Creating the Healthy Homes Initiative

Final Report
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Prepared for: New Jersey Housing and Mortgage Finance Agency

Prepared by: Edward J. Bloustein School of Planning and Public Policy
Matthew Camarda, MPP
Laraib Kamal, MPP-MPI
Kurt Lituma, MPP
Preethy Thangaraj, MPP
Yifan Ye, MPP

Faculty Advisor: Joel C. Cantor, ScD
Director, Center for State Health Policy
Distinguished Professor of Public Policy
Edward J. Bloustein School of Planning and Public Policy

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Executive Summary

The connection between housing and health is multifaceted and well-documented. As millions are forced indoors during the ongoing COVID-19 crisis, the quality of housing likely has an even greater impact on one's health than in the past. This report explores the relationship between health and housing and provides recommendations for healthy housing initiative programs based on both primary and secondary research.

Our analysis is based on existing data, published literature, and interviews with representatives of community health organizations, community development organizations, government officials, and academics. The primary goal of this report is to identify gaps in healthy housing initiatives in Newark and Paterson, New Jersey and offer recommendations for designing sustainable healthy housing initiatives in neighborhoods adjacent to St. Joseph's University Medical Center, Newark Beth Israel Medical Center, and University Hospital. Our analysis divides issues associated with health and housing into two broad categories: systematic and household issues. Systematic issues are macro-economic and social variables that might impact healthy housing, while household issues are more specific to structural and environmental issues inside a home.

Based on our findings, this report recommends that the Healthy Homes Initiative take a community-based approach. Program design models that engage the local communities and cultivate a greater sense of responsibility among landlords will be much more likely to improve housing quality issues. Second, our report makes recommendations addressing both physical and mental health components of healthy housing.

First, the report examines past research on the relationship between health and housing. Second, it provides quantitative and qualitative analysis based on New Jersey housing and health datasets and interviews with key stakeholders in Newark and Paterson. Third, the report reviews existing housing-related programs in Newark and Paterson and the potential financial costs of healthy home program services, provide recommendations, discuss barriers to designing and implementing the Healthy Homes Initiative, and end with a short conclusion. In the Appendix, we discuss our recommendations for defining geographic eligibility for the program, limitations and constraints on our analysis, and potential metrics for evaluating the program. It also provides the questions we asked our interviewees.

Background

The Connection Between Housing and Health

Research shows that poor housing quality can negatively impact both physical and mental health. The following section reviews relevant literature on the relationships between housing and health outcomes. We divide these relationships into a few broad categories.

Race/Ethnicity, Housing, and Health

National health statistics indicate an association between race/ethnicity and housing-related health threats. Blacks or African Americans tend to have a higher mortality rate than Whites, as do other racial/ethnic minority populations (Williams, 2006). Blacks are nearly twice as likely than the rest of the population to live in homes with severe physical deficiencies, and disproportionately feel the effects of environmental pollution (Matthew, Rodrigue, & Reeves, 2016). Racial/ethnic minority populations generally have lower education levels and lower income levels on average, resulting in lower housing affordability, which further leads to poor housing quality or unstable housing (Maness & Khan, 2014).

Housing Environment-Related Health Problems

A variety of housing environment conditions, relating to health, may contribute to an unsustainable living situation. Dampness caused by the absence of ventilation allows the growth of mold and leads to respiratory diseases. Exposure to the extreme cold can raise blood pressure and serum cholesterol (Shaw, 2003). Lack of safe drinking water and appropriate food storage, incursion of pests, and overcrowding will result in infectious diseases. Absence of complete kitchen facilities is associated with poor nutrition, especially for children (Krieger & Higgins, 2002). Poor housing quality, such as narrow staircases, also relate to potential risk of falls. Especially older and less expensive housing units may not comply with building codes (Ryu, Juhn, Hathcock, Wi, Olson, Cerhan & Takahashi, 2017).

Housing Stability and Health

Housing stability is another significant indicator of housing quality. Unstable housing may lead to homelessness, which is associated with shorter life spans (Maness & Khan, 2014). Homelessness also negatively impacts children's health. The earlier and the longer children experience homelessness, the more likely they will have academic and behavioral problems (Sandel, Sheward & Sturtevant, 2015).

Poor Housing Structural Quality and Asthma

A worldwide survey of the severity and control of asthma shows that in the United States, approximately 30% of the total number of asthma patients are under the age of 16 (Rabe, Adachi, Lai, Soriano, Vermeire & Weiss, 2004). Asthma is one of the most common chronic diseases among American children and the main cause of school absence (Rauh, Landrigan & Claudio, 2008). Research reveals that the prevalence of asthma is highest among people living in public housing (Northridge, Ramirez, Stingone, & Claudio, 2010), especially for short-term residents. Poor management and maintenance in public housing increase the prevalence of asthma triggers. Higher dampness results in more severe asthma (Williamson, Martin, McGill, Monie & Fennerty 1997). Disproportionate exposure to mold, lead, and allergens also increases

the morbidity of asthma. All of these triggers are commonly associated with living in poor housing stock (Rauh, Landrigan & Claudio, 2008).

Housing Quality and Mental Health

Cross-sectional and longitudinal studies support the connection of housing quality and mental health (Evans, Chan, Wells & Saltzman, 2000). Dampness, moldy, and cold indoor conditions are linked to anxiety and depression. Noise and overcrowding contribute to children's sense of instability, resulting in various mental health problems (Evans & Kantrowitz, 2002). Unstable housing and fear of homelessness are also the important sources of psychosocial stress (Krieger & Higgins, 2002).

Empirical Analysis

Housing, Housing Quality, and Health in New Jersey, Paterson, and Newark

This section outlines data on a series of factors that can inform the design of the Healthy Homes Initiative including household demographics, housing stock characteristics, housing quality issues, and hospital admission data. There are several charts/tables in the body of this report, and additional data can be found in the Appendices. Detailing the landscape of available data on health and housing can help paint a picture of existing systemic challenges and gaps, and frequently occurring concerns. Data for this section came from several sources, which we reference in more detail throughout.

Age Distribution

We examined the age of the New Jersey, Newark, and Paterson populations to investigate if reported housing-related health conditions vary; age is indicative of health patterns, and this parameter informed our program design by identifying which populations were most susceptible to which housing conditions and illness/injuries. We used data from the 2018 American Community Survey (ACS) to compare the demographic and housing characteristics of Newark and Paterson with those of New Jersey. Both Newark and Paterson have a higher proportion of residents under 18 years, who are more vulnerable to asthma and other health problems associated with poor housing quality.

Conversely, both Newark and Paterson have smaller populations of residents over the age of 65 than the state of New Jersey as a whole. Senior citizens face distinct challenges with regard to housing that does not allow them to age in place, leaving them prone to debilitating falls. According to the US Department of Housing and Urban Development (HUD), the population of seniors in the United States is expected to grow significantly in the coming years, and current housing stock across the country is not well suited for the aging population. Less than 4% of housing units are equipped for people with moderate disabilities, and fewer than 1% are wheelchair accessible. Additionally, HUD also estimates that 44% of households need some form of disability modification so that residents can use them without difficulty[1]. See Figure 1 below for the age distribution of residents in New Jersey, Newark, and Paterson.

[1] Housing for Seniors: Challenges and Solutions. (2017). *United States Department of Urban Development.* https://www.huduser.gov/portal/periodicals/em/summer17/highlight1.html

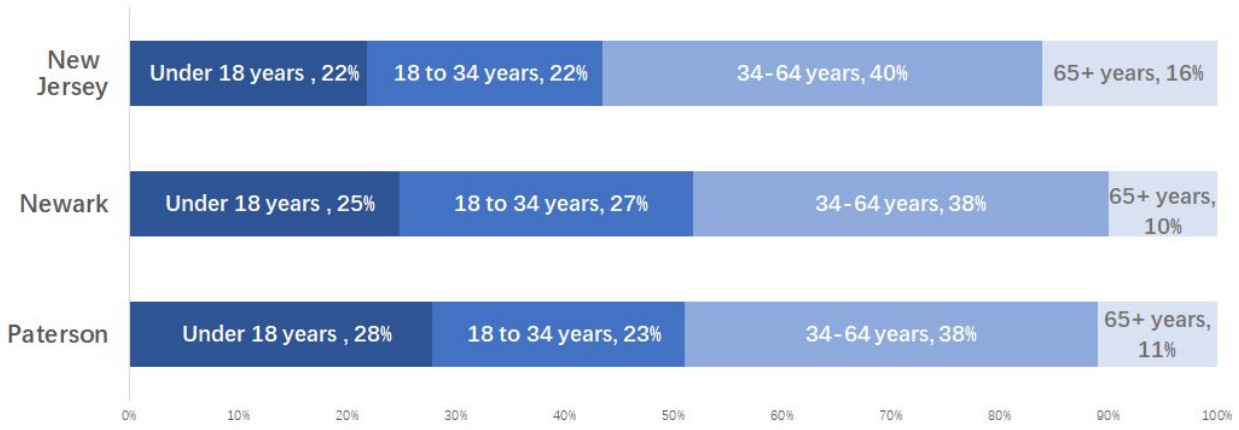

Figure 1. Age distribution of residents in New Jersey, Newark, and Paterson. American Community Survey (2018).

Race and Ethnicity

As evident from the literature review, race/ethnicity plays a significant role in health and housing, and racial and ethnic minorities comprise the majority of Newark and Paterson residents. Half of the total population in Newark is Black or African American, which is more than three times the state level. Over a third of Newark residents are Hispanic/Latino as well. The majority of Paterson residents are Hispanic/Latino, exceeding the percentage of Hispanics in New Jersey by a factor of three. There is also a significant Black or African American population in Paterson (26.5%), almost twice the state level. (See Figures 2 in Appendix D for a fuller breakdown of race and ethnicity in Newark, Paterson, and New Jersey.) Further, the high percentage of Hispanic/Latino residents in both cities likely necessitates some level of bilingual efficacy for any home improvement program.

According to the NJ Statewide Survey on Health and Well Being, which we discuss in greater detail further on, non-Hispanic Black and Hispanic residents reported not-steady housing or that they were worried about housing at significantly higher rates than non-Hispanic Whites, respectively 12.3% and 21.0% vs. 5.4%. Hispanics reported problems with pests, mold, lead, and lack of stove or oven over three times as often as non-Hispanic Whites, and a lack of heat ten times as often. Similarly, non-Hispanic Blacks reported pests, mold, and a lack of stove or oven twice as often as non-Hispanic whites. However, non-Hispanic Blacks also reported a lead issue over five times as often and a lack of heat over 11 times as often non-Hispanic whites. Asian residents did not report as many mold, lead, or oven and stove issues; however, they reported having no heat nine times as often and pest issues twice as often as non-Hispanic whites. Refer to Table 1 below for full percentages.

Table 1. Race Characteristics of NJ Residents by Housing Issues

	Housing Issues							Housing Security	
race	Pest	Mold	Lead	No Heat	No Stove/Oven	No Smoke Detector	Water Leak	Steady	Not Steady & Worried
White NH	5.9%	3.3%	1.7%	1.0%	1.5%	3.4%	6.5%	94.6%	5.4%
Black NH	12.3%	7.4%	8.6%	11.1%	2.5%	3.7%	9.9%	87.7%	12.3%
Hisp	17.8%	10.8%	6.4%	10.2%	6.4%	6.4%	7.0%	79.0%	21.0%
Asian	11.9%	0.0%	2.4%	9.5%	0.0%	4.8%	2.4%	97.6%	2.4%
Other	8.6%	6.9%	6.9%	6.9%	3.4%	5.2%	10.3%	91.4%	8.6%

Source: Rutgers Center for State Health Policy, Health and Well-Being Poll, 2019.

Age of Housing Stock

Newark and Paterson rely on housing considerably older than that of the state as a whole, leaving residents exposed to hazardous materials and a higher proportion of homes in need of serious repair or replacement. Homes built prior to 1978 -- when lead paint was banned -- have a higher chance of containing lead paint and exposing children to lead poisoning. According to the EPA, 87% of houses constructed before 1940 and 69% of homes built between 1940-1959 contain lead based paint[2]. 2018 ACS data shows that nearly half of housing units in Newark (47%) and a majority in Paterson (60.3%) were built before 1960, relative to New Jersey (40%). Old housing also increases exposure to asbestos, which, prior to its ban in 1977, was used in insulation and other building materials[3] and causes mesothelioma and lung cancer. Figure 3 below shows the full distribution of the age of the housing stock in New Jersey, Newark, and Paterson.

