state-level radon, lead, and mold legislation. Simply put, many conservative constituents in the rural center of the state with strong aversion to government intervention are not amenable to funding liberal interventionist programming viewed as a problem of inner-city urbanites. Different racial demographics of these groups adds another layer of complexity that often stymies progress toward legislating interventions (Firth 2017).

Pending Legislation

Despite the varied political positions of Commonwealth residents, considerable lead poisoning prevention legislation is on the Pennsylvania docket for consideration at the time of this report’s drafting. First, House Bill 666, the 2017 Lead Testing and Protection Act, was created in response to the low percentage of children receiving blood lead tests in the state of Pennsylvania and the high percentage of blood lead levels. According to the 2014 census, 140,524 children in the state of Pennsylvania were tested for blood lead. Of that group, 13,171 (or 9.4%) had elevated blood lead levels (EBLL) above 10 μg/dL (Pennsylvania Legislature 2017a). Since blood lead of any level can result in neurological damage and organic system complications, the bill would mandate education of parents before discharge from a hospital or birthing facility, insurance coverage for all screening tests and lead-related care for children under 72 months of age, and a testing schedule encouraging prenatal testing and repeat testing of all, and most especially at risk, children. An amendment to the adjacent Human Services Code adds sections requiring a lead risk assessment for children’s facilities and corrective action if the institution is found to have unacceptable levels of lead. Parents are to be notified of the lead level results (Pennsylvania Legislature 2017c).

An additional act currently under consideration is an amendment to the 1951 Landlord and Tenant Act known as the Lead Certification Act. This act embeds into state law the existing, but largely unenforced, Title X federal requirement that landlords must distribute the EPA publication entitled Protect Your Family from Lead in Your Home (US Environmental Protection Agency 2017e) or its equivalent to prospective renters. The act requires that the landlord inform the lessee whether or not the residential dwelling has been tested for lead-based paint, disclose the presence of existing hazardous conditions, post records and reports in common areas, gather a confirmation of receipt from the lessee, and make any lease voidable if the landlord does not comply with these guidelines. Violators of the article would be sentenced to pay a minimum fine of $5000 and face a third-degree misdemeanor charge with fines collected credited to The Lead in Healthy Homes Program (Pennsylvania Legislature 2017b).
Lastly, a current bill establishes a Superfund to remediate or abate schools, day cares, public housing units, municipal structures where children are located, municipal programs for residential remediation, hazardous sites, or any other structure deemed a significant risk to children (Pennsylvania Legislature 2017d).

Legislative Gaps

Radon

Progress toward statewide radon legislation has been varied in recent years. In the 1990s, for instance, a bill requiring radon testing in schools was voted down (Natalie Stewart 2017; Truth in Accounting 2017). Despite that loss, Pennsylvania is still one of 37 states to require disclosure of any testing data during real estate transactions and one of 25 to have radon certification laws. It is one of 11 states to impose civil penalties for misrepresenting radon readings, which is another step toward legislation that contains enforcement (Geltman 2016).

One method policy advocates are taking to support expanded radon legislation is to draw attention to impacts by the natural gas industry. The Utica and Marcellus formations are located under a large portion of Pennsylvania, and Governor Tom Wolf’s economic stimulus plan involves expanded opportunities for liquid natural gas, cracker plants, and petrochemical manufacturing (Governor’s Office 2017). A recent study indicates a possible link between natural gas fracking in Pennsylvania’s Marcellus Shale region and increased radon seepage from the ground (Casey et al. 2015). A connection between the two in the minds of the public may lead to increased concern over radon levels and the desire for expanded testing.

Mold

Legislation related to mold is limited to a single Senate resolution from 2002 urging the Department of Health to establish a task force to investigate mold in homes, schools, and other buildings (Pennsylvania Legislature 2002). There is still no such effort at the state level (Environmental Law Institute 2016).

Lead

Another void in state-level legislation is for comprehensive lead education, poisoning prevention, and abatement legislation. The Lead Certification Act of 1995 is the one of three major regulatory acts on record, which is primarily a state level adoption of EPA-mandated certification and training of lead workers: it puts the control of federally required training under the purview of the state, specifies who can do lead abatement work and how it must be done using lead safe work practices, and assigns fines and penalties for violators of the law (Pennsylvania Legislature 1995). The second requires laboratories to report blood lead levels to the Pennsylvania Department of Health, (Pennsylvania Department of Health 2017a). Lastly, the Plumbing System Lead Ban and Notification Act prohibits the sale of certain leaded materials used in plumbing as of 1989 is an adoption of Federally legislated gradual decrease of lead from plumbing accoutrements (Pennsylvania Legislature 1989).
There is room for improvement toward more comprehensive statewide laws, but it regularly proves difficult to align the various – and often opposing – stakeholder groups. Advocating for legislation in Pennsylvania involves navigating the ongoing competition for resources constrained by state debt, as well as understanding the multilayered socio-cultural terrain of regional voting blocks. If statewide change is difficult to achieve because of the diversity across Pennsylvania, it would follow that local initiatives may meet with less resistance. From here we will examine the intersection of state, county, and municipal roles and policies.

**ALLEGHENY COUNTY: OPPORTUNITY TO HARNESS AUTHORITY**

*Eighty-two percent of homes in Allegheny County were built before 1978, when lead was a common ingredient in paint, and all of that paint is still poisoning children (Hacker 2016).*

Many of these homes are at risk for other health hazards, such as mold, because of a combination of groundwater seepage, storm water runoff, lack of any foundation drainage (which was not common construction practice until more recently), and disrepair of the homes themselves that allows for moisture incursions; and radon, because of our location in a radon EPA level “Zone 1.” While federal legislation is minimal and/or infrequently enforced on the local level, and state legislation is slow to pass in part because of the diverse set of stakeholders statewide, the County has some measure of authority to influence laws and manage programs that safeguard its residents.

**Existing County Codes**

In an environment where passing state-level legislation is tricky, many County functions are overshadowed by municipal ones. However, the fundamental authority of Allegheny public health code shines as one area of straightforward clear dealing. Mold-causing water leaks are investigated here because of an ordinance governing it in existing code, as plumbing has been established as falling under the public health purview (Allegheny County Health Department 2017b). Yet there is no radon component, no mention of mold, and the lead component of the County code is insufficient to address the magnitude of Allegheny’s problems (Allegheny County Health Department 2017b). The Health Department does inspect schools every three years in accordance with Pennsylvania State Code chapter 171, (Allegheny County Health Department 2016; Namey 2017) and also investigates any complaint about air quality toxins in schools, performing air quality testing as a follow-up after first responders (usually gas companies and fire departments) have identified a problem and test for carbon monoxide or gas leaks. Despite the support provided when a problem is noticed, schools are not required to test for lead or radon (Marusic 2016), though the Health Department points out that most children in schools are above the age of six, and not at high risk for lead-based paint hazards (Namey 2017).
Section 649 of the County health code gives the County authority to cite landlords for lead-based paint hazards. Code also allows the County to cite landlords for peeling paint that has not been identified as lead-based, and the County has the authority to do so whether or not there are children under six years of age living in the home. While this is the published code with action thresholds that can be referred to, significant authority is conferred to the director of public health and her team, which may use its judgment through visual inspection, XRF testing, and environmental sampling to determine the presence of a lead-based paint hazard and, if one exists, to order the owner of the building to eliminate the hazard within a reasonable period of time, usually 30 days (Allegheny County Health Department 2017b).

The County has the authority to perform inspections, levy fees, issue licenses, determine the habitability of the building, and declare public health hazards when warranted. These responsibilities and scope of practice can be changed in a straightforward manner when political will and public support align, as was seen recently when regulating the use of electronic cigarettes in public buildings: a committee of informed professionals was assembled to weigh in on the issue (Naccarati-Chapkis 2017); a change was proposed to the Board of Health (an unpaid Board of nine members distinct from the County Council); public hearings were made; and final recommendations from the Board of Health were completed (Allegheny County Board of Health 2017). The nine-member County Council then reviews recommendations from the Boards of Health, approves the change, and the County Executive signs off on the final amendment (League of Women Voters of Greater Pittsburgh 2009; Namey 2017). Allegheny County’s uniquely powerful County Executive role was established by the County’s own home rule charter (League of Women Voters of Greater Pittsburgh 2009). In Pittsburgh, the City and County structures have remained distinctly separate with City employees reporting to the City and County employees reporting to their respective directors (Namey 2017).

Given the exceeding complexity of Pennsylvania state, county, and municipal jurisprudence, the Allegheny County Health Department has authority to act and enforce codes to protect the welfare of its constituents. It also has the power to develop, in conjunction with concerned citizens, new code and protocols to follow. Act 315, passed August 24, 1951, establish county level departments of health with clear jurisdiction over their area. The County’s role is made more difficult when it must contest with public opposition for a specific regulation. In the process of making or changing a regulation, there are public hearings, council committee meetings, and interactions with lobbying groups, activists, and advocates. The more complex the issue is, the more potential there is for varied opinions and opposition, making the process of reaching consensus longer and more difficult. The lead crisis in Flint has provided a window of opportunity for change in Allegheny County, but even while protecting children from lead poisoning seems like an easy win, certain stakeholder groups remain opposed to specific proposed measures. For example, some child advocates would rather see families sheltered in a housing unit with toxic lead paint than be homeless, and some business advocates view an apartment
or daycare registry as an unfair restriction on the operation of a private business. Any opposition from the public makes it significantly harder for the Health Department to pass codes and protocols to protect its citizens (Hacker 2017).

**Testing, Investigation, and Enforcement**

At present, County Health Department investigates complaints related to mold and lead. Homes with possible lead problems come to the Health Department’s attention when a child living at that residence is reported by the state as having an elevated blood lead level test result, and through tenant complaints (which are usually unrelated to lead paint, but lead paint might be discovered during the investigation). Once a home is identified, the Health Department reaches out to the family to schedule an investigation. An elevated blood lead level investigation consists of a paint inspection and risk assessment, which includes identification of potential alternate sources of lead exposure (e.g. cosmetics, toys, hobbies that involve lead materials, etc.) through examination of the home and interviews with family members. The one to two inspectors visiting the home may take 100 or more readings with an x-ray fluorescence (XRF) analyzer to determine the presence of any lead in the paint, collect dust wipe samples to be sent to a lab for testing, and gather samples from other sources, such as water and soil around the house, as needed for testing (Namey 2017).

There are limitations to this in-depth approach, primarily that of resources. The Health Department currently has a department of five certified lead inspectors, but because they have a variety of duties, only one full-time equivalent is currently working on lead investigations, and one investigator can perform approximately 75 to 100 investigations in one year. The other limitation relates to the number of homes that are available for investigation: the Health Department cannot perform investigations when the resident does not respond or declines a visit. About one third of the homes that are able to get a lead investigation typically decline or do not respond to the Health Department when contacted (Namey 2017).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Individuals Tested (County)</th>
<th>10+ ug/DL Confirmed (County)</th>
<th>5-9 ug/DL Confirmed (County)</th>
<th>Total Individuals Tested (Pgh)</th>
<th>10+ ug/DL Confirmed (Pgh)</th>
<th>5-9 ug/DL Confirmed (Pgh)</th>
<th>Total Individuals Tested (PWSA)</th>
<th>10+ ug/DL Confirmed (PWSA)</th>
<th>5+ ug/DL Confirmed (PWSA)</th>
<th>5-9 ug/DL Confirmed (PWSA)</th>
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<td>151</td>
<td>629</td>
<td>478</td>
<td>3255</td>
<td>70</td>
<td>307</td>
<td>237</td>
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Confirmed refers to venous test or 2 elevated capillary tests taken within 12 weeks and not on the same day.

*Fig. 25: Blood test results in Allegheny County. Reprinted with permission. (Allegheny County Health Department 2017c)*
Until July 2016, The Health Department also only performed investigations for homes where the blood level for a child under 6 years of age was confirmed at or above 15 μg/dL through a venous (blood draw) test. They have since expanded the set of home investigations to include any with children confirmed at or above 10 μg/dL, which still limits the set of homes addressed. They do not at present have the resources to investigate homes with children who have confirmed EBLLs between 5 and 10 μg/dL.

Per recommendation by the American Academy of Pediatrics (AAP), these values are confirmed through either one venous test or two capillary (finger prick) tests performed within twelve weeks of each other. It is important to note that there is some disagreement among authorities as to whether the two consecutive capillary tests should be considered valid. Improper testing method may result in a higher reading based on the level of lead on the skin, rather than in the blood. Because of the uncertainty surrounding capillary test technique, many communities – including Allegheny County – currently or will soon require a venous follow-up test for any capillary test resulting in 5 or higher μg/dL. (Allegheny County Health Department 2017a). Proponents of the double-capillary verification argue that while the child’s blood lead level may not yet be high enough to warrant investigation, the test result provides an indication that the child is coming into contact with lead somewhere, and that exposure needs to be identified and addressed (Firth 2017).

Based on data available from the past three years on record (2013 to 2015), the Allegheny County Health Department was only able to perform investigations in 83 homes identified as having a child with an elevated blood lead level (Allegheny County Health Department 2016). As mentioned above, the ACHD only had funding to perform investigations triggered by an EBLL of 15 μg/dL or higher. The number of children whose test results showed an EBLL at or above 5 μg/dL during those three years totaled 1270 in Allegheny County.

Of the units investigated that prove to contain lead paint, the Health Department has encountered high levels of compliance among landlords, and legal actions are not frequently necessary to promote remediation. In contrast to the days of Pittsburgh’s Housing Court, current housing cases are heard by City magistrates, which are less connected to the local community (Chintalapalli 2017). This shift has enabled local fines to be struck down or not enforced at all. However, the Health Department states that they have encountered only three noncompliant landlords since 2014, and they have observed that levying a civil penalty through the Health Department ($2500 for the initial fine plus $250 per day until the problem is corrected) tends to be more effective than fining the landlord through magisterial court (which results in a one-time fine but no legal authority to order a landlord to conduct remediation work). Last year the County ordered owners of 15 rental properties to remediate lead hazards and issued only one fine (Clift 2017). The addresses of the properties have been kept confidential, and the names of offending property owners have not been released because of concerns related to HIPPA and the Pennsylvania Disease Prevention and Control Act.
Resource Limitations

Allegheny County government finds itself in the margins of a complex patchwork of 130 municipal governments within the County while being held accountable for operations regardless of the robustness of federal funding contributing to them. In many other parts of the country, swelling economies and the taxes they generate feed more lush options in County programming. However, there are many areas of the country that do more with similar levels of resources and more innovative use of the federal Community Block Development Grants of which the County and City are regular recipients (as entitlement communities), as will later be discussed in the benchmarking section of this paper (Community Development Administration Division 2017).

At present, the County operates standard programming and has little to no user-friendly data transparency tools that allow its public to survey its operations easily. Nine elected County Council members work in conjunction with a County executive who wields significant authority to veto proposed changes in code (League of Women Voters of Greater Pittsburgh 2009). The County Public Health Department, meanwhile, does have broad jurisdiction over a number of environmental health concerns including food safety, public bathing areas, waste management, air pollution, carbon monoxide, plumbing and drainage, minimum standards of housing and (as of March 20 of 2017) the use of electronic cigarettes in public places (Allegheny County Health Department 2017b).

The resources for elevated blood lead level testing in children are not robust in general. In fact, the number of children reported as being tested annually across the nation has dropped 90% since 1997 (Centers for Disease Control 2015). In Allegheny County, the Health Department has had to deal with its own funding cuts that threaten program effectiveness. After the CDC Childhood Lead Poisoning Prevention Program stopped extending significant funding to Allegheny County in return for surveillance data after the 2012-2013 funding cycle, many protocols changed in response to the diminished resources. The medical case management that prompted physician follow-up ended. (Namey 2017). The Health Department stopped medical case management when CDC funding for that activity was taken away on June 30, 2013. Today, the Pennsylvania Department of Human Services requires Managed Care Organizations to provide medical case management of children with EBLL.

To make up for the funding cliff here at home, the Pennsylvania State Maternal Child Health Program stepped in to continue to fund risk assessments and more pared-down programming for families of children under 6 years of age with blood lead levels of 15 μg/dL and higher. Excising comprehensive medical case management, a new lead poisoning prevention and home health program, called The Lead and Healthy Homes Program, ran from 2013 to June 30, 2016. Under this grant, the Health Department investigated every case where families wanted an assessment in the home (i.e. responded to the Health
Department’s outreach and did not decline the visit). They continued doing this outreach even after the money went away, paying for it out of the Health Department’s budget (Hacker 2017).

