



Connecticut Green & Healthy Homes Pre-Feasibility Analysis Report

Prepared for Connecticut Green & Healthy Homes Partners
June, 2018

Acknowledgements

The Green & Healthy Homes Initiative produced this report on behalf of the Connecticut Green and Healthy Homes partners, including co-sponsors Connecticut Green Bank and Connecticut Department of Public Health and partners:

Connecticut Department of Public Health
Connecticut Department of Social Services
Connecticut Department of Energy and Environmental Protection
Connecticut Department of Housing
Connecticut Office of the Chief State's Attorney
Connecticut Department of Children and Families
Connecticut Office of Early Childhood
Connecticut on Unit on Aging
Eversource
United Illuminating

The following partners and stakeholders also contributed to this report:

Bridgeport Department of Health
Connecticut Children's Medical Center
Connecticut Legal Services
Dorgan Architecture and Planning
Northeast District Department of Health
Operation Fuel
University of Connecticut School of Medicine



Table of Contents

Executive Summary	iii
Introduction.....	1
Housing in Connecticut.....	1
Housing Characteristics	1
Demographic Trends and Access to Healthy, Energy-Efficient and Affordable Housing	3
Energy Needs	4
Asthma, Lead Poisoning and Household Injury in Connecticut	5
Housing, Health and Energy Interventions	7
Connecticut’s Current Energy, Health and Housing Programs	7
Statewide Program Descriptions.....	7
Home Energy Solutions (HES) and HES - Income Eligible (HES-IE) Programs	8
Weatherization Assistance Program (WAP).....	9
Connecticut Green Bank Solar for All with PosiGen Solar Solutions.....	10
Connecticut Green Bank EnergizeCT Smart-E Loan Program.....	11
Connecticut Green Bank Multi-Family Programs	11
Community Development Block Grant (CDBG).....	12
Multi-family Energy Loan (MEL) Program	13
Energy Conservation Loan Program.....	14
Lead Poisoning Prevention Programs	14
Connecticut Children’s Medical Center Healthy Homes Programs.....	16
Lead, Radon and Healthy Homes Program.....	16
Putting on AIRS	17
Falls Prevention Program.....	18
Connecticut Collaboration for Fall Prevention (CCFP).....	19
Locally-administered Programs and Pilots	20
Energize Connecticut Clean Energy & Healthy Homes Pilot.....	20
Operation Fuel	21
GHHI New Haven.....	21
Connecticut Social Health Initiative Project	22
Assets and Gaps in Current Framework	22
Capacity	23
Coordination	23
Geography.....	24

Funding	25
Eligibility	26
Impact Measures and Data Capacity.....	27
Political and Policy Alignment for Sustainably-supported Housing, Health and Energy Services	28
Connecticut’s Commitment to Sustainability	29
Pairing Health and Safety Interventions with the Energy Efficiency Provider Network.....	29
Connecting Healthy Homes to Reducing Greenhouse Gas Emissions	29
Reducing Energy Burdens and Supporting Healthy Housing through Innovative Financing	30
Connecticut’s Commitment to Increase Access to Affordable Housing.....	30
Supporting and Improving Connecticut’s Housing Stock	30
Connecticut’s Commitment to Health Equity and Addressing Social Determinants of Health.....	31
Aligning with Connecticut’s Medicaid Delivery Model.....	32
Connecticut HUSKY Healthcare Program.....	32
Statewide Innovation Model and Intensive Care Management.....	32
Improving Connecticut’s Health Outcomes through Planning and Action.....	34
Models for Energy, Health, and Housing Interventions	34
Coordination of Current Services	34
Pilot Integrated Model	35
Integrated Statewide Service Delivery Platform Model with Sustainable Funding.....	36
Strategies for Sustainable Funding for Housing, Health and Energy Services	37
Opportunities and Challenges in Partnering with Connecticut HUSKY	37
Innovations that Allow Medicaid to Pay for the Value of Services.....	38
Private Sector Investment in Successful Strategies	39
Hospital Community Benefits Funding	40
Value-Based Services	40
Other Funding Strategies	40
Pre-Feasibility Key Findings	42
Leveraging Existing Programs to Develop Infrastructure for Service Delivery.....	42
Toolbox of Innovative Funding Solutions for Connecticut	42
Additional Research and Further Considerations	43
References.....	57

Executive Summary

The Connecticut Green & Healthy Homes Initiative harnesses the state's existing framework for providing housing-based health and energy services, and seeks to integrate these resources into a sustainably-supported, holistic approach to addressing the full range of low-income housing needs.

An integrated housing, health and energy service delivery model, like the one explored here, would allow residents to seamlessly access housing-based services that support health improvements, reduce energy burdens and address housing deficiencies. Coordinated housing, health and energy interventions holistically address needs, and effectively harness Connecticut's existing framework for coordinated energy, health and housing services, address gaps in this system and expand access to these services statewide. The proposed model sustainably supports evidence-based services through strategically-leveraged public, private and philanthropic investment, and harnessing successful outcomes and future healthcare cost savings to repay investments in housing quality improvement.

Connecticut Green Bank (GREEN BANK) and the Department of Public Health (DPH) are working with the Green & Healthy Homes Initiative, along with partners including the Department of Children and Families (DCF), the Department of Energy and Environmental Protection (DEEP), the Department of Housing (DOH), the Department of Social Services (DSS), the Office of the Chief State's Attorney, the Office of Early Childhood, the Unit on Aging, Energize CT, Eversource, and the United Illuminating Company, to study the feasibility of an integrated statewide model for housing, health and energy services. The first step of exploring that model is the completion of this report, the Connecticut Green & Healthy Homes Project Pre-Feasibility Analysis.

The Connecticut Green & Healthy Homes Pre-Feasibility Analysis uses publicly-available data and Connecticut stakeholder insights to examine factors impacting feasibility of implementation of an integrated statewide delivery platform for energy, health and housing services in Connecticut. Connecticut state agencies, utility partners and others are engaged in providing evidence-based energy and healthy homes interventions, which include energy-efficiency measures, asthma trigger mitigation, injury risk reduction and lead hazard control. Interventions like these have been shown to produce lower healthcare costs and societal costs related to lead exposure,¹ household injury² and asthma³, and lower energy costs as well as increased financial stability for residents⁴.

This report has identified specific needs and gaps in the current system. Connecticut's low-income households experience poor housing quality and a lack of resources to access healthy, safe, and energy-efficient affordable housing, which results in poor health outcomes and high energy burdens. The following table outlines key challenges and impacts related to housing conditions:

Selected Challenges and Impacts of Housing Deficiencies in Connecticut, 2018

Social Determinants of Health	Housing Conditions	Health Impacts	Energy Burdens
Over 1/3 of Connecticut households are	More than 1/4 of homes served by Department of Public Health home	The state had 21,700 annual asthma-related hospitalizations ⁷ , and	The average energy burden for low-income households ⁱ is 60%

ⁱWith annual incomes at or below 60% of the State Median Income.

struggling to meet basic needs even as they work one or more low-wage jobs⁵	visiting programs had at least one health and safety deficiency. ⁶	over \$102 million in Medicaid claims related to asthma. ⁸	higher than the national average. ⁹
Over 497,000 Connecticut households, identify as being housing cost-burdened, meaning 30% or more of income is spent on housing-related costs.¹⁰	These deficiencies include damaged paint, lack of ventilation, mold growth, pest infestation, broken windows, lack of working smoke and CO detectors, & fall/trip hazards. ¹¹	Statewide, falls are the leading injury-related cause of mortality for older adults, and the fourth leading cause across all ages. ¹² Falls were involved in over 42,000 hospitalizations statewide over 5 years. ¹³	At least 25% of homes served by rate payer-funded energy programs were deferred for energy efficiency upgrades due to health and safety conditions. ¹⁴
		Over 2,100 children under the age of six are diagnosed with elevated blood lead levels in Connecticut. Just under 75% of these children were diagnosed with blood lead levels of 5-9 µg/dL. ¹⁵	These conditions include asbestos, knob & tube wiring, moisture infiltration and mold, roofing problems, and CO ₂ leaks. ¹⁶

There are a number of effective and robust resources for housing service delivery in Connecticut, chief among them are the state's residential energy efficiency programs.¹⁷ Approximately 20,000¹⁸ households receive energy efficiency interventions annually via the Connecticut Energy Efficiency Fund's (CEEF, also known as the Connecticut Conservation & Load Management Program) Home Energy Solutions (HES) and HES-Income Eligible (HES-IE) Programsⁱⁱ, and Department of Energy and Environmental Protection's Weatherization Assistance Program¹⁹. CEEF's 2016-2017 Energy and Healthy Homes Pilots coordinated health and safety interventions with Connecticut's robust energy service delivery platform, and were designed to better characterize the health- and safety-related causes of weatherization deferrals and test the operational feasibility of a more coordinated approach to health, safety and energy services. The Connecticut Green Bank provides financing for single-family and multi-family properties, including programs explicitly serving low income residents and a new program addressing the health and safety needs of properties.

Connecticut is also deeply committed to promoting health equity, and addressing the social determinants impacting the health of the state's population. Health equity requires continuous commitment, and for several decades, the Connecticut Department of Public Health and other agencies have invested in creating equitable opportunities for all Connecticut residents to experience good health. Some of DPH's investments include community health centers and school based health centers, identifying health professional shortage areas, and supporting local public health districts. DPH builds coalitions to improve health through advocacy, policy, and system changes and implements two multi-community evidence-based home visiting programs which address asthma (Putting on AIRS) and household injury (Falls Prevention Program). These programs use a multi-visit approach to resident education and provide

ⁱⁱ Households earning 60% of State Median income or less receive these services free of charge.

resources to reduce risks for asthma exacerbation and slip, trip and fall injuries in the home environment. State and local health departments implement lead and healthy homes programs that are federally-funded at over \$12 million and which focus on mitigating the lifelong toxic effects of early childhood lead exposure in communities across the state. A recent Department of Public Health Healthy Homes Surveillance Report, based on comprehensive health and safety assessments and surveys in over 1,500 Connecticut households, provides robust data on the conditions and challenges in housing across the state, and the impact of healthy homes interventions like the ones proposed as part of this initiative.

The Connecticut Department of Housing utilizes a variety of strategies to achieve greater access to healthy, safe and energy efficient affordable housing for Connecticut families, including capital funding for affordable housing creation and preservation, funding for permanent supportive housing, and coupling financing for health and safety upgrades to housing with energy conservation loans to improve efficiency. The Department's strong partnerships with the Connecticut Housing Finance Authority, Connecticut Green Bank and Connecticut Children's Medical Center enables organizations to work together to ensure that housing rehab financing is tied to meeting health, safety, energy efficiency design standards statewide and lead remediation and healthy homes services are available statewide. DOH, with the Connecticut Children's Medical Center, administers several multi-million dollar lead hazard abatement and healthy homes programs with federal funding. Future plans include launching the state's \$20 million lead poisoning prevention program funded through state bonds. In addition, a non-lapsing fund for lead abatement, to be administered through the Department of Housing, was created in this past legislative session.²⁰

Connecticut has experienced state budget cuts impacting housing, health and energy programs and services for low income households. However, even given these constraints, agency leaders from the Departments of Public Health, Social Services, Energy and Environmental Protection, Housing, and Children and Families and the Offices of Early Childhood and the Chief State's Attorney and the Connecticut Green Bank have stepped forward to support the vision and goals of the Connecticut Green & Healthy Homes Project.ⁱⁱⁱ

Even given Connecticut's considerable focus on improving the housing conditions that impact health and energy efficiency, there exist some critical gaps in the service network which can be effectively addressed through a sustainably-supported statewide model. The HES and HES-IE programs serve nearly 20,000 households annually, reach about 5% of all low-income households, and 20% of the low-income households receiving energy assistance statewide,²¹ however it is estimated that about 25% of referred homes cannot receive energy efficiency upgrades due to the presence of health and safety hazards²². Connecticut also has a number of evidence-based home visiting programs to address lead exposure, asthma, falls and other health and safety hazards in the home, however, these programs are not funded adequately to provide structural hazard remediation, and their current capacity does not match the energy services sector production capacity.²³ Geographic coverage is also a challenge for services in Connecticut. The state's large and medium-sized population centers receive the most housing, health and energy services resources, based either upon federal or state funding formulas or concentration of need in these communities. While rural parts of the state often engage in innovative partnerships to leverage limited resources, expanded program footprints and systematic coordination can offer more sustainable access to needed services statewide. Federal funds for asthma, lead, and injury-related housing interventions are not

ⁱⁱⁱ Commissioners from each of these key state agencies have attended a series of meetings and strategic convenings to publicly state support for advancing this model of service delivery, and pledge to work to leverage outside investment with state dollars in support of a pilot for this work.

stable grant-to-grant, and the state's most recent budget reduces the available state funding for services to this population. Efforts to garner Medicaid dollars to support Connecticut's evidence-based home visiting programs, including the Falls Prevention and Putting on AIRS asthma programs, has thus far been unsuccessful.²⁴

Sustainable funding is key to leverage and elevate the current framework for housing, health and energy services in Connecticut, and realize the vision of seamless access to holistic services. The current framework for services is funded through federal and state funds leveraged with private investment through strategic partnerships. The Green & Healthy Homes Initiative's extensive national research and conversations with the Centers for Medicare and Medicaid Services (CMS) have led to the assessment that Medicaid can be a source of sustainable support for services that address the underlying housing conditions related to health problems and reduce healthcare utilization and costs over time. Connecticut moved to a largely fee-for-service payment mechanism for Medicaid claims in 2010. Some recent initiatives, including the Intensive Care Management, Patient-Centered Medical Home and Patient-Centered Medical Home Plus (PCMH+), utilize patient-centered, value-based^{iv} or shared savings approach to payment for services, which may provide opportunities for strategic investment in healthy housing through Connecticut's HUSKY programs. In the case of PCMH+, providers both meet healthcare quality improvement standards and engage in strategies to reduce unnecessary utilization, and are eligible to receive some of the generated savings. Additional research is needed to fully examine the opportunity for Medicaid's support of the Connecticut Green & Healthy Homes model.

Connecticut has an extensive infrastructure for energy efficiency services in housing, evidence-based healthy homes programs, strong strategic intra-state agency partnerships, and many other resources that can be leveraged and scaled up to put together a sustainably-funded, statewide, integrated housing, health and energy services model. This model advances the shared vision of State agencies, utilities, community providers and many other stakeholders, to provide seamless, statewide access to services that holistically meet the needs of low income households. The model being researched under the Connecticut Green & Healthy Homes Project has the potential to be feasibly implemented in Connecticut, based upon this state resource asset and gap analysis of the preliminary feasibility considerations. In short, the state has all the necessary ingredients for the model to succeed. Further research is planned to quantify the potential for health care and other public costs savings, in order to make the business case for investment in an integrated, statewide approach to housing, health and energy.

^{iv} Medicaid value-based purchasing is defined as "any activity that a state Medicaid program undertakes to hold a provider or contracted managed care organization accountable for the costs and quality of the care they provide or pay for". Frequently, this refers to state Medicaid activities to implement alternative payment models. Alternative payment models change the way Medicaid programs pay providers, and can be implemented in all types of Medicaid delivery systems, including fee-for-service Medicaid programs and in Medicaid managed care." -January, 2017, National Association of Medical Directors.

Introduction

Connecticut is a leader in many aspects of energy, health and housing services, including setting strategic goals to reduce residential energy consumption by improving efficiency in low-to-moderate income properties²⁵ and supporting housing as a platform for improved health outcomes²⁶. The opportunity exists for the State to be the first in the nation to better align these public and private resources to replace traditional housing-related services with a systematically integrated service delivery model where households and individuals access a comprehensive set of services that support health, address housing deficiencies, and lower energy bills through a more seamless process.

Residential health and energy interventions can have positive impacts on a range of chronic health conditions, as well as other financial and quality-of-life outcomes.²⁷ This report concentrates on the impacts of housing interventions on asthma, household injury, and lead poisoning specifically. Deficiencies in the quality of housing such as roof and plumbing leaks, structural integrity problems, heating and cooling system inefficiencies, poor indoor air quality, pest infestations, and lead-based paint hazards are directly linked to asthma, lead poisoning and household injury risks for residents, especially children and older adults, and thus are the focus of this analysis.

The Connecticut Green Bank (GREEN BANK), in partnership with Connecticut Department of Public Health (DPH), and other state agencies and utilities across Connecticut, seek to take the first step in exploring the feasibility of this integrated approach to service delivery, through this Connecticut Green & Healthy Homes Project Pre-Feasibility Analysis. The following Pre-Feasibility Analysis outlines the programs, funding, capacity and policy resources that may be accessed to support an integrated approach to energy, housing and health interventions in the state, as well as the potential resource gaps and challenges that must be considered in implementing such an innovative, cross-sector approach.

Housing in Connecticut

The characteristics of the State's housing stock are unique region-to-region and neighborhood-to-neighborhood, with regard to affordability, quality and design. A statewide model for housing, health and energy services will need to take into account the challenges posed by regional variation in housing types, including differences in the utility or cost-effectiveness of certain interventions for different housing types, including single family homes and multifamily homes of all sizes.

Housing Characteristics

Connecticut's housing is older than the national average, and is composed of many smaller, less-than 10-unit properties, including the state's characteristic triple-decker and 'perfect six' properties.²⁸

The following table outlines key housing characteristics for selected Connecticut towns as compared to the state.

Selected Housing Characteristics, Connecticut and Selected Towns,^v 2016

Geography	Percent 1-4 unit housing	Percent Rental housing	Percent households with children that earn 200% FPL ^{vi} or less	Percent mobile housing ^{vii}	Percent pre-1940 housing
Ansonia	34.3	41.9	51.0	0.1	40.4
Bridgeport	26.4	59.0	63.8	0.1	38.5
Bristol	15.9	34.6	27.4	0.6	21.2
Connecticut	13.5	33.5	29.3	0.7	21.1
Danbury	22.1	41.1	37.5	1.4	19.0
East Hartford	14.1	43.6	49.6	2.4	14.4
Hartford	19.4	76.3	74.8	0.0	38.3
Manchester	19.0	43.8	37.8	0.2	19.3
Meriden	17.0	39.6	45.9	0.3	29.1
Middletown	14.6	46.4	29.7	0.2	18.6
Naugatuck	18.5	33.7	34.2	2.2	23.0
New Britain	22.0	60.3	60.0	0.2	31.2
New Haven	23.3	71.8	62.9	0.1	50.3
New London	22.0	66.2	69.6	0.3	48.8
Norwalk	17.9	38.9	31.9	0.3	20.7
Norwich	20.8	49.4	50.7	4.4	34.7
Stamford	16.9	45.5	30.0	0.1	14.4
Torrington	20.9	33.2	33.1	0.4	25.2
Vernon	13.7	46.0	27.5	2.2	12.5
Waterbury	15.4	56.3	66.2	0.2	29.1
West Haven	16.5	44.5	47.1	0.5	28.2
Windham	20.0	53.0	69.7	3.5	32.9

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-year Estimates

About 82% of Connecticut's housing consists of single-family or small multi-unit properties with fewer than 5 units.²⁹ Providing services to these types of housing units can be more resource-intensive, and most of the state's housing development and rehabilitation financing programs don't address this segment of the housing stock.³⁰ Some communities across the state have a substantially higher proportion of this type of housing including: Ansonia, Bridgeport, Danbury, New Britain, New Haven, New London, Norwich and Torrington.

Statewide, over a third of housing is rental occupied. However, most of the communities included in this comparison have higher-than-statewide-average proportions of rental housing. More than half of housing

^v Included towns have 20 or more elevated blood lead cases, based on 2015 Department of Public Health Lead Poisoning Surveillance Data.

^{vi} Federal Poverty Level

^{vii} Mobile housing is defined as prefabricated structures that are built in factories and transported to the site of use.

units are renter-occupied in: Bridgeport, Hartford, New Britain, New Haven, New London, Waterbury and Windham. A key to success for housing-related health and energy efficiency programs in these communities is to actively engage smaller rental property owners. These programs can be supported by enforcement of strong health and safety standards for 1-5 unit rental properties.