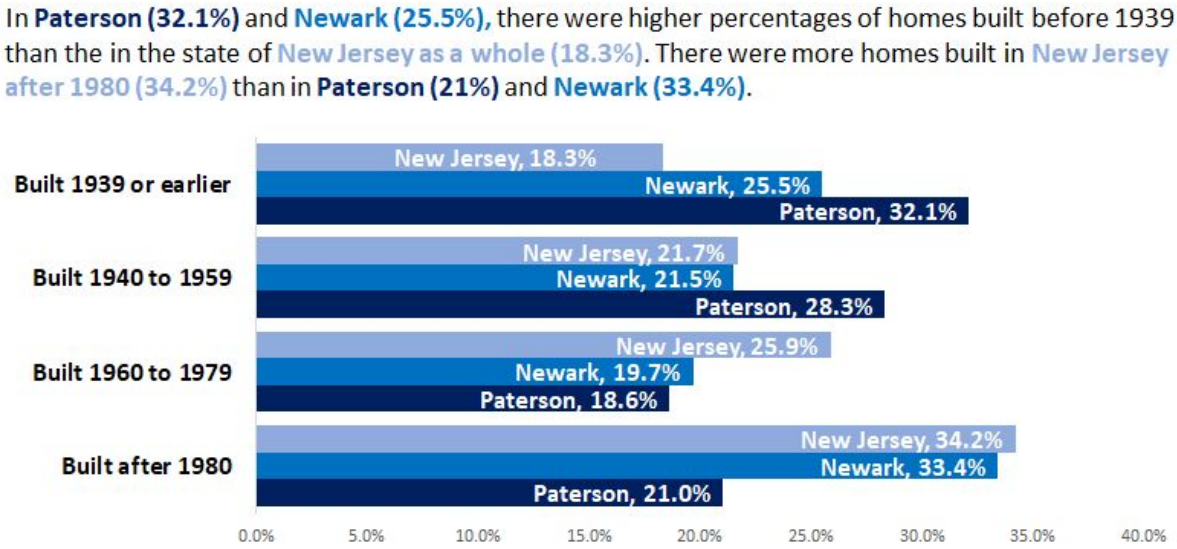

Figure 3. Age of Housing Stock in NJ, Newark, and Paterson. American Community Survey (2018).

Renter Population

Renters comprise a substantially higher proportion of Newark (78%) and Paterson (75%) residents than the state as a whole (36%). Renter-occupied units generally have more structural problems than owner-occupied units, thus exposing renters to more housing health threats. Additionally, data from the Health and Well Being Survey in New Jersey (HWB), which we explore in greater detail later on, found that renters are more likely than homeowners to experience all of the housing related issues that were measured in the study (e.g., pest, water leak, mold, no heat, no smoke detector, lead, no stove or oven).

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[2] United States Environmental Protection Agency. *Protect Your Family From Exposures to Lead.* https://www.epa.gov/lead/protect-your-family-exposures-lead)

[3] United States Consumer Product Safety Commission. *Asbestos in the Home*. https://www.cpsc.gov/safety-education/safety-guides/home/asbestos-home

Figure 4 shows the disparity in the amount of renter occupied dwellings in Newark and Paterson versus the state of New Jersey.

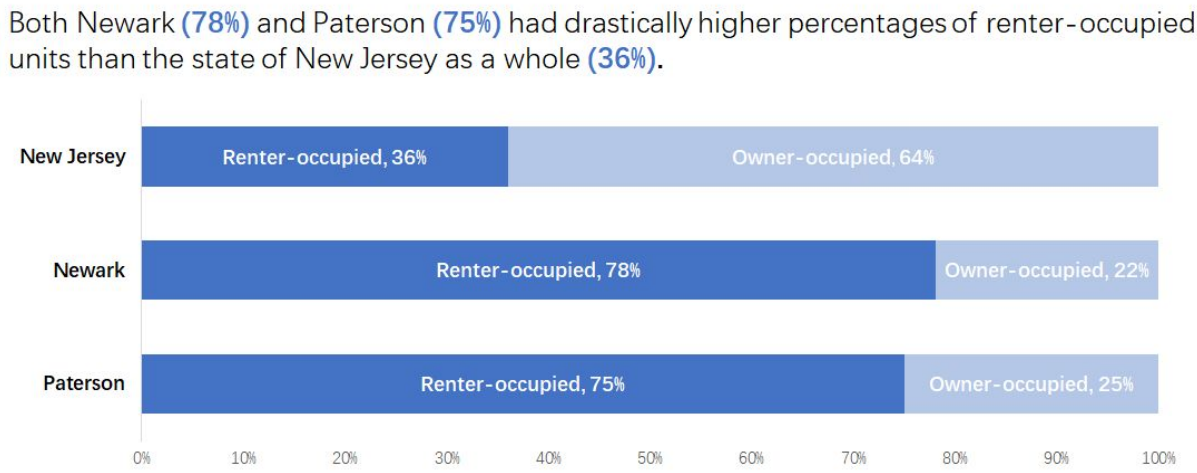

Figure 4. Housing Tenure in NJ, Newark, and Paterson. American Community Survey (2018).

Housing Facility Access and Usage

The vast majority of housing units in Newark and Paterson have access to utility gas as heating fuel, but there are still 1.9% of housing units in Newark have no fuel available. In Newark, approximately 3% of housing units lack other basic housing facilities, such as telephone service, plumbing facilities, and kitchen facilities. Paterson has a higher proportion of housing units lacking these facilities than that of Newark. The proportions in both cities are two to three times the state average level, which is 1.5%. (See Figure 6 in Appendix E for a complete breakdown.)

Furthermore, a great number of housing units suffer from overcrowding both in Newark and Paterson. 2018 ACS data shows that 3% of housing units in Newark have 1.5 or more occupants per room, Paterson has 2% of housing units with more than 1.5 occupants per room, both are higher than the state level of 1%. For more details, see Figure 5 in Appendix E.

Housing Affordability

The 2018 ACS data shows that Newark and Paterson renters and owners are more cost-burdened than their statewide counterparts. Figures 7 and 8 below show the percentage of monthly housing costs in household income for housing owners and renters in New Jersey, Newark, and Paterson.

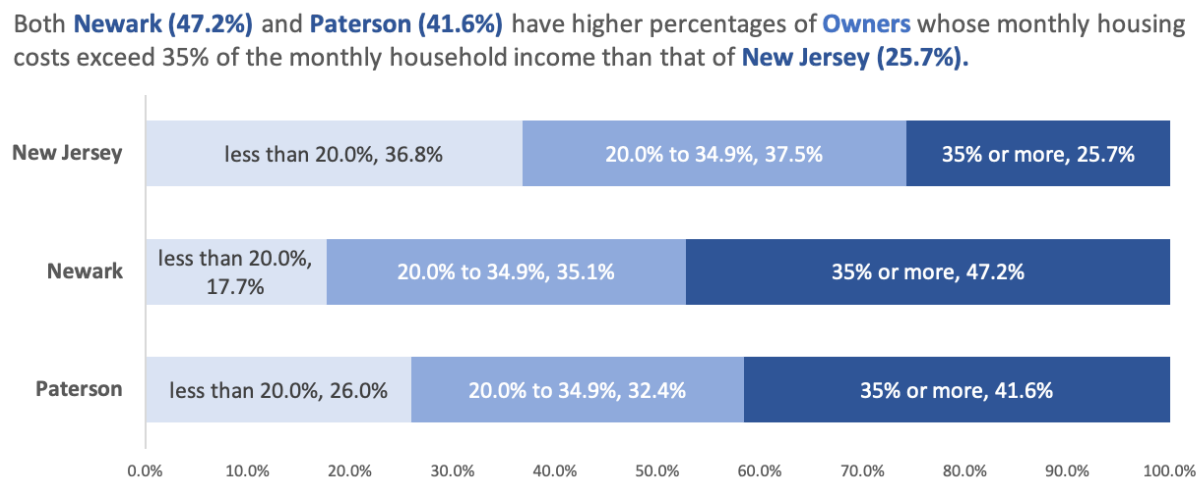

Figure 7. Monthly Owner Costs with a Mortgage as a Percentage of Household Income in NJ, Newark, and Paterson. American Community Survey (2018).

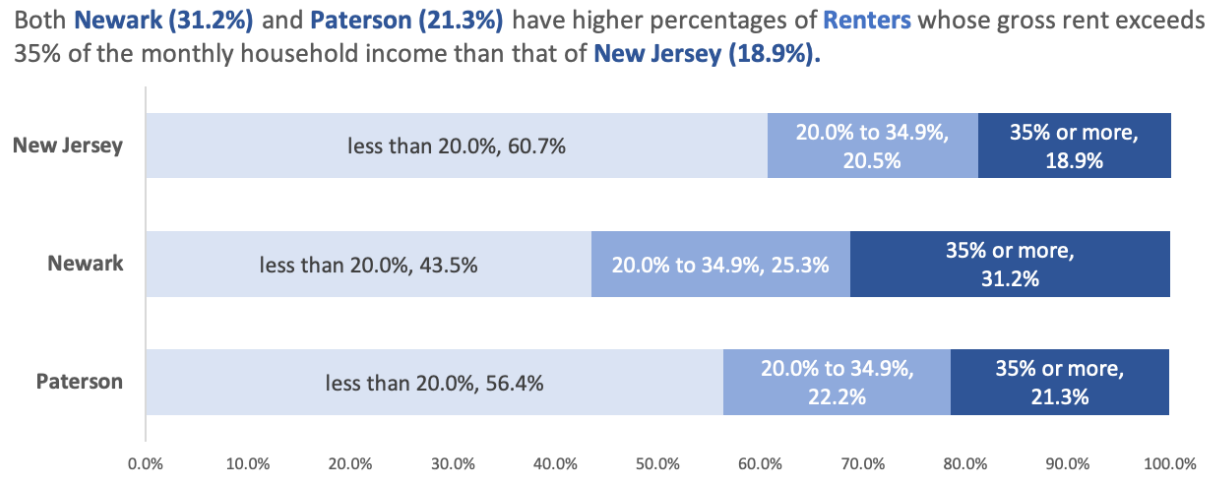

Figure 8. Gross Rent as a Percent of Household Income in NJ, Newark, and Paterson. American Community Survey (2018).

Housing Security and Quality in New Jersey

Health is both physical and mental. Housing insecurity is a major source of stress and anxiety; thus, it is important to examine the status of those who are housing insecure. The 2019 NJ Statewide Survey on Health and Well Being conducted by Rutgers Center for State Health Policy provides data from 860 adults NJ residents on their health needs, housing, and other social determinants of health in NJ. Over 91 percent of respondents had a steady[4] place to live[5], but approximately nine percent of respondents did not have a steady place to live or had a place to live but were worried about their living situation in the future.[6] See Figure 9.

[4] Steady housing is defined by Taylor as permanent shelter, with protection from weather elements.
[5] Taylor, Lauren. "Housing and health: an overview of the literature." Health Affairs Health Policy Brief (2018).
[6] CDC Healthy Housing Reference Manual https://www.cdc.gov/nceh/publications/books/housing/cha01.htm

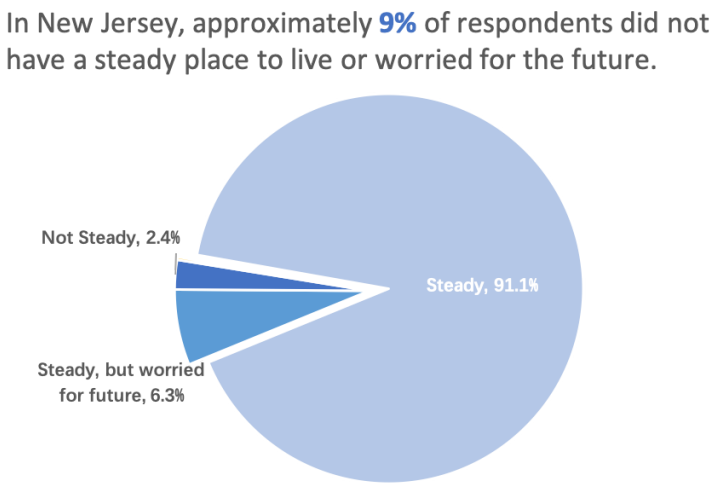

Figure 9. Living Situation Security in NJ. Rutgers Center for State Health Policy, Health and Well-Being Poll (2019)

Those without steady housing may temporarily be staying with others, or in a hotel, shelter, the street, beach, car, abandoned building, bus station, train station, or park. Respondents disclosed issues with such living spaces, such as: pests, mold, lead, lack of heat, malfunctioning oven or stove, malfunctioning or missing smoke detectors, and/or water leaks. Overall, respondents most commonly reported issues with pests, water leaks, and mold (9.2%, 7.0%, 5.1%, respectively).