At present, the Safe and Healthy Homes program is in operation through funding by the Pennsylvania Department of Health maternal child health program, running from 2016 until 2019. The program offers education about injury prevention, prevention of triggers for childhood asthma, and it offers pest control and basic home maintenance supplies. Under this program, there is no lead component other than a visual inspection for homes built prior to 1978. On staff, the Safe and Healthy Home Program has two inspectors, and the Housing and Community Environment program has 14 inspectors of which only two currently perform lead risk assessments. The current level of staffing for these assessments nowhere meets the need for the number of homes that need to be addressed.

**Collaborative Programs and Looking Forward**

Allegheny County Health Department has made some improvements on programs and outreach in recent years, despite resource limitations. Some of these accomplishments include:

- Lowering the investigation trigger from 15μg/dL to 10μg/dL, and creating outreach programs for the “5 to 9” group
- Passing a universal blood lead testing requirement for children under the age of 6
- Training an additional 10 housing inspectors to become lead risk assessors
- Forming a lead Task Force with the County Executive to examine policies dealing with lead and investigate use of best practices
- Successfully lobbying the State to lower the blood level threshold from 10 μg/dL to 5 μg/dL to accept children for early education intervention.
- Working with City on new regulations regarding lead and water.
- Playing an instrumental role in helping to promote a $3.4 HUD lead hazard reduction grant received by the County Economic Development Department
- Funding a new inspector position through the County when funding for EBLL investigations through the State for the Lead and Healthy Homes Program ended in June 2016
- Making numerous presentations at Board of Health meetings and neighborhood groups about lead hazards
- Conducting surveillance, analysis mapping, and predictive modeling to identify target areas
- Successfully winning a grant to hire a new lead epidemiologist
- Updating the ACHD web site with the latest scientific information about all sources of lead hazards.
The County has also shown movement toward more dynamic program management in its recent history. The Allegheny County Conservation District, in a unique non-profit/government memorandum of understanding, does perform a certain amount of environmental regulation through permit management. It recently took on an unrequired initiative to develop sustaining relationships and programs to test lead in prospective garden soil in the city lots and to offer limited testing to homeowners at pop up events (Burgess 2017).

Likewise, through the catalyzing action of a core group of individuals, a large-scale grant application was successfully submitted to the Housing and Urban Development to be managed under the Allegheny County Department of Economic Development. This grant will allow 175 housing units inhabited by families at 80% or less of the median income and with children under six years of age present a significant amount of time to receive comprehensive lead abatement services, until January 2020 (Saks 2017).

As referenced above, the Allegheny County Department of Economic Development is managing this $3.4 million grant in collaboration with intake services from ACTION Housing and public education and outreach services performed by the Health Department. With the average cost per unit at approximately $12,000, the $3 million of the grant earmarked for lead abatement will be spent relatively quickly and this limited funding will not address all of the homes in need throughout the county. The remaining $400,000 is earmarked for a Healthy Homes Program that inventories the houses being treated for lead for 29 other forms of hazards as well, including respiratory hazards, mold and radon (Saks 2017).

It is hoped that the core group that catalyzed the grant application will remain and seek funding again after the three-year funding cycle is finished, as funding remains available for communities willing to compete for it. In addition to the support of the lead hazard mitigation funding, the public health department has secured funding from the Hillman Foundation to purchase the necessary equipment to conduct in-house blood lead level testing. This step is intended to support a new measure just passed by Allegheny County Council to require universal childhood blood testing for lead (Namey 2017).

Further funding has been secured to put more of the inspection staff through formal training to assess lead hazards. This training aims to help build capacity for necessary lead risk investigations, the number of which increased after the Health Department lowered its investigation threshold from 15 μg/dL to 10 μg/dL (Namey 2017). It is evident that scrutiny and public demand for better lead poisoning prevention programming is once again in the spotlight, and the Health Department will likely be held accountable to rise to the occasion despite limits on its funding.
THE CITY LEVEL

“In order to achieve increased independence for City government, and more power over local matters, the people of Pittsburgh adopt this home rule charter as an instrument of progress and hope.”

Thus begins Pittsburgh’s Home Rule Charter. Before the adoption of the home rule charter, Pittsburgh had to go to the state legislature in order to get permission for actions on local affairs. By adopting a home rule charter, Pittsburgh could make decisions that were applicable to the concerns of Pittsburgh without having to go to the state level. A Home Rule Charter essentially enables a municipality to shift state legislation to the local level, except where specifically limited (City of Pittsburgh 2013b) The City decided on a “strong mayor system” that has evolved over time with different home rule charters.

The most recent incarnation of the charter was adopted on November 5, 1974 and remains in effect today. Interestingly enough, the body commissioned to research the political climate of Pittsburgh as part of the creation of this document found many of the same difficulties in authority that plague the City to this day. It made recommendations that...
municipalities ought to consolidate authorities, stating specifically that “consideration should be given to merging the City and County housing authorities.” Enshrined in the charter are the minority opinions of those both in favor and against the alteration of rules, which provides perspective about the pros and cons of different approaches.

The new charter makes ample room for advisory boards and neighborhood community groups, however one dissident voice points out that these groups have been “weakened” to being merely advisory roles, implying that constituents had more influence in previous times. One community member commented that “the charter as a whole got progressively worse as far as the people’s interests were concerned,” although little documentation is really available to understand exactly why or how this might be the case. The government study commission did, however, recommend an increase in accessibility and accountability of elected officials themselves as well as of City activities (Pittsburgh Home Rule Government Study Commission 1972). Arguably, this recommendation must still be heeded and appropriately adapted to today’s digital era.

One question that is being asked by community groups and non-profit organizations is why, in the battle against lead paint and other common home toxins, are we testing children already exposed to the toxic conditions and not testing the housing itself? The City is moving to respond, although not at a speed that satisfies concerned constituents. In response to tremendous community outcry, the Pittsburgh Water & Sewer Authority is committing to working toward solutions for lead in water according to protocol stipulated by the Federal Lead and Copper Rule and to improving citizen access to its data in ways seen in model communities (Gorsch 2017).

City Council proceedings show a paper trail of responses to the local political climate surrounding home health. In April of 2017, the City of Pittsburgh provided $375,000 to support the matching portion of the Housing and Urban Development Lead Safety and Healthy Homes Grant and moved to commit $12 million over a seven-year period in support of the Housing and Urban Development (HUD) Community Block Development Grant (CBDG) Choice Neighborhoods Initiative to build healthy multifamily housing projects (City of Pittsburgh 2013a, 2017). These concrete commitments are interspersed among various declarations on the connection between toxicity and human health. A City Council proposal from 2011, Bill 2011-1697, for example, condemns Mercury as a harmful neurotoxin and commends ongoing advocacy for clean air (City of Pittsburgh 2011). There are multiple bills passed to honor the observance of Autism Awareness Month and recognizing the condition as the fastest growing neurological disorder in the United States. The autism bills fall short, however, of recognizing the possible connection between air quality and autism, as it has been studied by epidemiologists at Pittsburgh School of Public Health (Talbott et al. 2015).
There is a conspicuous lack of bills dealing with the lead, mold, and radon toxicity afflicting residents in substandard housing. The most vital piece of legislation that will impact Pittsburgh's ability to protect itself from substandard housing hazards and fulfill its charter was passed as a City ordinance and then challenged in court. A Pittsburgh rental registration measure passed in 2015 requiring landlords to register rental units for a fee, and it established the baseline requirement that would open the door to more stringent housing quality measures. The business community has declared this legislation an invalid overreach of the City into the regulation of business (Chintalapalli 2017; City Paper 2016). As will be seen in this paper, passing this legislation is a key step to protect Pittsburgh's right to self-determination and preventing the slow poisoning of its youngest residents.

Pittsburgh's home rule charter calls for such action: “A responsible city is one which expects aggressive action from its officials toward the achievement of dignified housing, useful employment, pure air and water, efficient transportation excellent education, health, safety, recreation and culture, and the other conditions conducive to human growth.”

This core first step of creating a rental registry – or at least tracking information about testing and remediation data in rental units – has allowed municipalities across the country to powerfully and effectively protect their own health and welfare. This legislation can serve as the keystone that will begin to heal the fractured divide between County and City dealings that allow the public health department to perform lead inspections without properly communicating results to the City and the City performing building inspections without an effective public health component. Perhaps bringing together these roles will allow for Pittsburgh to adopt lead ordinances into its existing building code, which is not currently the case. It is hoped that a clear point of convergence streamline responsibilities between the two entities.
NON-PROFIT AND COMMUNITY

Apart from legislative activity, the City does maintain some programs and services directly related to lead, mold and radon concerns.

The Urban Redevelopment Authority manages interest-free long-term home improvement ($25,000 max) and energy efficiency loans ($10,000 max) that are packaged with partial lead abatement grants for low to median income homeowners (25% of total cost with a maximum of $10,000 granted). This program, unlike most, does not require having a child under the age of six in the home in order to receive funding. This program is self-sustaining, funded by repayment of loans, although it was originally created through municipal bond funding.

Realistically, however, the cost of home improvements (with the priority being to bring the building up to code) has changed dramatically, and a higher loan limit of $50,000 is more realistic. An adjusted ceiling could free funding for radon mitigation systems, which are as of yet not a standard part of the assessment plan. URA staff comment that many clients come to the program with existing liens on their mortgage and could use greater financial education. The program is ripe for potential collaboration on education for home health classes as seen in other case studies. With the City’s growing emphasis on sustainability and energy efficiency, so too are partnerships between the City and home health non-profits (Kohnfelder 2017).

The non-profit terrain of the greater Pittsburgh area is much like a patchwork quilt of disparate operations as opposed to one fluid social fabric of collaborating organisms. ACTION Housing, Rebuilding Together Pittsburgh, CCI, American Lung Association, Women for a Healthy Environment, growing tenant rights organizations, child asthma prevention proponents, Habitat for Humanity, City, and County, among a number of other stakeholders are converging around the issue of safe, healthy, and green housing (Steele 2017). Despite this common interest, efficient collaboration is still a growth opportunity.

Currently, the Green and Healthy Homes Initiative out of Baltimore, which recently signed a compact with the City of Pittsburgh and Allegheny County, is the main hub for interagency coordination. On a biweekly basis, organizations converge to divide home health cases among themselves to see what part of the remediation required they can take on. Although this is an excellent step in the right direction, the joint efforts have urgent need of a case coordinator to facilitate an order of operations (i.e. fix leaks first, then install insulation, then paint) and ensure follow-through with planned action. At present that function, which warrants a full-time position, is fulfilled on a volunteer basis on top of an existing workload (Steele 2017).
There is no non-profit group working on home health issues that feels adequately staffed or resourced for the magnitude of the challenge they are working to overcome. Lead in water is an emerging issue taking on momentum and collaborations of its own. Women for a Healthy Environment has independently taken on functions developing or present in public health departments outside Allegheny County and enshrined in legislation elsewhere in the country, namely: testing schools, offering indoor air quality assessments, distributing water filters, issuing micro grants for remediation of facilities where children are commonly present, and performing educational outreach on the hazards of environmental exposures. There is a clear and present need for an annual advocacy and legislative agenda agreed upon by these disparate groups in order to maximize the efficacy of their message and to pool resources toward a legislative liaison wherever possible. There is no non-profit group working on home health issues that feels adequately staffed or resourced for the magnitude of the challenge they are working to overcome.

Schools remain an important gateway for non-profits to raise awareness, as many parents hold the educational institutions of their children to a much higher standard than they do their own homes (Naccarati-Chapkis 2017). Advocating for, and performing testing for environmental hazards including lead, mold, and radon has been an effective strategy in raising awareness among community members. The American Lung Association employed an excellent strategy to equip science teachers with radon test kits for their students, enabling a lesson in the scientific process and an opportunity to reveal home health hazards.

Budget for remediation, however, is not forthcoming (Natalie Stewart 2017), and many neighborhoods are disproportionately impacted by substandard housing, which results in high percentages of childhood asthma cases and hospitalizations. Better and more transparent data integration of the various City, County, and home health groups’ systems could help direct resources directly to the neighborhoods and buildings in most urgent need of attention. Truthfully, forward progress in the Pittsburgh community must reflect and respect the indelible importance of its 90 distinct neighborhoods. In Pittsburgh, people identify with those neighborhood as opposed to the city or state (Steele 2017). Neighborhood culture can result in shifts in cultural practice that precipitate legislative change. In Philadelphia for instance, southwestern communities commonly test for radon despite the lack of state laws mandating that practice during real estate transactions (Natalie Stewart 2017).

In Pittsburgh, there is no doubt that the strength of neighborhood communities had a role to play in the groundswell of support that brought the Housing Court into existence. Perhaps it is time for public support of new programs and policies. The following section will explore successful programs and policies in place throughout the country at the federal, state, and local levels that could be adopted or modified for use here at home.
IV. Attacking the Problem: Policy Approaches Around the Nation

FEDERAL POLICY OVERVIEW

In short, lead, mold and radon exposure in the home is a threat to human life and welfare that warrants decisive action and intervention. Nonetheless, regulating these toxic exposures occurs at the thorny legislative confluence of private property and public welfare.

A community’s collective sense of responsibility to invest in protecting the health of its residents can be seen in the health of its programs, strength of its regulations, and commitment to enforcing policy. While there are as many responses to this conundrum as there are American cities, federal regulation sets much of the baseline trends that are then adapted to regional sociocultural differences.

Fig. 27: The numbers keep dropping but even 1 μg/dL (about the same as a gram of sugar) is causing irreparable damage. While prevalence of severe lead poisoning is dropping in the wake of improved regulation, it is a mistake to think that the lead poisoning problem in the United States is over. Reproduced with permission from Journal Pediatrics, Vol. 138(1), Page 2, Copyright © 2016 by the AAP (Council on Environmental Health 2016)

In an ideal scenario federal, state, and municipal legislation would fit like neatly nested boxes with federal law providing the general framework and state legislation closely backing up policies enforced at the city and county level. In reality, the large federal framework is riddled with holes, state policies are frequently absent, and cities are often left to make up the difference with duct tape and determination. Despite challenges, the federal government has taken significant steps to address lead hazards in homes, and this still forms much of the legal basis for stricter local policies.
In 1970, President Richard M. Nixon signed the Clean Air Act and established the Environmental Protection Agency, setting in motion full government regulation of environmental hazard remediation, which had previously fallen in the purview of tort law (Latham et al. 2011; US Environmental Protection Agency 2015a). This legislation not only created the necessary federal structure that was tasked with enforcing the new laws, but it also created a fiduciary body to broker federal funding to state-level (and thus municipal) programs. This function married a sizable portion of local communities’ ability to protect themselves from environmental hazards to the vagaries of funding available through the then newly-formed Environmental Protection Agency and its partner programs in Housing and Urban Development and Centers for Disease Control.

It was Pittsburgh’s own Dr. Herbert Needleman, a pediatrician and professor at the University of Pittsburgh Medical School, who connected the dots between lead in the home environment and its toxic impact on children. His work helped steer these organizations toward greater primary prevention strategies (Segarra 2016). At a time when the average blood lead level of children aged 1-5 was 15 μg/dL, a full 300% of the Centers for Disease Control’s current reference level for lead poisoning, Dr. Needleman’s work crystallized concerns and catalyzed a national response (Centers for Disease Control 1997; Rosner and Markowitz 2005).

Fig. 28: Groundbreaking findings from Dr. Needleman’s work with children show negative student behaviors as reported by their teachers. Survey results and their connection to the level of the lead found deposited in children’s teeth from The New England Journal of Medicine: Herbert L. Needleman, Charles Gunnoe, Alan Leviton, et al., “Deficits in Psychologic and Classroom Performance of Children with Elevated Dentine Lead Levels,” 300(13):689-95. Copyright © 1979 Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society. (Needleman et al. 1979).
Responding to pressure, the newly formed Environmental Protection Agency began taking action on primary lead poisoning vectors by beginning to phase out lead from gasoline in the early 1970s (though it was not completely banned until 1996); creating strong lead poisoning prevention standards in federal housing in 1971 (restricting the lead content in paint used in housing built with federal dollars); followed by a ban on residential lead paint in 1978 (Fowler 2008). As the opening infographic from the American Academy of Pediatrics shows, aggressively enforced legislation works to protect children. The most recent significant actions occurred with the federal Title X Legislation in 1992, which mandates real estate and residential lease disclosures for all properties built before 1978 and lead-safe renovation requirements as recently as 2008 (with significant expansions in 2010) (US Environmental Protection Agency 2008; 102nd United States Congress 1992).