In 2017, the Connecticut Department of Public Health's Lead, Radon and Healthy Homes program issued a surveillance report from a survey of over 1,500 homes involved in that home visiting program statewide over 6 years.³¹ The report reveals that just over a quarter of homes had at least one health and safety deficiency, including damaged or peeling interior paint (36%), lack of allergen bed covers (36%), lack of proper ventilation (35%), mold growth (31%), pest infestation (28%), lack of cleanliness or poor maintenance (23%), broken or missing windows (22%), and visible dust, dirt or clutter (20%). The surveillance data also revealed a lack of fire safety equipment in Connecticut homes. Over half of the homes did not have a working CO detector, and 20% did not have a working smoke alarm. The survey also found imminent fall-related risks in homes of older adults, including lack of bathroom grab bars (51%), and missing or damaged stair railings (15%).³²

Each of these deficiencies is directly related to risks for health conditions and the associated loss of function, healthcare utilization and other costs. An integrated statewide housing, health and energy service delivery approach would seek to address Connecticut's housing needs through evidence-based home visiting strategies paired with health, safety and energy specific housing interventions designed to improve outcomes and reduce costs.

The homes involved in DPH's Healthy Homes program tended to be older than the statewide average (71% pre-1950, versus 30% pre-1950 statewide), and were likelier to be renter-occupied (74% versus 33% statewide). Nearly 43% had at least one child under the age of six, and 10% had older adult residents. Most of the homes served in this program utilized natural gas for heat (69% versus 37% statewide), and about 13% reported that the temperature controls in their home were 'impossible' or 'difficult' to control.³³ The unique characteristics of the housing served by this statewide program may provide an indication of the kinds of challenges that a statewide, integrated housing, health and energy program may encounter in meeting the needs of low-to-moderate income^{viii} (LMI) households statewide.

Demographic Trends and Access to Healthy, Energy-Efficient and Affordable Housing

About 29% of Connecticut households with children under 18 have an annual income at or below 200% of the federal poverty level, or the equivalent of \$48,720 in annual earnings for a family of four. It is estimated that the annual income needed for a family of four to meet the basic needs to survive in Connecticut is closer to 300% of the federal poverty level, or \$66,168 or more annually for a family of four.³⁴ In many communities included in this comparison, the proportion of households with children who are living in poverty far exceeds the statewide average. Hartford (75%), New London (70%), Windham (70%), Waterbury (66%), Bridgeport (64%), New Haven (63%), New Britain (60%), Norwich (51%), and East Hartford (50%) are all communities where more than half of families are living at or below 200% of

^{viii} Connecticut Green Bank defined low-to-moderate income households as 100% area median income (AMI) or below, and low income households as 80% AMI or below.

federal poverty. Families in these communities are likely to experience poor quality housing and the health impacts and energy burdens associated with it.

Access to affordable, healthy and safe housing is impacted by income. In DataHaven's 2015 Community Wellbeing Survey, 6% of Connecticut residents reported experiencing housing insecurity³⁵, defined as high housing costs in proportion to income, poor housing quality, unstable neighborhoods, overcrowding, or homelessness.³⁶ Particularly for young children, housing instability can have a direct impact on health and ability to thrive.³⁷

Over 497,000 Connecticut households, or just under 37%, identify as being cost-burdened, meaning 30% or more of income is spent on housing-related costs.³⁸ Vulnerable populations often struggle in Connecticut. Nearly 1/3 of the state's children and 24% of adults over 65 are living in low-income households.³⁹

The United Way's Connecticut ALICE Report, part of a nation-wide research project that seeks to characterize the challenges facing the working poor, or Asset-Limited, Income-Constrained, Employed households, estimates that over 360,000 households statewide meet the 'ALICE' standard (in addition to over 143,000 households in poverty). Thus, over one third of Connecticut households are either living in poverty or struggling to meet basic needs even as they work one or more low-wage jobs.

The report also cited several trends in Connecticut's population, which point to future needs for better access to healthy, safe and energy-efficient housing, as well as to the opportunity to improve economic stability through workforce development in the housing, health and energy sectors:

- The number of struggling households is growing - from 2010 to 2014, the proportion of ALICE households increased statewide from 22% to 27%, and the proportion of households living in poverty also increased during that time, despite a plateau in population growth in the state from 2012-2014.
- The population is aging, and many seniors do not have the resources needed to support themselves – Connecticut has a higher proportion of senior-headed households than 2/3 of states. The number of senior-headed households grew steadily in Connecticut between 2007 and 2014, while the number of ALICE senior households dropped slightly during that time.
- The average hourly wage needed to meet basic needs for a family of four in Connecticut is over \$35. Almost half of all jobs in Connecticut pay less than \$20 per hour, and two-thirds of those low-wage jobs pay \$10-15 per hour.⁴⁰

Energy Needs

In order to holistically address the needs of these LMI households, it is important to understand and characterize the health and safety needs of households served by Connecticut's energy programs, and anticipate what the needs of these populations are likely to be in the future. Connecticut's energy needs are significant. The statewide average annual energy cost is 60% higher than the national average, and the average energy burden for a Connecticut household is 11.8% of annual income, 30% higher than the national average energy burden. This burden is higher for households living in poverty, who might spend as much as 58% of annual income on energy.⁴¹

The December 2016 APRISE^{ix} report estimates that over 430,000 households meet the income eligibility criteria for Connecticut’s residential energy efficiency programs. However, within that income-eligible population there are groups with characteristics that point to health and safety needs – 25% are older adults living alone, 16% have a child younger than 6 years, and 12% are non-elderly disabled.⁴²

Connecticut Energy Program-eligible Households by Vulnerable Member, 2016

Vulnerable Member	N households	% households
Elderly Member (60+)	182,127	42%
Young Child (<6)	70,603	16%
Disabled Individual	155,791	36%
Any Vulnerable member*	306,187	70%

*households with at least one elderly member, young child, or disabled member

Source: APRISE, 2016

The report characterizes the needs of vulnerable households differently, depending on their make-up. For seniors, particularly those living alone and with limited access, energy burdens are likely to be high and needs are likely to continue over time as income and assets remain fixed.⁴³ For this population, there is significant opportunity to save costs at the individual, household and state levels, by providing a holistic housing intervention that both improves energy efficiency and reduces risks for fall-related injuries and respiratory irritants.

Asthma, Lead Poisoning and Household Injury in Connecticut

Substandard housing is the source of many environmental health hazards known to cause or exacerbate illness.⁴⁴ Deficiencies in the quality of housing - roof and plumbing leaks, structural integrity problems, heating and cooling system inefficiencies, pest infestations, and lead-based paint hazards – are directly linked to asthma, lead poisoning and unintentional injury risks for residents, especially children and older adults.⁴⁵ In Connecticut, as elsewhere, poor housing quality disproportionately affects low-income neighborhoods and impacts families’ ability to succeed and thrive over a lifetime.

When considering the program design and allocation of resources for a statewide service delivery platform, it is essential to understand the extent of the health risks associated with poor housing conditions in Connecticut. The following is a brief analysis of the healthcare costs related to these three housing-related health conditions, using publicly-available data from the Connecticut Department of Public Health. In the next phase of the Connecticut Green & Healthy Homes feasibility research, actual claims data will be analyzed to ascertain the claims costs related to these health conditions for Connecticut’s Medicaid subpopulations.

In 2016, Connecticut saw over 21,700 asthma-related hospitalizations. The towns with the highest numbers of asthma-related hospitalizations are many of the same municipalities with housing-related risk factors discussed above, including: New Haven (3,205), Hartford (2,175), Bridgeport (2,010), Waterbury (1,219), New Britain (883), West Haven (625), Stamford (547), Hamden (497), Norwalk (477), Meriden

^{ix} APRISE, or Applied Public Policy Research for Institute for Study and Evaluation, is a nonprofit research institute dedicated to collecting and analyzing data and information to assess and improve public programs.

(391) (Appendix 5). It could be assumed that the largest numbers of asthma hospitalizations are concentrated in the state's population centers, but these same communities also have the highest age-adjusted asthma hospitalizations rates per 10,000: New Haven (54.6), Hartford (37.6), Bridgeport (29.0), New London (28.1), New Britain (25.0), West Haven (23.7), East Haven (23.7), Waterbury (22.0), Windham (18.1), Hamden (17.6) (Appendix 5).⁴⁶

Connecticut also measures the impact of asthma in terms of population-level health outcomes and healthcare utilization. New Haven is ranked highest in the state for asthma-related hospitalization costs, with nearly \$20.3 million in annual costs as of 2014 (Appendix 6).⁴⁷ Rounding out the top 25 towns in terms of asthma-related costs included many smaller and more rural communities such as Norfolk, North Canaan and North Stonington, suggesting that rural Connecticut experiences pockets of asthma-related need with relatively few resources to mitigate the contributing causes of asthma episodes. (Appendix 6).⁴⁸

While it is not always possible to isolate household injury from other types of unintentional injury using insurance claims data^x, unintentional injuries are connected to housing conditions, especially for young children and older adults.^{49, 50} Statewide, falls are the leading injury-related cause of mortality for older adults, and the fourth leading cause across all ages.⁵¹ Between 2007 and 2013, the most recent time period for which data are publicly available, falls were involved in over 42,000 hospitalizations statewide.⁵² Falls are the leading cause of hip fractures, traumatic brain injury, and nursing home admissions for older adults. Falls-related long term nursing care and rehabilitation cost Connecticut \$1.1 billion in healthcare, and falls-related emergency department usage cost over \$500 million during that same time period.⁵³

In 2015, the most recent year for which data are available, 2,156 children under the age of six (2.9%) were diagnosed with elevated blood lead level ($\geq 5\mu\text{g/dL}$) in Connecticut. Just under 3/4 of these children (1,609) were diagnosed with blood lead levels of 5-9 $\mu\text{g/dL}$. When examining raw numbers of lead-poisoned children, the state's population centers – New Haven (339), Bridgeport (292), Waterbury (282), and Hartford (164) have the highest numbers of lead poisoning cases.⁵⁴ As discussed below, these communities also benefit from some level of grant and loan resources to help identify and address lead hazards in housing. Smaller communities throughout the state also have relatively concentrated groups of lead poisoned children, including Meriden (75 cases in 2015), New Britain (70), Manchester (53), and Norwich (52).⁵⁵ Each of these communities receives an allocation of the state's federal lead hazard control funding and addresses lead-related housing risks using these resources, in partnership with local providers and community organizations.⁵⁶

DPH's Healthy Homes Program found damaged or peeling paint in 36% of pre-1950 homes assessed, and in 31% of homes overall, indicating the need to address this hazard in housing.⁵⁷ The direct healthcare costs of lead poisoning may be limited. Most lead poisoned children are not hospitalized or given therapeutic drugs to address the cause of lead exposure. There are, however, costs related to re-testing blood lead levels after the initial 'positive' result, as well as the attributable share of costs for treating attention deficit hyperactivity disorder due to lead exposure.⁵⁸ A full analysis of the economic impact of lead exposure in Connecticut, to be completed in the next phase of the feasibility analysis, includes the valuation of costs related to special education and criminal justice, and the value created by increased future earning potential as a result of avoided lead exposure.

^x The most recent update to the ICD, ICD-10, adds a code for 'place of occurrence' for unintentional injury. However most states report that providers and medical claims administrators do not widely utilize or require this code for payment of claims.

Housing, Health and Energy Interventions

Healthy homes interventions have been definitively linked to improved environmental and health outcomes in a number of categories, including multi-faceted asthma interventions, integrated pest management, moisture control and mitigation, and lead hazard control.⁵⁹ Residential interventions focused on specific target populations have been shown to reduce the severity and frequency of asthma symptoms,⁶⁰ risk for injury,⁶¹ and blood lead levels in children under six years of age⁶². In addition to reductions in asthma episodes and related medical costs, housing service delivery platforms coupling energy efficiency with health interventions can produce a number of other health and energy benefits.^{63,64,65,66} Fewer asthma episodes and lower rates of lead poisoning lead to improved school attendance and better educational outcomes for children, and better work attendance and career advancement for adults.^{67,68} Lower utility bills and improved property values due to energy efficiency upgrades lead to avoiding energy costs and potentially asset-building, especially for low-income households for whom high energy costs account for a significant portion of the monthly budget.⁶⁹

The proposed, fully integrated model of service delivery allows for operational and cost efficiencies which will be borne out by piloting an integrated model in Connecticut. Services in the proposed model are robust, evidence-based energy and healthy homes resident education, energy audit/environmental assessment and intervention designed to address asthma triggers, household injury risks and lead exposure as well as reducing energy loss. Connecticut's existing resources, including the state's energy efficiency services framework, will be harnessed and coordinated to provide these interventions, and interventions will differ household-by-household depending on the results of coordinated energy audits and environmental assessments. The next phase of the Connecticut Green & Healthy Homes work will provide an overview of the common services that would be included in an integrated service model, and recommendations specific to the regional needs and resources available throughout the state.

Connecticut's Current Energy, Health and Housing Programs

The following section examines the State's existing capacity for services to address these needs, particularly for LMI households. The programs discussed include those administered by state agencies, which typically include broad geographic footprints serving a variety of communities, as well as key smaller-scale pilots or programs addressing these needs at the local level.

Statewide Program Descriptions

The programs described below are implemented primarily through four agencies working in energy, health and housing at the state level: Connecticut Department of Public Health (DPH), Connecticut Department of Social Services (DSS), Connecticut Department of Energy and Environmental Protection the Connecticut Department of Housing (DOH), and the public-private partnership between the state and the utility companies, known as EnergizeCT. These agencies are key partners in advancing a statewide, integrated platform for services to LMI households. The brief descriptions of each program below offer an outline of the current level of services in the State, highlights assets that can be leveraged to successfully achieve the goals of the project, and gaps that can be addressed through implementation of a sustainably-funded statewide platform for services.

Home Energy Solutions (HES) and HES - Income Eligible (HES-IE) Programs

Implementing Agency and Partners: EnergizeCT , United Illuminating/Avangrid, (includes Southern Connecticut Natural Gas and Connecticut Natural Gas), and Eversource, and the Connecticut Energy Conservation Management Board (also known as Connecticut Energy Efficiency Board).

Geography: Services are available within the service areas of the utility partners, mostly statewide with the exception of a few towns including Norwich (these towns are covered by municipal co-operatives that offer a version of HES) and Wallingford (that offers a version of HES through the Wallingford Electric Division).

Eligibility: Households earning less than the threshold of 60% of State Median Income (SMI) receive energy audit and on-site energy efficiency upgrades free of charge through the HES-IE program, all others pay a modest co-pay for HES.

Funding: Funds for energy efficiency interventions come from electric and natural gas utility rate payers, via an on-bill consumption-based conservation fee. Regional Greenhouse Gas Initiative (RGGI) auction proceeds were also used to subsidize oil and propane customers (but will not be available for FY 2018-2019), and subsidies from the market rate Home Energy Solutions programs enable energy audit and initial interventions to be provided to HES-IE-eligible households free of charge.

Services and Annual Unit Production: Together, these programs have served just under 20,000 households annually with energy audits. The project unit production for the FY 2018-2019 budget period is reduced by a total of 12,900 units per year due to diversion of the conservation charge to address state budget gaps. In 2017, 17%-20% of units were deferred for weatherization, due to health and safety hazards.^{70,71} The remainder of units receive on-the-spot energy efficiency upgrades including blower door testing, home heating equipment testing, duct testing, air sealing, inefficient lighting replacement, water testing, pipe wrapping, and other measures during the initial visit, and are offered incentives for deeper measures.

Costs: The average per-unit cost of the HES-IE program is \$1,700.^{xi}

Challenges: Connecticut's 2017 budget negotiations resulted in some changes to the use of utility rate-payer charges, which impacts the level of funding for the HES programs, and will limit availability and capacity for services during the current state budget cycle by as much as 12,900 homes, including 5,600 low-income households.⁷² HES program data indicate that about 20% of properties receiving an energy audit fail to meet the health and safety standards for energy efficiency interventions, and must be deferred. This number may be an underestimate, as some properties are not documented as having an energy audit, if health and safety deficiencies are obvious upon cursory visual inspection.⁷³

Assets: The HES program has a very large service capacity, given Connecticut's size. It was estimated, prior to budget cuts, that much of the income-eligible population in the state will have received an energy audit by 2030.⁷⁴ Eversource, the larger of the two utility providers, currently has a network of 40 energy efficiency service providers statewide.⁷⁵ Weatherization interventions, like the ones provided in the HES-

^{xi} APRISE, 2016

IE program, have been shown to have positive benefits beyond reducing energy burdens, at the individual, household and community levels.⁷⁶

Gaps: The HES programs have limited funding for health and safety interventions, and utility partners estimate that about 20% of homes which receive an initial visit from the energy auditor, must be deferred from receiving full energy efficiency interventions due to conditions including asbestos-like material, vermiculite, roofing problems, knob and tube wiring, and CO₂ leaks.⁷⁷ Both utility partners report that some households, known as ‘walk-aways’, have severe or obvious health and safety hazards and do not receive a documented visual health and safety assessment from contractors. These properties are not included in the estimated deferral rate, indicating that the estimated deferral rate may not fully reflect the true need in terms of health and safety-related deferrals.^{78,79} Consumption-based charges for natural gas and electric customers help to fund the current HES/HES-IE program, but oil and propane customers do not have a similar obligation. Services to these customers are covered via Regional Greenhouse Gas Initiative (RGGI) auction proceeds, and subsidized by the contribution of electric and natural gas customers. These sources are less sustainable, and may result in eventual cuts to services to oil and propane customers.⁸⁰

Sources: Interview with Eversource, 2017; Interview with United Illuminating, 2017; DEEP 2018 Comprehensive Energy Strategy, February 8, 2018

Weatherization Assistance Program (WAP)

Implementing Agency and Partners: Connecticut Department of Energy and Environmental Protection (DEEP) and U.S. Department of Energy; partnering with the Community Action Agency network

Geography: Services are offered statewide.

Eligibility: In order to be eligible for WAP interventions, households must earn 60% of SMI or less, or 200% of federal poverty level or less. Households with children under the age of 6 and older adults are prioritized.

Funding: The WAP program has an annual funding level of \$2.4 million from grants from the U.S. Department of Energy.

Services and Annual Unit Production: 440 homes per year receive weatherization through WAP.

Costs: WAP interventions have an average cost of \$4,000 without health and safety measures, \$5,690 total.^{xii}

Challenges: WAP has a relatively small budget to address health and safety hazards in housing in order to reduce deferrals.

Assets: DEEP is able to track energy usage data pre-and-post through the utilities, which is used as an impact measure for WAP. The data suggests that much of the energy savings comes from reductions in

^{xii} APRISE, 2016

lighting and water usage. The program is provided statewide, and can serve rural communities with pockets of poverty. Weatherization interventions have been shown to have positive benefits beyond reducing energy burdens at the individual, household and community levels.^{81,82} WAP is administered through local Community Action Agencies, which use the same contractor network as HES-IE. WAP provides health and safety measures using federal grant funds administered through the Connecticut Energy Assistance Program (CEAP). DEEP is also using information from WAP and the HES-IE programs to produce technical guidance for energy efficiency providers.

Gaps: The capacity for services is smaller in WAP compared with the size of the Home Energy Solutions Income Eligible Program. Funding comes from federal grants, which may not be as sustainable over time.

Source: Interview with DEEP, 2017

Connecticut Green Bank Solar for All with PosiGen Solar Solutions

Implementing Partners: Connecticut Green Bank (GREEN BANK) is collaborating with PosiGen Solar Solutions on this program.

Geography: Implemented through community campaigns with partners in Bridgeport, Hartford, New Haven and New London and other nonprofit partners across the state.