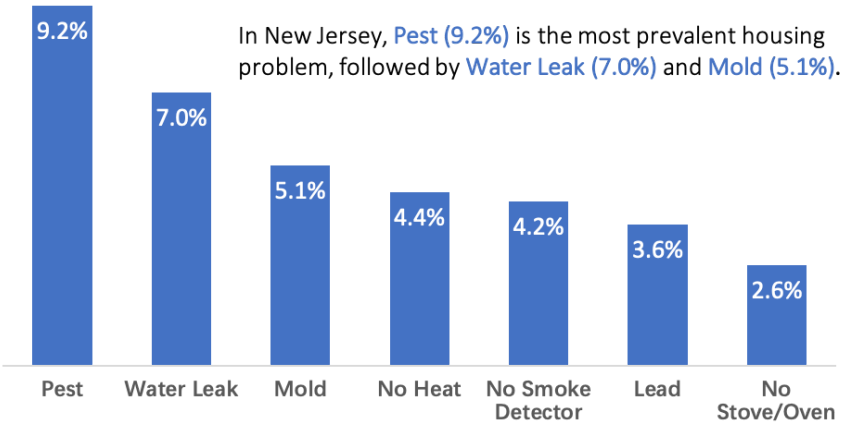

Figure 10. NJ Housing Quality Problems. Rutgers Center for State Health Policy, Health and Well-Being Poll (2019)

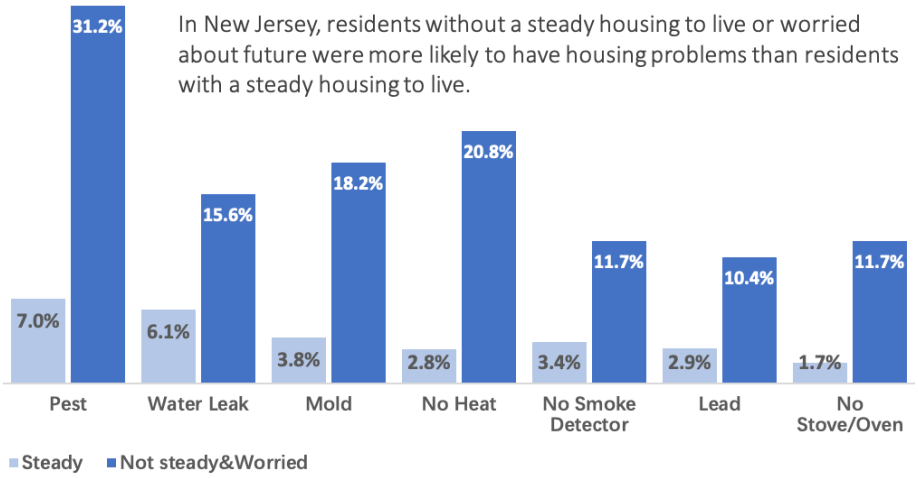

Figure 11. NJ Housing Quality Problems by Living Situation. Rutgers Center for State Health Policy, Health and Well-Being Poll (2019)

Among those without steady housing or who are worried about the future, 31.2% reported a pest issue, over four times higher than those who had steady housing (7.0%). Likewise, 15.6% of those worried or without steady housing reported water-leaks, nearly three times as likely as steady-housing residents (6.1%) to report the same problem. Similarly, non-steady and worried residents were nearly five times as likely to report mold (18.2%) than steady housing residents (3.8%). View Figure 11 for reported issues of lead, no heating, no stove or oven, no smoke detector by living situation.

Residents with lower incomes were more likely to experience housing quality issues. Households that earned an income of $40,000 or less were most likely to experience pest, mold, lead, and lack of heat problems. Compared to those who earned $40,000 or more; individuals earning less than $40,000 experienced pest problems approximately two-to-three times more, mold and lead problems two-to-six times more, and lack of heat between two-to-15 times more. Similarly, the $60K and under bracket lacked a stove or oven and a smoke detector almost five times as often as the $60K and up bracket. Households earning $20K or less experienced water leaks at the highest rates.

Of respondents who earned $20K or less, about 77% experienced at least one housing problem. Likewise, 68% of households who earned between $20K to $40K also experienced a housing problem. On the other hand, only 22% of respondents earning $80K or more reported a housing problem. See Table 2 for the full breakdown.

Table 2. Income Categories of NJ Residents by Housing Issues

	Housing Issues								Housing Security	
income category	Any Housing Problem	Pest	Mold	Lead	No Heat	No Stove/Oven	No Smoke Detector	Water Leak	Steady	Not Steady & Worried
$0-$20K	76.6%	15.6%	10.9%	9.4%	15.6%	4.7%	6.3%	14.1%	85.9%	14.1%
$20K-$40K	67.8%	18.6%	13.6%	8.5%	6.8%	5.1%	6.8%	8.5%	66.1%	32.2%
$40K-$60K	41.0%	9.8%	6.6%	3.3%	1.6%	4.9%	3.3%	11.5%	91.8%	8.2%
$60K-$80K	32.7%	7.7%	5.8%	5.8%	1.9%	0.0%	3.8%	7.7%	90.4%	9.6%
$80K+	22.2%	5.3%	1.6%	2.1%	2.9%	0.8%	2.5%	7.0%	97.5%	2.5%

Source: Rutgers Center for State Health Policy, Health and Well-Being Poll, 2019.

Of the total 860 respondents, approximately 69% owned their homes or apartments. About 29% of respondents rented their living spaces. Those who rented homes or apartments reported almost three times as many pest, mold, lead, and no stove or oven issues than those who owned homes or apartments. Renters lacked or had a malfunctioning smoke detector twice as often as owners. Similarly, renters were over ten times more likely to report a lack of heat issue than those who owned. Figure 12 below provides more detail.

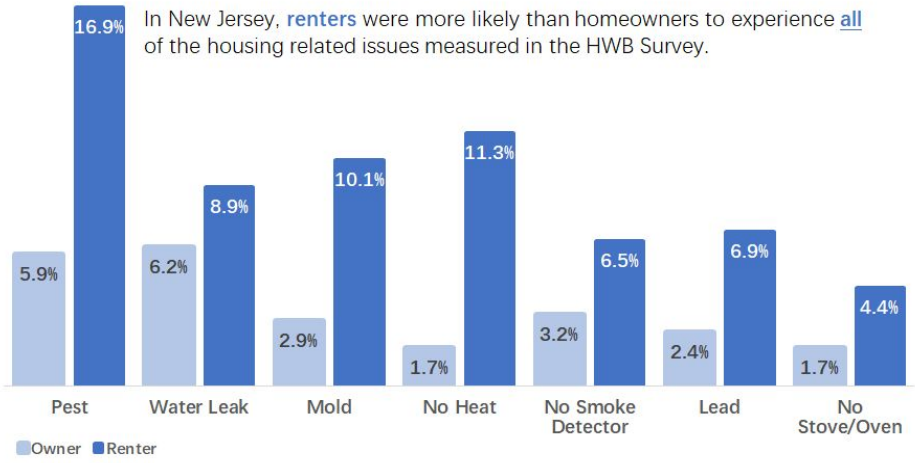

Figure 12. Ownership Characteristics of NJ Residents by Housing Issues. HWB Survey (2019)

Housing Related Health Conditions

We examined three health-related datasets with municipality-level data. The first is the New Jersey Behavioral Risk Factor Surveillance System (NJBRFSS), conducted by the Center for Health Statistics at the New Jersey Department of Health, funded partly by the Center for Disease Control and Prevention. While housing was not the primary focus of this survey, there were several questions which yielded useful information for our research. The second is the City Health Dashboard, created by the Department of Population Health at NYU Langone Health and the Robert F. Wagner School of Public Service at NYU with a grant from the Robert Wood Johnson Foundation. One of the benefits of this dataset is that it has data at the census tract level, as well as the city level. The third is data from New Jersey's Emergency Department Discharge Files. In the next few paragraphs, we highlight a few relevant health measures from these datasets.

Prevalence of Asthma

Looking at the NJBRFSS, one relevant health measure is the percentage of residents who currently have asthma. (To allow for comparisons between cities and the state as a whole, we used age-adjusted rates.) For Newark, the percentage of residents with asthma was 13.6%. For Paterson, that percentage is 14.0%. The rate of asthma for the state as a whole was 8.3%. In New Jersey, Non-Hispanic Blacks (12.3%) are significantly more likely to have asthma than non-Hispanic Whites (8.2%), but those disparities are substantially higher in Newark and Paterson. Asthma rates among non-Hispanic Blacks in Newark (14.5%) and Paterson (23.6%) are substantially higher than those of non-Hispanic Whites in those cities, 5.0% and 7.8% respectively. The statewide asthma rate for Hispanics (8.8%) is only slightly higher than

non-Hispanic Whites, but in Paterson their rates are higher (10.3%). Figure 14 shows how the asthma rates in each city differ by race.

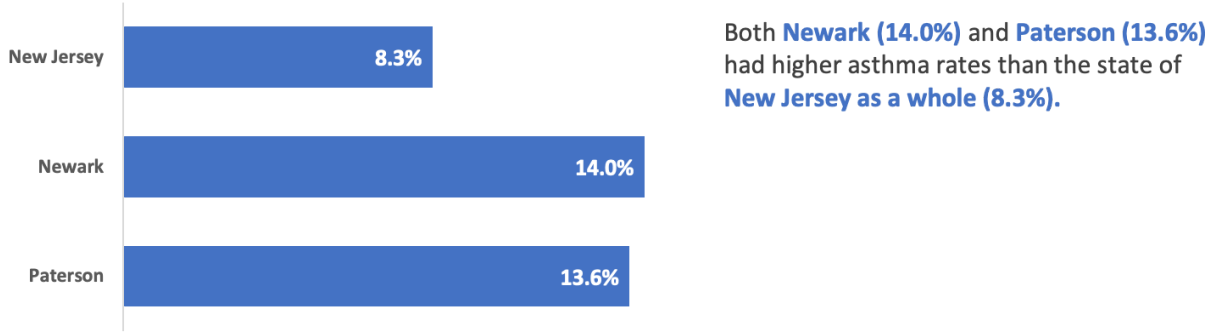

Figure 13. Asthma Rates in NJ, Newark, and Paterson. NJBRFSS (2017)

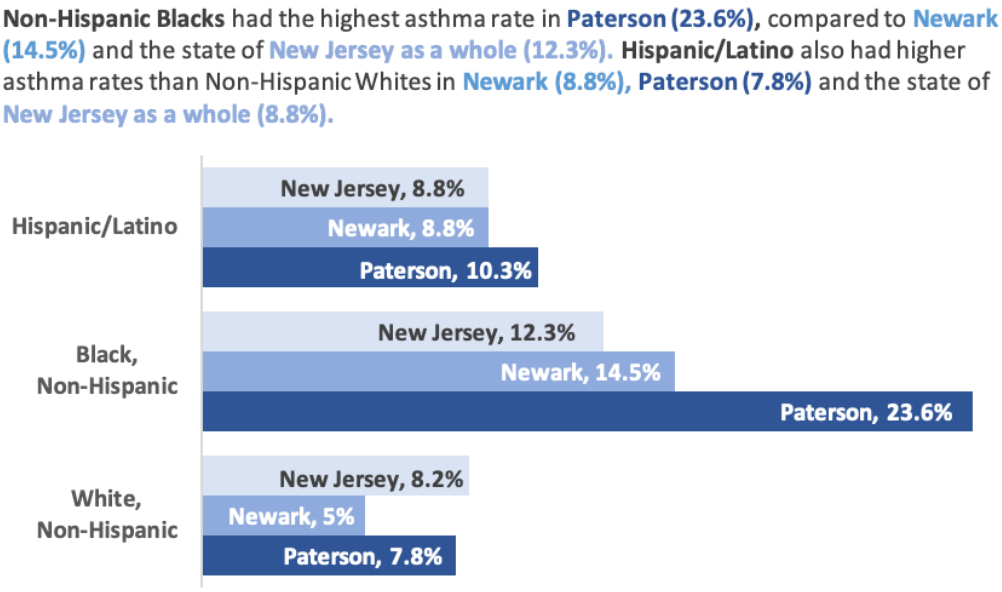

Figure 14. Asthma Rates by Race/ Ethnicity in Newark and Paterson. NJBRFSS (2013-2017)

According to 2008-2012 Emergency Department Discharge Files compiled by the New Jersey Department of Health, Paterson's age adjusted rate of Emergency Department (ED) asthma visits per 100,000 residents was 1,773 in Paterson, versus 1,964 in Newark, and 622 in New Jersey overall.[78] While we could not find the specific age-adjusted rates of ED asthma visits for children in Paterson and Newark, we found that the rates of ED asthma visits among children less than five years old and between five and 17 years old were higher in both Passaic and Essex counties than in New Jersey; both cities account for

[7] New Jersey Department of Health and New Jersey Asthma Awareness and Education Program. "Asthma in New Jersey: 2014 Passaic County Profile." https://www.nj.gov/health/fhs/chronic/documents/asthma_profiles/passaic.pdf
[8] New Jersey Department of Health and New Jersey Asthma Awareness and Education Program. "Asthma in New Jersey: 2014 Essex County Profile." https://www.nj.gov/health/fhs/chronic/documents/asthma_profiles/essex.pdf

the majority of ED asthma visits in their respective counties despite comprising a minority of their county's population.