The federal Lead and Copper Rule set similar aggressive standards for tests of the public water supply for lead contamination twice annually, public education of contaminants found in water, and comprehensive remediation plans for communities found out of compliance including lead service line replacement (US Environmental Protection Agency 1991). As lead poisoning disproportionately affects low income children, additional federal supports are in place for that group. Housing and Urban Development, otherwise known as HUD, conducts inspections and mandates remediation of its Section 8 housing in addition to issuing substantial grants for local community lead remediation programs (US Department of Housing and Urban Development 1995). Additionally, in the early 90s the Federal Health Care Financing Administration (the federal agency that administers Medicare, Medicaid, and the State Children’s Health Insurance Program) ordered mandatory blood lead testing for children under 72 months of age (Pear 1992).

While that mandate has now been downgraded to a simple recommendation by The Centers for Disease Control, the requirement that Medicaid treat the child and identify sources of lead remains in effect (Centers for Medicare & Medicaid Services 2016). More recent updates to Medicaid policy allow limited billing for nontraditional providers of medical care, such as respiratory health educators and home health specialists to “treat” sources of environmental hazard in the home (Childhood Asthma Leadership Coalition 2016). Advocates of the home health movement support keeping such stipulations against a national backdrop of changing healthcare plans. In all, these laws are plagued with enforcement and funding problems of their own. Yet they nonetheless form the federal bedrock upon which more stringent state and municipal lead poisoning prevention policies are built and largely funded (Korfmacher and Hanley 2013).

Efforts continue to extend indoor air quality legislation into other areas of concern, such as mold and radon, and to preserve the first successes of indoor air quality protection at large. At present, the EPA has developed guidelines for dealing with mold in schools for instance, but has not yet passed federal legislation for mold remediation and mitigation regulation standards. In a win for lung cancer prevention groups, however, The Environmental Protection Agency did pass the Indoor Radon Abatement Act (IRAA) in 1988. The act states that indoor
radon levels should be equalized with outdoor radon levels, and it encourages individual states to develop further legislation (Kevin Stewart 2017). On the downside, compliance with the Indoor Radon Abatement Act is entirely voluntary and essentially nothing more than a federal suggestion. Despite its lack of enforcement mechanisms, the IRAA did offer valuable guidelines for maximum indoor radon levels, a voluntary radon professional certification program, and earmarked funding for states to pursue its simple yet ambitious agenda (Centers for Disease Control 2013b; US Environmental Protection Agency 1988, 2005).

As learned from national lead poisoning prevention efforts, public education and concern are necessary to spur federal action. There is, as of yet, no national level of consciousness around radon risks (Kevin Stewart 2017). The American Lung Association convened a meeting with the national radon workgroup to draft the Federal Radon Action Plan. The plan focuses on four goals: increasing visibility of radon as a health hazard, encouraging testing and mitigation by certified professionals, providing incentives and support for radon risk reduction, and using radon resistant new construction in buildings (US Environmental Protection Agency 2011, 2015b). The plan was formally announced at the National Healthy Homes Conference in Denver Colorado on June 20, 2011 and continues to serve as the guidepost for indoor air quality legislation as it concerns radon today (US Environmental Protection Agency 2011).

Increasingly, various groups across the country are realizing that healthy housing is a point of intersection for many of their common interests: childhood asthma, tenant rights, lead poisoning, health equity, cancer prevention, addressing poverty, financial literacy, home rule, and energy efficiency all converge at the issue of decent, affordable housing (Chintalapalli 2017; Jacobs et al. 2007). In 2009 the Surgeon General Stephen Golson issued a “Call to Action to Promote Healthy Homes” statement leading to greater coordinated and holistic efforts between government agencies, national organizations, and community groups working on home health concerns (Centers for Disease Control 2011; Office of the Surgeon General 2009). Immediately following, Healthy Homes and the Lead Poisoning Prevention Branch merged within the Centers for Disease Control.

The Healthy People 2020 objectives published by the CDC in 2010 reflected the Surgeon General’s language and contained comprehensive goals related to lead, radon, asthma provoked by indoor allergens, and enhanced surveillance of health outcomes related to the home environment (Centers for Disease Control 2010a). Funding and training for related initiatives, albeit modest relative to the need, were thusly made available in following years.

Formal statements and recommendations on the national level serve as calls to action and draw attention to important issues. However, these recommendations do not in and of themselves accomplish as much as equivalent legislation would. The federal government continues to collect the tax money of individual states without returning them sufficient financing to properly enforce environmental legislation (Wines 2016). Appropriately responding to the resounding evidence on home health as a determinant of biomedical health continues to fall in the laps of the states themselves, the result of which is a variety of approaches with a range of effectiveness.

Increasingly, various groups across the country are realizing that healthy housing is a point of intersection for many of their common interests.
State law in response to indoor air quality concerns is as wide and variable as the US itself. Of the three chief concerns addressed herein, mold is the newest area of legislation, lead is the oldest, and radon falls somewhere in between. Mold is an emerging issue that is growing stronger in public awareness since a "60 Minutes" episode aired on the hazards of black mold in 2007 (Richen 2017). More frequent extreme weather patterns and climactic events are increasing precipitation in many areas across the country (US Environmental Protection Agency 2016a) and increasing the risk of mold in homes from water incursion through poorly-maintained housing. Regulation has also emerged, however tenuously, in an attempt to ensure effective and reliable mold remediation, as demand for these services has increased.

Ten states currently have regulation controlling mold remediation standards, and four have developed training and certification requirements at the state level. These states take a regulatory stance on the issue and require training for mold workers: Louisiana, Tennessee and Texas particularly. In fact, Texas requires photographic proof of proper mold remediation procedures, third party verification of job completion, and certification of all mold workers (Geltman 2015). In light of the high variability of air quality tests for mold and inconsistent sensitivities of tenants, mold is often a difficult issue to pursue through legal channels (Richen, 2017). Nevertheless a few states have emerged with specific landlord-tenant protection statutes related to indoor mold.

The District of Columbia, Montana, and Virginia Codes require landlords to remediate mold contamination and disclose previous mold contamination to prospective tenants. Washington State requires that landlords educate tenants in writing on the hazards
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of indoor mold. North Carolina and Virginia require that the landlord remediate in a reasonable period of time, and of the two, Virginia requires that a landlord pay for relocation during remediation (Environmental Law Institute 2012). Virginia is unique in its rigorous stance on mold-related issues. Several states have strategically combined real-estate disclosures on a variety of substances: Kentucky, California, Indiana, Oklahoma, Oregon, Michigan, New Jersey, and Ohio have laws requiring combined disclosure statements including, by and large, radon, asbestos, lead-paint, and formaldehyde to prospective buyers.

Pennsylvania has no standing mold remediation legislation. In 2002, Pennsylvania Senate Resolution No. 171 passed wherein Pennsylvania State urged the Department of Health to establish a task force to investigate mold in homes, schools, and other buildings. No other legislation was found. (Environmental Law Institute 2016)

Even in communities with an extensive awareness on mold as a public health concern, there is little in the way of standardized policy. Usually responsibility for fixing leaks, groundwater seepage, and plumbing falls under the jurisdiction of building codes and tends to represent the best course of action for preventing mold from occurring in the first place (Richen 2017). Virginia is one of a few states that have state building codes, a fact that likely facilitated its proactive mold regulation (Virginia Uniform Statewide Building Code (USBC) 2012). The state building code further creates the basis for landlords to keep painted surfaces of dwelling units in good condition. The landlord’s failure to meet this standard is enforceable and entitles the tenant to terminate the agreement. Most local government structures, however, adopt one of the standard uniform building codes, such as the International property maintenance code, or some customized variation. Ventilation and proper plumbing conditions are addressed in these statutes which, when adequately outlined and complied with, provide a decent measure of health protection in most circumstances (Richen 2017).

Radon on the other hand has significantly more movement across the country. Thirty-seven states require disclosure during real estate transactions of known radon hazards; about half of the country has professional radon mitigation certification standards in place. Colorado, Florida, Illinois, and Maine require landlords to disclose radon hazards to their tenants. Nine states require testing in daycare centers: Connecticut, Florida, Iowa, Illinois, Idaho, Michigan, New Hampshire, New Jersey, and Rhode Island. Thirteen states require testing in schools; Eleven states require public education on radon awareness; Eleven states impose civil penalties for misrepresenting radon readings; and an equal number impose criminal penalties. Five states impose penalties on both civil and criminal sides of the law. Eleven states have now required radon resistant new construction technique: California, Florida, Illinois, Maine, Minnesota, New Jersey, Oregon, Rhode Island, Washington and West Virginia. Minnesota’s blanket requirement to distribute radon education material during all real estate transactions is a particular success (Geltman 2016).

Eleven states impose civil penalties for misrepresenting radon readings.
Lead legislation, in its broad strokes, has the greatest breadth of regulation out of all indoor environmental hazard exposures discussed (Farquhar 2010). Before zooming into the specifics of individual state lead laws, significantly more complex a topic than mold or radon, it is worth taking a panoramic view of patterns in legislative approaches. Lead law is progressive in its degrees of investment and consumer protection. In our survey of legislation from state to state, the different baseline legislative stances toward lead hazards are easiest to understand as analogous to the different levels of options in a cell phone plan: some states adopt the minimal federal legislation to get by and other states invest in the best plan possible and “bundle” legislation into a comprehensive strategy that includes radon and other indoor air quality concerns.

### Level 1: The Econo Plan

For the budget-conscious buyer, this plan represents the bare minimum state adoption of federal lead hazard remediation standards and little else. This plan establishes state primacy, giving jurisdiction of federal rules and regulation over lead remediation workers to state agencies. Features of this plan include forbidding the sale of lead-based paint within state lines, as defined by the federal government, as well as adopting licensing, work, and certification requirements for lead abatement professionals.

**North Dakota** adopted such legislation in the same statute as similar asbestos remediation and certification laws (Farquhar 2010). Some states adopt this plan but make direct reference to further governmental divisions’ right to adopt stricter standards and programming, perhaps in hopes that cities will step up to the challenge as they can.

**Tennessee** uniquely forbids programs any more stringent than EPA guidelines surrounding lead remediation (Tennessee Code 1997).

### Level 1.5: The Econo Plan Plus

This plan includes all the stipulations of adopting federal regulation plus mandatory state reporting of EBLL to the central health department.

**West Virginia** and **Arizona** are examples of a state employing this regulatory tactic (Arizona Revised Statutes 2017; West Virginia Legislature 2006).
**Level 2.0: Almost Brass Tacks**

For those states looking for greater environmental protection without the risks of full budgetary commitment, the Almost Brass Tacks level is a popular option. This plan usually encompasses state regulation of federal Renovation Repair and Painting (RRP) rule requirements and makes loose reference to requiring the state public health department to establish a lead poisoning prevention program of its own. Few specific standards or enforcement provisions are listed in the law itself, and emphasis is on secondary prevention of already poisoned children.

**Kansas**, among others, has legislation that follows this model (Environmental Law Institute 2016; Kansas State Legislature 2017).

**Level 2.5: Almost Brass Tacks Plus**

This approach encompasses the “Almost Brass Tacks” approach and adds a partial element of more comprehensive legislation found elsewhere in the nation.

**Missouri** is one such example: the state has all the hallmarks of levels 1 and 2 but also requires blood testing of children in priority areas and offers limited lead abatement loans. The state has no proactive prevention strategy in place. While improper certification of workers does carry penalties in Missouri, there are no other enforceable provisions (Meyer 1994; Missouri Department of Health and Senior Services 2017). St. Louis both as a city and county developed its own lead poisoning preventative programs almost 20 years before the state to adopted its regulation, and one can infer that leadership of the City was responded to by the state (Farquhar 2010; Kincaid 2006). In general, nonspecific references to lead poisoning prevention programming in this style of legislation are on shaky ground, vulnerable to becoming symbolic during a budgetary crunch. As a result, in 2014, 9.2 percent – or 1,123 children – of St. Louis kids tested had a lead level above 5 μg/dL of blood. In several neighborhoods, more than 20 percent of kids have EBLL (Bernhard 2016).
**Level 3.0: Brass Tacks**

This plan represents a legislative bridge between a hands-off stance by the state and movement toward a consumer protection agenda. Although it does not address many specific fines for failure to comply, it does get down to key “brass tacks” and includes mandatory reporting of data, application of state funding, and/or authorization for the public health department to levee the necessary fees to support itself. This approach falls short of specific, measurable goals or penalties, but does recognize that programs cannot survive without funding – and moves to provide it.

**Iowa** has this legislation available, but only to municipalities that can provide “matching grants” (Farquhar 2010; Iowa Legislature 2017).

**Oklahoma** has a more unique funding byline that “authorizes the Department of Environmental Quality to make grants, from monies appropriated for that purpose, to state beneficiary public trusts serving communities affected by historic lead and zinc mining and located within the boundaries of federal Superfund sites; to assist parents or legal guardians of children six (6) years of age and younger” (Farquhar 2010; Oklahoma Legislature 1994).

These concrete financial commitments can sometimes come surprisingly quickly, as shown by the recent uproar in **Indiana** in 2017 after evidence emerged showing that soil in East Chicago had over 70 times the allowable lead limit. State aid was promptly provided (Associated Press 2017).

**Level 3.5: Brass Tacks Plus**

At this point in the spectrum, states move beyond covering their minimal basis toward more comprehensive and proactive planning. Alongside adopting federal regulation at a local level, the state mandates integrated blood lead level screening into other routine school or clinical procedures.

**Delaware**, for instance, requires all childcare facilities, preschools, and kindergartens to screen for blood lead levels unless parents object (Delaware Legislature 1997). The mandate is intended as a follow-up to a requirement to screen all children at one year of age.

**Virginia**, similarly, has lead education integrated into standard protocol for well-child checks, but no mandatory blood test. While the integrated screening procedures are excellent, there are no legislated case management procedures or follow-up protocols to accompany them legislated in the state of Virginia. In keeping with previous discussion of state level building codes, it is mandated into state law that landlords maintain painted surfaces in compliance with the International Property Maintenance Code (Farquhar 2010; Virginia Board for Asbestos, Lead and Home Inspectors 2015; Virginia Legislature 2012; Virginia Uniform Statewide Building Code (USBC) 2012). That pairing is a common one, as case management represents a significant investment.
**Level 4.0: Nearly Comprehensive**

Level 4.0 is where legislation can be considered comprehensive. Characteristics of this investment in public welfare include:

- Standard adoption of federal RRP certification process
- Provisions for investigating lead poisoning throughout the state
- Educating healthcare providers (at minimum)
- Case management services for poisoned children
- Identification of high-risk areas
- Surveillance and data management

This level of legislation is titled “nearly comprehensive” because it focuses on secondary as opposed to just primary intervention. This level of programming was first supported by the Centers for Disease Control Childhood Lead Poisoning Prevention Program, which was terminated during the 2012 funding cycle. For this and other reasons, there is periodically evidence of comprehensive legislation coming into being and then being repealed in response to federal vagaries. Louisiana is one such a case (Farquhar 2010).