Eligibility: This program is open to all customers regardless of income. A below market monthly lease price is made possible by a higher level of solar incentive available to LMI households based on income.

Funding: This program is supported through a leveraged co-investment of a total of \$40-\$50 million in funds for PosiGen's Connecticut activities, with a portion of investment funding coming from the GREEN BANK. PosiGen also receives incentives from the GREEN BANK's Residential Solar Incentive Program's Performance-Based Incentive, including an elevated incentive for homeowners income-qualified at 100% AMI or lower.

Services and Annual Production: The Solar for All Program provides opportunities for single-family households to lease solar panels and equipment, and receive energy efficiency services, leveraged through the HES and HES-IE programs. A premium package of energy efficiency upgrades is offered for an additional monthly charge. These services result in at least \$500 per year in energy savings after lease financing, and some customers save significantly more. The program produced 1,350 solar installations, of which 66% were LMI households. 98.4% of households get energy-efficiency measures, and 69% get deep energy efficiency measures financed through \$10 monthly ESA payments over 20 years.

Challenges: The state legislature's diversion of funds from GREEN BANK in the 2018-2019 budget has significantly reduced the budget available for program investments, marketing and administration.⁸³ Additionally, diversion of funding from CEEF programs is impacting the availability of HES programs, which the Solar for All program relies on. As in the HES programs, homes are deferred when health and safety issues are found, which causes a reduction in the energy savings opportunity for the household.

Assets: This program is directed to the single-family market, and leverages co-investment by PosiGen, the GREEN BANK, private investors, and the existing HES and HES-IE programs to pair solar installation with energy efficiency upgrades, resulting in net savings per household.

Sources: Connecticut Green Bank Interviews, 2017

Connecticut Green Bank EnergizeCT Smart-E Loan Program

Implementing Partners: Connecticut Green Bank (GREEN BANK) is collaborating with local lenders and contractors on this program.

Geography: Financing available to qualifying projects statewide.

Eligibility: Homeowners must meet financial eligibility criteria, properties must be owner-occupied 1-4 unit homes.

Funding: The GREEN BANK provides a loan loss reserve (structured as a second loss reserve) in order to attract local lenders who in turn originate and service loans at below market rates. The GREEN BANK also offered an interest rate buydown program through the end of 2017 using ARRA-SEP funds. Loan amounts from \$500 to \$40,000 are available.

Services and Annual Production: The Smart-E Loan is a residential clean energy loan product offered through a network of local community banks, credit unions and one CDFI. It uses a credit enhancement to achieve affordable unsecured rates with flexible maturities (5-20 years). The product has very generous credit underwriting requirements (FICOs as low as 580) to make cleaner energy solutions and better energy efficiency more accessible for homeowners. Up to 25% of the loan amount can be used to remediate health and safety issues related to energy upgrades. The program has originated nearly 2,700 loans for approximately \$50 million thus far.

Challenges: The state legislature's diversion of funds from GREEN BANK in the 2018-2019 budget has reduced the budget available to support the Smart-E Loan program.⁸⁴

Assets: This program has given a sales tool to 300+ energy efficiency, HVAC, and solar contractors (among others), and offers these services to customers with lower credit scores through six participating lending partners statewide.

Gaps: The need for increased funding due to state budget reductions, as well as the need to be able to use more than 25% of the loan for health and safety improvements related to energy upgrades.

Sources: Connecticut Green Bank Interviews, 2017

Connecticut Green Bank Multi-Family Programs

Implementing Partners: Connecticut Green Bank (GREEN BANK) is collaborating with the Connecticut Department of Housing (DOH), the Connecticut Housing Finance Authority (CHFA), EnergizeCT, Eversource and United Illuminating on this program.

Geography: Financing, incentives and grants available to qualifying projects statewide for properties with 5 or more units.

Eligibility: Multi-family property owners must meet financial eligibility criteria, units must meet affordability criteria to qualify for certain programs, and the scope of work must meet health and energy design standards.

Funding: GREEN BANK is supported by a \$0.001/kWh surcharge on electric ratepayer bills (about \$10 per household per year) that provides approximately \$27-30 million a year for investments. RGGI provides approximately \$5 million per year for renewable energy programs for low-income households. GREEN BANK also receives federal competitive solicitations (i.e. SunShot Initiative) and non-competitive resources (i.e. ARRA-SEP), and private and philanthropic investment.⁸⁵

Services and Annual Production: The goal of GREEN BANK's multi-family projects is to provide technical assistance and financing mechanisms to assist multi-family housing owners to save money on energy, increase property values, and improve tenant safety and comfort.^{xiii} GREEN BANK has a number of pre-development resources, including the Sherpa & Navigator Loans, to fill gaps in pre-development financing for multi-family properties. GREEN BANK offers the Multi-family LIME loan in partnership with Capital for Change, of which up to 25% can be used for health and safety measures if the property owner's cash flow supports this expenditure. GREEN BANK also administers Regional Greenhouse Gas Initiative (RGGI)-supported health and safety funds to selected projects. In addition, solar projects and gap financing are available for GREEN BANK's multi-family resources. Thus far, 63 multi-family projects for \$52 million impacting 4,xxx units were financed through the multi-family program.

Challenges: The state legislature's diversion of funds from GREEN BANK in the 2018-2019 budget has reduced the investment, administration and marketing budget available to support the Multi-Family programs.⁸⁶

Assets: GREEN BANK includes energy savings in the cost of underwriting for projects so that these dollars can be re-invested. Part of GREEN BANK's mission is to demonstrate the viability of innovative projects and to attract private capital investment in this area by reducing the perceived risks of investing. This includes using energy and operating cost savings to leverage holistic capital improvements that include addressing health and safety issues.

Gaps: Thus far, the scope of GREEN BANK's multi-family program is limited but growing with market awareness. Continued expansion is a goal and partnerships are in place to facilitate that goal.

Sources: Connecticut Green Bank Interviews, 2017

Community Development Block Grant (CDBG)

Implementing Partners: Connecticut Department of Housing, Local Departments of Housing and community partners.

^{xiii} GREEN BANK works cooperatively with DOH, which has, in collaboration with CHFA, committed \$300 million in bond financing (\$30M/year over 10 years) to investments in affordable housing. The original development guidelines for this investment were updated to mandate inclusion of energy-efficiency measures in financing and funding packages, and inclusion of these incentives as part of the cash stack for the property in order to receive approval.

Geography: Bridgeport, Bristol, Danbury, East Hartford, Fairfield, Greenwich, Hamden, Hartford, Manchester, Meriden, Middletown, Milford, New Britain, New Haven, New London, Norwalk, Norwich, Stamford, Stratford, Waterbury, West Hartford, and West Haven receive HUD CDBG funds directly, and the State of Connecticut provides funding to non-entitlement jurisdictions.

Eligibility: Households must earn at or below 80% AMI to access CDBG-funded services.

Funding: Connecticut receives over \$35.6 million in HUD CDBG funds in total.

Services and Unit Production: CDBG funds can be used to support a wide variety of housing and community development activities, including infrastructure development, capacity building, commercial opportunity and workforce development activities, lead hazard reduction and housing rehabilitation. In 2015, the most recent year for which unit production reports are available, 392 single-family properties and 1,211 units in multi-family properties were rehabilitated in Connecticut using CDBG funds. The state of Connecticut Department of Housing used CDBG funds to rehabilitate 167 single-family properties and 320 units in multi-family properties.

Challenges: There are competing priorities for CDBG funds and each jurisdiction determines the priorities for use of funds based on a community assessment and Annual Strategic Plans that must be submitted and approved by HUD.

Assets: Connecticut has a high level of investment of CDBG funds in addressing housing needs in all of the funded communities with the exception of Danbury and Meriden. CDBG funds are easily braided with other federal and local housing resources, and can be used to complete repairs that are not allowable under other programs, or leveraged to increase the capacity of existing programs.

Gaps: CDBG is federally-funded, and was specifically targeted for cuts in various budget proposals over the last several years, making the program potentially unsustainable or reduced in funding capacity.

Sources: Interview, DOH, 2017; HUD CDBG Performance Profile Reports, 2015. Retrieved from: <https://www.hudexchange.info/programs/cdbg/cdbg-performance-profiles>

Multi-family Energy Loan (MEL) Program

Implementing Partners: Connecticut Department of Housing, Capital for Change

Geography: Statewide

Eligibility: MEL is available to multi-family properties meeting tenant income requirements statewide, up to 30 units

Funding: State housing bond funds allow for low-interest and subsidized loans to owners of multi-family properties. Loan limits are \$3,500 per unit, \$100,000 per property, secured as a first or second mortgage

Services and Unit Production: MEL funds can be used to implementation of energy efficiency improvements, solar, and other renewable energy systems in multi-family housing up to 30 units.

Cost: Owners pay about \$500 in fees

Challenges: The loan does not offer specific funds for health and safety upgrades.

Assets: The loan is focused on multi-family properties, includes a 10 year term for repayment, and is flexible enough to fund energy efficiency upgrades and renewable energy system installation. The loan program leverages state bond funds with private investment to sustainably fund these energy efficiency and renewable energy upgrades

Sources: Interview, DOH, 2018

EnergizeCT website, <https://www.energizect.com/sites/default/files/Multifamily-Financing-Matrix-2017-05-FINAL.pdf>

Energy Conservation Loan Program

Implementing Partners: Connecticut Department of Housing and Capital for Change

Geography: Statewide

Eligibility: Available to low-and-moderate income 1-4 unit home owners (80% AMI

Funding: Funded by state housing bond dollars through the Department of Housing, Up to \$25,000 loans at below-market interest rates, and 0% interest rates for higher-efficiency boilers and furnaces

Services and Unit Production: Finance energy efficient home improvements

Assets: The loan has a 10 year repayment period, and can be 0 interest for certain repairs. This program is one of few that will finance repair/replacement of a leaking roof statewide.

Gaps: As of December, 2017, this program is only available on an “emergency basis”, to repair non-working heating systems and leaking roofs for homeowners who are ineligible for other programs

Sources: Interview, DOH, 2018

Energize CT Website, <https://www.energizect.com/your-home/solutions-list/Energy-Conservation-Loan-Program>

Lead Poisoning Prevention Programs

Implementing Partners: Connecticut Department of Health, local departments of health, community partners including Connecticut Children’s Medical Center, the Yale-New Haven Regional Lead Treatment Center, and the Hartford Lead Treatment Center.

Geography: Bridgeport, Hartford, Waterbury, the Torrington Area Health District (funded in 2017), New Haven, Norwich, New Britain (currently in a three-year grant cycle) and the State of Connecticut, which sub-grants to Bridgeport, Danbury, East Haven, East Hartford, Enfield, Hartford, Manchester, Meriden, Naugatuck, New Britain, New Haven, Norwalk, Shelton, Stamford, Torrington, Winchester, Waterbury, and West Haven.

Eligibility: Funds are utilized differently depending on jurisdiction, but HUD regulations require that funds are used on pre-1978, child-occupied facilities owned or rented by low-income families.

Funding: The statewide total of HUD lead hazard remediation and Healthy Homes Supplemental Grant funding in 2017 was \$12,575,000. The HUD lead grant funding is through HUD Lead-Based Paint Hazard Control and HUD Lead Hazard Reduction Demonstration Grant Programs.

Services and Unit Production: Connecticut's lead grant programs provide in-home lead hazard inspection/risk assessments, temporary relocation, lead hazard remediation and follow-up lead dust wipe clearance testing in homes of children under age 6 with elevated blood lead levels, or risk of lead exposure. A subset of these homes also receives healthy homes environmental assessments and health and safety interventions using the HUD Healthy Homes Supplemental Funds. Statewide, current funding levels will enable these services in about 750 homes.

Cost: The average per unit costs of lead remediation in Connecticut is \$10,417.

Challenges: HUD regulations can limit the flexibility of these funds to be used to address housing conditions that are not lead-based paint hazards so additional leverage funding for housing rehabilitation may be needed in units in order to complete interventions. HUD also requires extensive proof of household income, ownership, blood lead testing, and other documentation that can pose both administrative and client participation challenges.

Assets: Lead remediation funds are a source of hazard reduction funding that can be braided with non-federal sources of funds to holistically meet the health and safety needs of households. The program has a multi-community footprint and Connecticut receives a fair share of HUD lead remediation funds given its population size.

Gaps: Funding for lead remediation is dependent on federal grants with three-year cycles through a competitive grant application process. Funds are not sustainable beyond the current grant cycle and dependent on federal budget allocations. The geographic reach of this program is limited based upon federal funding eligibility, and rural counties and other areas of need in the state do not currently have access to resources to address lead hazards.

Sources: Interview, DPH, 2018; Department of Housing and Urban Development, "HUD Awards \$127 Million to Protect Children and Families from Dangerous Lead and Other Home Hazards". June 27, 2017.

Connecticut Children's Medical Center Healthy Homes Programs

Implementing Partners: Connecticut Children's Medical Center, Connecticut Department of Housing, Capital for Change, Connecticut Housing Finance Authority, Community Action Agency of New Haven, Eversource, United Illuminating, Neighborhood Housing Services of New Britain, NeighborWorks New Horizons, New Opportunities Incorporated, Rebuilding Together, Connecticut Department of Public Health, and Yale-New Haven Lead Poisoning and Regional Treatment Center.

Geography: Lead Hazard Reduction grant services are available to low-income households in Bridgeport, Danbury, East Haven, Enfield, Hartford, Manchester, Meriden, Naugatuck, New Britain, New Haven, Norwalk, Shelton, Stamford, Torrington, Waterbury, West Haven, and Winchester through the Healthy Homes Program.

Eligibility: Eligible households were built before 1978, residents earn at or below 80% AMI, owner-occupied properties must have a child under 6, and rental properties must meet Fair Market Rent affordability criteria.

Funding: The Department of Housing and Urban Development, funded through the Connecticut Department of Housing, other state housing funds and other philanthropic and private investment.

Programs and Services: The Healthy Homes program offers inspections and plans for lead and home safety hazard removal, financial assistance to remediate hazards, relocation assistance during construction, referrals to low- or no-cost home weatherization programs designed to increase energy efficiency, and lead hazard and healthy homes education for residents.

Challenges: Some restrictions in the allowed uses funding impact the extent to which the Healthy Homes program is able to leverage resources from energy partners. Energy efficiency funds cannot be used to replace leaded windows, for example.

Assets: The Healthy Homes program can provide services to families of children with EBLs of 5µg/dL or higher, which is a lower threshold than the state's regulations. Strong partnerships with local departments allows the program's geographic footprint to include 40% of Connecticut's population.

Gaps: The program is not currently systematically tracking the health outcomes of the intervention. Additional sustainable funding is required to meet the demands for these services, expand the reach of the program and advance the goals of CCMC's work.

Source: Interview, Connecticut Children's Medical Center, 2017

Lead, Radon and Healthy Homes Program

Implementing Partners: DPH, Torrington Area Health District and the Milford Health Department.

Geography: Areas covered by the Torrington Area Health District (which includes Bethlehem, Canaan, Cornwall, Goshen, Harwinton, Kent, Litchfield, Middlebury, Morris, Norfolk, North Canaan, Plymouth, Salisbury, Thomaston, Torrington, Warren, Watertown, and Winsted) and Milford.

Eligibility: There are no income-based or child-occupant eligibility requirements. Local health departments can use funds flexibly to address housing needs.

Funding: Centers for Disease Control funds and Preventative Health and Human Services Block Grant (PHHSBG) funds.

Services and Unit Production: Local health department home visitors conduct initial health and safety assessments, follow-up reassessment, if necessary, at 90 days. Local health departments may order the property owner to correct the identified health hazards, and enforce all applicable statutes, regulations, and associated technical standards. Residents are provided with remediation recommendations, suggested guidance, and references to appropriate educational materials on environmental hazards, and receive fire safety and cleaning supplies. The program serves 75 households and 245 residents annually.

Challenges: Local health departments engage in enforcement of local housing codes in order to address the health and safety hazards identified during the assessment. This strategy is effective in rental housing only and may limit the participation of tenants if property owners retaliate or otherwise create disincentives for participation.

Assets: The program involves partnerships with local departments of health, and provides a flexible source of funds to identify housing conditions, like radon, that typically are not addressed through existing federal programs. Local program providers also engaged in robust data collection and tracking, completing 1,500 surveys between 2010 and 2016. DPH produced a surveillance report on housing conditions, which is currently the only source of statewide data on housing conditions.

Gaps: The geographic reach of the program is limited to two regional health departments, in part because the program is an optional use of existing funds to address specific housing health and safety hazards. The funding source is federal, and is not sustainable beyond the current federal grant cycle. There are no sources of funds for remediation of the identified hazards.

Source: Interview, DPH, 2017

Putting on AIRS

Implementing Partners: DPH and six local health departments.

Geography: This program is administered statewide.

Eligibility: Eligibility criteria is based on asthma diagnosis and healthcare encounters, in order to target the intervention to poorly-controlled asthmatic patients. Referrals are received by local departments of health, from healthcare providers and school nurses, but most referrals come through the Emergency Department of participating hospital partners.

Funding: The program receives funding from the Centers for Disease Control and the State.

Services: Certified Asthma educators, respiratory therapists, and/or nurses provide one home visit and two follow-up calls or visits over six months. Home visits include home health and asthma trigger assessment, education and resources including allergen bed covers, cleaning materials and food storage containers. Providers collect data via a pre-post questionnaire, and education is focused on medication adherence and behavioral changes to reduce and remove asthma triggers. Recommendations are made to property owners regarding structural remediation.

Challenges: The program is administered through the local departments of health, which can limit willingness of clients to allow home visitors into their homes. The program has worked around this challenge by sometimes setting up the first meeting in a neutral location, followed by a home visit. There is limited use of community health workers to provide interventions, though DPH has started a pilot in January 2018 in partnership with the Stratford Department of Health, to hire and train a community health worker to provide Putting on AIRS. Most local health departments are still using clinically-trained professionals, which can increase costs and reduce client engagement. Efforts to engage HUSKY Healthcare to reimburse for home visiting services through Putting on AIRS have thus far been unsuccessful.

Assets: This program has a statewide footprint, and strong relationships with local departments of health in a variety of communities. The intervention is evidence-based, and evaluation metrics include school attendance, work attendance, Emergency Department use and hospitalizations through self-report data. The program has been shown to improve medical adherence in patients. Recently, referrals have been automated through the electronic intake form in partner Emergency Departments. This automated referral process has eased the burden on providers in the ED setting, and increased referrals.

Gaps: Funding is limited for this program, and there are no resources for structural remediation of identified asthma triggers. Funding sources for Putting on AIRS are reliant on federal grant cycles and state funds, and are not sustainable over the long term. There are waitlists of referred patients waiting for services in Hartford, New Haven, Bridgeport and some other larger communities due to lack of capacity in existing program resources to meet the referral demand. Most impact measures are currently collected via self-report questionnaires, though DPH is actively seeking the ability to track outcomes using Medicaid and other data sources.

Source: Interview, DPH, 2017

Falls Prevention Program

Implementing Partners: DPH and six local departments of health.

Geography: Farmington Valley Health District (Avon, Barkhamsted, Canton, Colebrook, East Granby, Farmington, Granby, Hartland, New Hartford, and Simsbury), Guilford, Hartford, Newtown, Wallingford, Westbrook.

Eligibility: Services are provided through community partners to older adults who might be at risk for falls in the home environment based on age and/or mobility. There are no income requirements for eligibility.

Funding: The current Local Health Departments received 3-year Preventative Health and Health Services Block Grants (PHHSBG), through September 2018, with the option to continue their programs for another three years, beginning October 1, 2018.

Services: The Falls Prevention Program is a multi-faceted approach to fall prevention which includes in-home hazard assessment, recommendations for modifications and follow-up via a home visit or phone call. Education includes information about physician's care, checking gait/balance, and looking for other risk factors. The Program also works with seniors on strength-training exercises.

Challenges: In-home services are provided by nurses or nurse-trained staff at the local level. Services provided by nurses may be more expensive than those provided by community health workers or other non-clinical professionals.