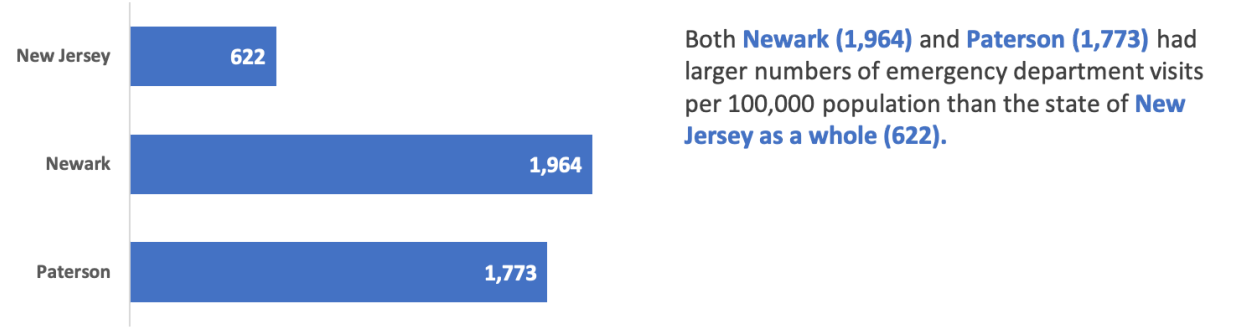

Figure 15. Emergency Department Visits per 100,000 population in NJ, Newark, and Paterson. Emergency Department Discharge Files (2008-2012)

Falls

Another important measure is deaths caused by unintentional falls. According to the New Jersey Death Certificate Database, Office of Vital Statistics and Registry in the NJ Department of Health, the age-adjusted death rate per 100,00 population due falls between 2010 and 2018 was 4.1 in Newark and 5.1 in Paterson. These rates were not significantly different from New Jersey's 4.6 average over the same time period.

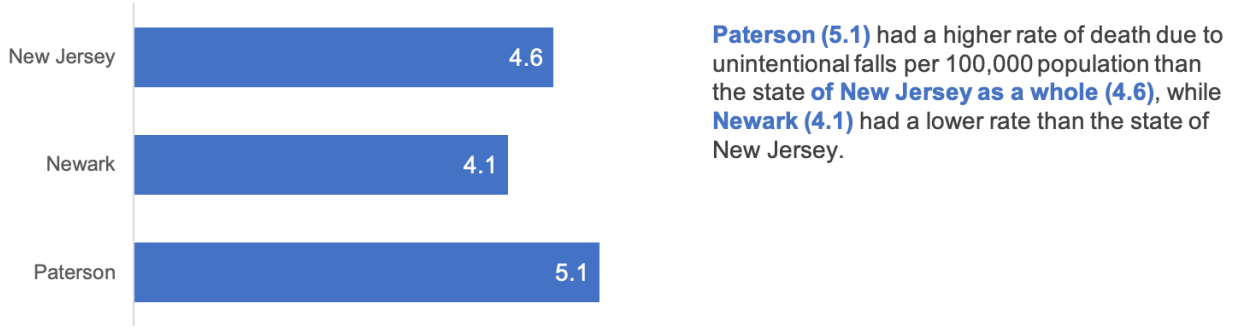

Figure 16. Rates of Death Due to Unintentional Falls per 100,000 population (Age-Adjusted) in NJ, Newark, and Paterson. New Jersey Death Certificate Database (2010-2018)

Psychological Distress

As previously mentioned, psychological or mental distress is another health problem associated with poor housing. NJBRFSS measures frequent mental distress as 14 days or more of poor mental health in the past 30 days. For Newark 2013-2017, 10.7% reported having 14 or more days of mental distress; for Paterson it was 11.2%. Neither of these rates differed significantly from the statewide rate of 10.8% during that time period. However, the City Health Dashboard also measures frequent mental distress as 14 or more days of not good mental health, with both cities reporting significantly higher rates than in NJBRFSS: 17% in Newark and 17.5% in Paterson.

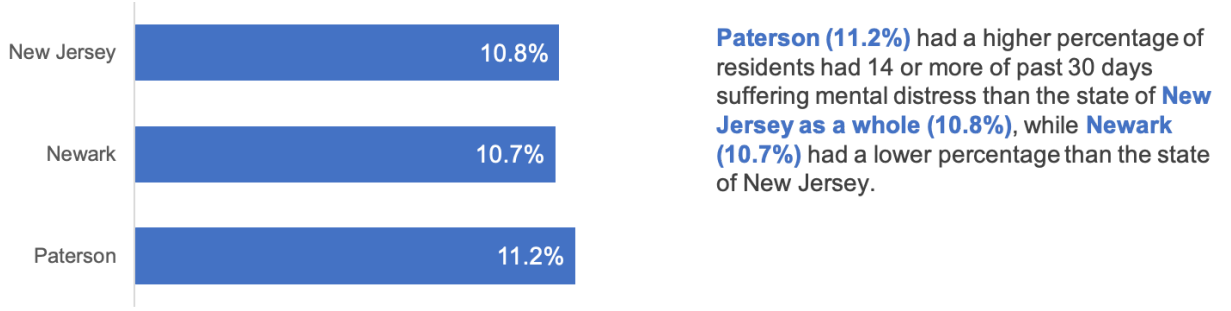

Figure 17. Percentages of Residents Had Poor Mental Health (Age-Adjusted) in NJ, Newark, and Paterson. NJBRFSS (2013-2017)

Perspectives of Housing and Health Stakeholders

In order to better understand community needs and the work currently being done to improve housing and health, we conducted interviews with 12 relevant professionals working in Newark (3) and Paterson (5), as well as faculty from the Bloustein School of Planning and Public Policy at Rutgers New Brunswick (4). Of the three Newark-based individuals, two are employed by hospitals and one by a community health organization. Of the five Paterson-based individuals, two are employed by community-based organizations, one by a community health organization, one by a hospital, and one is a city government official. Of the four Rutgers University professors, three are experts in housing and one is an expert in intimate partner violence and social policies affecting marginalized groups.

Interview Methodology

The Rutgers Institutional Review Board (IRB) approved the study procedures for this report. We identified potential study participants through a mix of purposive and snowball sampling methods. We began by identifying organizations/people who had expertise in the areas of housing, the relationship between housing and health, and the communities within Paterson and Newark and reached out to them via email. As the interviews began, we also asked if the interviewees knew any other people who could provide valuable insights for the study and contacted them accordingly. We prepared an invitation email in accordance with IRB requirements, and sent it to 19 potential interviewees. We sent up to three follow up emails to potential participants who did not respond. Twelve participants agreed to be a part of the study, four refused, and three did not respond after numerous follow up emails. All interviews were conducted by phone, with two practicum team members on the call for note taking purposes. Originally, we intended to offer in-person interviews as an option as well, but this was not viable due the development of the COVID-19 pandemic. The interviews typically lasted between 20-35 minutes, and followed a pre-designed interview script (provided in the Appendix), meant to structure the conversation. Throughout our interviews with these stakeholders, the following key themes emerged:

I) Systemic Issues

High Poverty

The biggest takeaway was that poverty poses a substantial barrier to acquiring healthy housing and living a healthy life. Substantial percentages of Newark and Paterson residents cannot afford to buy quality housing, and rent older homes that suffer from mold, lead paint, lack of insulation, etc. Reducing poverty would not only directly impact housing, but will have a multiplier effect on other social and economic characteristics. With higher incomes, residents could afford better homes and the necessary maintenance repairs to keep them healthy and safe -- reducing health issues and costs.

Old Housing Stock

Interviewees from two different community organizations and a government official from Paterson brought up the problem of exceptionally old housing stock. Multiple interviewees said that much of this housing no longer serves the needs of its residents and, ideally, should be rebuilt. These observations matched data we found on PolicyMap. For example, in one census tract (34031182100) adjacent to St. Joseph's, 28.77% of units were built in 1939 or earlier. In another census tract (34013004700) adjacent to Newark Beth Israel, it was 44.88%. A professor at Rutgers University highlighted the importance of prioritizing high impact repairs for old housing stock, as many properties likely are in need of several different repairs. A representative from St. Joseph's Medical Center also connected the old housing stock to the lack of affordable housing options, saying that many residents are forced to live in old and substandard housing because they are the only somewhat affordable options available.

Affordability

Nearly all interviewees discussed the lack of affordable housing in their respective cities. Most of the new housing developments in both cities are at market rates, excluding a substantial number of the cities' residents. Affordable housing shortages leave renters in both cities paying significant percentages of their income in rent. According to U.S. Census and ACS data accessed through PolicyMap, from 2014 to 2018, 56.24% of Paterson renters and 58.6% of Newark renters were paying more than 30% of their income in rent, compared to 49.5% of renters in New Jersey. This cost-burden puts pressure on residents' ability to purchase food, clothing, and medicine for their families.

Absent landlords

Nearly all the Paterson interviewees we spoke with discussed the problem of absent landlords, who are slow to respond to tenants' issues and defer necessary maintenance. Both a Paterson city government official and an employee from a local community organization referenced the difficulties that absentee landlords present to the residents of the city. These problem landlords often ignore the requests of their tenants and refuse to complete much needed repairs to their properties. Hospital representatives in both Newark and Paterson shared similar sentiments. The majority of residents in both cities are renters, which limits their ability to address long-standing problems in their homes, as the absentee landlords would likely have no interest in having repairs made to their properties. Interviewees discussed the importance of holding landlords accountable for making housing repairs and that the program finds a way to reach renters.

Mental Health & Public Safety

Many homes in need of repairs or that would qualify for Healthy Housing Programs are in high crime and low-income areas, which also adversely affect both mental and physical health. Further, problems of

overcrowding can negatively impact both mental and physical health. A hospital stakeholder from Newark discussed the correlation that housing instability and poor housing conditions has with mental health. A city government official from Paterson also made the connection between mental health related to domestic violence, and how that can be tied to housing when people do not have other viable living options. Mental health would likely be more difficult to address directly through home repairs because it is often less tangible, but a staff member from a community organization in Paterson talked about an existing program in the city that seeks to do so by making repairs related to public safety. These include: installing smoke alarms, solar powered motion detector lights on the exterior of homes, and reflective external lighting for first responders.

II) Household Issues

Asthma and Asthma Triggers

Nearly every relevant stakeholder we spoke to, including hospital representatives from Newark and Paterson, mentioned asthma as one of the most common and pernicious health problems exacerbated by poor housing. Other participants from health-related organizations also echoed this sentiment. Interviewees named in-home triggers such as mold, poor ventilation, dust mites, and pest infestation as potential sources for remediation. One interviewee from a community health organization in Paterson discussed installing HEPA filters, regularly vacuuming or replacing old carpets, and cleaning or replacing old pillowcases. They also emphasized the importance of educating residents about asthma triggers and empowering them to identify and address them.

Senior Accessibility

There are large senior populations in both cities, and multiple interviewees raised the issue that many homes were not senior friendly. Many houses do not have the basic necessities for seniors installed such as a ramp that could make their daily lives easier. A stakeholder from a community organization in Paterson cited the need for "aging in place" programs for older residents in the city. Aging in place programs/repairs focus on improving housing stock so that people are able to stay in their homes as they age, rather than being forced into nursing homes because of unsafe housing conditions. For a lot of homes to qualify as healthy housing, they need to be renovated to address the needs of the senior population. This issue can be tricky to tackle with, given that the senior population is smaller than the state average and many seniors prefer nursing homes or old age homes. HMFA could design and plan provisions or repairs needed in case a family with senior members qualified for their healthy housing programs. It would not be financially or practically viable to target all houses to make them more senior-friendly, but having a set of protocols beforehand would make it easier to implement if need be.

Overcrowding

Multiple interviewees, particularly in Paterson, stressed the problem of overcrowded housing. Overcrowding can contribute to poor mental health and the spread of infectious diseases. Furthermore, residents who are overcrowding may be violating the law, and hence, may be reluctant to interact with state and local officials for fear of legal consequences and/or eviction or deportation.

Programmatic Recommendations

We outline this section by first providing a detailed review of existing home improvement programs that serve the cities of Paterson and Newark, and then follow with an analysis of the costs of potential repairs that could be covered through a home improvement program. After benchmarking, we discuss our specific recommendations for the Healthy Home Initiative's home improvement program, some potential barriers to implementation, and finish with our conclusion.