**Level 4.5: Nearly Comprehensive + Tenant Protections**

This level of legislation recognizes the vulnerability of tenants that comes into being when more scrutiny and potential penalties can be leveraged against landlords. For example, the lead poisoning prevention legislation of Arkansas was upgraded from its comprehensive status to expressly prevent retaliatory action from property owners and to allow the public health department to search without a warrant, better preventing interference from property owners (Arkansas Legislature 2010).
**Level 5.0: Model Legislation**

**Massachusetts** offers a glimpse of standard attributes of model legislation that cover significant ground in both primary and secondary prevention. Including insurance provisions is an important step in providing a foundation for universal lead screenings – an intuitive but uncommon inclusion. (Farquhar 2010; Massachusetts Trial Court Law Libraries 2016). Massachusetts established a comprehensive lead prevention program to:

- Promulgate regulations regarding screening of children under 6 years and pregnant women, create guidelines for medical follow-up, and procedures for reporting EBLL
- Manage an educational and publicity program
- Create an early diagnosis program to examine all children under 6 years and a recording system of the children examined
- Detect sources of lead, providing for inspections of residential premises, procedures to notify owners/occupants, and screening of residents 6 years of age or less
- Establish a loan program for lead abatement in the commonwealth of Massachusetts
- Allow the director to designate emergency areas identified with high levels of lead poisoning that will receive special attention during inspection
- Establish a lead poisoning laboratory to analyze results
- Require the owner of a residential premise to remove or cover lead-based materials so as to make them inaccessible to children under 6 years
- Require disclosure of lead hazards to prospective purchasers of property and make inspections available
- Require RRP certification for any construction or renovation work performed
- Require tenant protections from discrimination arising from participation in lead poison prevention programming
- Require standard certification procedure for private laboratories and lead workers
- Designate authority for the revocation, suspension or cancellation of any such license or certification
- Include enforcement provisions to punish violators
**New Jersey** is slightly less exacting but adds key additional protections:

- Provisions that require every health insurance plan covering a group of 50 or more persons, including HMOs and Managed Care Organizations, to cover the cost of lead screening and childhood immunizations without any deductible
- A grant program to provide loans to local boards of health to abate lead paint nuisances
- The authority to order an owner to remove and dispose of lead paint if an individual in the unit is suffering from lead poisoning and to complete abatement within 10 days
- Provisions forbidding an owner to evict an occupant for the purpose of avoiding abatement procedures
- Setting blood lead level consistent with the most recent recommendations from the federal Centers for Disease Control and Prevention (CDC).

(Centers for Disease Control 2010b; Farquhar 2010; New Jersey Assembly Democrats 2017).

**Level 5.5: Model Legislation Plus**

Beyond comprehensive primary and secondary prevention measures, some states mandate school inspections and/or contain additional clauses to hold both public health departments and abatement workers accountable for professional and timely service. Language of such model legislation tends to be precise and measurable.

**Connecticut** is one state that has specific, measurable, and timely protocols. Within the bounds of this state’s legislation, there are clear provisions for financial assistance in the form of loans and grants of up to two thirds the cost of abatement. Structural organization has occurred to place the public health department in charge of licensing daycare centers, thus facilitating requirements for their lead poisoning prevention inspections, maintaining screenings of children in their program, and running unannounced inspections of 33% of licensed children’s homes every year. All clinical laboratories must report to the local director of health any blood lead level equal to or greater than 10 μg/dL.
Laboratories are required to give monthly reports with detailed information on both the results and the chain of command ordering them. Physicians must report any blood lead levels equal to or greater than 20 μg/dL and initiate an investigation. Local health directors, pending availability, are encouraged to use community resources to relocate occupants of offending buildings. Owners of buildings are required to maintain or abate their units in such a way as to prevent lead poisoning. A community education program stipulates thorough outreach to the general public, Health and Human Services workers, teachers etc. on the sources of lead poisoning and how to prevent it.

Deeper in the health code the state of Connecticut are embedded checks and balances to ensure high quality and timely response. Investigations into the sources of blood lead levels equal to or greater than 20 μg/dL must begin within five days of receipt of a confirmed blood test. A report on the results of the lead inspection must be completed within two days of said inspection and filed with both the department and property owners. A 75% failure rate to abide by this timeline will result in the referral of the local health department to the state Department of Health administration branch. Code inspectors have lead risk assessment training in order to facilitate its biannual inspection of daycare facilities for associated risks (Connecticut State Health Department 2017; Farquhar 2010).

Having provided an overview of general trends in the structure of state laws, the remainder of this section will explore further legislation, programs, and model cases in municipalities around the country.

**SURVEY OF MUNICIPALITIES**

*In the chronically understaffed environment of community policy and practice, it is rarely possible to step back from urgent tasks at hand to take stock of how other cities are approaching similar issues.*

Of the thousands of cities across the United States, there are many that have derived effective and streamlined responses to indoor air quality issues that are worth examining, if not emulating. The following is by no means an exhaustive list, but rather a useful tour of alternatives, some of which could be adopted directly or modified to augment the current efforts in the City of Pittsburgh and Allegheny County.

It is important to note that the scope of this research did not allow us to identify quantifiable reductions in lead, radon, or mold as a result of the programs in each of these benchmark municipalities. With additional support in this area, we would hope to examine the subject further.
A Regional View: Washington DC, Baltimore, Montgomery County, and Maryland State

In between the sprawling metropolis of our nation’s capital and Baltimore lies Montgomery County, home to the National Institutes of Health laboratories in Bethesda and adjacent to forward-thinking municipalities such as Greenbelt, an experimental community partially designed by Eleanor Roosevelt in 1935 to benefit worker health through affordability, cooperative ownership structures, and the earliest awareness of the connection between health and the built environment (Knepper 2001). Given its location, it is unsurprising that such an area would be marked by progressive policies that are informed by scientific practice. Our research into Montgomery County has revealed a unique openness to public health interventions.

As of October 2016, all homes must be tested for radon prior to any real estate transactions. Since 1995, all homes built in the county must adhere to Radon Resistant Construction standards. Maryland state backs its requirement by offering low to no cost radon test kits, typically funded by federal EPA grants, through local public health departments wherever possible (Department of Environmental Protection, Montgomery County, MD 2017b). Montgomery County went a step further and expanded the definition of “indoor air pollutants” to include dust, odor, viruses, bacteria, fungi, radon, asbestos, smoke, gas, and mold into their Department of Environmental Protection guidelines. A clear definition of indoor air pollutants is the first step toward comprehensive action to address them. Enforcement of indoor air quality provisions – following violations that are substantiated by two individuals – results in a warning letter from the DEP, followed by a penalty of up to $500, which then increases to $750 by repeat offenders (Department of Environmental Protection, Montgomery County, MD 2017a).
Lead paint is treated with equal importance and is backed by powerful state law. In accordance with Maryland law, property owners are required to submit a Lead Poisoning Prevention Checklist annually in addition to obtaining a Lead Paint Inspection Certificate. The inspection certificates fall into five categories:

1. If a building is certified as “lead-free,” a certificate must be registered one time only.
2. If it is registered as “limited lead-free,” it must undergo a re-inspection two years from the date of the first certification to be reclassified.
3. The “full risk reduction” category properties must have a dust inspection test at change of tenancy, but preferably in a vacant unit before occupancy. This designation refers to successful stabilization of chipping paint or dust hazards previously assessed.
4. The “modified risk reduction” category must have a visual and dust inspection and is typically performed in an occupied unit after a blood level of 10 μg/dL has been found in a pregnant woman or child. Occupants must be relocated to a lead safe dwelling while abatement work occurs.
5. A “lead safe” designation must have a dust and/or visual inspection together with verification that windows are lead-free or friction surfaces adjacent to windows have been treated to be classified as lead-free at change of tenancy.

Inspections are performed by a state-accredited inspector at the property owner’s expense. This is a reflection of normal protocols requiring property owners to have a professional verify that their plumbing and electric are operating at a safe standard. Fees from filing paperwork with the County support the program (Farquhar 2010; The Maryland Department of the Environment 2015).

Adjacent to Montgomery County is the sprawling City of Baltimore, birthplace of the Green and Healthy Homes Initiative. Baltimore, famously, directly orders lead abatement of properties if lead hazards are found, demands that tenants be relocated during abatement at no expense to them, and performs clearance inspections. This procedure is standard application of Maryland state law. As a city, Baltimore instituted additional protections allowing for tenants to pay rent in escrow in order to collect monies for remediation of urgent hazards, in alignment with state law. The City offers an easily-accessible database so that prospective tenants can check if an apartment or home has a lead hazard violation that has not been fixed. The City health department has a lead poisoning prevention program that has an unusual legal enforcement component to aid victims, education component, and comprehensive case management for children with lead poisoning. Heavy fees can be successfully leveraged against property owners (The Maryland People’s Law Library 2017a). Opponents of these
strong tenant protections have raised concerns over mothers potentially poisoning their children on order to receive free rent (Dresser and Wheeler 2015). We were unable to find any additional information related to that subject.

With respect to the presence of mold in rental units, tenants within Baltimore city limits are able to register a complaint, and Code Enforcement will investigate water intrusion arising from noncompliance with building code. Noncompliance with code is direct cause for a citation (The Maryland People’s Law Library 2017b; Baltimore City Charter & Codes 2015). Clearly listing mold as an indoor air pollutant in Montgomery County allowed for a legal precedent to be set to increase tenant protections. A tenant under Montgomery County jurisdiction complained about high levels of mold that caused illness and property damage, and then filed a successful lawsuit against the property owner. The tenant claimed that the landlord did not maintain the property in a reasonably safe condition, and the court awarded the tenant $19,400 in total compensatory damages (Krauser and Nazarian 2015). Such a case proves that going a step beyond building codes and plainly defining mold as a health hazard can serve as a deterrent to substandard maintenance practices. At the state level, a task force formed in 2001 gave rise to mold remediation licensing and work standards; unfortunately implementation has been suspended indefinitely. In 2014, however, mold prevention standards for public school buildings were successfully adopted as outlined by the International Green Construction Code and Maryland Green Building Council (Environmental Law Institute 2016).

In keeping with the regional trend, Washington DC is a hub for proactive public health policy. Unlike its neighbors, Washington DC has incorporated mold provisions directly into their City policy. The City has adopted a universal “tenant’s rights proclamation,” which must be distributed with any lease signed in the area. Landlords are required to disclose lead-based paint hazards, previous mold infections, and a copy of the latest lead hazard clearance report. Listed on the Tenant’s Bill of Rights is the provision that when tenants suspect mold infection, landlords are required to investigate within seven days and remediate within 30. Mold professionals are required to be licensed and adhere to minimum standards of work practice. Tenants are also informed of their right to receive relocation assistance if major work must be completed on the property, as well as the right to organize tenant unions (DC Office of the Tenant Advocate 2015; Environmental Law Institute 2016).

In 2008, the District of Columbia passed the Lead Hazard Prevention and Elimination Act, making the presence of lead-based paint hazards illegal in all residential dwelling units, common areas of multifamily properties, and child-occupied facilities. The law grants authority to the District government to enter such places and conduct a risk assessment. If a District official finds a hazard, then the property owner will receive a Notice of Violation and an Order to Eliminate Lead-Based Paint Hazards, specifying where the hazard is and how the owner must proceed with abatement (DC Department of Energy & Environment 2015). After work has been finished, a clearance inspection must be completed by an

The City has adopted a universal “tenant’s rights proclamation,” which must be distributed with any lease signed in the area. Landlords are required to disclose lead-based paint hazards, previous mold infections, and a copy of the latest lead hazard clearance report.
independent assessor. The Lead Safe Washington Program in the public health department proactively pursues lead-safe affordable housing by testing units free of charge for lead hazards and offering grants to eligible property owners to remove lead-based paint. The program is funded through HUD’s Office of Healthy Homes and Lead Hazard Control grants (OHHLHC) and the District’s local Housing Production Trust Funds monies. Typically matching funds are required for HUD grants to be released (DC Department of Housing and Community Development 2017).

The City as a whole has zeroed in on its growing asthma epidemic among children which, at 15.2%, was the third highest in the nation in 2008. The City passed the Green Building Act, requiring that new construction or substantially improved residential projects actively avoid asthma triggers. The law specifies the use of low volatile organic compound (VOC) building materials; prohibits composite wood with added formaldehyde and carpet installed in areas prone to moisture and mold; mandates proper ventilation, radon mitigation for areas in Zone 1, prevention of water intrusion, and integrated pest management; and other features. The current rate of asthma is nearly 12% according to the National Capital Asthma Coalition, proof that slow change is taking place (National Capital Asthma Coalition 2017).

Austin, Texas

Austin Texas is another island of proactive and integrated antipoverty, lead poisoning prevention, and substandard housing improvement programs (Austin Neighborhood Housing and Community Development 2012). The Lead Smart Healthy Homes Program offers free education, blood testing, and lead abatement work to qualified property owners.
The program requires a child present in the unit at least six hours of any seven-day period and that the unit is owned and occupied by a family at 80% or below of the median income level. Landlords are forbidden from raising the rent for the year following abatement work and must prioritize renting to families with young children for three years following abatement work. The program additionally requires that 50% of treated units must be made available to families earning below 50% of the area’s median income level.

Cognizant of the persistent overlap between thermal regulation problems and unstable lead paint, the program mandates the replacement of old windows, one of the greatest sources of lead dust, with new energy efficient aluminum windows. Residents are eligible for up to $30,000 of free lead abatement services under this program (Austin Neighborhood Housing and Community Development 2017). Like Pittsburgh, Austin offers loan programs for home improvements that bring houses into building code compliance and partners with many non-profits to conduct free or low-cost repairs. Unlike Pittsburgh, a certain portion of the loan is forgiven when individuals refrain from leasing, pulling equity, or selling, and use the repaired home as their primary residence.

There is additional grant money available to repair or replace wastewater service lines that appear to be damaged, although not lead service lines. These programs are advertised within greater antipoverty programming of down payment assistance, home buying education classes, and matching savings programs to help finance education, homeownership, and small business ventures. At least part of the funding for these programs comes from innovative use of the HUD Community Block Development Grants (Austin Neighborhood Housing and Community Development 2012; City of Austin 2017).

Tenants in Texas have generally less protection than more intervention-focused states. In the one salient point of Texas' mold remediation laws, an exemption exists allowing property managers and landlords to perform their own assessment and remediation in all but the most severe cases (Texas Health and Human Services 2017). This point represents a clear conflict of interest favoring landlords, yet the state has also developed and adopted statutes in the state residential property law protecting a tenant’s right to withhold rent for necessary repairs (Texas Legislature 2008).

Austin, like many municipalities, has adopted the International Building Code with local amendments. There are no special provisions for lead, mold, or radon in this code or in the city charter (Austin Municipal Code 2017). Without concrete codes and legislation, Austin must rely on the continuation of prevailing priorities, staffing, and socio-cultural norms to ensure its indoor air quality programming remains in place. So far these programs have been successful, but memorializing practice into policy is by far a more sustainable strategy.
Focus on Lead: The Story of Burlington Vermont

In Burlington, Vermont, health information is visible and commonplace throughout the City. Water quality reports are found neatly lining brochure cases in public offices boasting of lead-free water. Annual reports publishing the salary of every single person on municipal payroll, City debt obligations, budgets, and individual department accomplishments are found on the tables of local cafés (City of Burlington 2016); they are circulating in abundance. The City is actually having trouble spending its lead hazard reduction money lately within City limits and is taking programming to neighboring Winooski (Tanguay 2017). Their problem is that they have done such an effective job of educating their population and enforcing City ordinances, that most tested properties pass a lead clearance.

It took a little over 12 years of consistent effort to make lead poisoning almost a thing of the past. The housing inspectors on staff overseeing the Section 8 voucher program seem to chuckle at their success. “It’s real easy on our end. If they don’t pass an inspection [including a lead clearance according to 1993 HUD guidelines] they have 30 days to fix it before we withhold rent. Then they have to deal with city fines on top of it... Gets ‘em moving...” (Winegar 2017). Burlington City departments have many points of synergy: Housing Authority potentiates City ordinances; Code Enforcement dovetails with public health authority; code refers clients to the Lead Hazard Reduction Program but docks their loan forgiveness rate for not being code compliant in the first place; City ordinances potentiate the enforcement of State Law (Ward 2017).

The Women Infants and Children (WIC) supplemental nutrition program, as a department housed within the state public health department that cares for 50% of Vermont children, has access to the lead screening data of their clients and makes calls to the Housing Authority when they see a red flag. They fax lead screening referrals to local physicians’
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offices (Charnley 2017). The Attorney General does not flinch to prosecute fraudulent Essential Maintenance Practices (EMP) certificates or lead hazard noncompliance with hefty fines. In a city where 80% of homes represent a potential lead risk, teamwork has woven a tight net that makes it more difficult for children to slip through (Tanguay 2017).

Vermont was one of the first states in the nation to define 5 μg/dL as the reference level for blood lead levels far before the CDC (Reddinger 2017). Since the ‘80s, state law has granted the right to safe housing in a “warranty of habitability” law, stipulating that the premises are safe, clean, and fit for human habitation. The state has legislated further basic minimum standards for rental units detailing water supply, lighting, heating, and sewage, among other standards (Vermont Legislature 1985). While the rental housing health code does not include statutes related to lead, separate legislation controlling lead in rental units was passed in 1996 (Vermont Housing and Conservation Board 2017; Vermont Legislature 1996). This state lead law, like Rhode Island lead law, is comprehensive legislation that has very few teeth until municipalities take the initiative to enforce it (Korfmacher and Hanley 2013).