Assets: The program is evidence-based,^{xiv} and has a multi-community footprint. Partners in Hartford have had particular success in implementation, by developing channels to recruit and enroll older adults in the program.

Gaps: Linkages with clinical care are not part of the current menu of services. The source of funds to support this program is a federal grant which raises uncertainty around sustainability. The current program does not include funds for home hazard remediation. Where modifications are required, local partners are sometimes able to braid other resources case-by-case to address those needs or residents may cover these expenses out-of-pocket.

Source: Interview with DPH, 2017

Connecticut Collaboration for Fall Prevention (CCFP)^{xv}

Implementing Partners: Connecticut Hospital Association, Connecticut Associate for Home Care, Gaylord Hospital, Qualidigm, Yale School of Medicine, University of Connecticut School of Medicine, Community and Provider partners, Visiting Nurses Association, and others.

Geography: Southeastern Connecticut and Greater Hartford area.

Eligibility: Materials are available to partners and providers who serve older adults who might be at risk for fall-related injuries.

Funding: Funded through the Patrick and Catherine Donaghue Medical Research Foundation and a \$400,000 per year subgrant from the Connecticut State Unit on Aging, which receives the funds from the Connecticut State Legislature.

Services: CCFP is a set of evidence-based educational resources that are provided in community settings, through partnerships with providers and organizations in the Greater Hartford area. CCFP is implemented

^{xiv} DPH uses the guidelines set forth by the Centers for Disease Control in the 2015 publication "Preventing Falls: A Guide to Implementing Successful Community-based Falls Prevention Programs".

^{xv} This collaboration may not be continuously active at this time, but was included as an examples of Connecticut's cross-sector collaboration specifically around falls prevention among older adults.

with partners in multiple settings, including hospitals, home care agencies, assisted living facilities, senior centers, adult day care centers, emergency medical service organizations, physician offices, and outpatient rehab facilities.

Challenges: There are costs associated with the materials and there is not a standardized in-home component, though some partners are implementing the evidence-based approach in-home.

Assets: The CCFP includes strong research partners who have been actively engaged in researching falls prevention since 1996. The project has developed partnerships in the clinical and community settings, and is supported through both philanthropic investment by the Donaghue Foundation and public investment through the State Legislature and the Office on Aging.

Gaps: The project is limited geographically to strong partnerships in the Greater Hartford area and a newer initiative in southeastern Connecticut, including local health departments in Old Saybrook and surrounding areas. There is no funding for home hazards remediation in this program, and in-home assessments are not always provided, depending on the setting of the setting of the program.

Source: DPH Interview, 2017 CCFP website, 2018. Retrieved from:
<https://medicine.yale.edu/intmed/geriatrics/fallprevention/collaborations/>

Locally-administered Programs and Pilots

Locally administered programs and innovative pilot projects may inform a broadly integrated approach to housing, health and energy, and highlight opportunities for alignment and scaling-up of smaller scale, innovative efforts to meet the needs of Connecticut's LMI households. The following are current or recent projects that relate to the proposed Connecticut Green & Healthy Homes comprehensive model.

Energize Connecticut Clean Energy & Healthy Homes Pilot

Implementing Partners: CEEF/EEB Eversource, and United Illuminating/Avangrid.

Geography: Service area of each utility.

Eligibility: Properties were selected from the HES-IE program, and must be owner-occupied and 1 to 4 units.

Funding: Eversource received \$1.2 million in dedicated health and safety intervention funding and United Illuminating received \$300,000.

Services and Unit Production: The pilot was designed to track and address the health and safety deficiencies which prevent properties enrolled in the HES-IE program from receiving energy efficiency interventions. Each utility partner utilized a slightly different implementation protocol, and had a different per-unit budget. There were no specific unit production goals, but the most recently available data suggests that Eversource provided interventions to 49 homes and United Illuminating provided interventions to 37 homes in the first half of the pilot period.

Costs: The per-unit budget for pilot properties ranged from about \$5,529 to about \$9,924 in the first half of the pilot period, depending on the utility provider. Further research is needed to better understand the factors in the variability in per-unit costs among the utility providers.

Challenges: Utility providers report challenges in recruiting residents to participate in their residential education program, and addressing behavioral factors in improving health and safety (for example addressing excessive clutter and managing pests). Utility providers also reported challenges in providing follow-up to ensure ongoing maintenance of the health and safety interventions over time.

Assets: This pilot enabled utilities to characterize the average costs of providing health and safety interventions to households enrolled in their HES-IE programs. Utilities built capacity to administer these types of interventions, and identified private sector providers of structural health and safety measures. Energy-efficiency providers gained experience in coordinating energy interventions with health and safety repairs.

Gaps: Health and safety interventions were limited to addressing asbestos-like materials, mold remediation and pest management. For one of the utility providers, lead and other hazards were addressed through braiding resources in partnership with funded lead hazard reduction providers. Pilot activities did not build capacity among energy intervention providers to perform health and safety assessments and interventions or collect data related health and safety outcomes, instead relying on external subcontractors to perform those functions. Both reported some limitations in the capacity of the current general contractor network to take on this work.

Source: Eversource Interview, 2017; United Illuminating Interview, 2017

Operation Fuel

Connecticut's Operation Fuel is a community-based organization that has its origins in the oil embargo of the 1970's, during which community and faith-based organizations joined forces to provide assistance to families who didn't have access to heating fuel. Now, the organizations provide access to the state's energy assistance and energy efficiency resources through 109 intake sites across Connecticut serving 6,000 to 8,000 households per year.⁸⁷ Operation Fuel commissioned a report from the Applied Research Institute for Study and Evaluation (APRISE), which characterized the ongoing energy burdens faced by Connecticut's low-to-moderate income households, even those who have access to CEAP benefits. The report underlines the impact and importance of investment in residential energy efficiency in Connecticut.⁸⁸

GHHI New Haven

The Green & Healthy Homes Initiative New Haven site aligns resources from the City of New Haven Department of Environmental Health, City of New Haven Livable City Initiative, City of New Haven Office of Sustainability, Community Action Agency of New Haven, Community Foundation of Greater New Haven, Greater New Haven Community Loan Fund, Neighborhood Housing Services of New Haven, United Illuminating, Annie E. Casey Foundation, and Yale-New Haven Regional Lead Treatment

Center. These partners work together to holistically address lead hazards, minor housing rehabilitation and energy efficiency needs in New Haven households, through braiding resources to increase access to a broad range of housing services. GHHI New Haven is working to replace stand-alone programs with a comprehensive strategy that reduces barriers to intergovernmental and program coordination by: aligning existing programs from federal and local agencies, foundations, and private sector entities; blending funding streams which support home intervention work conducted various agencies and housing sectors and coordinating the activity of organizations that provide home services to improve client service delivery. The goal is that work is done in concert, thereby increasing efficiency, effectiveness, and leveraging the benefits of multiple home improvements that boost gains in health, safety, educational performance and financial stability for low income families.

The GHHI New Haven's lead hazard control and healthy homes programs conduct comprehensive environmental assessments and energy audits through its partnerships with energy efficiency programs in utilizing the integrated GHHI model. The GHHI New Haven site has produced 479 comprehensive green and healthy homes units since 2010.

Source: New Haven GHHI, 2018

Connecticut Social Health Initiative Project

A pilot, funded through \$100,000 from the Connecticut Health Foundation, is underway through March 2018 in four Connecticut hospitals: MidState Medical Center, Bristol Hospital, Day Kimball Hospital and St. Mary's Hospital. Hospitals are using a standardized questionnaire to assess for patients' housing, transportation, food security and employment needs, and referring patients to community-based services to help address those needs. The goal of the pilot is to collect data on these social determinant of health needs, in order to inform development of a more robust supports network, and to test the feasibility of applying this approach more broadly.⁸⁹ This philanthropy-funded, healthcare-based assessment and referral helps to target resources to high healthcare resource utilizer populations, and a sustainable community-based network for housing and health services can address the needs identified by healthcare providers using this assessment tool.

Assets and Gaps in Current Framework

In developing a framework for energy, health and housing services that will allow for widespread, seamless access across the State, there are several key considerations, including:

- The current capacity for these services
- The gaps and needs within the existing framework
- Opportunities to coordinate, combine, and leverage resources to sustainably support a broad approach to housing, health and energy services

The following discussion synthesizes the description of individual programs and policy initiatives and the initial analysis of funding strategies, above, to consider these factors in the feasibility of a statewide, integrated model for housing, health and energy services.

Capacity

The capacity for providing energy services to low income household in Connecticut is very large given the size of the state. The HES and HES-IE programs serve nearly 20,000 households annually, reach about 5% of all low-income households, and 20% of the low income households receiving energy assistance statewide.⁹⁰ One barrier to energy service delivery is the 20% or so of properties that must be deferred based on health and safety conditions.^{91,92}

Direct housing rehabilitation services, funded through federal CDBG and HOME investment (discussed below), produce just under 2,000 housing units annually, statewide. Connecticut also has a number of evidence-based home visiting programs to address lead exposure, asthma, falls and other health and safety hazards in the home, however, these programs are not funded adequately to provide structural hazard remediation, and their current capacity does not match the energy services sector production capacity.

Connecticut is currently working on a statewide training and certification protocol for Community Health Workers, which may increase the capacity for home visiting and resident education services (which are included in the evidence-based model described above).

In order to support a statewide approach to meeting Connecticut's housing, health and energy needs, housing and health service capacity must be scaled up to meet the level of the energy services sector.

Coordination

Connecticut state agencies share a common vision of bringing broader access to healthy, safe and affordable housing to Connecticut residents. This vision has resulted in a number of efforts to coordinate programs, services and funding across state agencies and local programs.

Examples include CHFA and DOH partnering with Eversource, United Illumination and the Connecticut Green Bank to address the energy needs of affordable multi-family properties. Connecticut Green Bank is also aligning the Solar for All program with CEEF's HES and HES-IE energy efficiency services, pairing energy cost savings with clean energy generation. The Interagency Committee on Supportive Housing is a collaboration between Connecticut Housing Finance Authority (CHFA), the Department of Mental Health and Addiction Services (DMHAS), the Department of Social Services (DSS), the Department of Children and Families (DCF) and others, which produces housing units with built-in supportive services, and tracks outcomes related to chronic health conditions. DPH aligns with DSS on a number of initiatives, in order to target services, track outcomes and align resources. DEEP collaborates with DSS to direct \$1 million of the Connecticut Energy Assistance Program (CEAP, Connecticut's LIHEAP) to health and safety upgrades that make properties eligible for the Weatherization Assistance Program.

In 2017, the Connecticut Department of Public Health worked with Health Resources in Action (HRiA), and the Connecticut Healthy Homes Coalition, to develop a strategic plan to align and guide efforts to improve housing health and safety across the state. Partners included hospitals, municipal governments, and other state agencies, and the resulting plan highlighted accomplishments and goals in the areas of program integrations, technical capacity, coordination with external agencies, and outreach. Many of the strategic goals of the plan align with the model for statewide services proposed by Connecticut Green & Healthy Homes.⁹³

Local efforts to braid resources in Connecticut include the Connecticut Children's Medical Center's Healthy Homes and New Haven GHHI programs. In each of these programs, community-level organizations and providers partner to coordinate and comprehensively address the housing, health and energy needs of households using available resources from existing programs. At the local health department level, efforts are underway in communities like Bridgeport and Torrington to align several DPH-administered healthy housing and home visiting programs, to holistically address health and safety needs in housing and maximize the reach of multiple programs. These local efforts are very important at demonstrating the ability to integrate resources, and can be supported through improved coordination at the state level, with regard to eligibility, funding, implementation and data collection and evaluation. For Connecticut's housing-based health and energy programs, coordination may be an important first step toward seamless statewide access to a holistic set of services to meet the needs of LMI households.

An opportunity to increase coordination in Connecticut may also lie in property maintenance code enforcement. The state does not have a statewide property maintenance code, which results in vast differences in the ways in which rental housing conditions are monitored and addressed across the state.⁹⁴ A uniform statewide property maintenance code could increase coordinated housing code enforcement across jurisdictions, improve housing conditions in the private rental market, and align with the goals of a statewide model for health, safety and energy-efficiency in housing. In Maryland, for example, statewide property maintenance codes have improved coordination and increased access to healthy, safe, and affordable rental housing by leveling the playing field for monitoring and addressing health and safety issues in rental housing statewide.

Geography

Connecticut is a state of towns. Most programs are administered and resources directed through the local departments of health, local housing authorities and other municipality-based organizations. The state's large and medium-sized population centers receive the most, based either upon federal or state funding formulas or data indicating housing needs, energy needs and/or health outcomes in these communities. However, there are several innovative evidence-based programs currently being administered in the more rural regions, which demonstrate the opportunity for effective service delivery outside of the state's population centers.

Energy services are provided on the basis of the service areas of the two HES-IE-administering utility companies, Eversource and United Illuminating. There are some towns that are not included in the service area for the two largest utility providers, including Norwich and Wallingford, though the HES and HES/IE programs that are offered through municipal utilities in these areas. The Weatherization Assistance Program funded-activities are available statewide, but the capacity of this program is very limited as compared with HES-IE.

The evidence-based asthma home visiting programs administered through the Department of Public Health, in partnership with the local health departments, do not have wide geographic coverage, but are targeted to communities where risk is high, and partners have the capacity to provide services. Lead hazard remediation and healthy homes programs are targeted to the state's larger population centers, where the numbers of lead poisoning cases are highest. In Torrington, a community in northern Connecticut, Putting on Airs and lead grant program resources are braided to more holistically provide healthy homes services in this more rural community. Connecticut's housing resources are funded

through federal funding formulas and federal grants which are directed to larger, federal entitlement jurisdictions, including Hartford, New Haven, Bridgeport, Waterbury, and others, and to the state for coverage in non-entitlement areas.

Funding

Federal funds for housing rehabilitation, asthma, lead, and injury-related housing interventions are not stable grant-to-grant, and the state's most recent budget reduces the available state funding for services to this population. Efforts to garner Medicaid dollars to support Connecticut's evidence-based home visiting programs, including the Falls Prevention and Putting on AIRS asthma programs, has thus far been unsuccessful.⁹⁵ These programs are typically delivered by clinically-licensed, trained professionals through partnerships with local health departments or community organizations, who may already receive Medicaid reimbursement for other patient services.⁹⁶ As described below, the state Department of Public Health also works with the Department of Social Services Medicaid program to measure the impact of these interventions for Medicaid patients.⁹⁷ There is an opportunity to explore mutually-beneficial coordination of these programs with the Connecticut HUSKY Medicaid and Children's Health Insurance (CHIP) program, resulting in better health outcomes for patients, and sustainable support for evidence-based home visiting.

In October, 2017, the state legislature passed the 2018-2019 budget, which diverted a total of \$87.5 million per year from energy efficiency services: \$10 million from RGGI funds, \$63.5 million from the Connecticut Energy Efficiency Fund (Conservation and Load Management Fund) energy-efficiency programs, and \$14 million in funding for the Connecticut Green Bank.⁹⁸ This loss of funds will result in over 12,900 fewer homes, including fewer 5,600 LMI households, receiving energy assessments and energy-efficiency upgrades per budget year and puts pressure on GREEN BANK residential financing programs.⁹⁹ In addition, DEEP plans to reduce training and support for contractor workforce development, and anticipates lay-offs and other impacts to the current energy sector workforce in Connecticut due to the reduced investment of public funds, and the lost private sector investment leveraged by these funds.¹⁰⁰

Within the current framework for funding the Home Energy Solutions program, there is what DEEP calls an 'unsustainable and unequitable' structure in existing funding mechanisms.¹⁰¹ The 3 mil consumption-based conservation charge used to provide funds to the Connecticut Energy Efficiency Fund (CEEF) applies only to electric and natural gas customers. There is currently no charge on the bills of customers using oil or propane to heat their homes, despite the fact that oil customers in particular comprise the largest segment of households participating in CEEF programs – over 50%.¹⁰² According to their 2018 Comprehensive Energy Strategy, DEEP “anticipate(s) rationing and ultimately eliminating efficiency services at most oil heated homes once RGGI funding is depleted”.¹⁰³

The current federal budget has held steady or increased spending for some key housing and energy programs, including the US Department of Housing and Urban Development's (HUD) Home Investment Partnership (HOME) program and Community Development Block Grant (CDBG), and Department of Energy's (DOE) Low-Income Energy Assistance Program (LIHEAP – a portion of which is dedicated to energy efficiency upgrades in housing in Connecticut¹⁰⁴), and Weatherization Assistance Program (WAP). CDBG funds, in particular, are flexible, and the current investment of CDBG funds in housing rehabilitation in Connecticut is high.¹⁰⁵ Priorities for CDBG funds are typically set at the local or state level, depending on the jurisdiction, and may change over time. In addition, the future level of federal

funding for the program are undetermined and reductions may impact the level of future services in Connecticut. HUD funding is also cyclical and not necessarily sustainable beyond the three-year grant cycle.

The HUD Office of Healthy Homes and Lead Hazard Control (OHHLHC) has seen budget increases in the last several years, including the most recent increase of \$80 million across the total OHHLHC budget. Even at increased funding levels, HUD OHHLHC funds solely cannot meet the need for housing services to Connecticut's low-income households. The table below details the current HUD funding levels for CDBG, HOME and Lead Hazard Control funding which comes from OHHLHC.

Connecticut Federal Funding Source and Unit Production, 2016-2017

Program/Funding Source	Funding Amount (funding period)	Capacity (units)
CDBG	\$35,627,649 (annual)	1,603
HOME	\$10,906,329 (annual)	148
Lead Hazard Control	\$12,575,000 (3 years)	744

In addition to federal sources of funding, Connecticut utilizes a number of innovative financing mechanisms for housing rehabilitation, through partnerships between the Department of Housing, the Connecticut Housing Finance Authority, and Connecticut Green Bank among others. However most of these financing and incentive programs are targeted to larger multi-family properties, not investor-owned 1-5 unit properties which make up the majority of housing in many at-risk communities.¹⁰⁶

Eligibility

The current framework for housing, health and energy services includes a number of eligibility criteria, many of which use slightly different standards or require different or duplicate verification of similar income standards. The table below compares the income eligibility standards of the largest state-administered housing, health and energy programs.

Eligibility for Current Statewide Energy, Health and Housing Programs, 2018

Agency	State-Administered Housing Program	Income Eligibility Criteria
Eversource/UI	Income-Assisted Home Energy Program	60% of State Median Income
GREEN BANK	Solar for All/Posigen	100% of Area Median Income
GREEN BANK	Smart-E	None
GREEN BANK	Multi-family Programs	80% of Area Median Income (for at least 60% of units)
DOH	CDBG/HOME	80% of Area Median Income
DEEP	Weatherization Assistance Program	60% of State Median Income
DPH	Putting on AIRS	None
DPH	Falls Prevention Program	None

DPH/Eligible Jurisdictions	Lead-Based Paint Hazard Control Grant, Lead Hazard Reduction Demonstration Grant Programs	80% of Area Median Income
-----------------------------------	---	---------------------------

A duplicative and conflicting system of eligibility determination can create barriers to access for LMI households, requiring extra time, effort and expense to comply with multiple standards. Though some of the standards above are established by federal funders, states and jurisdictions can establish streamlined mechanisms for determining eligibility that are approved by these entities. For example, if determination of Medicaid eligibility by DSS could allow a household or individual to be eligible to receive all housing and health programs administered by the state without further documentation, administrative efficiencies and cost savings can be achieved. This process change has been used in other jurisdictions, even where programs are funded using federal dollars from a variety of sources or programs.^{xvi}

Standardizing program eligibility criteria and required documentation is also a step toward coordinating current programs. An integrated statewide approach may streamline the eligibility determination process by allowing residents to apply or be referred for services from a variety of sources, through a unified access or ‘portal’ with standardized criteria, documentation and process across programs. This single point of entry model may increase access the full range of services that may meet the needs of households more comprehensively, and facilitates data sharing across programs. A current example of this approach is GREEN BANK’s Solar for All/Posigen program, which automatically qualifies resident who are eligible for other state and federal programs. Broad implementation of this model may require data capacity to be scaled up to provide an enhanced platform for gathering housing data and sharing individual and household-level eligibility determination and other data.