Existing Resources for Addressing Health-Related Housing Quality

In order to inform how the Health Homes resources can be most effectively targeted, we reviewed the availability of existing federal, state and local housing improvement resources in the targeted areas. At the local level we specifically focused on Newark and Paterson neighborhoods. We concluded that there were only two programs that specifically targeted home repairs, both initially in Paterson but no longer operational. Most of the home improvement programs that operate in Newark focus on either sustainable energy or health related issues (lead and asthma exposure). While some of these programs can be broadened to include repairs that are less related to the subjects (such as the Comfort Partners program), there are not currently any programs that provide more general repairs for the residents of Newark. The following section briefly reviews the State and local healthy housing programs.

There are four programs that operate on a state level in New Jersey: *Comfort Partners Program,* the *Home Energy Assistance Program, Weatherization Assistance Program (WAP), and In-Home Asthma Intervention Pilot Project.* The Comfort Partners Program focuses on improving homes by making them healthier and more energy efficient. Some of the eligible home improvement activities include: efficient lighting products, hot water conservation measures, replacement of inefficient household appliances, and heating/cooling equipment maintenance. Eligibility for this program is also based on income, with the requirement being household income below 250% of the federal poverty guidelines. In Newark, Habitat for Humanity of Greater Newark administers this program in partnership with PSEG as the Critical Repair and Healthy Homes Initiative[9]. The goal of this program is to improve low to moderate-income homeowner's quality of life through targeted repairs. They work with low income families, seniors, and veterans. Eligible recipients must meet certain federal poverty guidelines or be enrolled in one of several federal aid programs. Thus far, we have been unable to find evidence that this program is being administered in Paterson.

The Home Energy Assistance Program[10], is a government assistance program designed to assist low-income households with utility (cooling and heating) bills. This program is part of a national program: Low Income Home Energy Assistance Program, which is available in every state. The program is administered by the Department of Community Affairs (DCA). The main purpose of this program is to help lower the costs of heating and cooling and provide emergency fuel to low-income households if needed. The cost of heating and cooling is brought down in two basic ways: through providing monetary

[9] Habitat for Humanity: https://www.habitatnewark.org/our-programs/critical-repairs/
[10] LIHEAP Assistance: https://liheapassistance.org/liheap-info-by-state/new-jersey-liheap-program/?utm_source=google&utm_medium=cpc&utm_campaign=LIHEAP_NJ&utm_content=General&utm_term=Liheap%20nj&gclid=EAIaIQobChMIyIz0rNPq5wIVDJSzCh0q5g1TEAAYASAAEgLrNvD_BwE

grants to pay the bills and secondly by aiding to make homes more energy efficient. Based on the applicant's demographic and economic profile, they may receive a grant ranging anywhere between $47-$1056.

The Weatherization Assistance Program (WAP)[11], which is similar to the Home Energy Assistance Program. This program is designed to assist the elderly, handicapped, and low-income people in improving their heating systems and conserving energy in their homes. The program is funded by the US Department of Energy (DOE) and administered by the NJ DCA. Assistance is provided in the form of financial grants to qualified NJ residents based on income and other factors.

The In-Home Asthma Intervention Pilot Project[12] is funded by The Nicholson Foundation. This program does not specifically target home repairs but aims to reduce the overall healthcare costs through improving the asthma outcomes of children ages 2-17 enrolled in the NJFamilyCare program. Children eligible for the NJFamilyCare program are low-income with the income up to 335% Federal Poverty Level (FPL). This program began in 2016, healthcare providers visit home of these children and deliver evidence-based interventions to provide a healthy home that meets the definition of Asthma Regional Council (ARC). This project also provides education and guidance to these families and helps them to reduce environmental triggers at home. The state-wide funding is approximately $260,000 during 2018 to 2020. In the city of Newark and Paterson, the partnership of this program includes the Health Coalition of Passaic County (HCPC)[13], St. Joseph's Medical Center, and Paterson Community Health Center, etc. For the area of Essex County and Newark, the total funding during 2018 to 2020 is $210,000. It is unclear whether the Nicholson Foundation will renew funding 2020.

In Newark there are two programs that fit the criteria of healthy housing initiatives: *New Jersey Health Initiative (NJHI), and the Advancing Safe and Healthy Homes Initiative (ASHHI)*. The New Jersey Health Initiative (NJHI),[14] is a state-wide grantmaking program funded by the Robert Wood Johnson Foundation. Working primarily with families with young children, the program's goal is to increase the number of 'healthy homes' in the community -- defined as free of health hazards, especially asthma triggers and lead. In Newark, the NJHI is a part of the Believe in a Healthy Newark coalition's Healthy Homes Impact Team. The program operates primarily in the Fairmount Heights and Clinton Hill neighborhoods. Currently, the program manages a $120,000 grant (with matching funds) that seeks to achieve the following: conduct remediation and weatherization for 40 families, door-to-door outreach and conducting healthy homes assessments, distribute household cleaning kits, and conduct community presentation on keeping a healthy home. Long-term, the program aims to improve the health profiles of homes by supporting families economically and socially, improving children's health and educational outcomes.

The Advancing Safe and Healthy Homes Initiative (ASHHI), supported by the Kresge Foundation and administered by the National Center for Healthy Housing, operated in six communities nationally, including Newark. The focus of this program is to reduce home dangers for children, such as exposure to lead, asthma-triggering allergens, fire hazards, weatherization, and repair problems. Within Newark, the city's Department of Health and Human Services administers the program, and focuses primarily on

[11] State of New Jersey: Department of Community Affairs: https://www.nj.gov/dca/divisions/dhcr/offices/wap.html
[12] The Nicholson Foundation: https://www.thenicholsonfoundation.org/news-and-resources/nicholson-foundation-and-nj-department-health-launch-asthma-home-intervention
[13] Health Coalition of Passaic County: https://healthcoalitionpc.org/our-work/asthma
[14] New Jersey Healthy Initiative: https://www.njhi.org/submissions/healthy-homes-neighborhood-pilot/

reducing asthma-triggering allergens and exposure to lead in children through Newark's Childhood Lead Poisoning Prevention Program (CLPPP). It helped open several "lead safe houses" in the city. The goal of the program was to remediate lead affected areas, and some of the eligible activities include: replacing old lead based paint components with new windows, doors, walls, and other affected areas. The program was designed for 1-4 units homes in Newark constructed before 1978, with families at or below 80% of the area median income (AMI). The program was administered in 2012, with a yearly budget of $50,000.

In Paterson, there were only two healthy housing programs that do not operate any longer: *Homeowner Rehabilitation Program, and the Paterson Minor Home Repair Program.* The Homeowner Rehabilitation Program,[15] enabled extremely low to moderate income homeowners to make major system repairs to their homes. The Community Development Block Grant (CDBG) provides funding for the program, which was administered by the Paterson Department of Community Development. The yearly budget for this program was approximately $28,000.

The Paterson Minor Home Repair Program[16] was also funded by the CDBG. This program was administered on a much smaller scale, where the maximum grant given to a household was $15,000. This program provided funds and promoted minor repairs to low-to-moderate income family households in various neighborhoods in Paterson. The household would take a mortgage equivalent to the amount of grant for seven years. If the household sold the repaired house in seven years, they would have to repay the grant. This was a pilot program that was only administered by the city in 2011/2012.

Gaps identified in Newark and Paterson

Based on our preliminary analysis of existing programs, we have identified some gaps in both Paterson and Newark, which could be opportunities for the HMFA Healthy Homes Initiative's program. In the following paragraphs, we discuss what gaps were identified, and how the HFMA's repair program could fill in some of these existing gaps.

In Paterson, healthy housing programs are in dire need, given the demographics of the neighborhood and the lack of operational healthy housing programs. This leaves a gap and demand for broad-based housing repairs, including those mentioned above. Eligible repairs introduced by the Healthy Homes Initiative allow for expansive housing repair and maintenance, while addressing health related housing issues.

Another gap in both the Newark and Paterson home improvement programs is income related. Out of the ten national, state, and local programs available to Newark or Paterson residents, four have low-income requirements and another four have health requirements. While these targeted low-income programs are beneficial for struggling Newark residents, there are likely many families who do not meet the income requirements but could still benefit greatly from a home improvement program. For example, the CLPPP program in Newark only targets those at or below 80% of AMI, which is just $35,181 in Newark. Eligibility for the Comfort Partners program extends to 250% of the federal poverty level (FPL), which reaches more residents in both cities, but likely still misses many families who are more financially stable yet still in need of repairs. This gap could be addressed through the HMFA program by having an income eligibility that reaches a wider range than the programs discussed. Additionally, neither city has home

[15] City of Paterson: Department of Community Development: https://www.patersonnj.gov/egov/documents/1413380190_608856.pdf
[16] City of Paterson: Department of Community Development: https://www.patersonnj.gov/egov/documents/1330971918_599853.pdf

improvement programs that specifically target public safety. According to Office of Disease Prevention and Health Promotion[17], healthy housing is also directly correlated with safety. Poor or moderate-income households are more likely to live in neighborhoods that have a high crime rate. The HMFA program can potentially include installing security systems and making homes safe for residents. This would not only impact physical health, but mental health of Paterson and Newark residents as well.

Given these gaps in existing programming, HFMA's healthy housing program should focus on providing home improvement assistance to low- and moderate-income households for a wide range of health related repairs. These repairs could include: a fresh coat of paint, basic plumbing and electric jobs, repairing damaged furniture or household appliances, fixing stairs, windows and other architectural faults. These repairs can either be made by giving direct funds or through hiring a third-party contractor to make repairs for applicants in these programs. HMFA can also benefit by collaborating with other state and local programs such as WAP, in developing their healthy homes program.

Board of Public Utilities (BPU) - Comfort Partners Program

Benefits of energy efficiency are not limited to just macro-level environmental and utility system improvement, such as reduced electricity demand and mitigated carbon emissions. Installation of energy efficiency measures in the house can improve household occupant health and well-being and lower household utility bills. Comfort Partners[18] offers an opportunity for collaboration with the Healthy Homes Initiative, based on an aligning objective: to increase participant's health, safety, and comfort in their homes. The energy education component of the CP program can be helpful for improving energy literacy and changing behaviors, although there is only minimal relevance to Healthy Homes.

Not only do Comfort Partners (CP) and the Healthy Homes Initiative both target a lower-income NJ demographic, but CP also seeks to implement some of the same interventions that are recommended for the Health Homes Initiative. These include: reinforcing the building envelope and upgrading HVAC, kitchen appliances, plumbing, and other measures which will be discussed further in the recommendations section of this paper. CP specifies that it will expedite attention to urgent health and safety issues relating to energy. For example, in cold weather situations, immediate solutions for delivering heat may be addressed quicker than other lower-priority issues. The Healthy Homes Initiative can utilize a similar strategy in order to implement solutions that address situations more urgent than others.

Spending is a barrier to collaboration, however. CP procedures scrutinize for review any "out-of-scope" interventions for the Comfort Partners program. In other words, if a measure requires more work to install, remediate, or is structurally unfeasible to install without major renovation, CP may not approve the funding for the work. For example, mold remediation may not be covered by CP during installation of floor insulation. Or, pipe insulation may not be installed for a hydronic heating system if asbestos is present. BPU has not entirely factored in health and safety measures in their provided spending guideline. Correspondingly, they mention the need for written approval for projects exceeding $2,500. More

[17] Quality of Housing: https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-health/interventions-resources/quality-of-housing
[18] Board of Public Utilities: New Jersey Comfort Partners Procedures Manual. 2014, revised Feb 2020.

investigation is needed into specific stipulations in the CP budget, to ensure complete or partial monetary coverage of priority interventions.

It may be in the best interest for Healthy Homes to collaborate with CP to oversee and carry out the energy efficiency intervention component of the Healthy Homes program, because 1) BPU has experience running similar low-income energy efficiency programs, 2) BPU has a predetermined list of trustworthy contractors, trade allies, and program administrators, and 3) BPU has a firmer technical grasp on lighting, baseload measures, HVAC, insulation, windows, and thermostats.

Potential Costs of Healthy Homes Program Services

Financial costs are one of the most crucial elements of any project with the potential to make or break it. Policy recommendations are only as good as if they are financially sustainable. We conducted preliminary research to get a sense of repair costs. Market research via interviews did not reveal the exact dollar amounts of the specified interventions. However, a series of web searches were conducted to assess the average cost of solutions for common problems. In a 2018 report by the Bipartisan Policy Center for the Departments of Housing and Urban Development and Health and Human Services, the most common housing-based interventions which demonstrated positive health benefits include those listed in Table 3 below.