Since passing the laws in 1996, Vermont has required owners of rental units and daycare centers built before 1978 to perform essential maintenance practices to prevent the deterioration of lead paint. Seventy-five percent of Vermont’s lead poisoning cases occur in rental units, so property owners are specifically targeted in the legislation. Contrary to popular belief, lead paint maintenance practices are quick, cheap, and easy. They represent things that responsible landlords should be doing anyway: inspecting paint surfaces, fixing deterioration using approved methods, installing low-cost liners in window wells, and cleaning dust with a HEPA filter after stabilization work and at turnover (Tanguay 2017). The state offers free training on how to perform essential maintenance practices, and all are welcome to attend. Landlords are required to complete an approved training. The lead law presumes that all paint in pre-1978 housing is lead-based and mandates that landlords distribute lead poisoning prevention pamphlets to current and prospective tenants (in accordance with federal law), post a notice requiring tenants to report deteriorating paint to the owner, and sign a compliance statement with the state, tenant, and insurance carrier indicating that essential maintenance practices have been completed every year. Daycare centers must also submit a certificate of compliance (Vermont Housing and Conservation Board 2017).

On other issues, the state health department is still struggling to pass legislation or even mount a practical response. While state lead poisoning data is clear and accessible online, it lacks information on follow through or initial actions taken (Vermont Department of Health 2017). There is little on the books by way of radon legislation despite long-standing free radon kits available for distribution (Geltman 2016; Reddinger 2017). Greater movement has occurred requiring schools to address indoor air quality, to create an online clearinghouse for information on environmental health in schools, and to use of green cleaning products, per a state mandate (Environmental Law Institute 2016). The Burlington state health department is working to develop a pilot program that will offer environmental health assessments to local area schools (Reddinger 2017). The assessments

Contrary to popular belief, lead paint maintenance practices are quick, cheap, and easy. They represent things that responsible landlords should be doing anyway.
are only to offer recommendations, not to enforce criteria. To the state’s credit, however, the minimal habitability standards for rental units include the requirement that dwellings be maintained “to be free from the regular or periodic appearance of standing water or excessive moisture, which may result in visible mold growth” (Vermont Legislature 1985; Vermont Rental Housing Codes 2017). The City, desiring to formalize a more energized enforcement protocol, requested and received authority to enforce those state provisions (City of Burlington 2017c; Ward 2017).

Burlington, like Philadelphia (as we will see later), is a city where at least one person of influence has had a child of his or her own exposed to high amounts of lead. The Burlington Community Economic Development Office’s highly successful lead program was founded in 2003 by a City worker whose own child suffered from lead poisoning (Tanguay 2017). The passion of the current director, in office since 2004, is known throughout the town. He gets to work in the wee hours of morning and regularly goes above and beyond the call of duty. The Director of Code Enforcement down the road is cut from the same cloth. It is believed by many within the municipal government that the duo’s individual leadership and collective teamwork set a high standard for addressing local home health issues (Winegar 2017).

With this spirit of dedication, the municipal program has continually and aggressively sought federal funding since 2003, and, because of its high performance and motivation, regularly receives it. The program offers grants and interest-free deferred loans payable on sale of the property in order to reduce lead paint hazards and to prioritize abatement work at daycare centers and properties occupied by children under the age of six. Special incentives exist for Section 8 housing providers, who are eligible to receive a total of up to $10,000 per unit at 0% interest. The program has plastered information on lead hazards, unsafe work practices, and instructions on how to receive a free blood lead level test for children under six all over the city. As an additional form of outreach, the program hangs an enormous, garish drop cloth on the exterior of the building with a bright neon green “L” on it. The drop cloth functions to limit lead dust in the area and also to get neighbors talking amongst themselves about lead hazards.

After the work is completed, if property owners rent to Section 8 individuals for eight years, the loan will be completely forgiven. If Code Enforcement refers landlords to the program due to a lead hazard, property owners are eligible for 50% forgiveness of loan on sale of the property. The program performs its own risk assessments, project design, and administrative management to ensure as much oversight over program operations as possible. Of its four full-time staff members, three are trained as certified risk assessors, and two are trained as certified project designers. Due to its extensive in-house capacity, the program is able to offer a one-month turnaround from submitted application to work plan. A shortage of certified lead hazard workers in the state, however, sometimes delays implementation of projects (Tanguay 2017).
Since its inception, the program has recognized the need to secure the goodwill of the local area landlords. While HUD grants have very specific requirements for how money is to be used, there is some freedom to design education and outreach efforts. The program director developed landlord barbecues for Section 8 lessors in particular. The lead hazard reduction program outreach highlighted the benefits of primary prevention. The state Attorney General spoke of her commitment to pursuing lead violations to the fullest extent of the law. The stick and carrot relationship was made very clear. The program funded Renovation Repair and Painting (RRP) trainings at a significantly lowered cost for local area building professionals in the similar spirit of securing their understanding and support. In all, the department has placed a strong emphasis on the importance of organizing face-to-face meetings and bringing together service providers to co-promote, among other things, services such as energy efficiency and lead abatement (Burlington Lead Program 2017; Tanguay 2017).

Code Enforcement officers were put through certification classes to become certified lead risk assessors early in the municipal ordinance development process. The certification costs $500 annually to maintain, and it quickly expires. This sizeable and ongoing investment in having a well-credentialed team left an impression on the enforcement officers, and the value they attributed to their work has remained strong. As opposed to seeing themselves as low-ranking City employees, they came to view themselves as the frontline protectors of their community. This positive shift in work culture has facilitated a steady trend in increased efficiency and shorter turnaround time. The department receives positive reviews from both tenants and property owners alike, who feel that operations are timely, professional, and fair. Small changes such as carrying business cards and performing inspection inventories on a digital tablet facilitate communication and timely completion of reports.

One Code Enforcement officer, a social worker by education, does case management of difficult situations and coordinates with other municipal bodies as necessary. Her presence and skill alleviates much of the stress and strain that would otherwise fall on the shoulders of officers primarily working in the field. Recent innovations in the department include using a seeclikfix.com internet platform, which allows citizens to report code violations and receive status updates on their complaints directly. Outreach on lead poisoning prevention has been so successful that citizens use this platform to report peeling paint code violations in their neighborhoods. Code Enforcement feels that this tool has helped citizens to see directly into the magnitude of the department’s workflow and the quality of their efforts.

For violations issued, fees increase substantially for subsequent visits. Nevertheless, the department does not abuse the potential source of revenue and does everything possible to give landlords a break for good faith effort. Landlords who maintain their properties effectively undergo mandatory inspections every five years, whereas improperly maintained units must undergo an annual inspection (Ward 2017). Critical in this positive work culture is the full backing of the City attorney and state attorney general in dealing with recalcitrant
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landlords (Tanguay 2017; Winegar 2017). This support creates an environment where Code Enforcement does not become discouraged by seeing their work come to no avail. To the contrary, the decisions they make and fines they levy, although subject to appeal and review, are generally upheld.

Burlington historically has been ahead of the curve in connecting health and substandard housing. Ten of the eleven officers are charged with enforcing City building code and are trained as deputy public health officers. In other words, a Code Enforcement officer can simultaneously enforce two codes that in other cities would require two separate sets of personnel and inspection processes. Code Enforcement is capable of stopping unsafe lead work practices and ordering lead hazard remediation on the spot in their role as deputy health officers. In order to streamline their authority, Code Enforcement signed memoranda of understanding with the state to be able to assess minimal occupancy standards. The department itself has been overseen by the City Board of Health for decades. The board functions as a hearing and appeal body for health orders issued in Burlington. The director of Code Enforcement, a former police officer, is also the director of the City Board of Health (Ward 2017).

In 2008, a core group comprised of the Code Enforcement director, the lead hazard reduction program director, and the City attorney carefully crafted proposed City legislation based on the input of academic and political experts who had created similar legislation throughout the East Coast. The lead hazard reduction program leveraged its position and requirements to perform education and community outreach in order to help push the legislation through. First, the lead program performed tests on the homes of elected officials who had children under the age of six. Even though the homes were lead-safe, the act of testing communicated the psychological message that their children might not be safe in their own homes. This step created a sense of empathy and commitment that helped local politicians weather the storm of resistance from landlords.

Landlords, moreover, warranted a communication strategy of their own. Landlords who came to understand the ease of lead poisoning prevention and ultimately supported the ordinance volunteered to speak at public meetings on behalf of the proposed legislation. They worked from the inside to encourage property owners to “do the right thing.” These conscientious landlords would sit with City officials during meetings to break the dynamic of an “us against them” mentality. For those who resisted or tried to steer the conversation away from the matters of health, one question typically brought things back into focus: “can you really tell me that you are against the children of Burlington?” This question was particularly effective, as it increasingly came from the lips of proactive landlords themselves.

Proponents of the law pointed out how much money resistant landlords were already paying through their tax dollars to deal with the cost of lead poisoning after the fact. Such arguments helped win over apartment associations, which took care of bringing the rank-and-file property owners on board. As deliberations over the ordinance continued, the lead hazard reduction program sent satisfied clients to speak with elected officials about the impacts on their lives and how much it meant to them to have lead hazards reduced in their community (Tanguay 2017).
Through the process of negotiation, many of the more stringent lead hazard controls were removed, such as requiring property owners to cover drip lines to prevent children from ingesting contaminated soil in the immediate perimeter of the building. Further dilutions included limiting control of unsafe work practices to owners of rental units only. Some concessions had to be made to get the ordinance on the books. Nevertheless, requiring compliance with state law in order to be granted an occupancy permit has made Burlington a success story in the area of lead poisoning prevention, boasting the highest compliance with Vermont law in the state (Tanguay 2017; Ward 2017).

**Chicago, Illinois**

In June 2016, an ordinance was added to the City of Chicago’s code establishing a proactive rental housing registration and inspection ordinance. This measure assured tenants that their prospective units were up to code and free of hazards (American Legal Publishing 2017). The ordinance was passed with the following language: “substandard and deficient rental housing units are unfit or unsafe for human occupancy, and their conditions jeopardize the health, safety, and welfare of their occupants and of the public. Substandard housing conditions pose a particularly acute risk to young children (from lead poisoning or asthma attacks due to mold and other airborne irritants, among other health concerns), seniors, and people with chronic illnesses.” Chicago ranks as one of the top five cities in the country for proactive public health policy according to a national survey from the Beaumont Foundation’s City Health Initiative. Part of this success rests on state legislation, and part is the unique creation of the municipality (Beaumont Foundation 2016).

Illinois is a state that stands out as having strong radon legislation and state-supported radon education campaigns. In 2008, the state mandated disclosures during real estate transactions and began to require certification of all radon workers. In 2012, that requirement was extended to include landlords’ disclosure to tenants. Both civil and criminal penalties are enforced in the state for misrepresenting radon readings. As of
2013, new mandates passed requiring testing in schools, daycares, and high-priority buildings. Additionally, statewide requirements for radon-resistant standards in new construction were added to existing mandates for use of low VOC materials and non-toxic products (Geltman 2016; Illinois Legislature 1997). As part of these guidelines tied to areas frequented by children, schools must submit indoor air quality plans in their facilities’ performance reports.

The Illinois Department of Public Health Toxicology Program offers information and telephone consultation for a wide variety of indoor air quality concerns including mold (Illinois Department of Public Health 2017). Illinois is one of the handful of states to require mold remediation workers to register and adhere to work standards. The state requires landlords to disclose the existence of toxic mold and makes provisions for tenants to either break the lease or withhold rent until the landlord hires a registered remediation specialist (Environmental Law Institute 2016; Geltman 2015; Illinois General Assembly 2017). The division will occasionally perform an on-site visit on the recommendation of a physician or under unique circumstances. Lastly, the state does maintain a lead poisoning prevention and intervention program that focuses on case management and surveillance, community outreach, and standard abatement and mitigation licensures. The program is a vehicle to oversee enforcement of comprehensive legislation that includes screening of children in high risk areas, annual educational materials sent to parents of children in day care, posting lead hazard warnings in paint stores and the common areas of buildings where lead hazards have been found, and providing enforcement provisions for violations of the law (Farquhar 2010; Illinois General Assembly 2015).

Working from this foundation, Chicago has adopted concrete municipal codes related to lead poisoning prevention that bolster existing state legislative proceedings: the municipal code stipulates primary prevention; buildings are required to be maintained in such a way so as to prevent the creation of a lead hazard; the City reiterates state law that paint stores or paint removal supply must post or distribute information educating the public on unsafe lead removal practices; preschools and day care centers must distribute lead poisoning information pamphlets and, beyond state requirements, also demand blood lead level screening for admission to their programs; Code Enforcement is given express permission to enter and inspect dwellings and facilities where children may be present; and if a lead hazard is discovered to be present, then the building owner must post public notice as to what and where the lead hazards are, how to request an inspection in Chicago, and the recommended standards for blood lead level testing for children under the age of six (American Legal Publishing 2017).

In all, there is a close fit between Illinois state and Chicago municipal legislation, and both have formalized their commitments in statutes and ordinances. Other initiatives beyond legislation include a developing “big data” partnership to leverage academic institutions’ ability to integrate analytics into a system that would alert physicians to patients coming from potential high-risk environments (Hawthorne 2015). There is progress on the project,
but communication between state and municipalities have stymied full implementation. By the same token, there have historically existed City grants to help augment lead abatement funded by the state. Markedly, the lead poisoning prevention programs at both the city and state level have been hard-hit by funding cuts, and fees from inspections alone are not sufficient to keep the program afloat. There is movement to figure out how to increase revenue to keep the program operational, with one innovative solution including a small tax added to the sale of paint within city limits (Hawthorne 2015). It will be worth following Chicago’s progress in solving their funding gap as Pittsburgh determines the best ways to address its own.

**Cleveland, Ohio**

In 2003, Ohio created a Lead Poisoning Prevention Fund from fees assessed against contractors who violated lead-safe building practices. Since 2003, the fund has accumulated exactly zero dollars. The Ohio Department of Health confirms that the state puts $3.8 million a year toward the issue, nearly twice what Pennsylvania invests (Klibanoff 2016). Ohio, like Pennsylvania, doesn’t have a mandatory universal blood lead testing law, and as a result, in 2014 only about 22% of children under the age of six were tested for lead. State law does require testing for children on Medicaid and for children in high-risk ZIP Codes (Ohio Healthy Homes Network 2014; Ohio Legislature 2014), but according to a New York Times article in 2016, Cleveland had rates of childhood lead poisoning double that of Flint, Michigan at 14% (Wines 2016).

Despite the low funding levels for its programs, Cleveland has strong lead legislation on the books that includes mechanisms to perpetuate their funding if followed as intended. Unlike many cities that employ a “stick and carrot” tactic, Cleveland invites landlords to participate in a purely voluntary “Certificate of Lead Maintenance and/or Leadfree Status” to protect them in the event of a lead poisoning lawsuit. The manager of a dwelling is
encouraged to submit the applicable certificate with the application for rental registration. If lead-based paints are found to be maintained in a safe manner, a "lead safe" certificate valid for one year is issued. If a unit is abated entirely, a "lead free" certificate is granted and remains valid until revoked. Cleveland's ordinance reiterates federal requirements to disclose potential lead hazards during lease or sale and to distribute educational material on the health hazards of lead exposure. Tenants are allowed to sue for failure to comply with these provisions and will be awarded court costs, attorney fees, expert witness fees, and damages if the suit is successful. The law also uniquely allows non-profit environmental health or housing rights organizations to file suits on the tenant's behalf, expanding the threat of litigation.

Neither state nor local law requires sporadic inspection of properties in the absence of a confirmed Elevated Blood Lead Level, but fines and inspections can be leveled in the case of an EBLL. Effectively, this program only bolsters secondary prevention, which deals with damage already done, but the format has some teeth: clauses allow for court orders to permit lead risk assessments to be performed even if entry to the building is denied. City code specifically lists lead hazards as a public nuisance in its building code, and violations of that code can result in the revocation of a building's annually-issued occupancy permit. The City does have a fund for lead hazard repairs to encourage abatement (City of Cleveland 2017; Korfmacher and Hanley 2013).