Impact Measures and Data Capacity

Connecticut’s housing, health and energy programs collect, analyze and report a large amount of data. Programs use a variety of data collection protocols, data platforms and measures of intervention impact. Many State agencies are using proprietary databases that are not linked with other data sources, which likely results in duplicative data collection, especially where programs serve the same populations. In some cases these databases are provided or mandated through the programs funding source, as in the case of DPH’s lead and asthma programs.

DPH also uses a Performance Dashboard to monitor health outcomes from Connecticut’s extensive work around the State Health Improvement Plan. Outcomes related to falls, asthma, healthy homes are tracked and compared over time, in order to measure individual program performance, and evaluate programs’ collective capacity to improve health outcomes over time. This data tool links information across programs, and institutionalizes results-based accountability within DPH.

The data system for energy utilization and costs, administered through the Department of Energy And Environmental Protection, measures and makes publicly available data related to energy costs and utilization, which is often used to demonstrate opportunities for savings through deeper energy efficiency interventions.¹⁰⁷ Currently, however, this information is not linked to income, housing conditions, health outcomes or other data, in a way that can help characterize the need among LMI households, or track the

^{xvi} This eligibility standard is used in Maryland, Philadelphia, and other jurisdictions to determine eligibility for HUD, DOE and utility-rate-payer-funded programs.

impact of energy services on housing and health conditions. Operation Fuel and the Connecticut Low Income Energy Advisory Board have recommended data sharing between utility energy efficiency and energy assistance programs. Recently, utility providers have engaged in data sharing with the Department of Social Services (which administers Medicaid, Connecticut Energy-Efficiency Assistance Program, and other benefits programs for low-income households), with the purpose of better understanding the energy burden on state's low-income residents.

The Department of Energy and Environmental Protection recognizes the transformative impact of energy-efficiency interventions, which create skilled employment opportunities, improve property values, and improves the health and safety of residential buildings.¹⁰⁸ Linking or measuring health and housing data related to energy efficiency services such as non-energy benefits (NEBS) can allow for broader impact measurement, and help to fully value energy efficiency as a resource.^{109,110}

The Department of Public Health frequently requests and receives data from the Department of Social Services in order to track health outcomes and healthcare costs related to asthma, falls, lead exposure and other conditions at the community level. The Putting on AIRS program, for example, tracks asthma-related healthcare utilization for participating residents pre- and post-intervention.¹¹¹ However, there is not currently a shared data platform, a protocol for routine data sharing, routine access to Medicaid data or other data tracked by benefits programs, in order to characterize the needs of low income residents or measure the impact of specific programs in producing improved health outcomes.

Connecticut's non-profit DataHaven is an important source of regional and statewide health, housing and socio-demographic data. DataHaven, in partnership with policy-makers, community-based organizations, foundations and residents, collates and makes available a large variety of existing public information and data resources, as well as developing the DataHaven Community Wellbeing Survey, a tool that gathers information from thousands of in-depth surveys in communities across the state. DataHaven publishes and analyzes data pertaining to Fairfield, Litchfield, New Haven, Tolland, Hartford, Middlesex, New London and Windham Counties, as well as data at the state and town-level.

An integrated approach to housing, health and energy services may include streamlined data collection and shared impact measures, so that the true value of these interventions can be measured and reported. Shared data collection, storage and evaluation protocols also introduce efficiencies into program administration, and eliminate duplicative efforts.

Political and Policy Alignment for Sustainably-supported Housing, Health and Energy Services

A broader approach to providing integrated housing, health and safety interventions statewide aligns well with the policies and vision of Connecticut's key housing, health and energy stakeholders. In 2017, the state experienced a well-publicized budget crisis, which resulted in some deep cuts to housing, health and energy programs and services for the LMI population. In the midst of these constraints, support for the work of Connecticut Green & Healthy Homes Project has been expressed by the Commissioners of the Department of Public Health, the Department of Social Services, the Department of Energy and Environmental Protection, the Department of Housing, the Office of Early Childhood, the Office of the Chief State's Attorney and the Department of Children and Families. Commissioners and Deputy

Commissioners at each of these cabinet-level state departments have participated in public meetings and strategic planning sessions for this project and have demonstrated support for a coordinated approach. These leaders recognize the potential for the transformative impact of an integrated approach to housing, health and energy services - to meet the needs and improve the lives of the Connecticut residents that their departments serve every day. The alignment of the proposed model with the both specific policy initiatives, and with the broader vision of state departments, is explored in more detail below.

Connecticut's Commitment to Sustainability

Connecticut has a history of leadership and commitment to addressing the causes of climate change through energy efficiency programs, innovative financing mechanisms for renewable energy technologies, partnerships to mitigate and adapt to climate change, and state legislation mandating reductions in statewide greenhouse gas (GHG) emissions.¹¹²

Pairing Health and Safety Interventions with the Energy Efficiency Provider Network

The capacity of Connecticut's residential energy-efficiency programs is robust, and the impact is clear, both in terms of reduced energy costs and reduced consumption. The Connecticut Department of Energy and Environmental Protection is committed to making these services accessible to the broadest possible population statewide, and recognizes that housing health and safety issues limit that access. In 2017, the Department worked with the largest providers of residential energy-efficiency services, United Illuminating and Eversource, to design and fund the Energy and Healthy Homes pilot projects, in order to test the operational feasibility of providing health and safety interventions through the energy-efficiency service provider network, and collect robust data health- and safety-related deferral factors. These pilots demonstrate the thought leadership of both the Department and the utility partners on these issues, and provide key lessons that can assist in designing and implementing a statewide model for broad, integrated service delivery.

Connecting Healthy Homes to Reducing Greenhouse Gas Emissions

As a member of the Regional Greenhouse Gas Initiative (RGGI), the state has set goals for reduction of carbon emissions, and has implemented statewide carbon emissions trading programs based upon statutory and regulatory authority.¹¹³ In 2012, the state reached its 2020 emission reduction goals (10% reduction below 1990 levels) eight years ahead of schedule, even as the state experienced population and economic growth.¹¹⁴ The Governor's Council on Climate Change (GC3), a three-year-old initiative, is designed to advance progress toward the 2050 GHG emissions targets and interim goals, assess the efficacy of existing emission reduction policies and regulations, and recommend policy and regulatory innovations.¹¹⁵ GC3 recently invited the Connecticut Green & Healthy Homes Project partners to present information about the purpose, progress and future goals of this work. The level of interest from this key group of stakeholders highlights the role of broader access to residential energy-efficiency services in helping the state reach its GHG emission reduction goals. Moving forward, Connecticut Green & Healthy Homes Project partners will continue to engage the GC3, to build support and enthusiasm for statewide integrated housing, health and energy services as an innovative conservation strategy.

Reducing Energy Burdens and Supporting Healthy Housing through Innovative Financing

The goals of Connecticut Green Bank (GREEN BANK), the first green bank in the nation, are to support and achieve more affordable, cleaner and more reliable sources of energy, while creating clean energy jobs and supporting local economic development. GREEN BANK achieves these goals by attracting private capital to advance Connecticut's clean energy policy goals, leveraging and reinvesting public funds, reducing the cost of clean energy, and reducing energy burdens for low income communities, by supporting healthy, efficient and affordable homes and businesses.

GREEN BANK's work has reduced energy burden in over 26,000 homes and businesses, and their support for healthy and efficient homes was the catalyst for the current research into the feasibility of a statewide, sustainably-supported model for housing, health and energy services in Connecticut. GREEN BANK is actively engaged in a pilot to leverage RGGI funds provided by DEEP and private investment to finance and incentivize energy and health and safety upgrades in multi-family properties, and remains committed to supporting and advancing the housing health, safety and energy vision of a broad range of partners across Connecticut.

Connecticut's Commitment to Increase Access to Affordable Housing

The Connecticut Department of Housing was created in 2013 to align Connecticut's many housing programs which were implemented across different agencies at that time, in order to preserve the affordable housing stock, and identify solutions to end homelessness in Connecticut. Investment in affordable housing has seen a more than 10-fold increase across the state since 2013, and the DOH works closely with key partners, including the Connecticut Housing Finance Authority (CHFA), to invest in innovative strategies to improve housing access and quality.

Supporting and Improving Connecticut's Housing Stock

The Department utilizes a variety of strategies to achieve greater access to healthy, safe and energy efficient affordable housing for Connecticut families, including capital funding for affordable housing creation and preservation and coupling financing for health and safety upgrades to housing with energy conservation loans to improve efficiency. The Department's strong partnership with the Connecticut Housing Finance Authority enables the organizations to work together to ensure that housing rehab financing is tied to meeting health, safety, energy efficiency design standards statewide.

Starting in 2014, DOH and CHFA began a statewide effort to invest in rehabilitation and redevelopment of the state's public housing portfolio, using green standards and benchmarking energy impact using WeGoWise. This effort is unique to Connecticut in terms of its scope and inclusion of green building practices and energy impact measurement. DOH is also planning an innovative pilot in 2018, the Homelessness Prevention and Response Fund, which will provide funding to property owners to improve conditions in low-income rental property, and make those units available for rapid rehousing of homeless youth and families at low or no-rent as a form of repayment of DOH's investment. This fund is part of the larger effort to reduce and homelessness, and avoid the human and financial costs that homelessness causes, by forming and strengthening the state's coordinated access network system, producing more supportive housing units, funding capital improvements in shelters, and designing and adopting various interventions to address the different root causes of homelessness.

The proposed integration of housing-based health and energy services aligns with the priorities and policies of Connecticut Department of Housing and the Connecticut Housing Finance Authority, and would further advance the goals and vision of each agency.

Connecticut's Commitment to Health Equity and Addressing Social Determinants of Health

Health equity requires continuous commitment, and for several decades, DPH and other agencies have invested in creating equitable opportunities for all Connecticut residents to experience good health. Some of DPH's investments include community health centers and school based health centers, identifying health professional shortage areas, and supporting local public health districts. In this way, vulnerable Connecticut communities are connected to essential public health services. In 1998, an Office of Multicultural Health within the Connecticut Department of Public Health was created by state statute (CGS 19a-4j). In 2014, it was renamed the Office of Health Equity. The Office has been active in identifying populations that experience disparities in health, promoting diversity, and developing partnerships to better understand the needs of communities of color, of people with limited English proficiency, and championed non-discrimination and language access policies for staff, vendors and partnerships.

Currently, DPH is actively engaged in tracking indicators of health disparities statewide, and planning and implementing public health interventions to address the underlying social and economic factors that impact health, including housing, nutrition, and access to care. In addition to the innovative State Health Improvement Plan discussed below, DPH implements evidence-based direct service home visiting and education programs, in partnership with local departments of health, that address the housing-related causes of asthma, injury and elevated blood lead levels. DPH is part of the core planning team for the Connecticut Green & Healthy Homes Project, and actively supports the vision of a broad, sustainably-supported approach to housing, health and energy services.

The State Health Improvement Coalition was established in 2013, to allow diverse stakeholders from local, regional and statewide organizations to focus and integrate their efforts to achieve measurable health improvement outcomes for Connecticut residents. The Coalition is made up of approximately 250 members across 7 Action Teams, who together worked with the State Health Improvement Advisory Council to create Healthy Connecticut 2020, a Statewide Health Improvement Plan (SHIP) based on a Statewide Health Assessment (SHA). The SHIP includes specific, measurable health impact goals, objective and strategies that uses Healthy People 2020 framework for improving health in Connecticut. The Environmental Health Action Team has set forth an Action Agenda with goals related to the reduction and elimination of elevated blood lead levels among children, improvements to air quality awareness to mitigate asthma symptoms, and adoption of a uniform property maintenance code statewide to improve conditions particularly in low-income, privately-owned rental housing. Improved housing is supported by other Action Teams working on maternal, infant and child health and mental health and substance abuse, given its relationship to health conditions in these areas.

These Action Agenda goals support and align with the goals of the model proposed here, which would increase seamless, statewide access to sustainably-supported housing, health and safety interventions. The work of Connecticut Green & Healthy Homes Project can support the state in implementing the SHIP,

and achieving measurable health improvements across Connecticut's population.

Aligning with Connecticut's Medicaid Delivery Model

The Connecticut Department of Social Services implements a unique model for insuring residents through Medicaid, which offers opportunities for alignment with a statewide integrated housing, health and energy program, which addresses the underlying 'social determinants of health' DSS has prioritized. However, the state's Medicaid model may also present challenges in identifying and building a strategy to support housing-related services. The following section explores these issues further and lays the groundwork for the next phase of research in this project.

Connecticut HUSKY Healthcare Program

Connecticut's HUSKY Healthcare Program offers income eligibility-based coverage to children, parents, relative caregivers, older adults, adults without children and pregnant women. The state's Medicaid and Children's Health Insurance Program (CHIP) are both under the umbrella of the HUSKY Program¹¹⁶. Connecticut is one of three states who administer Medicaid funds almost entirely under a self-insured, fee-for-service model, utilizing three statewide Administrative Service Organizations (ASO) to administer member services, handle member enrollment, claims processing, case management, outreach and education in each of four categories – medical, behavioral health, and dental.^{117,118} In most other states, Medicaid is administered through either a managed care model,^{xvii} or a combination of managed care and fee-for-service.

Connecticut moved to self-insured ASO model in 2012 from a managed care model in an effort to improve efficiency, quality and health outcomes. Since 2013, DSS has reported improvement in patient and process outcomes, including reduced unnecessary Emergency Department utilization, greater provider participation and reduced administrative costs.¹¹⁹

Statewide Innovation Model and Intensive Care Management

DSS is implementing several programs within HUSKY Healthcare, using a person-centered orientation, in contrast to the typical fee-for-service payment model. The importance of these programs is that the patient-centered payment allows for flexibility in patient care strategies, as long as the provider meets quality of care benchmarks that are tied to health improvements and/or reductions in unnecessary healthcare utilization. In patient-centered programs, services that address the social determinants of health can be supported through Medicaid investments. Two of HUSKY Healthcare's patient-centered programs, the Person-Centered Medical Home Plus (PCMH+) program, developed to be part of the State Innovation Model grant, and the Intensive Care Management services offered via each of the ASOs, are examined here.

^{xvii} In a Managed Care system, entities receive a set payment, per member, per month, to administer healthcare services to Medicaid enrollees.

The Statewide Innovation Model (SIM) program is a \$45 million federally funded initiative to improve population health, improve healthcare outcomes, and reduce costs for 80% of Connecticut's population by 2020 (i.e. Medicaid, Medicare, and commercial). The funding is allocated among 4 drivers: payment models (e.g. patient-centered medical homes), capacity building for advanced networks and Federally-Qualified Health Centers, consumer engagement, and planning support to address socio-economic factors.

In January 2017 DSS launched the Patient-Centered Medical Home Plus (PCMH+) program, an extension of the existing PCMH approach to service delivery, which already serves 43% of Connecticut's Medicaid members. Collectively, these efforts will further DSS's preventative health work and support population health goals, specifically for those patients facing substance abuse, behavioral health challenges, limited education, poverty, homelessness and neighborhood violence. This is accomplished through support to Federally-Qualified Health Centers and other 'advanced networks' to increase care coordination capacity and enable practice transformation to address "a package of strategies designed to prevent, detect and remedy under-service" to these populations.¹²⁰

The original title of the PCMH+ initiative, the Medicaid Improvement and Shared Savings Program, provides an indication of its purposes – to track and measure specific quality improvement measures in patient care, enable shared savings arrangements, and engage in supplemental payments to support specific care improvements. While providers are still paid based on the underlying fee for service architecture, PCMH+ includes two payment incentives to participating primary-care networks: 1) an upside-only shared-savings payment to both FQHCs and 'advanced networks' and 2) a fixed care coordination payment to FQHCs only. The shared-savings payment is calculated by comparing the total cost of care for a participating entity (FQHCs and 'advanced networks') with the individual pool of insured patients and then distributing any savings to the entities based on a set of quality score benchmarks, including a required minimum score. Savings generated from entities that do not meet their minimum quality scores will be distributed as a 'challenge pool' to the entities that did meet their criteria based on a set of additional quality metrics. The fixed care coordination payments to FQHCs are to support the following improvements: behavioral health integration, cultural competency including use of the Culturally and Linguistically Appropriate Services in Health and Healthcare (CLAS) standards, children and youth with special health care needs, and disability competency.¹²¹

In addition to the PCMH+ initiative, there are two additional programs through SIM that may relate to the goals of the Connecticut Green & Healthy Homes Project work: Health Enhancement Community Initiative and Prevention Services Initiative. For the Health Enhancement Community Initiative, the state is providing planning grants to selected "reference communities" to address root causes of poor health (behavioral and social determinants).¹²² For the Prevention Services Initiative, the state is providing technical assistance grants to both community based organizations and healthcare organizations. This funding is intended to help the awardees create a set of contracts between them for community-based asthma and diabetes management services that leverage community health workers and social determinants of health as the savings mechanism. Prevention Services Initiative is geographically limited to south-central Connecticut^{123, 124}.

In recent years, HUSKY Healthcare has offered Intensive Care Management (ICM) services to HUSKY members via the three ASOs. ICM uses predictive modeling techniques to identify HUSKY members with excessive social and healthcare needs, or those HUSKY members at-risk of developing such needs. ICM promotes wellness and preventative care by providing care coordination to medically complex members with medical, dental, and behavioral health needs. The ICM utilizes a multi-disciplinary care

team, which includes community health workers, specialty educators, dietitians, and medically-licensed professionals to coordinate care and meet patients' needs specifically related to heart disease, mental and behavioral health, chronic diseases (asthma, diabetes, sickle cell), transplants, maternity and newborn needs, and children with special healthcare needs. Members can be referred into ICM through a variety of entry points, including community service providers, and care is coordinated among medical and community-based providers. With the transition to PCMH+, the state is asking the patient-centered medical homes to incorporate these ICM patients, with exceptions for high-need patients, who will still receive their ICM services from the state's ASO. Patients have the option of staying with the state's ICM program.

These patient-centered approaches can provide flexibility to address social determinants of health and coordinate home-based interventions with medical case management. Additional research is required to assess the potential for housing health and safety interventions to be supported through these or other patient-centered HUSKY Healthcare programs.

Improving Connecticut's Health Outcomes through Planning and Action

The State Health Improvement Coalition was established in 2013, to allow diverse stakeholders from local, regional and statewide organizations to focus and integrate their efforts to achieve measurable health improvement outcomes for Connecticut residents. The Coalition is made up of 250 members across 7 Action Teams, who together worked with the State Health Improvement executive committee to create the Statewide Health Improvement Plan (SHIP). The SHIP includes specific, measurable health impact goals, objective and strategies that uses Healthy People 2020 benchmarks as a framework for improving health in Connecticut. The Environmental Health Action Team has set forth an Action Agenda with goals related to the reduction and elimination of elevated blood lead levels among children, improvements to air quality awareness to mitigate asthma symptoms, and adoption of a uniform property maintenance code statewide to improve conditions particularly in low-income, privately-owned rental housing.

These Action Agenda goals support and align with the goals of the model proposed here, which would increase seamless, statewide access to sustainably-supported housing, health and safety interventions. The work of Connecticut Green & Healthy Homes Project can support the state in implementing the SHIP, and achieving measurable health improvements across Connecticut's population.

Models for Energy, Health, and Housing Interventions

Improving the alignment of health, energy, housing initiatives/outcomes can be accomplished through a variety of policy and program modifications. The spectrum of integration begins with improving coordination of existing programs, and extends to a fully integrated approach for administering, delivering and evaluating services. The following section defines the proposed integrated model, and outlines potential steps to move toward the vision of a fully integrated service delivery platform that provides seamless access to services to address energy, health and housing needs among LMI households statewide.