Table 3. Average Cost in Dollars of Common Housing Interventions Linked to Positive Health Benefits

**National average cost values determined for a 2,000 sq ft house*

***Additional vapor-related technologies/materials specified in source*

Housing-Based Intervention Recommendation	Average Cost ($)*
Roof Remediation[19]	$859
Roof Replacement[20]	$7,920
Improved insulation; weatherstripping	$4,317
Install energy efficient appliances	$2,880
Installing necessary appliances (refrigerator, oven, stove, smoke detector)	$3,800
Improved HVAC system (80% AFUE)	$4,050
Mold Removal	$2,232
Pest control; pest elimination	$173
Toxic lead mitigation (paint)	$2,900
Radon gas abatement	$969
Fixing uneven flooring (warping, buckling)	$1,750
VOC intrusion mitigation - low porosity sealant**[21]	$2,500
Carbon monoxide detectors	$82
At-Home Air Inspection Kits (VOC, Formaldehyde, Asbestos, Mold and/or Dust, Carbon Monoxide, Lead, Radon)	$325

According to the average costs presented, it would be **most cost-effective to prioritize reducing asthma triggers, which is the most prevalent housing issue in all neighborhoods**. Interventions to determine and reduce asthma triggers include providing at-home air inspection kits, mold removal, and pest control. Other interventions should be taken based on specific needs of housing units, for example, fixing floors and installing necessary appliances.

[19] Referring to leak repairs; intervention would address smaller-scale broken/missing shingles, cracked vent booting, skylight leaks, and other deteriorated-sealant issues.

[20] A full roof replacement project typically involves removing the existing shingles, making spot repairs to the underlying shingle, and installing new shingles. Price fluctuates depending on: size, products, supplies, code requirements, layers, installation, other features (chimney, skylight, plumbing), etc.

[21] TRC Solutions: Vapor Intrustion White Paper
https://cdn.trccompanies.com/legacy/images/TRC-white-paper-Vapor-Intrusion-FINAL-March-2016.pdf

As noted by a green building academic professional we interviewed, **fixing one aspect of an unhealthy home, may have a positive domino effect on other conditions**. For example, if an occupant is having issues with mold and moisture, slippery floors, carpet buckling, damaged ceiling, or other water damage, Healthy Homes should prioritize roof remediation for this house. An argument can be made for reviewing interventions implemented by Healthy Homes on a case-by-case basis, since there is no one-size-fits-all solution for poor housing conditions.

Further investigation is needed due to limited preliminary market research. There was a lack of engagement from abatement contractors, who could not be reached or refused to participate in the study. The opportunity to inquire about their charge structures in detail was lost.

Recommendations

- Before developing any healthy housing initiative, it is important to define health, as suggested by a professor at Rutgers University. Many interviewees, from both Paterson and Newark argued that health is both physical and mental. Most of the houses that have problems such as mold, or lead paint etc. are also in low income and high crime areas. **The Healthy Homes Initiative should not only focus on improving physical but mental health as well.** Home Repair programs can include installing an alarm system, fixing broken doors and windows, and putting in bolts and locks etc. Since affordability and accessibility to good housing is a major challenge for people, factors such as whether the house is in a safe area, or whether it is near public transportation should also be considered.

- **An initial housing audit should be conducted to survey housing issues in the area of interests**, as the first stage of program implementation. This can establish a baseline of housing quality conditions.
    - Interventions are case-specific, although we recommend prioritizing roofing, primary HVAC system remediation, and mold removal as most urgent.
    - A second housing audit should be conducted at the completion of program implementation. Periodic audits and program redesign may be necessary during implementation if housing quality issues fail to subside.

- As discussed in earlier sections, poor housing conditions contribute to many health problems, but one of the most prevalent, particularly for school-aged children, is asthma, which contributes to missed school days, emergency department visits, and in rare cases, death. The In-Home Asthma Intervention Pilot Project in Newark and Paterson help residents on Medicaid identify asthma triggers such as mold and droppings from cockroaches and other pests. **The Healthy Homes Initiative should provide for the removal of asthma triggers, including mold.** It is also helpful for nurses or community health workers to make home visits and provide education about home health concerns to enhance asthma action plans. The In-Home Asthma Intervention Pilot Project could also serve as an on-ramp to the Healthy Homes Initiative for Medicaid recipients.

- One of the general approaches for improving healthy housing is adopting a more **community-based approach**. The following types of approaches were discussed during the interviews.
    - Buying, selling and hiring locally would help fuel the local economy, raise incomes and people's ability to look for better housing options. For the Healthy Housing Initiative, this could take the form of requiring that landlords use local firms for repair work when possible.
    - Another community-based approach would be to incentivize landlords to maintain properties for renters. Renters comprise large majorities in both cities, and landlords often neglect to make necessary repairs or maintain their properties because they themselves do not live in those houses. To incentivize landlords to maintain their properties and not charge obscene amounts of rent, HMFA could design an inspection program, where they can offer free ground inspection of the landlord's property and offer recommendations to ensure that all standards are met.
    - A series of stakeholder hearings with community leaders to encourage public participation in initial program decision-making may be employed to align program considerations with equitable standards. Community leaders working with residents of Paterson and Newark regularly, can offer insight on prioritizations of interventions based on community-needs. Public engagement can boost program support, and transparently display the in-good-faith reasoning to remediate housing because of health concerns. Investing in repairing Newark and Paterson housing stock should not be interchangeable with perceptions of gentrification.[22]
    - A model suggested for healthier housing was for residents to purchase duplexes, where they rent half of it and live in the other half of the property. This way, renters are more likely to maintain the property, because its quality would impact them directly.

- Housing must be **safe and accessible for seniors** as suggested by multiple interviewees. Installing ramps or lifts could make it easier for seniors to move around their homes, reducing the chance of physical injuries, such as hip fractures, thus lowering medical bills.

- Retrofitting housing through a Healthy Homes initiative should not serve as a one-time fix. **Healthy housing repairs must be maintained periodically and consistently.** By working with other local community development organizations and contractors, routine maintenance can be ensured. We recommend designing a schedule and performing maintenance about every one to two years.[23]

- There should be an **evaluation protocol** designed at the development stage of the healthy housing program to assess the progress and impact of such a community-based program as it is implemented. This matrix can be based on pre-existing parameters of healthy housing or they can

[22] National Low Income Housing Coalition: Gentrification and Neighborhood Revitalization, 2019. https://nlihc.org/resource/gentrification-and-neighborhood-revitalization-whats-difference
[23] Angie's List: How often does HVAC need service? https://www.angieslist.com/articles/how-often-does-air-conditioner-need-service.htm

be defined specifically to the program and its objectives. See Appendix C. for an evaluation framework proposal.

Barriers to Designing and Implementing Healthy Housing Initiatives

There was some overlap in interview responses when discussing barriers to implementing a successful Healthy Homes initiative based on the issues discussed above. Policymakers and community organization staff in Paterson cited issues with a lack of resources in the city, and therefore an absence of necessary funds to cover the cost of housing repairs. They raised concerns that without subsidization, creating a living environment with an intentional-health design would not work naturally in the market, since it would cost more money. The current state of the housing stock in both cities would likely necessitate a large amount of improvement.

Both were also skeptical of proper program administration and effective implementation if a Healthy Homes initiative was carried out. There are logistical issues such as administrative problems and the cost of the programs. One community organization staff member brought up the challenge of establishing relationships with the community organizations who might implement the program. Not only would these organizations have to be identified, they would also have to be vetted based on their capacity. After identifying these organizations, the program design would need to include oversight, ensuring effective implementation of the program.

Additionally, pointed out by some interviewees in Paterson, there are also challenges in reaching out to renters or the target audience. Renters are likely to be most in need of home improvement measures, but more difficult to reach as they themselves are unable to apply for/approve the repairs. Absent landlords were a common issue cited by interview participants, which makes it more difficult to reach those tenants who are most in need of home improvements. One Newark hospital executive said that commercial property management businesses may be more responsive to needs of renters rather than private individual landlords because they want to maintain a strong reputation and remain in business. There is also a greater check by government officials on commercial housing projects compared to private landlords.

One hospital executive in Newark also raised the issue that many renters would be concerned about being displaced while their homes were being repaired. The program would need to ensure that renters, who comprise most of both cities' residents, have a safe, affordable place to stay, preferably within their communities of residence to minimize disruption to work and school.

Finally, there is insufficient advocacy (and resources to advocate) on behalf of tenants. One Newark hospital executive argued that tenant advocacy strength can vary significantly from building to building. Lawyers who advocate for tenants are in short supply. Further, many tenants are not informed about their rights or housing related programs from which they could benefit.

Conclusion

The evidence documented in this report reflects a strong relationship between housing quality and health. There are multiple health issues; both mental and physical that arise from inadequate housing. The data in Newark and Paterson show a significant need for healthy housing projects, especially Paterson given that there are no other Federal, State or Local healthy housing programs that operate in the neighborhood. HFMA's Healthy Housing Initiative should focus on providing home improvement assistance to low and moderate income households for a wide range of health related repairs. Interventions of priority include those focused on abatement of asthma triggers in the home, in a cost-effective manner. Our final recommendations discuss how the Healthy Homes Initiative can take a community-based approach to improving housing -- from buying and hiring locally to integrating feedback from residents. Overall, our recommendations target housing-related health threats specific to the demographics and housing conditions of Newark and Paterson. If implemented, they should ultimately improve residents' health outcomes, reduce emergency room visits and hospitalizations, and increase quality of life.

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Appendix A.
Defining Neighborhoods for the Healthy Homes Initiative

To better understand the boundaries of implementation and healthy housing needs of Paterson and Newark, this section defines the neighborhoods based on zip codes. This allows us to run a preliminary analysis on the demographic, social, and economic data of Paterson and Newark to inform our policy recommendations.

Using PolicyMap and Census Data, we analyzed the immediate areas surrounding Beth Israel Medical Center and University Hospital in Newark, and St. Joseph's Regional Medical Center in Paterson. Upon collecting descriptive statistics about poverty rate, rental rate, age of housing stock, amount of people with asthma, and percent of people over the age of 65, we developed general profiles for each area. These profiles were used to define the bounds of each "neighborhood."

Beth Israel Medical Center, Newark

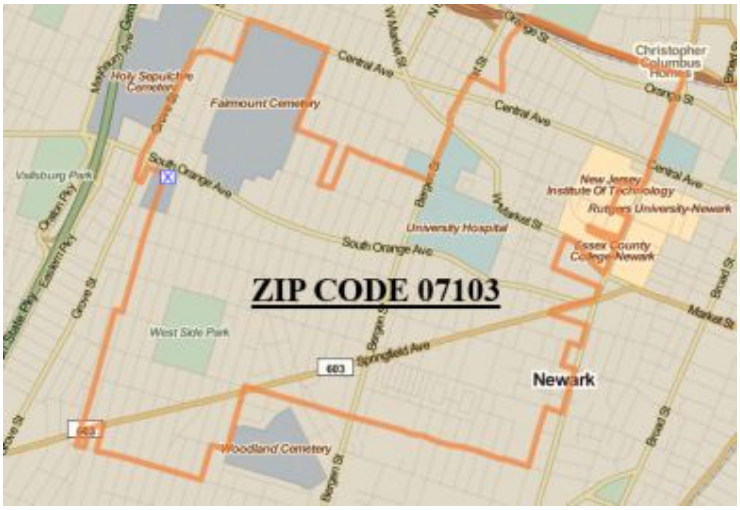
The Beth Israel Medical Center is located in the Weequahic Neighborhood of Newark. Unlike the other two hospitals we are analyzing, Beth Israel Medical Center is in the center of a pre-existing neighborhood within the city of Newark. The Weequahic Neighborhood has its own history and identity within the city of Newark, so we recommend using the existing Weequahic boundaries as the basis for defining the neighborhood around Beth Israel Medical Center. The Weequahic Neighborhood's border follows the I-78 Express to the West and North, its southeastern border is along Weequahic Park, and it is bordered by the Township of Hillside to the southwest. Conveniently, the Weequahic neighborhood is fully contained in the Zip Code 07112, which slightly exceeds the neighborhood boundaries to the north. There are 10 Census Tracts that make up the 07112 Zip Code. See Figure 19 for reference.

Figure 19. These images taken from PolicyMap show how the Zip Code 07112 from Newark compares to the Weequahic neighborhood in the city.

University Hospital, Newark

University Hospital is located at the intersection of Fairmount, University Heights, Westside, and Springfield/Belmont neighborhoods. Because these neighborhoods are adjacent to the university, some characteristics are shared within neighborhoods, such as the high percentage of renters and the low percentage of the population aged 65 or older. In addition, all these neighborhoods report a high percentage of adults with asthma and a high percentage of residents in poverty. The scope covered by these neighborhoods roughly matches the scope of Zip Code 07103, so we recommend using the Zip Code 07103 to define the neighborhood around the RWJ University Hospital. See Figure 20 for reference.