Despite this lead legislation, there are as of yet no mold ordinances at the city level (City of Cleveland 2017). The local public health department does employ sanitarians who can perform mold and other inspections on request (Cleveland Department of Public Health 2017). In like manner, the City has a non-regulatory radon licensing, outreach, and education program. Ohio is one of the states that requires real estate disclosure, certification, and testing in schools, and the state imposes both criminal and civil penalties for misrepresenting radon readings (Geltman 2016; Ohio Department of Health 2017). The disclosure rule for real estate requires simultaneous radon, lead-based paint, asbestos, and urea-formaldehyde foam insulation disclosure. The state mandated form further requires disclosure of mold inspection or remediation of the property and contains a warning statement about mold to purchasers (Environmental Law Institute 2016).

All things considered, Cleveland has a solid foundation of state laws off of which to build and some noteworthy and innovative self-funding law on the city level. It is hoped that its programs will get the resources they need in order to create the impact intended (Dissell and Zeltner 2015; Klibanoff 2016).
Detroit, Michigan

The public-health code of Detroit Michigan unequivocally outlines penalties of up to $8,000 based on the size of the unit for failure to remediate lead hazards and “relies on Wayne County prosecutor to pursue failures to comply with notice to remove hazard.” According to health ordinances, owners of rental properties built before 1978 must have a lead inspection and lead clearance in order to receive a Certificate of Compliance required for residential occupancy. Units using interim controls must have an annual assessment at the owner’s expense, whereas units that have undergone abatement must undergo assessments every three years. If the risk assessment of abated units shows no persistent hazards (such as soil and dust), no further assessments are required.

Where a child is found to have an elevated blood lead level over 10 μg/dL and property managers fail to remediate, Detroit ordinances mandate up to 93 days in jail and fines upwards of $10,000 (City of Detroit 2010, 2017). Allowing lead hazards to persist where a child is present can incur additional penalties of up to $500 per day. With this in mind, state law requires recipients of WIC supplemental food benefits to be tested for blood lead levels in hopes of identifying more EBLL cases (Michigan State Legislature 2006). The state Attorney General does maintain a landlord-tenant legal hotline to help tenants navigate these and other issues. However, the Detroit attorney general has the 10th largest caseload in the US and a small staff, making pursuing lead cases difficult (Wayne County Michigan 2017).

Detroit is, nonetheless, a city with extensive non-profit leadership in home health issues (Detroit Green and Healthy Homes 2017). ClearCorps Detroit, for instance, has clear combined home energy efficiency and lead safe housing programming. The organization is funded through a composite of private donors, subcontracts from the public health department itself, HUD and various foundations (ClearCorps Detroit 2017). Michigan has overarching building codes dating back to 1917 when social reform movements targeted, among other things, slum housing (Lopez 2012; Michigan State Legislature 1917).
codes dictate proper drainage and ventilation, which help prevent mold issues. Further state laws from as early as 1948 have stipulated protections for tenants’ “withhold and repair” rights and prevent landlord retaliation (Michigan State Legislature 2011).

Nevertheless, the strong presence of non-profits is proof that there is a high need for remediation of substandard housing. In this community, many non-profits take on what would otherwise fall under the public health purview. This trend suggests that the public health department is acutely under-resourced relative to local need. The Michigan State Childhood Lead Poisoning Prevention Program, as evidence, was repealed in 2007 (Farquhar 2010), and non-profit partnerships have taken on the challenge of making the difference.

Focus on Mold and Radon: Boulder County’s Approach

Boulder County is a progressive community nestled between Denver and the soaring Rocky Mountains. In the public health department of Boulder County, employees seem to be passionate and excited about the work they do. Much of the area is unincorporated land, so the County has a significant presence. The County does not aggressively pursue lead, as it is a much less significant issue in this area than in other parts of the country (Spaulding 2017). Statewide blood lead testing statistics hover at a low 14.5%. In 2014 no blood lead levels over 10 μg/dL were reported in Boulder County, and approximately 1.1% of children had confirmed blood lead levels between 5 and 9 μg/dL (Centers for Disease Control 2016). The County has other problems unique to the area, specifically radon, mold, and remediation of highly carcinogenic methamphetamine residue from both laboratories and the countless private homes where it was smoked (Spaulding 2017).

Relationships between City and County officials here can be characterized as collaborative and open. Code Enforcement has unique practices that vary from city to city: the City of Boulder, for instance, does have a rental licensing and inspection requirement to ensure no code violations (City of Boulder 2017); Longmont, the second largest municipality in...
Boulder County, has benefited from a particularly low turnover rate over the years that has enabled Code Enforcement officers to develop their own unique programming (Spaulding 2017). The code enforcers of Longmont have managed to reach out to property managers and create a sense of “being on the same team.” They offer trainings on indoor air quality issues that both inspectors and property owners can attend, and strive to create an environment where no one is seen as an enemy. In this City, Code Enforcement officers took the initiative to create their own Substandard Housing Committee. Code Enforcement invited City, County, and area non-profit professionals to an interdisciplinary team, working to address the complex needs of low-income residents. Child Protective Services, City police, fire department, hoarding psychologists retained by City funds, County mold specialists, animal control, Housing Authority, and Senior services, among others, work in concert both behind and at the scene of substandard homes to refer vulnerable residents to the services they need. It has proven a great asset to build that level of coordination, as housing is the nexus between health, poverty, building codes, and behavioral health. Unfortunately, long-time Code Enforcement officers have recently retired, making practices that arose from their initiative and goodwill vulnerable to disappearing. Good ideas and successful practices will be more likely to remain if they are institutionalized into code (Spaulding 2017).

Architecture plays a unique role in the success of Boulder County programs. Simply put, buildings and offices have been built with collaboration in mind. The largest health provider in the area has open floor plans where case managers, doctors, nurses, and behavioral health professionals collaborate on the various aspects of low income patient care. Boulder County has all of its offices on an open campus that clusters collaborating departments together. In Longmont, municipal offices are centrally-located allowing an individual to pay her municipal utility bill on one side of an atrium and walk to the Housing and Community Development Division on the other. There, low-income individuals can apply for City down-payment assistance, $2,500 emergency home repair grants, $5,000 mobile home emergency repair grants, $5,000 accessibility adaptation grants with $10,000 in additional forgivable loans, and $25,000 deferred loans to address energy efficiency, health, and safety hazards (City of Longmont 2017a).

The County manages a similar program for the City of Boulder and other municipalities, offering additional programming to improve the effectiveness of City offerings. Creative use of Community Block Development Grants and state funds has given rise to broad antipoverty and home health programs. The County offers the Personal Investment Enterprise to match individual savings at a 1:4 ratio with a maximum of $4,000 granted for higher education, small business, and down-payment assistance (Gallo 2017). As part of the process of qualifying for a matching down-payment savings plan, participants must undergo rigorous financial education coursework including savings, budgeting, managing debt collection interactions, getting out of debt, and even investment in partnership with

Homeownership classes, partially funded by the Colorado Housing Finance Authority, feature robust training on a variety of housing issues including lead, radon, mold, and how to negotiate remediation of these issues during real estate transactions.
the Boulder Workforce program. Homeownership classes, partially funded by the Colorado Housing Finance Authority, feature robust training on a variety of housing issues including lead, radon, mold, and how to negotiate remediation of these issues during real estate transactions (Zipkin 2017).

In a geographic area that is increasingly prone to flooding, Boulder County takes the relationship between mold and health outcomes seriously. In 2003 a special assessment vote was taken to dedicate funding for a permanent mold specialist. For years the County had been receiving concerned calls from citizens about mold issues, so elected officials responded by designing a position capable of a qualified response from the general county fund (Richen 2017). Like most places in the country, this general fund is a composite of property tax, sales tax, private donations, and federal funding administered by the state. EPA funding typically takes care of air and water concerns, FDA funding takes care of food concerns, HUD addresses housing, and community development and CDC grants apply to targeted health issues. Citizens approved the measure to use County funds in a direct vote to hire industrial hygienist and mold expert Michael Richen.

Colorado is a state that hangs in the balance between its conservative roots and growing progressive tendencies. The state has some of the most conservative tax laws in the nation yet famously voted to legalize marijuana in 2014 (Arizona State University 2005; Frank 2015). Colorado, characterized by the fierce independence of the Western frontier, still is not amenable to much state intervention. When it comes to mold, Michael Richen has no authority beyond referring violations of the International Property Maintenance Code to City Code Enforcement. He tries to avoid that route and instead uses language to educate and inform property owners on the risks of mold and its connection to water intrusion. His department supplies a report of “best practice recommendations” to both tenants and property owners alike. Richen does his best to convince property owners that it is in their best interest to properly maintain their units. In essence, he is a highly educated consultant that draws his practice recommendations from the book of American Industrial Hygiene Standards and the New York City Mold Guidelines of 2008, among others.

Longmont’s particularly active Code Enforcement team makes Richen’s recommendations mandatory while other municipalities do not. In the worst-case scenario, an occupancy permit can be revoked at his recommendation. His services are free and open to any member of the public on request. The local non-profit health clinic is working to tighten collaboration with Mr. Richen to follow up on suspicious allergy cases as well as the occasional elevated blood lead level investigation. He, in turn, commonly refers cases to the clinical system when behavioral health care is needed. Occasionally you can find Mr. Richen in his office calling physicians to verify that they performed adequate follow up counseling for children with blood lead levels over 5 μg/dL. If a blood lead level is reported at or over 15 μg/dL, he will be on the case immediately with an x-ray fluorescence (XRF) analyzer. However, due to the low level of lead poisoning among the children of the County, those are rare events (Richen 2017).
As a qualified specialist, Richen educates on hazards as well as recommended remediation protocol to local area residents. His unique position as a mold specialist has caught the attention of many other local area health departments: he conducts comprehensive trainings at the annual conference of state health officials where Code Enforcement, Section 8, state government, and environmental health specialists, among others are welcome to attend. He hopes more departments will adopt the Boulder model, but he has little time for advocacy. In fact, his workload has just expanded to include ordering methamphetamine residue abatement in compliance with 2014 Colorado state law, which regulates remediation workers and declares the residue a public nuisance subject to public health jurisdiction (Colorado Department of Public Health and Environment 2017a).

We further examined the history behind Colorado’s methamphetamine regulations to highlight how public awareness of a health issue can drive action in the legislative arena. It is worth a mention that the creation of these statutes is linked to a steady campaign of methamphetamine abuse awareness. For years in Colorado, one couldn’t drive down the highway without seeing at least a billboard featuring a disfigured methamphetamine addict. The sale of Sudafed and other decongestants became carefully regulated. Every stuffy-headed Coloradan was reminded that methamphetamine abuse was a major problem in the state each time he or she had to show an ID to a pharmacist to purchase cold medicine. These small wins brought considerable public attention to the issue and paved the way for passing government regulation modeled on lead hazard remediation.

Mr. Richen is flanked by a County radon expert, Patty Dooley, who also works in the Boulder County Indoor Air Quality Department. Unlike many professionals concerned with the general state of ignorance about radon risks, Mrs. Dooley does not appear to be disheartened. In fact, she planned on this lack of awareness, created strategy for it, and is working exactly on that issue. Most of the state of Colorado is an EPA Radon Zone 1, and many communities already have respiratory health programs that promote an anti-smoking agenda, even if radon awareness is low. In fact, state tobacco taxes have funded anti-cancer programs, and within them radon risk reduction was named a funding priority.

Before jumping into altering code, advocating for stronger regulatory action, or even applying for grants, directors of various County public health programs had to establish relationships between their departments in order to facilitate coordinated Radon outreach efforts. Boulder County took the lead on applying for anti-cancer grants, performed focus groups, and created an informational infographic on radon risks (below) to be distributed throughout the state by local health departments. Dooley helped develop the Colorado “Public Health Regional Radon Roadmap” by researching policy, best practices, mapping system relationships between stakeholders, inventorying intervention opportunities, and developing recommendations for building standards tailored for Colorado’s unique environment. The current three-year anti-cancer grant funding Ms. Dooley’s position is focusing on a targeted strategy to educate stakeholders, specifically construction industry professionals, elected officials, County representatives, and real estate professionals. Focus groups conducted with representatives from these sectors showed that many either believed radon was made up or hadn’t heard of it at all (Dooley 2017).
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County programming involves continuing education credits for real estate professionals. This added resource lightens the workload of credentialing agencies and is thus welcomed. As part of the presentation, realtors are invited to sign a pledge to give radon information to all of their clients. Those who do so receive “radon smart” certificates from the public health department and are promoted on the website.

Furthermore, the County performs behind-the-scenes education of elected officials to make sure that individuals sitting on boards and councils will always have radon in the back of their minds. Eventually the program hopes to adjust the rental license requirement in the City of Boulder to include radon concerns. The program has succeeded in building enough awareness and support from County officials to have them fund free radon test kits for participants in the County energy efficiency program. Energy efficiency upgrades pose particular radon risks, as sealing the envelope of the home can often seal in high concentrations of this deadly gas (Dooley 2017).

Colorado is one of a handful of states that requires disclosure of radon hazards to both tenants of rental units and prospective homebuyers. The state also mandates radon testing in schools. The work of the Indoor Air Quality Department counts on support from the state, but is encountering opposition from radon professionals. A certification program is in development that will prevent the improper installation of radon mitigation systems, which often worsen the problem. Supporters of the certification program believe resistance may be due to the traditional conservative reflexes against state regulation of business activities (Dooley 2017; Geltman 2016) or perhaps over the threat of reduced profitability in the high-radon zone.

Despite this resistance, energized leadership in the state public health department has succeeded in developing “LIRMA,” or the Low-Income Radon Mitigation Assistance program, which was being rolled out at the time of this paper’s writing (Colorado Department of Public Health and Environment 2016). The program will offer up to $1,200 in mitigation system installation assistance for low-income families.

Finally, with respect to lead, Colorado’s state regulations fall under the “Econo Plan” heading. Federal rules have been adopted at the state level, which includes certification programs and the creation of a lead poisoning prevention program through the public health department. On a positive note, concerned residents can always order a free 3M lead check kit from the state (Colorado Department of Public Health and Environment 2017a). There is no reference to mold anywhere in the Colorado statutes, nor are there any successful cases of tenants winning mold cases against landlords (Richen 2017).
Fig. 30: Informational Radon document created by Boulder County Health Department. Reprinted with permission. (Boulder County Public Health Department 2017)
As federal budgets slim down, individual states experience greater pressure to contribute the resources necessary to keep public health programs afloat. Federal lead abatement programs have had a 43% reduction of their funding since 2003, and the Centers for Disease Control have cut funding for blood testing by half since 2009 (Wines 2016). Lead poisoning rates remain alarmingly high in Philadelphia (Pell and Schneyer 2016). While most of lead poisoning focus is on children, Pennsylvania reports the highest rate of lead-poisoned workers in the country (Raval 2017). Pennsylvania simply is not investing nearly as heavily as its neighbors. The state spends only $2 million a year, whereas its less-populous neighbor, New Jersey, invests a solid $11 million annually, partially supported by a tax on paint sales (Centers for Disease Control 2010b; Klibanoff 2016). Without adequate state or federal backing, municipalities in Pennsylvania must rely on the threat of civil damages to deter lead hazards instead of hiring state-funded workers. Lead hazard deterrence in Pennsylvania is, in essence, reverting to the pre-EPA practice of tort law (Latham et al. 2011). However, with an effective Lead Court, lead-poisoned tenants in Philadelphia do have additional options for legal recourse (City of Philadelphia 2017b; Robert Wood Johnson Foundation 2013).

The Philadelphia Property Maintenance Code originally required landlords to correct peeling paint, cracked or loose plaster, decayed wood, and other defective conditions in a rental unit. The additional Philadelphia Lead Disclosure & Certification Law mandates that landlords now certify that a property is lead safe before children 6 years or younger move in. A Philadelphia Department of Public Health (PDPH) Lead Safe Certificate or Lead Free Certificate must be filed at change of tenancy when a child 6 years or under is moving in. The tenant must sign the certificate, and a signed copy must be left on file with the Health Department (City of Philadelphia 2017c, 2017d; Pennsylvania Apartment Association East 2017). As of March 2017, the certificate includes verification of lead-free service lines. Although not quite a Tenants’ Bill of Rights, the City of Philadelphia does require landlords to distribute a brochure outlining the rights and responsibilities of both tenants and landlords (City of Philadelphia 2015). Equally important, the tenant must receive a certificate of rental
suitability issued by the Department of Licenses and Inspections no fewer than 60 days prior to residency, as well as a written statement confirming that the unit is licensed, listing the rental license number.