Coordination of Current Services

Concurrent with a pilot phase, Connecticut may wish to further coordinate current health, housing and energy services in preparation for operationalizing a statewide integrated model. This approach can include coordinated eligibility determination, shared data platforms, and shared impact measures across housing-based health and energy programs. Systematic supports for direct and trackable referrals across programs are often an initial step in improved coordination in addition to service delivery coordination.

A ‘one-stop’ client intake and assessment portal for applying to receive housing-based services and alignment of eligibility requirements across state-administered programs can further streamline access. This approach may require building new data platforms or linking existing data platforms to enable sharing of participant and service data, which can also allow for metrics tracking across programs to measure the true impact of services provided in coordination. Impact metrics tracked through a shared or linked data platforms can include operational cost efficiencies achieved through better coordination, improved health outcomes, improved physical conditions in housing, reduced deferral rates for energy services, reduced health care utilization, reduced energy burden, and increased financial stability at the household and even community levels.

While coordination is an important first step to an integrated service delivery platform, a scaled, statewide model must move beyond coordination of programs at current levels to realize the full opportunity for transformative impact through new and sustainable funding mechanisms.

Pilot Integrated Model

An integrated service delivery model is one that provides coordinated access to address the energy, health and housing needs of Medicaid subpopulations and other LMI households who are at-risk for asthma, household injury, and lead exposure-related adverse health outcomes, and high energy costs. An integrated service delivery platform provides services through cross-trained providers and includes the ability to employ evidence-based, cost-effective energy and health interventions and collect standardized data. The vision for an integrated model is sustainably funded through a mix of leveraged resources from public and other sources. In order to prove out the technical, operational and economic feasibility of an integrated energy, health and housing program in Connecticut, it is necessary to pilot the model in jurisdictions around the state.

A multi-site pilot project will allow for testing of the assumption that the evidence-based in-home asthma, injury and lead interventions, when coordinated with energy interventions, will result in reduced health care utilization within the state’s actual Medicaid populations in different regions. Therefore, the pilot project should target Medicaid high utilizers with claims related to one or more of these health outcomes or other high risk populations as determined through a project design phase. Partners can make decisions about how to target services specifically, based on operational considerations, evaluation needs, cost and other pilot design considerations including geography. Partners may consider designing a pilot for a minimum of a two-year implementation and evaluation period, and include data collection and evaluation mechanisms that allow Medicaid claims and other outcomes to be tracked for participants over time.

A multi-site pilot project may also prove out the operational feasibility of coordinating services through existing programs currently administered by the state and local agencies and private partners, and expanding the capacity of these programs to build out a platform for broader statewide service delivery. As part of a pilot project, existing energy, health or housing program staff can be trained to complete

home health assessments, and energy and health interventions can be offered in an integrated platform – streamlining eligibility determination, data collection, assessment, intervention, education, follow-up and evaluation activities. Program evaluation processes and systems can also be put into place and funding sources can be leveraged using a variety of mechanisms in order to sustainably fund a multiyear program. A pilot project with continuous process improvement protocols would allow for fine-tuning of the integrated model throughout the pilot phase, and provide funders with consistent process and performance reports.

Further, a multi-site pilot project would test assumptions regarding average intervention costs for an integrated model and identify where the model results in government and private cost efficiencies for delivering these services in the State through cross trained assessors-auditors, resident educators and contractors. The design and implementation phases of the pilot would allow partners to measure the potential of these interventions, when delivered together, to result in upstream health care cost savings over time, and for which populations the intervention results in the greatest return on investment. A pilot project will provide the opportunity to gauge the rate of return that is acceptable to funders and partners, given the health and social benefits of the interventions. The pilot design phase should include determination of interventions to include in an integrated model, as well as which program staff from various agency and other programs may be best equipped to deliver each type of service – resident education, environmental assessment-energy audit, housing intervention, data collection and evaluation, and follow-up.

Integrated Statewide Service Delivery Platform Model with Sustainable Funding

Simply coordinating existing housing, health and energy programs will not result in a truly scaled statewide service delivery platform that targets at-risk households with needed services and produces the broadest level of health improvement and costs savings. A scaled, statewide model for providing health, housing and energy services includes several key elements that move beyond coordination:

1. Services are available across a broad area of the state, including in rural areas where current coverage for grant-funded services is limited.
2. Medicaid high utilizers, those with a history of claims related to asthma diagnoses, household injury and/or elevated blood lead levels, are targeted for services so that projected cost savings can be realized in the health care sector.
3. A shared set of cross-trained service providers determine eligibility using uniform criteria, employ evidence-based, cost-effective energy and health interventions, engage participants using evidence-based education materials, collect data in a standardized way, and provide follow-up support.
4. Services are sustainably funded through a mix of leveraged resources from public and other sources, including Medicaid funds, philanthropic catalyst funding, state and federal grants, hospital community benefit funds, and other innovative sources.

5. The statewide service delivery platform is accompanied by policies, including property maintenance enforcement and incentives, which support health, safety and energy standards in the private market, and include provisions to preserve affordability and housing access.

An integrated model moves beyond coordination of current health, housing and energy programs, and presents the opportunity to address key gaps in current services in the State's energy, health and housing sectors, including the following:

- **Geographic capacity** - A scaled, statewide approach to delivering energy, health and housing services that are sustainably-funded can help to move current programs beyond their geographic footprint. For example, both the Putting on AIRS and Falls Prevention home visiting programs would like to achieve a greater geographic footprint. By pairing these programs with Connecticut's energy efficiency services sector, and sustainably-funding their activities, these evidence-based programs could be scaled up to meet the demand for services statewide.
- **Waitlists** - The capacity to provide in-home asthma interventions, for example, is currently outstripped by the demand for these services. As more patients get access to these services through streamlined referral processes, the need is likely to increase. Increased funding and an integrated, statewide model can expand DPH's capacity to provide these interventions, by linking program services to a sustainably-supported service delivery platform.
- **Long-term cost savings** - Among the potential benefits of integrated, statewide model are long-term returns on public health care dollars. Across the country, states are moving toward investing Medicaid funds in housing strategies that have proven results in improved health outcomes and reduced future costs. Connecticut should examine Medicaid funding sources to scale services to meet the demand from Connecticut residents and to meet the capacity of the state's energy efficiency programs that could be leveraged with local health services.

Connecticut has the opportunity to implement a broad, integrated approach to housing, health and energy services, which utilizes a variety of public, private and philanthropic strategies to sustainably support this initiative.

Strategies for Sustainable Funding for Housing, Health and Energy Services

Current funding for health and housing work does not meet the level of funding for energy interventions, and is not sufficient to meet the needs of the State's LMI households. Funds are also inconsistent from grant cycle-to-cycle and budget year-to-year. Therefore current funding sources do not provide sustainable support for these interventions. Innovative funding solutions must be identified in order to sustainably support services that will allow the State to realize the full potential of an integrated statewide model.

Opportunities and Challenges in Partnering with Connecticut HUSKY Healthcare to Support an Integrated, Statewide Approach to Housing, Health and Energy

The Intensive Care Management (ICM) and Patient-Centered Medical Home Plus (PCMH+) initiatives demonstrate DSS's commitment to expanding and coordinating services to Medicaid patients to better address social determinants of health. Both initiatives are specifically focused on populations who would be served through integrated, comprehensive housing programs, including children with special healthcare needs and those with disabilities. Additionally, these initiatives demonstrate the operational capacity within DSS to track quality improvement metrics through the Administrative Services Organizations and provider network, and complete actuarial analyses to identify cost savings and compare costs across groups.

Among patient care advocates and others in Connecticut, there is some opposition to programs like Intensive Care Management and PCMH+, on the basis that savings might be generated through denial of expensive medical care to at-risk Medicaid populations.¹²⁵ Similar concerns have been voiced by patient advocates around DSS's exploration of other innovations in Medicaid, including an 1115 Waiver^{xviii} to engage in Value-Based Purchasing. Value-based Purchasing (VBP) is a Medicaid program payment structure that is based on a provider's or contractor's meeting benchmarks for quality of care and cost. Value-based Purchasing has been used as an alternative or supplement to fee-for-service payment structures, where payment is based on the volume of care delivered. VBP models seek to incentivize value and quality of care, and can be implemented in all types of Medicaid delivery systems, including Connecticut's self-insured fee-for-service model.¹²⁶

Continued stakeholder engagement around the opportunity for expansion of preventative services under this model may help to address some of this consistent opposition.

Each of these factors suggests opportunity for alignment of the service model proposed in this Pre-Feasibility Analysis with DSS's current priorities and initiatives. Next steps would include conversations among key state agencies, stakeholders and DSS to determine where and how Medicaid investments might support the proposed initiative.

Innovations that Allow Medicaid to Pay for the Value of Services

Through its 2016 Medicaid and CHIP Managed Care Final Rule, the Centers for Medicare and Medicaid Services allowed for a state and its MCOs to enter into contracts that enable value-based payments. Although Connecticut does not have Medicaid managed care organizations, this rule indicates directional support for Medicaid to cover services that are not medically reimbursable but do result in value to the healthcare system through a value-based payment mechanism. Given Connecticut's somewhat unique Medicaid administration framework – use of ASOs and largely fee-for-service payment mechanism, additional research is required to explore opportunities to enter into these types of shared savings arrangements. Factors to consider include who will share in or benefit from the savings, and what parameters need to be set to ensure that savings are garnered through innovative strategies that promote prevention and improve health outcomes while reducing costs. However, the ICM and PCMH+ initiatives may signal a move toward value-based Medicaid investments within the current structure of HUSKY Healthcare.

^{xviii} Section 1115 of the Social Security Act gives the Secretary of Health and Human Services authority to allow a state to use federal Medicaid funds in ways that are not otherwise allowed under federal rules.

Private Sector Investment in Successful Strategies

‘Pay for Success’ (also described as “social impact bonds”) are public-private partnerships that focus on the results that a social service causes, rather than solely on the delivery of services. In its most basic form, private investors pay the upfront costs for providing social services and government agencies or institutions repay investors with a return on their investment (“success payments”) if the program achieves agreed-upon outcomes (such as decreased healthcare expenditures). The Centers for Medicare and Medicaid Services, Center for Medicare & Medicaid Innovation, and U.S. Dept. of Health & Human Services are supporting increased flexibility in the use of Medicaid funding and CMS have assigned personnel resources to assist jurisdictions and health related entities in exploring how PFS financing can be used in the healthcare system.

Figure 1. Pay For Success Transaction Structure



The primary benefits of Pay for Success funded programs compared to traditional lead and healthy homes programs are greater flexibility in use of funds and the ability to utilize private capital to fund services where public resources are inadequate or where they are insufficient to allow service providers to increase capacity, scale up, and increase the scope of services to create an integrated program model. Other key considerations in support of the use of PFS funding for Healthy Homes Project services in the State are:

- PFS financing is a model that allows health plans to address the social determinants of health that are outside of traditional clinical care.
- Focus on evidence-based services that can be targeted to more preventive measures versus an after the fact treatment approach often employed in the health care sphere due to limited intervention resources.
- PFS financing is a new source of capital to fund and scale interventions such as housing interventions and multiple in-home resident educations outside of traditional federal, local, or philanthropic grants.
- With the focus on outcomes, PFS financing allows for more flexibility in service delivery to ensure the most effective and efficient implementation that produces improved, verifiable outcomes and increased cost savings.
- PFS can foster cross sector collaboration between health and housing to produce improved outcomes.

- Success payments come from entities (government, healthcare payers) that benefit from the services funded by the capital after outcomes are verified through rigorous evaluation.

Hospital Community Benefits Funding

Non-profit hospitals are required by the Internal Revenue Service (IRS) to make community benefit investments that are transparent, concrete, measurable, and responsive to community needs. A Community Health Needs Assessment (CHNA) is conducted every three years by the hospital, which then adopts an implementation plan for the use of its community benefit investments. Services not included in the CHNA can still be supported by community benefit funds. Community benefit investments can encompass “physical improvements and housing” and “environmental improvements.” While not as sustainable as Medicaid funding, Hospital Community Benefits funding could provide needed funding support for pilot program services or to supplement other more sustainable funding. These services could include potential asthma trigger, lead hazard and home safety hazard reduction interventions, environmental assessment and prevention education through in-home resident education.^{127, 128}

Value-Based Services

CMS has approved Oregon’s amendment to their Rule 1115 Waiver that allows for flexible services authorized by the waiver, and community community-benefit initiatives conducted by their managed care providers to be classified as “health-related services” with the associated expenditures included in the numerator of the medical-loss ratio for those managed care entities. Air conditioners for members with respiratory issues are used as an example of the type of service that can be included. A similar model could be used for environmental assessment and home remediation as health-related services. The Connecticut Department of Social Services has explored 1115 Waivers as a mechanism for flexible spending of Medicaid funds to address social determinants of health. They have not formally applied thus far for that waiver and have encountered some opposition from patient advocates around this idea in the past.

Other Funding Strategies

Other potential funding sources that require development but should be considered in developing a sustainable network for:

- HUD OLHCHH Grant Funding – HUD Increasing HUD Office of Lead Hazard Control and Healthy Homes Lead Grant and Healthy Homes Supplemental grant funding could provide additional funds to address lead hazards, asthma triggers, and safety hazards in homes in the state. This includes having the state and local jurisdictions coordinate more closely on the annual lead grant applications as well as potentially pooling smaller cities or counties into a combined grant application that will be more competitive for grant awards and which would service multiple jurisdictions. The FY2017 federal budget for the Office, including funding for Lead-Based Paint Hazard Control and Lead Hazard Reduction Demonstration Grants was increased from \$120 to \$145 million. The FY2018 funding was also substantially increased from \$145 million to \$230 million.

- **Utility Merger/PSC Funds** – Explore the opportunity to capture utility merger funds or other related funding from the Connecticut Public Utilities Regulatory Authority, that allows for flexibility in funds allocation, and can be used for housing quality improvements related to energy efficiency and health and safety interventions for low income households.
- **Connecticut Energy Assistance Program (CEAP) Intervention Funding** – Increasing the percentage of CEAP funding that is available in the state to conduct weatherization interventions from 10 percent to 25 percent and increase the health and safety budget of CEAP funded weatherization to allow for increased health and safety measures. In 2015, the Connecticut Department of Energy and Environmental Protection shifted a portion of CEAP funds to address removing health and safety barriers to accessing the Weatherization Assistance Program (WAP). This fiscal year, \$1 million in CEAP funds are directed to these interventions through a community action partnership.
- **Philanthropic Funding** – Philanthropic funding could be utilized to leverage public and private sector investment. For example, funding could support advanced phases of feasibility research, provide bridge funding for the commencement of the pilot project as sustainable funding commitments are being secured, provide funding for elements of the pilot project implementation that cannot be supported through other investments, support enhanced data analysis and evaluation, and/or provide gap funding to support a robust network of providers in the pilot or statewide model. Nationally, philanthropic investments are increasing in the areas of aging in place and achieving grade-level reading and other educational outcomes. In Connecticut, Community Foundations and other regional and statewide funders are investing and tracking community-level outcomes around workforce development, health improvement, and other outcomes related to this work. At GHHI designated sites across the country, national, regional and local philanthropy has contributed significantly to supporting integrated health, energy and housing models.
- **Housing Financing Program Funding** – The Connecticut Department of Housing prioritizes investment in affordable housing creation and preservation, and, in partnership with the Connecticut Housing Finance Authority, has increased the statewide investment in affordable housing from \$30 to \$200 million over the last eight years. Much of the investment is directed to creative solutions to end homelessness, by increasing access to affordable housing options. The Connecticut Housing Finance Authority works with the Connecticut Green Bank, Eversource and United Illuminating to provide innovative financing, incentives and leverage funding for green upgrades in multi-family housing, and the Department of Housing has recognized the need to increase financing and incentive program for rehabilitation and redevelopment of smaller, 1-6 unit affordable properties, and is interested in working with stakeholders to identify those opportunities.
- **Alternative sources of federal funding**, including Maternal Child Health Services Block Grant (Title X) funds, US Department of Agriculture Rural Development Housing Preservation Funds, and other non-traditional or flexible federal funding sources can be directed to investments in housing interventions, to fill geographic gaps, provide wrap-around services and supplement existing programs.

Each of these potential funding sources can be part of an innovative set of strategies to support energy, health and housing services in Connecticut. For many of the strategies described here, community agency providers could contract directly with Medicaid, a healthcare entity, philanthropy or another payer, to

provide services aligning with particular goals and meeting economic or health outcome benchmarks. As discussed above, the role of state agencies in a service delivery model where funds are provided directly to community agencies can be to administer service programs, serve as a conduit for grant funding, manage data platforms and select providers.

Pre-Feasibility Key Findings

The Pre-Feasibility analysis has identified a strong network of existing services in Connecticut, upon which to build a more seamless, broad and holistic approach to addressing housing, health and energy needs for the state's LMI households. The key finding discussed below will inform the design and implementation of the Connecticut Green & Healthy Homes Project going forward

Leveraging Existing Programs to Develop Infrastructure for Service Delivery

Connecticut is a national leader in innovative greenhouse gas emission reduction strategies, which include energy-efficiency interventions that reduce the energy burden and support stability for LMI households. The capacity of these services is very large, given Connecticut's size, and there is an opportunity to leverage this service provider network to expand access to housing-based health and safety interventions. The most recent, DEEP-funded Energy and Healthy Homes pilot has not yet uniformly tested the capacity of energy intervention providers across Eversource, United Illuminating and DEEP's programs to complete health and safety assessments, produce coordinated scope of work, provide health and safety measures and collect impact measure data. Some of the barriers identified through the pilot work, for example resident education, could be addressed by pairing energy interventions with evidence-based home visiting programs like Putting on AIRS, and Falls Prevention Program, the Connecticut Children's Medical Center Healthy Homes Program, and the Lead, Radon and Healthy Homes Program.

These home visiting programs, most administered through DPH in cooperation with local departments of health and community providers, align well with the vision of a statewide integrated approach, which utilizes evidence-based home visiting services paired with structural interventions to improve health outcomes and reduce energy burdens. Though limited in capacity and geographic footprint, and facing challenges like waitlists and limited funding, these successful programs are building blocks for a broader statewide approach to integrated service delivery.

Toolbox of Innovative Funding Solutions for Connecticut

Connecticut is already utilizing innovative strategies to attract and leverage investment in housing, health and energy interventions. National leaders like Connecticut Green Bank, Connecticut Housing Finance Authority and Connecticut Department of Housing leverage public funds with private investment to advance the goals of improving housing and reducing energy burdens. Other sources of investment, including philanthropic and private, and flexible federal funds are already being used to support aspects of this work in Connecticut. Further exploration and leveraging of these resources can sustainably support a broader approach to housing, health and energy.

There may be opportunities to harness the recent innovations in HUSKY Healthcare, which focus on patient-centered care coordination and measure the value of patient care in terms of improved health outcomes and avoided unnecessary healthcare utilization. Additional research is needed to understand where housing-related services might fit into DSS's priorities for addressing the social determinants of health and what cost-benefits justify such integrated platforms and increased healthcare investments.

Additional Research and Further Considerations

The next phase of this Project, the Connecticut Green & Healthy Homes Feasibility Analysis, will analyze health care utilization rates and associated costs for the asthma, injury and elevated blood lead subpopulations within Connecticut's Medicaid population, project potential cost savings as a result of the evidence-based treatment effect of the proposed interventions, and characterize other factors that impact the potential for return on this investment. This research will be conducted using Medicaid data for a three-year time period, including any beneficiary with claims related to asthma, injury and lead. This work is expected to take place in the near future as Connecticut Medicaid claims data are shared within project partnerships. Additional research is also required to better characterize the benefits of reduced medical costs related to housing services within Connecticut's public healthcare system. The feasibility analysis will examine the incentives for reducing healthcare costs through investment in housing services, and to whom these incentives accrue within the HUSKY Healthcare Program, in order to build the business case for investment in the proposed model.