Figure 20. Zip Code 07103 surrounding University Hospital in Newark (PolicyMap)



St. Joseph's Regional Medical Center, Paterson

The areas adjacent to St. Joseph's Regional revealed the need for assistance to better health and housing. The neighborhood of interest in Paterson includes South Paterson, and a portion of Sandy Hill; boundaries were drawn primarily based on proximity to the hospital. If we were to limit these neighborhoods further, the following districts would be of interest: Ward 2 District 11 &12 and Ward 6 District 1 & 2 (Zip Code 07503). Zip Code 07501, east of the Conrail would also be of interest based on program design parameters, but does not border St. Joseph's. Limitations are explained throughout this study. Since the aforementioned factors used to generate descriptive statistics have a direct impact on the design of the Healthy Homes program, the specified neighborhood bounds are justifiably determined on an evidence basis. Keeping in mind that the program would cater to residents subjected to housing quality issues, respiratory disease, and injury burdens who are in close proximity to the hospital, this area qualifies. However, since St. Joseph's Regional serves all of Paterson and its surrounding area, pinpointing a target demographic for service is difficult. In other words, hospital admission is not contingent on which neighborhoods are adjacent to the facility because St. Joseph's Regional Medical Center caters to the whole city. If you couple this with the fact that there is not a single home repairs program operation in the area, it becomes clear that Paterson lacks resources and is extremely vulnerable.

Figure 21. Zip Code 07501 (left) and 07503 (right) surrounding University Hospital in Paterson (Taken from PolicyMap)

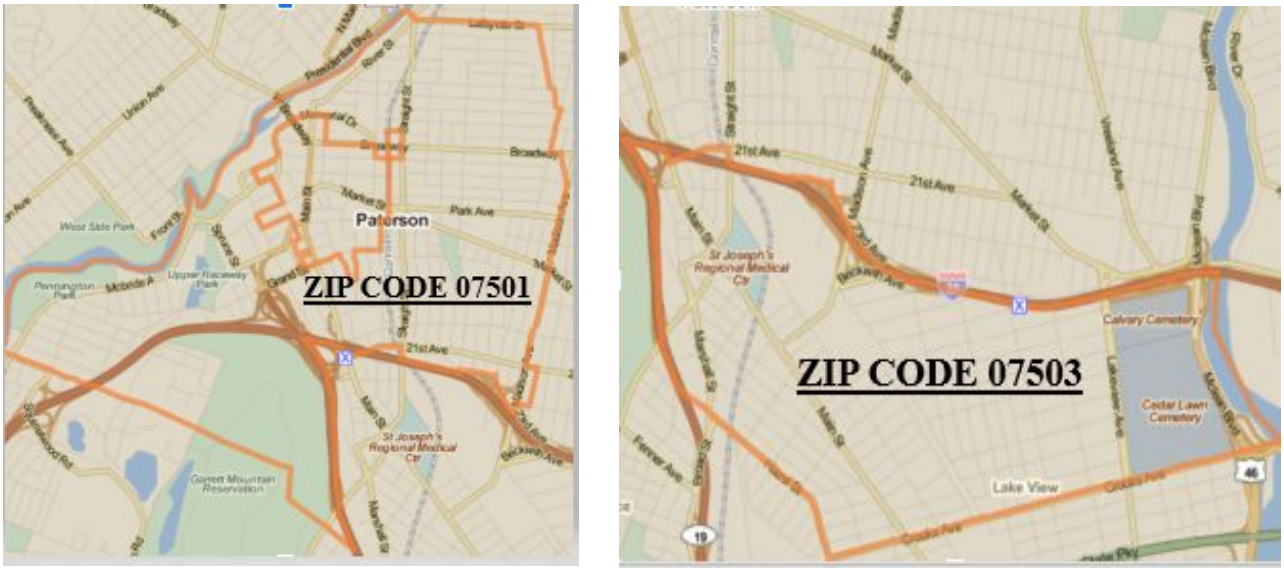


Figure 22. Paterson Ward and District Map (2012)[24]

[24] City of Paterson: Ward Boundary Map Revised Feb. 2012 https://www.patersonnj.gov/egov/documents/1381775007_804473.pdf

Other existing programs in Paterson and Newark did not disclose how their service areas were defined. Most programs were administered at the state or city level, not at the neighborhood level. Subsequently, no program benchmarking could be conducted to define the neighborhood.

Appendix B.
Limitations and Constraints

Clear connections can be drawn between health and housing to effectively design the Healthy Homes Initiative. However, determining conclusive recommendations was constrained by a series of limitations:

Developing the Study Sample
Given the time constraints of one semester and unexpected complications resulting from the COVID-19 pandemic, our ability to recruit participants for this study was limited. Being that the study was conducted over the span of just 11 weeks, and the IRB approval process consumed several of those weeks, we had a relatively small window of time to identify, contact, schedule, and conduct interviews. Helpful, but time constrained, once we started conducting the interviews, participants referred us to other informative contacts; however, the window of time to reach out to these contacts to schedule interviews was restrictive. The lack of time became an increasingly limiting factor as we neared the end of the semester. Some key stakeholders were unreachable or unable to participate in interviews because of 1) the steep escalation of the COVID-19 pandemic in NJ and 2) schedule conflicts because of the short time frame. Several of our intended participants were government officials or healthcare professionals and administrators, and their availability for interviews decreased significantly due to prioritization of COVID-19 related issues, understandably. Given the severity of the situation, we did not want to be overly demanding of the potential participants who were responding to the crisis.

Defining the Neighborhoods
The task of defining what should constitute the "neighborhoods" proved difficult without extensive knowledge of the communities in Newark and Paterson. Each city has its own set of neighborhoods with their own unique history and attributes. While research into these areas was helpful, much of the work was surface-level; it was not possible to develop a deep understanding of the communities in the given timeframe, which limited our ability to recommend which areas should be served by the Healthy Homes Initiative. Unfortunately (but expectedly), all of the hospital locations did not exactly fit in one single predefined neighborhood based on legal boundaries. University Hospital, for example, was at a junction between four neighborhoods in the city of Newark. This added complications for determining how to define the program service territories. Also imposing difficulty, the predefined neighborhoods as deemed by local government were not complementary with some standard geographic units of measurement, such as Zip Code and Census Blocks. After analyzing each of the areas, we ultimately decided that using Zip Codes would be the most effective way to define the "neighborhoods," while also taking into account the city-deemed neighborhood boundaries.

We also grappled with the varying issues and levels of need within each city when deciding how the neighborhoods should be defined. In some cases, there were Zip Codes that had much higher rates of poverty, and other metrics associated with housing related health problems, than areas directly adjacent to the hospitals. We understand that as with any program, resources are limited, so deciding which areas should be served will always prove to be a difficult task.

Limited Local Data Connecting Health and Housing

While we were able to find relevant data about the health and housing of Newark and Paterson residents, there was a lack of data connecting specific health problems to housing. As the hospital and community health organization interviewees told us, it is difficult to determine whether someone is presenting at a hospital because of a housing-related health problem. Patients may not even realize the specific cause of the problem or may be embarrassed or unwilling to discuss it when asked. Thus, it is difficult to isolate the housing component of health problems for which numerous environmental and socioeconomic factors contribute.

Role of Environmental Factors Not Discussed

While we have addressed the connection between housing and health, we have mostly left out the crucial role that environmental factors play. Exposure to high levels of air pollution leaves residents vulnerable to a wide array of health problems and reduces lifespans.[25] Food swamps, defined as areas with a lack of healthy food, contribute to numerous health problems independent of housing.[26] Proximity to public transportation has been shown to have health benefits.[27] The presence of crime may negatively impact one's psychological and physical health.

Scope of Housing and Health

During the interview process, multiple participants stated how vast the connections between housing and health are. As we were researching the subjects, it became evident that the broad approach we had taken was somewhat of a limitation. The numerous connections between housing and health include a wide variety of issues. They can be evident in issues such as: exposure to hazardous materials, asthma triggers, and lead; as well as other more physical deficiencies that impact health in the shorter term, including: leaking roofs, collapsed stairs, and problems with electrical wiring. The connections also occur at a slightly more macro-level. One of the Rutgers University professors we interviewed also connected housing location alone to many other factors that can impact health, such as pollution, area crime rates, and lack of healthy food options. As discussed previously, housing can even impact things beyond people's physical health. Other indicators of poor housing quality and household characteristics suggest a need to address not just physical health and well-being, but also mental health and well-being. Depression, anxiety, substance abuse, and domestic violence are just a few mental hardships related to housing quality and financial strain. For example, a smaller residence is susceptible to overcrowding, which may evolve into regular conflicts over space, food, water, heat, etc. Burdenous housing conditions or housing costs have strenuous impacts on occupant mental health. This aspect should be addressed in program implementation.

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[25] Greenstone, Michael and Claire Qing Fan. 2018. "Introducing the Air Quality Life: Twelve Facts about Particulate Air Pollution, Human Health, and Global Policy Index." Energy Policy Institute at the University of Chicago. https://aqli.epic.uchicago.edu/wp-content/uploads/2018/11/AQLI-Report.111918-2.pdf

[26] Cooksey-Stowers, Kristen, Marlene B. Schwartz, and Kelly D. Brownell. 2017. "Food Swamps Predict Obesity Rates Better Than Food Deserts in the United States." International Journal of Environmental Research and Public Health. *14*(11), 1366-1386.

[27] Djurhuus, Sune Henning S. Hansen, Mette Aadahl, Charlotte Glümer. "The Association between Access to Public Transportation and Self-Reported Active Commuting." International Journal of Environmental Research and Public Health. *11*(12): 12632–12651.

COVID 19 and the Future of Health and Housing

The recent pandemic has also raised the concerns regarding the self-sufficiency apartments or homes. Normally, apartment buildings have communal laundry spaces. Are such shared spaces sustainable during COVID-19, and should new apartments have separate washing machines? While the pandemic is relatively new and understudied, it may alter our understanding of healthy housing. That being said and considering the facts which link housing quality to health, the above recommendations offer opportunities to sustainably and holistically develop healthy housing. A primary focus should be on isolating key housing quality factors and parties primarily subjected to poor housing quality, to best design and implement a Healthy Homes program. Addressing these housing quality issues can not only improve the health and overall quality of life of NJ residents, but also lessen a burden on NJ healthcare and social service systems.

We disclose limiting factors not to discredit our findings, but to raise awareness of some gaps the Healthy Homes Initiative should ultimately address in its final planning stages.

Appendix C.
Evaluation Metrics

For Healthy Homes to be as successful as possible in its implementation, a series of organized evaluation criteria must be examined. We suggest the following structured process evaluation model, be considered. In assessing procedures and overall outcomes of the implementation of the Healthy Homes Initiative, evaluation must take place before, during, and after the duration of the program. Only then can inputs, processes, outputs, and impacts be properly and fairly assessed.

1) A home audit details the conditions of the housing structure, and establishes a baseline metric for 1) identifying necessary interventions, maybe initially undetected as a priority, and 2) understanding the end outcomes of the Healthy Homes program. An initial assessment and endline assessment can effectively evaluate impact and overall change as a result of program implementation.
    a) Assessments during (in between first home assessment and last home assessment) may be required periodically to track program performance and health outcomes.
    b) Longer-term assessments and revisits to the site of improvement should be considered to understand whether the program has long-term benefits and whether it is financially sustainable? For example, if in a year from remediation the occupant develops a new respiratory illness, program design may be flawed or other environmental and health factors need to be considered.
    c) A detailed audit by a third party to ensure financial sustainability of the program and assess whether the funds are being allocated effectively and efficiently? This would also help identify gaps and opportunities in the program, so it can be modified.
2) Feedback from contractors and landlords should be a required component of evaluation; by eliciting feedback from contractors and landlords, this would not only allow installation metrics to be tracked (prevalence, cost, etc.), but occupancy satisfaction can also be monitored. Regular communication with contractors and landlords, can guide program improvements. Contractors may notice trends or preferences of households to address mold remediation over window sealing, for example, which is an important factor to consider when rolling out Healthy Homes. Program delivery can improve greatly if contractors and landlords provide valuable feedback, considering they are in primary contact with residents.[28]
    a) Nuances of program design and incentives for contractors/landlords to provide feedback, need to be reviewed. Our understanding is that Healthy Homes will not operate with a commission-based incentive system or in other words, pay contractors and landlords to install specific measures. Although, a program like BPU's Comfort Homes program may incentivize contractors to install energy efficient measures; this in turn may lead to contractors over-intervening to collect incentive money.[29] Customer double-dipping into

[28] DOE Energy Efficiency and Renewable Energy: Residential Program Solution Center. https://rpsc.energy.gov/tips-for-success/establish-collaborative-partnerships-contractors-and-communicate-them-early-and
[29] PG&E/MCE Sample Advice Letter, 2019. https://www.mcecleanenergy.org/wp-content/uploads/2019/08/MCE-Advice_-_Letter_36-E_PGE_Advice_Letter_4107-G-5563-E.pdf

these incentives is also a concern, so further clarification is needed to set up preventative measures for program design and evaluation.

   b) Residents should also be strongly encouraged to provide feedback upon installation of housing interventions. Providing an incentive, for example, like a $5 Amazon gift card should be considered to encourage a high response rate. Adhering to ethical standards, such an incentive can ensure that no coercion takes place in evaluation.