City ordinances address lead hazards, and the Philadelphia Health Code does as well. The City public health department forbids lead paint on any interior or exterior surface where it has determined that a lead hazard is posed to children under the age of six. (City of Philadelphia 2017c, 2017d; Pennsylvania Apartment Association East 2017). If the health department orders the hazard to be eliminated, the tenant cannot be evicted or coerced into changing the terms of the lease. RRP rules must be followed to eliminate the lead-based hazard. If these requirements are not complied with within 30 days of receiving the order, property owners can face charges in “Lead Court,” where judges issue fines and order abatement of properties in violation (City of Philadelphia 2017e).

Allegheny County has approximately 1.2 million people, while Philadelphia has approximately 1.5 million. Both areas have 90% pre-1978 housing (Clift 2017), and both of these areas have high lead, high radon, and high child asthma rates (CBS Pittsburgh 2017; Feyler 2015; Pennsylvania Department of Health 2015, 2017b). About 40% of households statewide have indoor radon levels that warrant mitigation: one of the worst rates in the nation. Even rural well water commonly tests high for dissolved radon gas (U.S. Geological Survey 2017). The airborne gas, like airborne lead dust, poses a significantly higher threat than water-borne sources. It is the inhalation of the gas that leads to lung cancer (American Academy of Pediatrics 2017; Reddinger 2017; Zahran et al. 2013).

The Pennsylvania Department of Environmental Protection (DEP) runs an informational hotline and offers free confirmation testing sent via express mail to homeowners who have received radon test results above 100 picocuries per liter (pCi/L) (Pennsylvania Department of Health 2017b). The EPA action threshold is 4 pCi/L (US Environmental Protection Agency 2014b). Homeowners who have installed a radon mitigation system are also entitled to receive a free long-term radon test to ensure that the system is working, according to Pennsylvania State radon mitigation standards (Pennsylvania Department of Health 2017b). While radon-resistant new construction is not part of the statewide building code, or its many local variations, it is strongly encouraged.

Philadelphia has a similar Lead and Healthy Homes program that provides home visitations to identify and reduce lead hazards (City of Philadelphia 2017a). As in Pittsburgh, the program does not have a significant radon component. (At the time of this paper’s writing, the website was down, and more detailed information was not available.) The American Lung Association is active in the area and notes that cultural practices of testing for radon during real estate transactions, if not legislation, are taking root in some Southwestern Philadelphia neighborhoods (Kevin Stewart 2017).

With the childhood asthma rate of approximately 22%, which is double the national average, Philadelphia has much work yet to do to address indoor air quality hazards (PediatricAsthma.org 2017). The Healthy Homes Healthy Kids Program is one example of an innovative pilot program leveraging clinical asthma care, environmental hazard
remediation, lead poisoning prevention, and energy efficiency measures. Mold removal is a key feature of the program, which unfortunately is very limited in the number of Philadelphia kids it treats (Feyler 2015). Similarly, the Safe and Healthy Homes Program and local chapter of the Green & Healthy Homes Initiative represent other active responses to indoor environmental hazards (Green & Healthy Homes Initiative 2012).

Portland, Oregon

A quick glance at lead poisoning prevention programs in Portland, Oregon provides one strong message: the value of clear, well organized, comprehensive, and user-friendly databases. Data transparency helps hold public officials accountable for their work, fosters trust, and helps inform residents so they can avoid hazards.

Transparency of data, as such, is the most cost-effective form of primary prevention of lead poisoning. Concerned citizens can see registries of lead paint hazards in municipal playgrounds and actions taken to abate them (City of Portland 2017f). Property maps in Portland show an impeccable level of detail: owner name, address, public nuisances issued and resolution status, permits, plumbing plans, zoning, property taxes paid, nearby parks, crime statistics, assessment of Federal Emergency Management Agency (FEMA) hazards, information on how to report a maintenance issue, traffic counts, and emergency transportation plans. Even maps of water and sewer lines are carefully categorized (City of Portland 2017f). Using this system, individuals can look at their buildings and find out the date of construction and, by default, whether or not there may be a lead hazard. Previous lead hazards are inventoried under public nuisances, and lead hazard remediation efforts are categorized under capital improvement permits. It is a sizeable undertaking.

Portland Oregon currently runs a rental housing inspection program that targets certain sectors of the City for enhanced inspections. The program shows that numerous health problems are alleviated by adherence to property maintenance code standards, and it seeks to increase housing inspections as a way to promote public health (City of Portland 2017e; Oregon Public Health Institute 2013). This program operates in tandem with strong tenant protections, as those most vulnerable to health conditions resulting from substandard housing are also those who most fear arbitrary rent increases and eviction (City of Portland 2017b). The rental housing inspections program is couched in strong, well-researched,
This program operates in tandem with strong tenant protections, as those most vulnerable to health conditions resulting from substandard housing are also those who most fear arbitrary rent increases and eviction.

health-based language. A broad coalition of tenant organizations, City departments, law centers, public health divisions, and non-profits contributed to creating a landlord-tenant handbook for distribution to area residents. It clearly describes home health risks and how to prevent them: lead, mold, and radon are featured prominently (Multnomah County Healthy Homes Coalition 2017; Multnomah Housing Coalition 2013).

Portland has a unique governance structure wherein elected officials have voting power directly proportional to the votes they earned during their election campaigns. Consequently, there is a close flush between voter interests and elected official activity (City of Portland 2017c). Tenant rights are notably strong, and affordable housing is assiduously protected. Landlords who raise the rent over a certain percentage are liable for relocation expenses of families who are priced out of their homes. The City manages the HOME Program, which provides funds for rehabilitation and acquisition of affordable housing. Recipients of this funding must perform a visual assessment and stabilization of deteriorated paint surfaces annually and at turnover; associated paperwork must be filed with the City. City law specifies that landlords must give lead education information and disclose any lead hazards to their tenants (City of Portland 2013, 2017d).

Similar to the level of transparency seen in the housing information databases, different City bureaus all have their strategic plans, budgets, performance reports, and audits all publicly listed on the City’s website (City of Portland 2016, 2017g). Citizens can track the goals set by the City and see clear data on the progress of various initiatives without cherry-picked sample sizes.

Historic documents from the early 2000s show clear coalition building between a number of non-profits including The American Lung Association, tenant rights boards, and the Public Health Department with the aim of improving home health policy. Notably, a HUD grant had a steering committee comprised of community non-profits, tenant rights organizations, government agencies, and property management entities (Healthy Homes Coalition Of Multnomah County 2012). Stated goals of historic collaborations included educating low-income tenants, organizing leadership and collective activity against slum housing, and strengthening policy related to indoor environmental health for tenants. Such work has a likely role in the excellent tenant protections of the area.

Oregon is one of several states that requires radon-resistant new construction (Illinois, Rhode Island, Minnesota, New Jersey, California, Florida, Maine, Texas, Washington, and West Virginia are the others). It has radon certification laws, mitigation requirements, school testing, and real estate disclosures (Geltman 2016). The state does not at present have comprehensive lead legislation (Farquhar 2010; Oregon Health Authority 2017).

Having examined this range of approaches in detail, it is time to explore what components of these innovative programs and success stories can be translated back to Pittsburgh and Allegheny County. Furthermore, it will be important to examine how best to go about incorporating these benchmark practices into our existing framework of government and non-profit programs.
V. Bringing it Home: Recommendations for the Pittsburgh Region

1. **PROTECT CHILDREN**
   - Investigate all instances of elevated blood lead levels in children.
   - Demand resources for known “hot-spot” neighborhoods.
   - Safeguard places where children gather.

2. **PROTECT PEOPLE WHO RENT**
   - Establish all rental units – including voucher-paid housing units – as healthy homes.
   - Confirm lead-safe construction and demolition practices are being followed.
   - Engage landlords to take a voluntary healthy home pledge.

3. **DECLARE HEALTHY HOMES A PUBLIC HEALTH POLICY PRIORITY**
   - Fix the homes and apartments that pose health risks from lead, radon, and mold.
   - Leverage synergies between city and county efforts.
   - Involve the medical community to assist in best practices and data tracking.

4. **ARM THE PUBLIC WITH ACCESS TO INFORMATION**
   - Post easy-to-navigate home health data on the county health department website.
   - Boost disclosure of information at time of sale or lease.
   - Coordinate ongoing education and support opportunities for residents.

5. **GUARANTEE GOALS THROUGH MONITORING AND REPORTING**
   - Expand support to at-risk homes through cross-functional network.
   - Create county-wide rental registry on testing, remediation, and compliance.
   - Publish an annual healthy homes scorecard.
It is easy to get lost in the data, facts, statistics, and strategy when it comes to home health. The wealth of information available can make even the most diligent researcher lose sight of what it means to live in a substandard home. While it is not only older buildings in less affluent neighborhoods that come with health and efficiency issues, it is these homes – and the families who live in them – that tend to be disproportionately affected. People who live in dilapidated buildings where paint is peeling, carpet molding, and insulation failing during hard winters often have greater short-term concerns than long-term health risks.

For low-income homeowners, their homes are likely the largest assets they have, even if the windows are rotting away and the walls are slanting at a dangerous angle. For tenants living paycheck to paycheck, there is little recourse for dealing with an unresponsive landlord, especially if they fear retaliation for a filed complaint. The struggle to survive can be so overwhelming and stressful that there isn’t enough mental energy left to think about abstract, invisible, and long-term concerns, such as indoor air quality and what implications there may be down the road. It is understandable how a parent would likely be far more concerned in the immediate moment about feeding her hungry child than protecting that child’s developing brain from lead poisoning.

The graphs included below paint a picture of the current struggle for low-income communities and their rent burden. Of the roughly 300 actively engaged participants in Grassroots Green Homes, about two-thirds of them were renters, not homeowners. All four parts of Oakland in these graphs average below Pittsburgh median income. Many neighborhoods in the Hill District (bordering Uptown and Oakland, home to some GGH participants who, while not living in the target neighborhoods, were not turned away from the program) are in the lowest bracket of $20,000 per year. Meanwhile, as of these 2014 numbers, rents have increased 15-30% in parts of Oakland, and 45% or more in the rest of Oakland and Uptown. It is likely that these residents are prioritizing short-term concerns, such as paying rent, over long-term health concerns.

![Fig. 31: Renters vs. Home owners by Income. Reprinted with permission. (City of Pittsburgh 2016)](image-url)
On the other side of the equation, we see the landlord. There are plenty of responsible landlords and property managers in Allegheny County who operate clean and affordable rental units. However, even in situations where a landlord wants to do the right thing, he may not necessarily know what the “right thing” is. In many cases – seen both in our research and here at home – the presence of health hazards in a rental unit is not necessarily because of malice or greed on the part of the landlord, but rather because of ignorance. Landlord and tenant alike may be unaware of the presence or effects of toxins such as mold, lead, or radon.
However, even with expanded tenant education in this area, we cannot assume that tenants will necessarily feel confident enough to advocate for themselves, even if they are given the proper knowledge and resources. Landlords and tenants alike need the support of their communities and adequate investment in education, testing, and enforcement when necessary. Low-income homeowners, in particular, need adequate support to bring their buildings up to code. They need continued momentum of Pittsburgh’s resurging tenants’ rights movement (Krauss 2016).

Based on our research into successful policies and practices around the country, as well as past and existing efforts in Pittsburgh, we have assembled a set of recommendations that serves to safeguard the health of our residents, particularly children who are the most vulnerable to some of these hazards; to support the people who will be impacted by any changes, including homeowners, tenants, and landlords; and to ensure that the patchwork of organizations whose missions focus on these issues are working together efficiently and effectively.
PROTECT CHILDREN

Investigate ALL Instances of Elevated Blood Lead Levels in Children

Regardless of testing method, if a child is shown to have an elevated blood lead level, he/she is being exposed to lead somewhere, and no level of lead exposure is safe. We need to end the practice of treating elevated blood lead levels in the finger-prick (capillary) test as inconclusive. All homes, whether owner-occupied or a rental unit, should be investigated for lead risk if the child's blood lead level shows over 10 μg/dL.

Centers for Disease Control (CDC) and American Academy of Pediatrics (AAP) guidance lists 5 μg/dL as the current reference level for blood lead, and we recommend the County Health Department expand lead investigations from cases of 10 μg/dL or greater to cases of 5 μg/dL and or greater the next five years.

On the ground:

<table>
<thead>
<tr>
<th>Massachusetts</th>
<th>Comprehensive state legislation includes an early diagnosis program to examine all children under 6 years of age and a recording system of the children examined. (See the summary on p. 61 under “Model Legislation” of state laws for a full summary of their wide-ranging program.)</th>
</tr>
</thead>
</table>

Link to Program: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/lead/

Demand Resources for Known “Hot-Spot” Neighborhoods

The Health Department has already gathered data on blood lead levels for County children and cross-referenced it with housing stock condition and age. These maps information can be used to identify high-risk neighborhoods that are in need of targeted inspections, remediation, and education on lead risks and lead-safe practices in the home.

While The Health Department is utilizing the resources they currently have, they do not have enough support to cover the homes that need it. The County needs to provide additional resources that will enable the Health Department to expand lead education and investigations.

Public outcries often provide windows of opportunity for change. The Health Department’s information on testing data – sorted by municipality, school district, or legislative district – should be shared with the public in an easy-to-navigate manner in order to help garner more support for much-needed interventions.
**On the ground:**

<table>
<thead>
<tr>
<th>Massachusetts</th>
<th>Comprehensive state legislation includes a provision to allow the health department director to designate emergency areas identified with high levels of lead poisoning that will receive special attention during lead inspection.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Link to program:</strong></td>
<td><a href="http://www.mass.gov/eohhs/researcher/community-health/environment-health/lead/childhood-lead-poisoning-screening-and-statistics.html">http://www.mass.gov/eohhs/researcher/community-health/environment-health/lead/childhood-lead-poisoning-screening-and-statistics.html</a></td>
</tr>
<tr>
<td>Portland, OR</td>
<td>The city currently runs a rental housing inspection program that targets certain sectors of the city for enhanced inspections.</td>
</tr>
<tr>
<td><strong>Link to program:</strong></td>
<td><a href="http://ophi.org/city-of-portland-rental-housing-inspections-program-hia/">http://ophi.org/city-of-portland-rental-housing-inspections-program-hia/</a></td>
</tr>
</tbody>
</table>

**Safeguard Places Where Children Gather**

Developing brains and lungs are very delicate, making children under the age of six particularly susceptible to the risks associated with poor indoor air quality and home health hazards. Lead paint dust can cause irreparable damage to IQs and cause a host of other developmental problems, including ADHD. Mold spores can exacerbate asthma or cause illness. Radon exposure over a long period of time can cause lung cancer.

There is currently a bill in the state legislature to establish a Superfund to remediate or abate schools, daycares, or any other structure deemed a significant risk to children. This bill should be supported. Furthermore, daycares and schools should be required to test for indoor air quality levels tied to mold, lead, and radon in order to procure their operating licenses. Annual inspections of schools by health officials should include checks for lead, radon, and mold. Schools and communities should be required to test playgrounds for the presence of lead and to make the test results publicly available.

**On the ground:**

<table>
<thead>
<tr>
<th>Vermont</th>
<th>Daycare centers must submit a certificate of compliance with the state indicating that essential maintenance practices have been completed every year with respect to safe practices around lead paint.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Link to program:</strong></td>
<td><a href="http://DCF.vermont.gov/cdd/laws-regs/childcare">http://DCF.vermont.gov/cdd/laws-regs/childcare</a></td>
</tr>
</tbody>
</table>
PROTECT PEOPLE WHO RENT

Establish All Rental Units – Including Voucher-Paid Housing Units – as Healthy Homes

In order to ensure health and safety of rental units, many cities surveyed have taken on the task of changing building codes to include language to cover health hazards, such as mold, lead, and radon. We understand that making adjustments to municipal building codes is a sizeable challenge, but a model code developed by a stakeholder group representing multiple municipalities, such as CONNECT (Congress of Neighboring Communities in Allegheny County), could frame a set of recommended changes, which would provide some consistency across municipalities.

It is important that all rental units, including affordable housing units, provide a safe environment for their tenants. Programs exist elsewhere that offer assistance in the form of loans that enable affordable housing providers to make necessary improvements to their housing units.