There is a considerable opportunity for the State of Connecticut to revise its approach to health, energy, and housing by adopting a system change model that better integrates and improves the coordination of energy, health and housing service programs. The Connecticut Green & Healthy Homes Project is designed to explore safer and more energy efficient housing as a platform for improved health outcomes through comprehensive, evidence-based home interventions. These interventions will seek to generate substantial medical and energy cost savings through improved health outcomes related to asthma, lead poisoning, and household injury along with reductions in energy consumption. This Project has the potential to demonstrate how sustainably-funded, comprehensive housing interventions can cost-effectively produce healthier housing in low- and moderate-income neighborhoods and reduce energy and healthcare costs. As the Connecticut Green & Healthy Homes Project moves forward, with the support of partners throughout the state, research will continue into the additional operational and funding considerations that will impact the feasibility of implementing a statewide integrated housing, health and energy services in Connecticut.



APPENDICES

Appendix 1:

Households below the ALICE Threshold, Largest Cities and Towns in Connecticut, 2014

Largest Cities and Towns (above 20,000 Households)	Number of Households	Percentage of Households below ALICE Threshold	Percent Change 2007-2014	
			HOUSEHOLDS	BELOW AT
	2014	2014		
Bridgeport	49,779	59%	7%	23%
Stamford	49,377	30%	8%	15%
New Haven	49,281	63%	5%	16%
Hartford	44,740	75%	3%	13%
Waterbury	39,608	66%	-9%	23%
Norwalk	33,461	36%	2%	38%
Danbury	28,524	38%	-7%	2%
New Britain	27,764	64%	6%	17%
Milford	20,536	32%	1%	15%

Source: American Community Survey, 2007-2014, and the ALICE Threshold, 2007-2014; see Exhibits and ALICE Methodology for details

Source: Connecticut United Ways, 2016

Appendix 2. Connecticut Federal HUD Allocations, 2017

NAME	CDBG	HOME
BRIDGEPORT	\$2,759,039	\$842,678
BRISTOL	\$576,672	\$0
DANBURY	\$574,854	\$0
EAST HARTFORD	\$498,058	\$0
FAIRFIELD	\$468,093	\$0
GREENWICH	\$738,876	\$0
HAMDEN TOWN	\$388,097	\$0
HARTFORD	\$3,136,470	\$1,057,235
MANCHESTER	\$534,623	\$0
MERIDEN	\$892,364	\$0
MIDDLETOWN	\$404,689	\$0
MILFORD TOWN	\$442,243	\$0
NEW BRITAIN	\$1,420,690	\$447,474
NEW HAVEN	\$3,434,597	\$985,625
NEW LONDON	\$740,234	\$0
NORWALK	\$854,502	\$0
NORWICH	\$778,804	\$0
STAMFORD	\$875,430	\$365,232
STRATFORD	\$551,421	\$0
WATERBURY	\$1,917,162	\$637,414
WEST HARTFORD	\$874,003	\$0
WEST HAVEN	\$603,864	\$0
CONNECTICUT NON-ENTITLEMENT	\$12,162,864	\$6,570,671
TOTAL	\$35,627,649	\$10,906,329

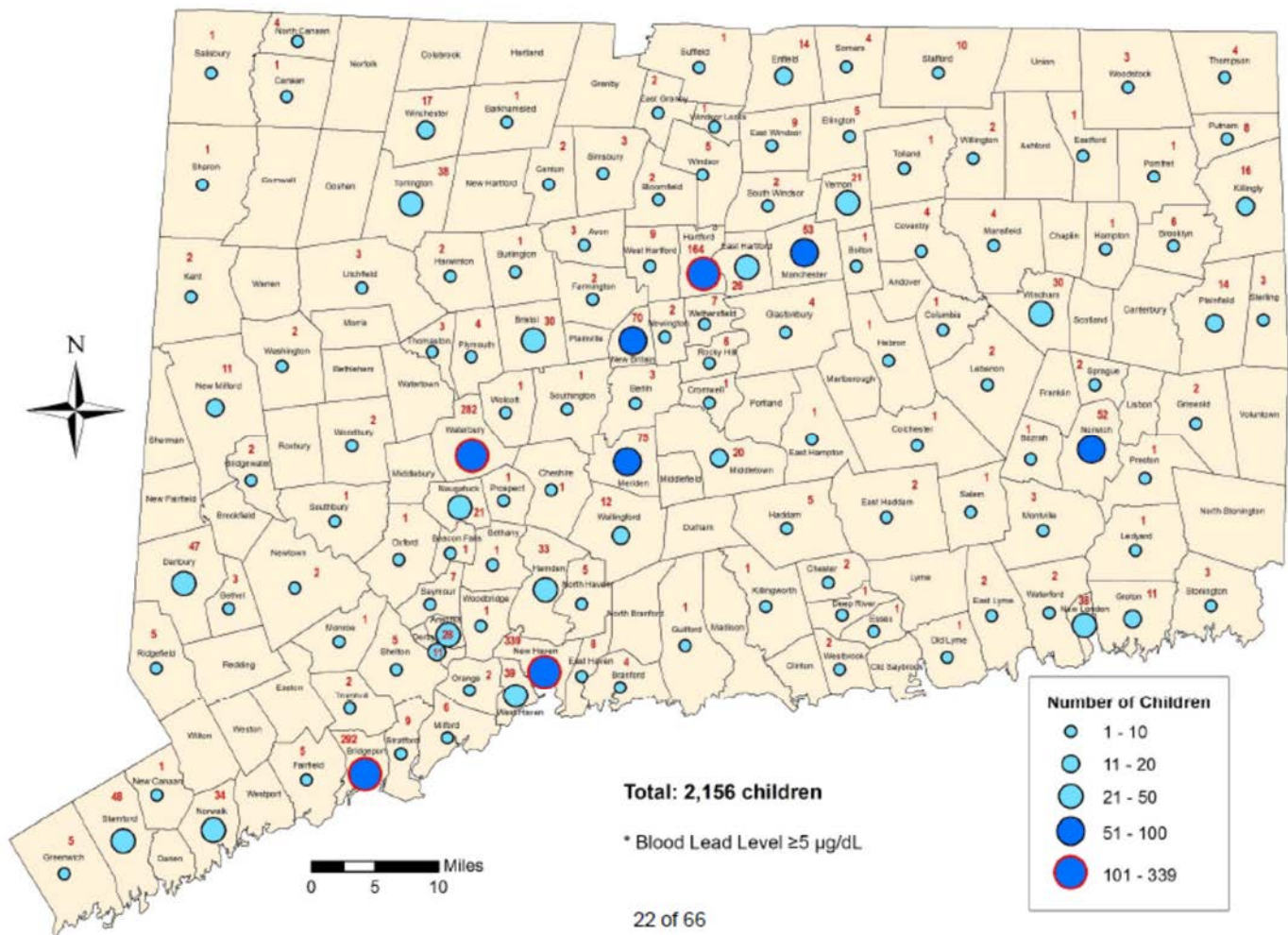
Appendix 3. Lead Remediation and Healthy Homes Funding and Unit Production Goals, 2017-2020

Funding Recipient Jurisdiction	Award Amount	3-Year Production Goals
City of Bridgeport	\$2,875,000	150
City of Hartford	\$3,400,000	197
City of Waterbury	\$2,900,000	165
State of Connecticut	\$3,400,000	232
Total	\$12,575,000	744

Source: HUD, 2017

Appendix 4.

Number of Lead Poisoned Children* Under 6 Years Old by Town, Connecticut 2015



Source: Connecticut Department of Public Health, Childhood Lead Poisoning Prevention and Control. *2015 Annual Disease Surveillance Report*. May 9, 2017.

Appendix 5. Asthma Hospitalization Rates by Town of Residence,
Primary Diagnosis, 2010-2014

Town	N	Age-Adjusted Rate (per 10,000)
Andover	7	4.6
Ansonia	102	10.7
Ashford	13	6.6
Avon	27	2.7
Barkhamsted	a	A
Beacon Falls	23	8.2
Berlin	65	6.0
Bethany	10	4.6
Bethel	62	6.2
Bethlehem	a	A
Bloomfield	154	13.9
Bolton	9	3.4
Bozrah	9	6.7
Branford	156	11.1
Bridgeport	2,010	29.0
Bristol	303	9.6
Brookfield	18	1.7
Brooklyn	30	6.5
Burlington	7	1.5
Canaan	10	13.3
Canterbury	30	11.1
Canton	14	2.1
Chaplin	7	5.2
Cheshire	83	5.8
Chester	6	3.8
Clinton	56	8.5
Colchester	41	5.7
Columbia	10	4.0
Cornwall & Warren	a	A
Coventry	27	4.0
Cromwell	40	5.8
Danbury	270	6.9
Darien	35	3.3
Deep River	8	2.7

Derby	72	11.3
Durham	15	4.6
East Granby	7	2.5
East Haddam	15	3.0
East Hampton	34	5.8
East Hartford	381	14.8
East Haven	341	23.7
East Lyme	71	8.3
East Windsor	47	8.4
Eastford	a	A
Easton	17	4.0
Ellington	20	2.6
Enfield	257	10.6
Essex	12	2.0
Fairfield	188	5.7
Farmington	64	4.9
Franklin	12	14.6
Glastonbury	58	3.3
Goshen	9	6.9
Granby	22	3.8
Greenwich	256	7.0
Griswold & Lisbon	66	7.9
Groton	246	12.3
Guilford	62	5.1
Haddam	11	2.9
Hamden	497	17.6
Hampton	a	A
Hartford	2,175	37.6
Hartland	a	A
Harwinton	12	3.8
Hebron	14	2.5
Kent	6	3.5
Killingly	71	8.0
Killingworth	13	3.8
Lebanon	17	4.8
Ledyard	61	7.3
Litchfield	24	4.9
Madison	41	6.8
Manchester	255	9.3
Mansfield	33	5.4
Marlborough	8	3.2

Meriden	391	12.9
Middlebury	17	3.7
Middlefield	8	2.6
Middletown	215	9.2
Milford	185	6.9
Monroe	62	6.3
Montville	82	8.5
Morris	a	A
Naugatuck	146	8.9
New Britain	883	25.0
New Canaan	32	3.4
New Fairfield	20	3.0
New Hartford	7	2.2
New Haven	3,205	54.6
New London	351	28.1
New Milford	57	4.1
Newington	105	6.1
Newtown	48	3.3
Norfolk	a	A
North Branford	60	9.0
North Haven	105	8.5
North Stonington	a	A
Norwalk	477	11.0
Norwich	294	14.4
Old Lyme	26	5.8
Old Saybrook	22	6.6
Orange	42	5.3
Oxford	30	4.7
Plainfield	74	9.8
Plainville	91	9.3
Plymouth	41	7.3
Pomfret	8	3.2
Portland	32	6.3
Preston	27	8.8
Prospect	38	7.0
Putnam	41	8.1
Redding	22	3.5
Ridgefield	34	2.8
Rocky Hill	70	6.5
Salem	9	4.6

Salisbury	a	A
Scotland	a	A
Seymour	57	7.5
Sharon	10	5.2
Shelton	153	7.4
Sherman	a	A
Simsbury	57	4.6
Somers	47	8.4
South Windsor	59	4.7
Southbury	49	3.5
Southington	144	5.9
Sprague	12	9.3
Stafford & Union	75	9.6
Stamford	547	8.6
Sterling	10	5.8
Stonington	13	1.0
Stratford	322	12.0
Suffield	43	4.7
Thomaston	23	5.3
Thompson	20	3.7
Tolland	37	5.4
Torrington	189	10.3
Trumbull	139	6.6
Vernon	124	8.4
Voluntown	10	7.7
Wallingford	134	6.2
Washington	a	A
Waterbury	1,219	22.0
Waterford	89	8.6
Watertown	54	4.5
West Hartford	229	6.6
West Haven	625	23.7
Westbrook	16	4.4
Weston	17	4.2
Westport	44	3.3
Wethersfield	107	6.8
Willington	15	6.5
Wilton	31	3.1
Winchester	33	5.4
Windham	203	18.1

Windsor	149	9.6
Windsor Locks	56	7.8
Wolcott	45	5.2
Woodbridge	26	4.9
Woodbury	19	3.2
Woodstock	20	5.6

Source: Connecticut Department of Public Health, *The Burden of Asthma in Connecticut: Updated Report Tables (2016)*.

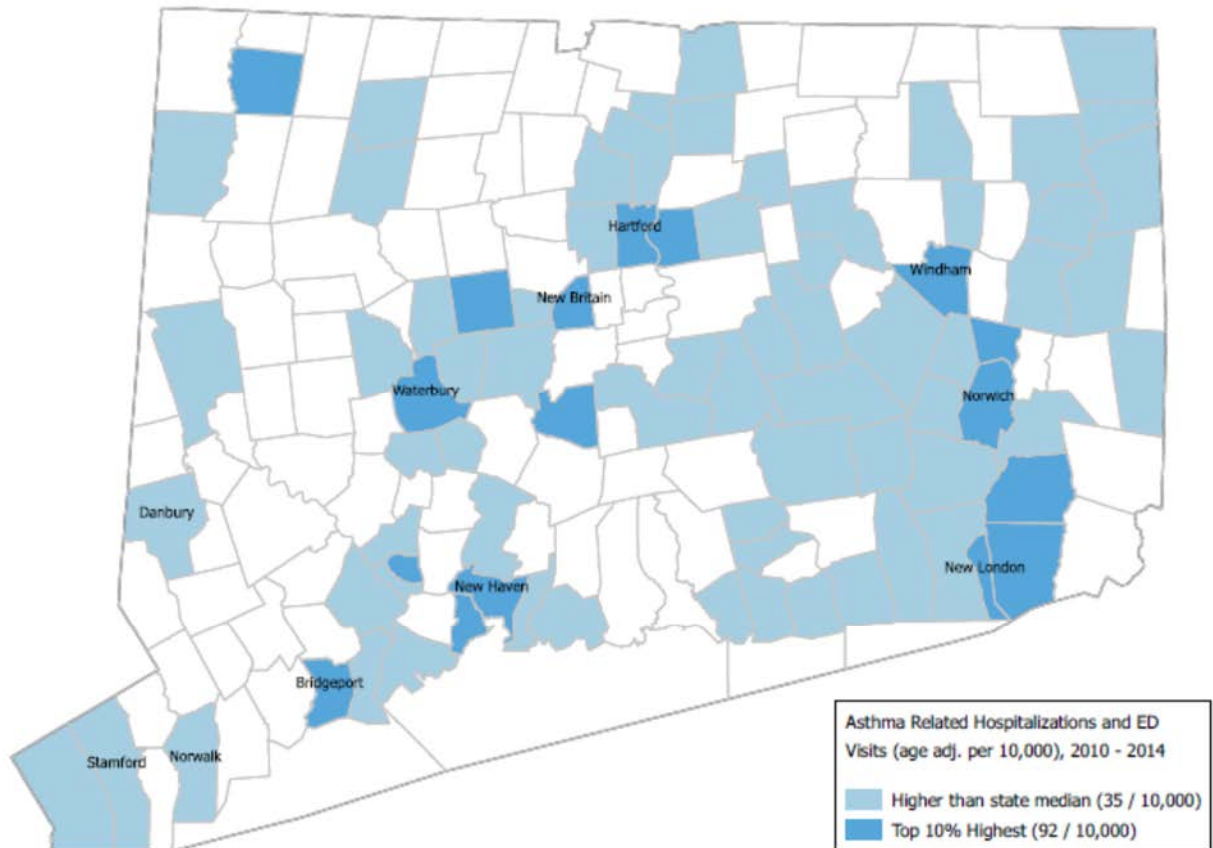
Appendix 6: Asthma-related Hospitalization Healthcare Costs,
Ranked Top 25 Towns, Connecticut, 2014

Rank	Town	N	Total Charges
1	New Haven	2,260	\$20,284,580
2	Trumbull	57	\$525,147
3	New London	535	\$1,642,150
4	Unknown CT	9	\$21,128
5	New Milford	106	\$244,444
6	Vernon	180	\$955,838
7	Newington	111	\$619,157
8	Voluntown	20	\$75,766
9	Newtown	46	\$305,488
10	Wallingford	122	\$438,883
11	Norfolk	12	\$8,347
12	Washington	a	a
13	North Branford	32	\$399,675
14	Waterbury	2,165	\$7,657,683
15	North Canaan	a	a
16	Waterford	137	\$442,869
17	North Haven	64	\$760,110
18	Watertown	72	\$409,633
19	North Stonington	11	\$15,237
20	West Hartford	203	\$1,285,899
21	Norwalk	380	\$3,034,060
22	West Haven	443	\$3,612,466
23	Norwich	571	\$1,567,188
24	Westbrook	33	\$130,367
25	Old Lyme	34	\$142,768

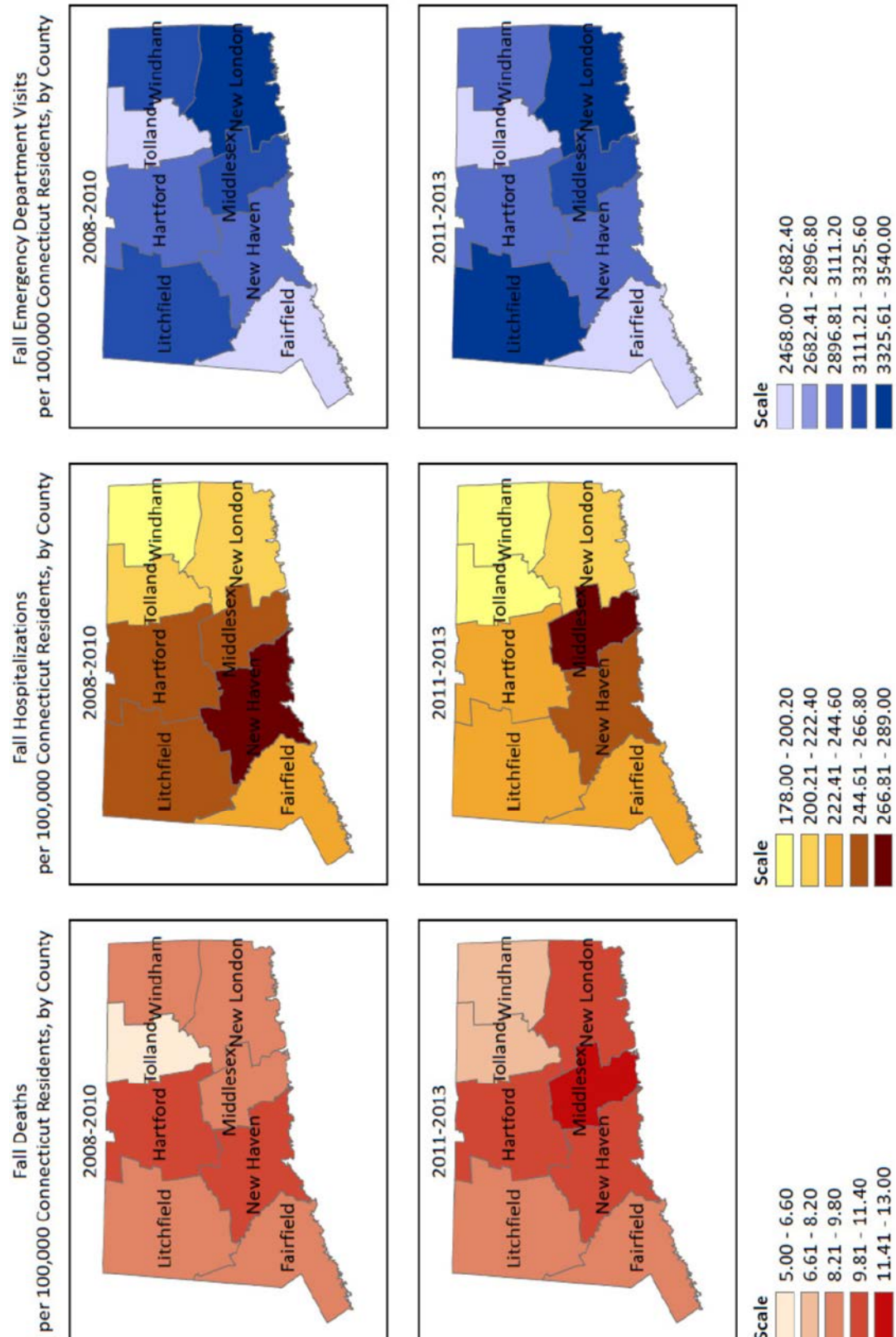
Source: Connecticut Department of Public Health, *The Burden of Asthma in Connecticut: Updated Report Tables (2016)*.