3) A saturation survey, similar to that administered by utilities in the form of residential appliance saturation surveys, may prove useful to collect information about housing structure, amenities, and appliances, and satisfaction with the program. Data collected via saturation surveys can provide information about amenities and appliances based on home type, location, and other household characteristics, to forecast patterns of intervention adoption and/or demand.
4) A demographic survey should be conducted periodically in the neighborhoods, maybe every 2-4 years to ensure that there hasn't been a drastic change in basic characteristics such as age, or income or family size: factors that may impact housing. This kind of survey ensures that the program targets the most vulnerable population, and how and when the program needs to be altered to fit the needs of the neighborhoods.

A full evaluation outline can be provided upon further request of investigation. Our evaluation framework considers overall program performance, cost and quality of interventions, and occupant satisfaction.

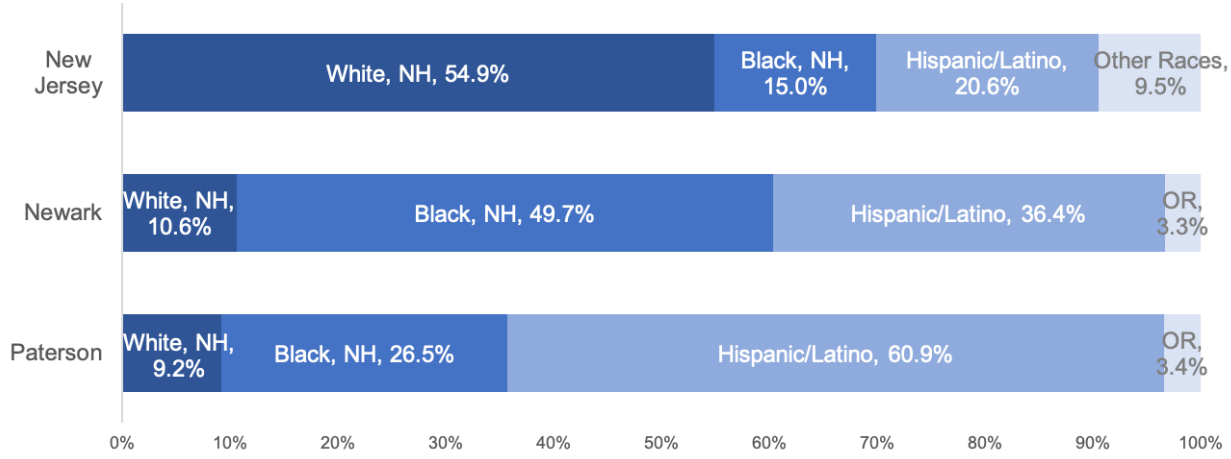
Appendix D. Demographic Data

Table 1. Race Characteristics of NJ Residents by Housing Issues, see p. 6

Table 2. Categories of NJ Residents by Housing Issues, see p. 11

Figure 1. Age Distribution of Residents in New Jersey, Newark, and Paterson - American Community Survey (2018) See p. 5

Figure 2. Race/Ethnicity Breakdown of New Jersey, Newark, and Paterson. U.S. Census Bureau (2019)



Appendix E. Housing Data

Figure 3. Age of Housing Stock in NJ, Newark, and Paterson. American Community Survey (2018). *See p. 6*

Figure 4. Housing Tenure in NJ, Newark, and Paterson. American Community Survey (2018). *See p. 7*

Figure 5. Occupants Per Room in New Jersey, Newark, and Paterson - American Community Survey (2018)

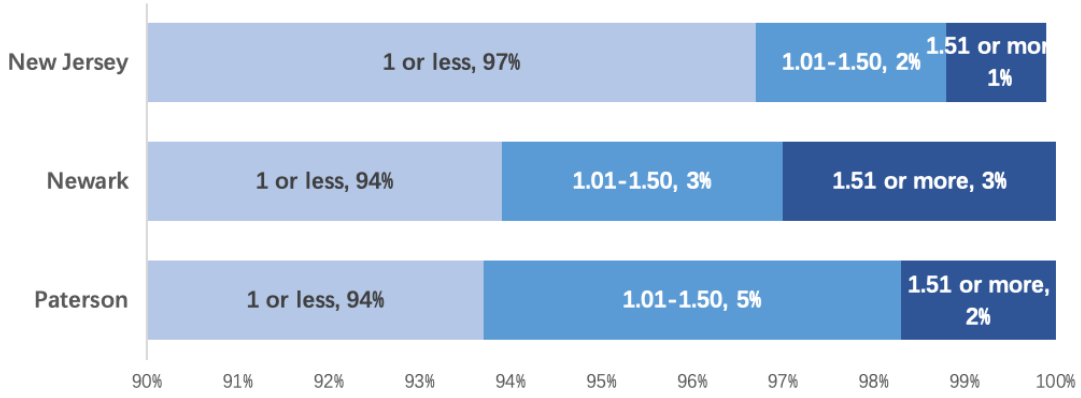
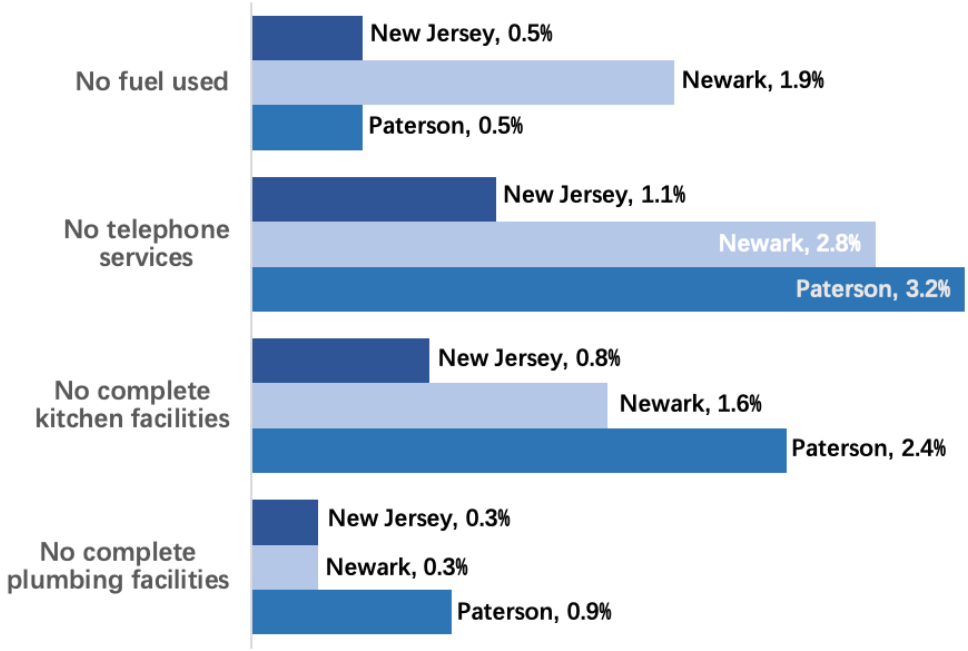


Figure 6. Households Lacking Facilities in New Jersey, Newark, and Paterson - American Community Survey (2018)



Appendix F. Health and Well-Being Data

Table 3. Problems with Living Situation of NJ Residents - HWB Survey (2019)

housingsecurity	Pest	Mold	Lead	No Heat	No Stove/Oven	No Smoke Detector	Water Leak
Overall	9.2%	5.1%	3.6%	4.4%	2.6%	4.2%	7.0%
Steady	7.0%	3.8%	2.9%	2.8%	1.7%	3.4%	6.1%
Not steady & worried	31.2%	18.2%	10.4%	20.8%	11.7%	11.7%	15.6%

Figure 9. Living Situation Security in NJ. Rutgers Center for State Health Policy, Health and Well-Being Poll (2019), see p. 10

Figure 10. NJ Housing Quality Problems. Rutgers Center for State Health Policy, Health and Well-Being Poll (2019), p. 10

Figure 11. NJ Housing Quality Problems by Living Situation. Rutgers Center for State Health Policy, Health and Well-Being Poll (2019), p. 11

Figure 12. Ownership Characteristics of NJ Resident by Housing Issues - HWB Survey (2019), p. 12

Figure 13. Asthma Rates in NJ, Newark, and Paterson. NJBRFSS (2017), p. 13

Figure 14. Asthma Rates by Race/ Ethnicity in Newark and Paterson. NJBRFSS (2013-2017), p. 13

Figure 15. Emergency Department Visits per 100,000 population in NJ, Newark, and Paterson. Emergency Department Discharge Files (2008-2012), p. 14

Figure 16. Rates of Death Due to Unintentional Falls per 100,000 population (Age-Adjusted) in NJ, Newark, and Paterson. New Jersey Death Certificate Database (2010-2018), p. 14

Figure 17. Percentages of Residents Had Poor Mental Health (Age-Adjusted) in NJ, Newark, and Paterson. NJBRFSS (2013-2017), p. 15

Appendix G. Interview Questions

Note: These were broad questions designed to lead interviews but were adjusted based on the profile of the individual interviewees.

1. (Community Organizations): What is the purpose of your organization? What area of community development due you mostly focus on?

2. (Hospitals/Community Organizations): What is your role at the organization? Do you engage with local political leaders? Do you play an active role in advocacy or lobbying? What other organizations are in the area that you work closely with?

3. (Community Organizations): Does your organization have any ongoing programs to improve housing conditions in your neighborhood? How are these programs funded? What is the main focus of these programs? Who is the target audience?

4. (Hospitals/ Community Organizations): Do you know of any other existing housing improvement programs that serve your neighborhood? [If yes] What can you tell about these programs? What are their strengths and areas of weakness? What are some gaps in housing improvement services that are not met by these programs? Do you have any recommendations on how to improve these existing programs? Is your organization working on anything specific regarding these programs recently?

5. (Community Organizations/Policymakers): What are some barriers that you think might arise for the implementation of a housing improvement program such as this? How can policymakers overcome these barriers?

6. (Policymakers): Can you tell us about the housing inspection process for your city? How effectively does the process identify and lead to correction of health-related problems such as mold and pests? Is it efficient? Does the system need to be updated?

7. (Policymakers): What existing ways are there for residents in your city to address substandard housing issues they might be having? How does this process differ for renters/homeowners?

8. (Hospitals/Community Organizations): Do you see a connection between housing quality and the health of residents in the neighborhood? [If yes] What are the major health-related housing quality problems in this area? For how long have these health issues been prevalent in the area?

9. Housing Conditions probe: Are there mold issues? Water leaks? Pests? Unsafe stairs/railings? Drafty windows? Dusty vents? Malfunctioning ventilation systems?

10. (Hospitals/Community Organizations): What types of health problems would you associate most closely with poor housing quality? Why do you think these particular issues are so much more prevalent in the area?

11. (Hospitals): How common is it for you to see patients that come in with health problems which can be associated with poor housing quality each month?
    a. What methods (if any) are used for tracking these issues related to housing quality? Are there protocols to determine what the root cause of their health issues might be?

12. (Hospitals) Relatedly, are there any community health or social workers who collect and track this information? Or is it dependent on the patient to report any housing quality issues they are having? What local/state organizations collect data on these issues?

13. (Hospitals/Community organizations): What kind of housing improvements would you recommend in order to alleviate those health problems that are associated with poor housing?

14. (Community Organizations):How common is it for people to come in looking for better rentals or housing options? What sort of protocols or services do you have in place to assist them? Is this group restricted to any income or ethnic/racial group?
    a. Do people explicitly connect their housing conditions to health conditions?
    b. If so, how many of these people attribute health problems to their current housing situation?

15. (Hospitals/Community Organizations): Based on your experience working with community residents, what are some of the biggest housing quality issues that residents face?

16. (Hospitals/Community Organizations/Policymaker): Is there any other information that you think would be useful for us in our research on health and housing in your neighborhood?

17. (Hospitals/Community Organizations): Are there other people/groups that you think would be beneficial for us to interview for our research?