On the ground:

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burlington, VT</td>
<td>Free equipment loans and lead inspections are offered to all city residents. An interest-free loan program is available to Section 8 housing providers for the purpose of reducing lead paint hazards.</td>
</tr>
<tr>
<td>Montgomery County, MD</td>
<td>Montgomery County modified Department of Environmental Protection statutes defining indoor air pollutants to include dust, odor, viruses, bacteria, fungi, radon, asbestos, smoke, gas, and mold.</td>
</tr>
</tbody>
</table>

Confirm Lead-Safe Construction and Demolition Practices are Being Followed

Federal Title X legislation mandates real estate and residential lease disclosures for all properties built before 1978 and lead-safe renovation requirements as recently as 2010. While contractors performing construction work on pre-1978 homes are required to follow lead-safe practices, that does not always happen. The PEW Charitable Trusts and the Green and Healthy Homes Initiative (GHHI) have also recently encouraged increased enforcement of this legislation and adoption of state and local standards, respectively, to ensure a safer environment with less exposure to lead dust.
We understand that legislation and enforcement, while a step in the right direction, do not always guarantee the solution intended. Through our work with Grassroots Green Homes and partnering with other organizations that manage renovation services, we engage a large number of contractors. As an alternative to legislation, contractors engaged by home weatherization companies could be made to submit photos of the lead-safe practices being adhered to on site as part of their scope of work.

**On the ground:**

<table>
<thead>
<tr>
<th>Texas</th>
<th>Texas state legislation requires photographic proof of proper remediation technique, third party verification of completion, and certification for all workers with respect to mold. Similar processes could be followed for lead, in support of Federal Title X legislation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link to program:</td>
<td><a href="https://www.dshs.texas.gov/mold/default.shtm">https://www.dshs.texas.gov/mold/default.shtm</a></td>
</tr>
</tbody>
</table>

### Engage Landlords to take a Voluntary Healthy Home Pledge

Landlords have a prime opportunity to safeguard the health of their tenants. Cities examined in our research saw successful changes in landlord involvement tied to healthy housing testing and remediation as a result of education, rather than legislation. Joint education sessions – even barbeques – hosted for the benefit of Code Enforcement officials and landlords alike have helped landlords to see the benefit of checking and maintaining their rental units.

Other cities, such as Washington, DC have incorporated a Tenant’s Bill of Rights, which is distributed to renters upon lease signing and details items for which the landlord can be held accountable. Landlords can voluntarily ensure lead, mold, and radon checks of their rental units and provide proof of inspection to their renters. Compiling a list of landlords who opt-in to a pledge or bill of rights can help inform renters who are looking for housing.
On the ground:

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Link to program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulder County, CO</td>
<td>Code Enforcers in the city of Longmont have managed to reach out to property managers and create a sense of “being on the same team.” They offer trainings on indoor air quality issues that both inspectors and property owners can attend and strive to create an environment where no one is seen as an enemy.</td>
<td><a href="https://www.longmontcolorado.gov/departments/departments-a-d/community-and-neighborhood-resources/landlord-tenant/landlord-training-alliance">https://www.longmontcolorado.gov/departments/departments-a-d/community-and-neighborhood-resources/landlord-tenant/landlord-training-alliance</a></td>
</tr>
<tr>
<td>Washington DC</td>
<td>Landlords are required to disclose lead-based paint hazards, previous mold infections, and a copy of the latest lead hazard clearance report. The “Bill of Rights” lists rights and responsibilities of tenant and landlord with respect to healthy housing and minimum standards of work practices.</td>
<td><a href="https://ota.dc.gov/publication/tenant-bill-rights">https://ota.dc.gov/publication/tenant-bill-rights</a></td>
</tr>
</tbody>
</table>

### Declare Healthy Homes a Public Health Policy Priority

#### Fix the Homes and Apartments that Pose Health Risks from Lead, Radon and Mold

While blood lead testing is an important indicator of child health, and universal testing is a legislative win, we need to devote more resources to primary prevention, thereby fixing the homes before they poison children. Preventative actions, such as maintenance on homes, will keep children safe in the first place, rather than using their test results as an indicator of where the problems are.

We recommend outreach and education to neighborhoods particularly at risk of lead poisoning, based on the age and condition of housing stock. The Health Department does not have enough resources to achieve these goals. Greater priority needs to be given to this public health issue by applying necessary resources to expand their team. The Health Department can also partner with Community-Based Organizations that operate in these neighborhoods for greater impact.
On the ground:

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burlington, VT</td>
<td>The program director for Section 8 housing developed an education and outreach program in the form of barbecues for multiple stakeholders, but specifically targeting local landlords. The lead hazard reduction component of this education focused on primary prevention.</td>
</tr>
<tr>
<td>Link to program</td>
<td><a href="http://burlingtonhousing.org/">http://burlingtonhousing.org/</a></td>
</tr>
</tbody>
</table>

Leverage Synergies Between City and County Efforts

In addition to demanding more resources to expand the ongoing efforts by the Health Department, we recommend the County explore ways to capitalize on the efforts of other departments within the County and in the City as well. The Health Department could empower all City and County agents who make residential visits for other purposes to assess homes for health risks such as lead paint chips or dust, visible mold, or radon. These deputy health assessors could begin the conversation about preventative maintenance, educating residents about warning signs and health risks. The Health Department has already taken steps in this area by training 10 of their inspectors in lead assessment skills.

Collaborative efforts could be guided by the CDC’s “Healthy People 2020” objectives, in which the Surgeon General listed comprehensive goals related to lead, radon, asthma provoked by indoor allergens, and enhancing surveillance of health outcomes related to home environment. These guidelines could be adopted by the City and County, similar to the 2030 District Challenge (2030 Districts 2017) or the Green and Healthy Homes Initiative compact, signed in July 2017 (Pittsburgh Post-Gazette 2017).

On the ground:

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burlington, VT</td>
<td>Burlington city departments have many points of synergy. Housing Authority potentiates city ordinances; Code Enforcement dovetails with public health authority; Code refers clients to the Lead Hazard Reduction Program; City ordinances potentiate the enforcement of state law; WIC has access to lead screening data and makes calls to the Housing Authority when they see a red flag; lead screening referrals are faxed to local physicians’ offices; Code Enforcement officers were put through certification classes to become lead risk assessors; and so on.</td>
</tr>
<tr>
<td>Link to program</td>
<td><a href="https://www.burlingtonvt.gov/PZ/About-Us">https://www.burlingtonvt.gov/PZ/About-Us</a></td>
</tr>
</tbody>
</table>
Involve the Medical Community to Assist in Best Practices and Data Tracking

There is an indication that the accuracy of a finger-prick (capillary) test is greatly dependent upon the technique used by the physician, so continuing education for doctors could include content such as proper testing technique, current best practices in lead poisoning prevention, and updated information on the CDC’s reference level, which has been lowered to 5 μg/dL.

With universal blood lead screenings starting at the beginning of 2018 in Allegheny County, pediatricians will have a platform for discussion with families about lead exposure and lead-safe practices in the home. Doctors will be mandated to report blood lead test results on an annual basis, but this reporting mechanism could be a great opportunity to track additional factors including whether the child lives in a private home or rental unit, if the family declined testing (and for what reason) or never scheduled an appointment, etc.

Federal guidelines provide blood lead testing and support for children under six years of age whose families are on Medicaid. These resources need to be utilized to the fullest extent possible.

On the ground:

<table>
<thead>
<tr>
<th>City</th>
<th>City-wide initiatives beyond legislation include a developing “big data” partnership to leverage academic institutions’ ability to integrate analytics into a system that would alert physicians to patients coming from potential high risk environments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link to program</td>
<td><a href="https://dssg.uchicago.edu/project/predictive-analytics-to-prevent-lead-poisoning-in-children/">https://dssg.uchicago.edu/project/predictive-analytics-to-prevent-lead-poisoning-in-children/</a></td>
</tr>
</tbody>
</table>

ARM THE PUBLIC WITH ACCESS TO INFORMATION

Post Easy-to-Navigate Home Health Data on the County Health Department Website

Widely supported, and included among the recommendations by the recent PEW report and GHHI lead recommendations, is public access to local lead-related data. The County Health Department has posted a lot of useful information on their website tied to blood lead testing data, as well as the age and condition of housing stock (both indicators of lead paint risk). We believe the proper presentation of this information can greater increase its use to the public.
The online information already maps cases of blood lead levels equal to or greater than 10 μg/dL, but the data could be further expanded to show those at or above 5 μg/dL. Data can be displayed by communities with highest incidences of EBLL and by tracking outcomes for residents of homes investigated. Other useful statistics for residents could include:

- Total counts of finger-prick and vein-drawn blood tests for children
- Age and census tract of child’s residence
- Whether the residence is a rental unit or private home
- The number of homes touched (whether through investigations or education) by Health Department efforts per year
- Five-year Health Department plan with detailed goals.

On the ground:

| Portland, OR | Concerned citizens can see registries of lead paint hazards in municipal playgrounds and actions taken to abate them. Property maps in Portland show an impeccable level of detail: owner name, address, public nuisances issued and resolution status, permits, plumbing plans, zoning, property taxes paid, nearby parks, crime statistics, assessment of FEMA hazards, information on how to report a maintenance issue, traffic counts, emergency transportation plans, and maps of water and sewer lines are carefully categorized. |

Link to program: https://www.portlandmaps.com/

Boost Disclosure of Information at Time of Sale or Lease

Potential home buyers and renters are at a disadvantage when choosing a home if they do not have access to information about the health risks present. While some disclosures are enforced at the time of sale for a house, it is less often the case for rental units. We recommend pursuing mandatory testing and disclosure of health risks such as lead paint, mold, and radon for all housing. Similar laws are already in place across the country in several states and cities included in this study.

Ideally, this information would be made available through a platform such as a rental registry or real estate listing, thereby providing easy comparisons for potential residents. Being able to provide negative test results or proof of remediation would serve as an additional selling point to the conscientious consumer and added value for the seller or landlord.
On the ground:

### Cleveland, OH
City ordinance reiterates federal requirements to disclose potential lead hazards during lease or sale and distribute educational material on the health hazards of lead exposure. State level disclosure guidelines for real estate transactions require radon, lead paint, asbestos, formaldehyde foam insulation, as well as mold inspection or remediation.

**Link to program:** [http://ohiorealtors.org/consumers/required-disclosures/](http://ohiorealtors.org/consumers/required-disclosures/)

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#### Coordinate Ongoing Education and Support Opportunities for Residents

While informational materials are a good start, studies indicate that they do not create much of a positive impact on their own. In our own community involvement, we perceived a trend between regular contact opportunities and increased awareness on the part of the resident. In order to create a lasting impact on homes and communities experiencing these health risks, we recommend a multi-pronged approach for education and coaching.

Home health experts can collaborate with green construction firms and community-based organizations for regular resident coaching sessions; real estate firms can assist with first-time homebuyer classes; do-it-yourself construction classes at big box stores can provide information about how to ensure home projects are lead-safe; also the City, the County, and home health advocates have an opportunity to increase visibility for the issue by creating a Lead Awareness Month to raise awareness and mount a social media campaign to keep information about health risks and remediation assistance in the public eye.

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### Portland, OR
A broad coalition of tenant organizations, City departments, law centers, public health divisions, and non-profits contributed to creating a landlord-tenant handbook for distribution to area residents that clearly describes home health risks and how to prevent them. Lead, mold, and radon are featured prominently.

**Link to program:** [https://multco.us/health/inspections-and-licensing/rental-housing](https://multco.us/health/inspections-and-licensing/rental-housing)

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### Boulder County, CO
Homeownership classes, required for a matching down payment savings plan, includes savings, budgeting, managing debt collection interactions, getting out of debt, and investment in partnership with the Boulder Workforce program. Classes also feature robust training on a variety of housing issues including lead, radon, mold, and how to negotiate remediation of these issues during real estate transactions.

**Link to program:** [https://bouldercolorado.gov/homeownership/how-to-apply-2](https://bouldercolorado.gov/homeownership/how-to-apply-2)
Expand Support to At-Risk Homes through Cross-Functional Network

In July 2017, the City and County signed a compact with the Green and Healthy Homes Initiative, with the goal of better coordinating outreach and remediation of area homes, and – per the GHII mission – breaking the connection between unhealthy homes and unhealthy families. To that end, regional organizations with operations tied to home health now meet on a regular basis to share information and coordinate services to homes in need. This original group of compact signers could further collaborate on ways to expand support to the at-risk homes in our region.

Funding options are currently being explored to support the full-time coordinator role, or “Outcome Broker,” to manage this group, which is currently dependent upon volunteer time. We recommend the funding of the full-time Outcome Broker position in order to coordinate resources and services to support the health of area homes and their residents.

On the ground:

Baltimore, MD

Baltimore is the home to the Green and Healthy Homes Initiative, both as an organization and its pilot round. Nineteen cities have now signed formal compacts (Pittsburgh being the most recent, as of July 2017), with engagement ongoing in many more. This initiative is constructed around the model of coordinating services and braiding resources to improve the health of homes in a holistic manner.

Link to program: http://www.greenandhealthyhomes.org

Create County-Wide Rental Registry on Testing, Remediation, and Compliance

At the time of this paper’s writing, the City Council’s rental registry ordinance was being contested. While we support the passing of this measure, we also recommend tasking the above-mentioned network with creating and managing an independent rental registry. Responsibilities for this group can include compiling information on the health and safety of rental units (including dates of any testing done for health hazards such as lead, mold, and radon), test results, and remediation steps taken. This level of detail will be beneficial to renters looking for healthy homes, to conscientious landlords who wish to showcase their efforts in making their rental units safe for tenants, to medical practitioners who wish to include information on high-risk areas when educating their patients, and to the County when choosing where to focus their attention for enhanced lead investigations.
On the ground:

Baltimore, MD | The city offers an easily accessible database so that prospective tenants can check if an apartment or home has a lead hazard violation that has not been fixed. This list is updated quarterly and states the exact address, zip code, date of violation, and apartment number.

Link to program: [https://www.baltimorecountymd.gov/Agencies/permits/rentalregistration/reports.html](https://www.baltimorecountymd.gov/Agencies/permits/rentalregistration/reports.html)

Publish an Annual Healthy Homes Scorecard

This network of organizations could also be engaged in ongoing monitoring of the region’s performance against policy recommendations contained within this paper and/or recommended by the County’s Lead Task Force. Reporting on achievements and progress toward healthy homes goals happens elsewhere in the country, whether managed by a city or independent entity.

An annual report will increase visibility not only of the problems, but of the efforts being put in place to correct them, giving credit where credit is due. We see a need for transparency of plans, goals, budgets, and performance reports, all of which will result in a more educated community, increased public support behind risk abatement, and a higher profile for this crucial issue, which will hopefully result in additional funding to expand services.

On the ground:

Portland, OR | Similar to the housing information databases made available in Portland, different city bureaus all have their strategic plans, budgets, performance reports, and audits all publicly listed on their website. Citizens can track the goals their city has set and how they are measuring up and working to fulfill them.

Link to program: [https://www.portlandoregon.gov/article/25147](https://www.portlandoregon.gov/article/25147)
CONCLUSION

As we have seen, our region is the perfect storm for home health issues, such as lead, mold, and radon, because of geographic features and older housing stock. Any home, new or old, can be at risk for mold or radon, and the vast majority of the homes in the area are at risk for lead paint. Pittsburgh used to be a leader in lead action and fair housing. We have the opportunity to regain that position.

Pittsburgh and the surrounding region have a history of leadership around ensuring a healthy environment for its residents, as well as a spirit of fierce determination in the face of opposition. It is within our capabilities to combine our efforts and affect deep and lasting change for the residents of our community, made achievable both by looking forward at opportunities that lie ahead, but also by reaching back into our own past best practices.
Bibliography


THE CASE FOR HEALTHIER HOMES


THE CASE FOR HEALTHIER HOMES


Gorsch, Barbara. 2017. Allegheny County Health Department Public Drinking Water Department.


——. 2017. Allegheny County Health Department Director.


Minnesota State Legislature. 2016. “144.496 MINNESOTA RADON AWARENESS ACT.” https://www.revisor.mn.gov/statutes/?id=144.496#stat.144.496.1.
Namey, David G. 2017. ACHD Program Chief of the Housing and Community Environment Program.


——. 2017d. Remediation and Abatement Act.
THE CASE FOR HEALTHIER HOMES


Stewart, Kevin. 2017. Director of Environmental Health at the American Lung Association Pennsylvania Chapter.


Stockdale, Justin. 2017. Regional Director of Pennsylvania Resources Council.


Tanguay, Jeff. 2017. Burlington Lead Program Director.