Appendix 7:

Per Capita Asthma-Related Hospitalizations and ED Visits (Kids and Adults), 2010 - 2014



Appendix 8: Rates of Falls, 2008 - 2013



References

- ¹ Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. *Environmental Health Perspectives*. 2009 July; 117(7):1162-1167
- ² Gillespie, et al *Interventions for preventing falls in older people living in the community (Review)*. Cochrane Review. December, 2009. Retrieved from: <http://www.mnfallsprevention.org/downloads/Review-Interventions-for-preventing-falls.pdf>
- ³ Kanchongkittiphon W, Mendell MJ, Gaffin JM, Wang G, Phipatanakul W. “Indoor environmental exposures and exacerbation of asthma: an update to the 2000 review by the Institute of Medicine”. *Environmental Health Perspectives* 123. 2015. Pp 6–20.
- ⁴ Tonn, Bruce, Carroll, David, Pigg, Scott, Blasnik, Michael, et al. “Weatherization Works: Summary of Findings from the Retrospective Evaluation of the Department of Energy’s Weatherization Assistance Program”. September, 2014.
- ⁵ United Way of Connecticut. *ALICE: Asset Limited, Income Constrained, Employed Report, 2016 Update*. Retrieved from: UnitedWayALICE.org/Connecticut
- ⁶ Connecticut Department of Public Health, Healthy, Healthy Homes Initiative, *Connecticut Department of Public Health 2017 Healthy Homes Surveillance Report*. 2017.
- ⁷ Connecticut Department of Public Health, *The Burden of Asthma in Connecticut: Updated Report Tables (2016)*. Retrieved from: <http://www.portal.ct.gov/DPH/Health-Education-Management--Surveillance/Asthma/Asthma-Surveillance>
- ⁸ *Ibid.*
- ⁹ APRISE, Incorporated. *Meeting the Energy Needs of Low-Income Households in Connecticut: Final Report*. December, 2016
- ¹⁰ United States Census. *Selected Economic Characteristics, 2012-2016 American Community Survey 5-year Estimates*. Retrieved from: <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>
- ¹¹ Connecticut Department of Public Health, Healthy, Healthy Homes Initiative, *Connecticut Department of Public Health 2017 Healthy Homes Surveillance Report*. 2017.
- ¹² Connecticut Department of Public Health. *Falls Prevention Program: How Big is the Problem?* 2018. Retrieved from: <http://www.portal.ct.gov/DPH/Health-Education-Management--Surveillance/The-Office-of-Injury-Prevention/Falls-Prevention-Program>
- ¹³ *Ibid.*
- ¹⁴ Interview, Eversource. 2017.
- ¹⁵ Hung, T., Davila, J., Veneziano, K. (2017). CT Department of Public Health 2015 Annual Disease Surveillance Report on Childhood Lead Poisoning Prevention and Control. Hartford, CT: Connecticut Department of Public Health
- ¹⁶ Interview, United Illuminating, 2018.
- ¹⁷ Governor’s Council on Climate Change. *GC3 Exploratory Report*. January, 2016. Retrieved from: file:///C:/Users/cklinger/Desktop/CT%20Background%20Docs/gc3_exploratory_report_2016.pdf

-
- ¹⁸ Connecticut Department of Energy and Environmental Protection Interview, 2017.
- ¹⁹ Ibid.
- ²⁰ Interview, Department of Housing, 2018.
- ²¹ Applied Public Policy Research Institute for Study and Evaluation (APRISE). *Meeting the Energy Needs of Low-Income Households in Connecticut: Final Report*. December, 2016.
- ²² Interview, Eversource, 2018.
- ²³ Interview, Department of Public Health, 2018.
- ²⁴ Interview, Department of Public Health, 2017.
- ²⁵ Eversource Energy, the United Illuminating Company, Connecticut Natural Gas, Southern Connecticut Gas. *2017 Annual Update of the 2016-2018 Conservation & Load Management Plan*. Revised March 1, 2017.
- ²⁶ Connecticut Department of Public Health, Healthy, Healthy Homes Initiative, *Connecticut Department of Public Health 2017 Healthy Homes Surveillance Report*. 2017.
- ²⁷ Norton, Ruth Ann, Brown, Brendan, Lee, Catherine, et al. *Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-energy Benefits in the United States*. 2018. Retrieved from: http://www.greenandhealthyhomes.org/sites/default/files/AchievingHealth%26SocialEquity_final-lo_0.pdf
- ²⁸ Interview, Connecticut Department of Housing, 2017.
- ²⁹ United States Census Bureau, Physical Housing Characteristics for Occupied Housing, 5 year estimates 2012-2016, Connecticut. Retrieved: <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>
- ³⁰ Ibid.
- ³¹ Davila, J. Veneziano, K. (2017). State of Connecticut Department of Public Health 2017 Healthy Homes Surveillance Report. Hartford, CT: Connecticut Department of Public Health.
- ³² Ibid.
- ³³ Ibid
- ³⁴ United Way of Connecticut. *ALICE: Asset Limited, Income Constrained, Employed Report, 2016 Update*. Retrieved from: UnitedWayALICE.org/Connecticut
- ³⁵ DataHaven Community Wellbeing Survey, 2015.
- ³⁶ Cutts DB, Meyers AF, Black MM, et al. US Housing Insecurity and the Health of Very Young Children. *American Journal of Public Health*. 2011;101(8):1508-1514. doi:10.2105/AJPH.2011.300139.
- ³⁷ Ibid.
- ³⁸ United States Census. *Selected Economic Characteristics, 2012-2016 American Community Survey 5-year Estimates*. Retrieved from: <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>
- ³⁹ Ibid.

⁴⁰ United Way of Connecticut. *ALICE: Asset Limited, Income Constrained, Employed Report, 2016 Update*. Retrieved from: UnitedWayALICE.org/Connecticut

⁴¹ APRISE, Incorporated. *Meeting the Energy Needs of Low-Income Households in Connecticut: Final Report*. December, 2016

⁴² Ibid.

⁴³ Ibid.

⁴⁴ Thomson, Hilary, Thomas, Sian, Sellstrom, Eva, Petticrew, Mark. "Housing improvements for health and associated socio-economic outcomes." *Cochrane Database Systematic Review*. 2. 2013.

⁴⁵ World Health Organization, International Workshop on Housing, Health and Climate Change. "Developing guidance for health protection in the built environment mitigation and adaptation responses". October 2010.

⁴⁶ Connecticut Department of Public Health, *The Burden of Asthma in Connecticut: Updated Report Tables (2016)*.

⁴⁷ Ibid.

⁴⁸ Ibid

⁴⁹ Davila, J. Veneziano, K. (2017). State of Connecticut Department of Public Health 2017 Healthy Homes Surveillance Report. Hartford, CT: Connecticut Department of Public Health.

⁵⁰ Kendrick D, Young B, Mason-Jones AJ, Ilyas N, Achana FA, Cooper NJ, Hubbard SJ, Sutton AJ, Smith S, Wynn P, Mulvaney C, Watson MC, Coupland C. "Home safety education and provision of safety equipment for injury prevention". *Cochrane Database of Systematic Reviews* 2012, Issue 9. Art. No.: CD005014. DOI: 10.1002/14651858.CD005014.pub3.

⁵¹ Connecticut Department of Public Health. *Falls Prevention Program: How Big is the Problem?* 2018. Retrieved from: <http://www.portal.ct.gov/DPH/Health-Education-Management--Surveillance/The-Office-of-Injury-Prevention/Falls-Prevention-Program>

⁵² Ibid

⁵³ Ibid

⁵⁴ Hung, T., Davila, J., Veneziano, K. (2017). *Connecticut Department of Public Health 2015 Annual Disease Surveillance Report on Childhood Lead Poisoning Prevention and Control*. May 9, 2017.

⁵⁵ Ibid

⁵⁶ Interview, Department of Public Health, 2017

⁵⁷ Davila, J. Veneziano, K. (2017). State of Connecticut Department of Public Health 2017 Healthy Homes Surveillance Report. Hartford, CT: Connecticut Department of Public Health.

⁵⁸ Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. *Environmental Health Perspectives*. 2009 July; 117(7):1162-1167

-
- ⁵⁹ National Center for Healthy Housing, *Housing Interventions and Health, a Review of the Evidence*. January, 2009 Retrieved from: <http://www.nchh.org/LinkClick.aspx?fileticket=2lvaEDNBldU%3D&tabid=229>
- ⁶⁰ Kanchongkittiphon W, Mendell MJ, Gaffin JM, Wang G, Phipatanakul W. “Indoor environmental exposures and exacerbation of asthma: an update to the 2000 review by the Institute of Medicine”. *Environmental Health Perspectives* 123. 2015. Pp 6–20.
- ⁶¹ Gillespie, et al *Interventions for preventing falls in older people living in the community (Review)*. Cochrane Review. December, 2009. Retrieved from: <http://www.mnfallsprevention.org/downloads/Review-Interventions-for-preventing-falls.pdf>
- ⁶² Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. *Environmental Health Perspectives*. 2009 July; 117(7):1162-1167
- ⁶³ Green & Healthy Homes Initiative. “Weatherization and its Impact on Occupant Health Outcomes”. 2017.
- ⁶⁴ Tohn Environmental Strategies Team, “Occupant Health Benefits of Residential Energy Efficiency” November, 2016.
- ⁶⁵ Norton, Ruth Ann, Brown, Brendan W., et al. Non-Energy Benefits of Energy Efficiency and Weatherization Programs in Multifamily Housing: The Clean Power Plan and Policy Implications” September 2016.
- ⁶⁶ Norton, Ruth Ann, Brown, Brendan, Lee, Catherine, et al. *Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-energy Benefits in the United States*. 2018. Retrieved from: http://www.greenandhealthyhomes.org/sites/default/files/AchievingHealth%26SocialEquity_final-lo_0.pdf
- ⁶⁷ Meng, Ying-Ying, Susan H. Babey, and Joelle Wolstein. “Asthma-Related School Absenteeism and School Concentration of Low-Income Students in California.” *Preventing Chronic Disease* 9 (2012): E98.
- ⁶⁸ Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. *Environmental Health Perspectives*. 2009 July; 117(7):1162-1167
- ⁶⁹ Drehobl, A. and L.Ross "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities." American Council for an Energy Efficient Economy. 2016.
- ⁷⁰ Interview, Eversource. 2017.
- ⁷¹ Interview, United Illuminating. 2017.
- ⁷² Connecticut Department of Energy & Environmental Protection. 2018 Comprehensive Energy Strategy. February 8, 2018.
- ⁷³ Interview, Eversource, 2017.
- ⁷⁴ APRISE, Incorporated. *Meeting the Energy Needs of Low-Income Households in Connecticut: Final Report*. December, 2016
- ⁷⁵ Interview, Eversource, 2018.
- ⁷⁶ Norton, Ruth Ann, Brown, Brendan, Lee, Catherine, et al. *Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-energy Benefits in the United States*. 2018. Retrieved from: http://www.greenandhealthyhomes.org/sites/default/files/AchievingHealth%26SocialEquity_final-lo_0.pdf
- ⁷⁷ Interview, Department of Energy and Environmental Protection, 2017.
- ⁷⁸ Interview, Eversource. 2017.

-
- ⁷⁹ Interview, United Illuminating. 2017.
- ⁸⁰ Connecticut Department of Energy and Environmental Protection. 2018 Comprehensive Energy Strategy. February 8, 2018.
- ⁸¹ Norton, Ruth Ann, Brown, Brendan, Lee, Catherine, et al. *Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-energy Benefits in the United States*. 2018. Retrieved from: http://www.greenandhealthyhomes.org/sites/default/files/AchievingHealth%26SocialEquity_final-lo_0.pdf
- ⁸² US Department of Energy, Oak Ridge Laboratory, *Health and Household-Related Benefits Attributable to the Weatherization Assistance Program*, 2014. Retrieved: https://weatherization.ornl.gov/Retrospectivepdfs/ORNLTM-2014_345.pdf
- ⁸³ Connecticut Department of Energy and Environmental Protection. 2018 Comprehensive Energy Strategy. February 8, 2018.
- ⁸⁴ Ibid.
- ⁸⁵ Connecticut GREEN BANK. *Connecticut GREEN BANK: Sparking the GREEN BANK Movement*. August 31, 2017.
- ⁸⁶ Ibid.
- ⁸⁷ Interview, Operation Fuel. 2017.
- ⁸⁸ Applied Research Institute for Study and Evaluation (APRISE). *Meeting the Energy Needs of Low-Income Households in Connecticut: Final Report*. December, 2016.
- ⁸⁹ Stearns, John. *Hartford Business.Com*. “CT Hospitals Launch Test Project on Social Determinants of Health”. January 24, 2018. Retrieved from: <http://www.hartfordbusiness.com/article/20180124/NEWS/180129960/ct-hospitals-launch-test-project-on-social-determinants-of-health>
- ⁹⁰ Applied Public Policy Research Institute for Study and Evaluation (APRISE). *Meeting the Energy Needs of Low-Income Households in Connecticut: Final Report*. December, 2016.
- ⁹¹ Interview, United Illuminating, 2017
- ⁹² Interview, Eversource, 2017.
- ⁹³ Connecticut Department of Public Health, Health Resources in Action, *Connecticut Healthy Homes 2017 Strategic Plan*. 2017. Retrieved from: https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/environmental_health/lead/Case-Management/Healthy-Homes-Strategic-Plan-2017.pdf?la=en
- ⁹⁴ Interview, Office of the Chief State’s Attorney, 2018.
- ⁹⁵ Interview, Department of Public Health, 2017.
- ⁹⁶ Ibid.
- ⁹⁷ Ibid.
- ⁹⁸ Connecticut Department of Energy and Environmental Protection. 2018 Comprehensive Energy Strategy. February 8, 2018.
- ⁹⁹ Ibid.

¹⁰⁰ Ibid.

¹⁰¹ Ibid.

¹⁰² Ibid.

¹⁰³ Ibid.

¹⁰⁴ Interview, Department of Housing, 2017.

¹⁰⁵ Interview, Department of Housing, 2017.

¹⁰⁶ Interview, Department of Housing, 2017.

¹⁰⁷ Applied Public Policy Research Institute for Study and Evaluation (APRISE). *Meeting the Energy Needs of Low Income Households in Connecticut: Final Report*. December, 2016.

¹⁰⁸ Connecticut Department of Energy and Environmental Protection. 2018 Comprehensive Energy Strategy. February 8, 2018.

¹⁰⁹ Applied Public Policy Research Institute for Study and Evaluation (APRISE). *National Weatherization Assistance Program Evaluation Analysis Report: Non-Energy Benefits of WAP Estimated with Client Longitudinal Survey Final Report*. January, 2018. Retrieved from: <http://www.appriseinc.org/wp-content/uploads/2018/02/WAP-Non-Energy-Benefits-Analysis-Report.pdf>

¹¹⁰ Norton, Ruth Ann, Brown, Brendan, Lee, Catherine, et al. *Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-energy Benefits in the United States*. 2018. Retrieved from: http://www.greenandhealthyhomes.org/sites/default/files/AchievingHealth%26SocialEquity_final-lo_0.pdf

¹¹¹ Interview, Department of Public Health, 2017.

¹¹² Governor's Council on Climate Change. *GC3 Exploratory Report*. January, 2016. Retrieved from: file:///C:/Users/cklinger/Desktop/CT%20Background%20Docs/gc3_exploratory_report_2016.pdf

¹¹³ Regional Greenhouse Gas Initiative (RGGI). *State Statutes and Regulations*. 2018. Retrieved from: <https://rggi.org/program-overview-and-design/state-regulations>

¹¹⁴ Ibid.

¹¹⁵ Ibid.

¹¹⁶ Connecticut Department of Social Services, *Connecticut's Healthcare for Children and Adults*. 2018. Retrieved from: <http://www.ct.gov/hh/site/default.asp>

¹¹⁷ Fitzpatrick, Mary, Dwyer, Katherine M, *Office of Legislative Research Report: Medicaid Managed Care in Connecticut and Other States*. January 12, 2015.

¹¹⁸ Connecticut Department of Social Services. *A Snapshot of Connecticut Medicaid*. 2015. Retrieved from: <http://www.ct.gov/hh/site/default.asp>

¹¹⁹ Fitzpatrick, Mary, Dwyer, Katherine M, *Office of Legislative Research Report: Medicaid Managed Care in Connecticut and Other States*. January 12, 2015.

¹²⁰ Connecticut Department Social Services. "Connecticut HUSKY Health: Patient-Centered Medical Home + (PCMH+) Update". Presentation to the SIM Steering Committee. March 9, 2017. Retrieved from:

http://www.healthreform.ct.gov/ohri/lib/ohri/sim/steering_committee/2017/3-09/husky_health_-_pcmh+_update_for_sim_steering_committee_march_2017.pdf

¹²¹ Connecticut Department Social Services. “Connecticut HUSKY Health: Patient-Centered Medical Home + (PCMH+) Update”. Presentation to the SIM Steering Committee. March 9, 2017. Retrieved from: http://www.healthreform.ct.gov/ohri/lib/ohri/sim/steering_committee/2017/3-09/husky_health_-_pcmh+_update_for_sim_steering_committee_march_2017.pdf

¹²² State of Connecticut Office of Health Strategy State Innovation Model Program Management Office. Request for Proposals Health Enhancement Community Initiative: Reference Communities. February 6, 2018. Retrieved from: https://biznet.ct.gov/SCP_Documents/Bids/45463/HEC_ReferenceCommunities_RFP_2-6_18_Final.pdf?mc_cid=c92760a8eb&mc_eid=6701488623

¹²³ State of Connecticut Office of the Healthcare Advocate State Innovation Model Program Management Office. Request for Applications (RFA) for Prevention Service Initiative for Healthcare Organizations. March 2, 2018. Retrieved from: https://biznet.ct.gov/SCP_Documents/Bids/45353/PSI_HealthcareOrganization_RFA_1_26_18_FINAL_posted.pdf

¹²⁴ State of Connecticut Office of the Healthcare Advocate State Innovation Model Program Management Office. Request for Applications (RFA) Preventative Service Initiative for Community-based Organizations. February 6, 2018. https://biznet.ct.gov/SCP_Documents/Bids/45454/Prevention_Service_Initiative_CBOs_RFP_Final.pdf

¹²⁵ Toubman, Sheldon. “Plan to ‘Fix’ State Medicaid Program is Flawed”. *Hartford Courant*. April 22, 2017. Retrieved from: <http://www.courant.com/opinion/op-ed/hc-op-toubman-ct-medicaid-costs-0422-20170421-story.html>

¹²⁶ National Association of Medical Directors. “Issue Brief: Value-based Purchasing in Medicare and Medicaid: Areas of Intersection and Opportunities for Future Alignment”. January, 2016.

¹²⁷ IRS Guidance (see Dec 18, 2015 entry): <https://www.irs.gov/charities-non-profits/exempt-organizations-update-archive>

¹²⁸ Enterprise, Catholica Health Association of the United States. *Housing and Community Benefit: What Counts?* January, 2018. Retrieved from: <https://www.chausa.org/docs/default-source/community-benefit/community-benefit-and-housing-final.pdf?sfvrsn=0>