

The Next Nexus: Exemplary Programs That Save Energy and Improve Health

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Contents

About the Authors.....	iii
Acknowledgments.....	iii
Executive Summary	iv
Introduction.....	1
Methodology	2
Award-Winning Programs.....	4
Overall Excellence: Bronx Healthy Buildings Program.....	4
Overall Excellence: Green & Healthy Homes Initiative Asthma Reduction Program...	6
Overall Excellence: Zero Energy Modular Program.....	9
Uplifting Communities: EnergyFIT Philly	11
Innovative: SystemVision	13
Reach: Vermont One Touch.....	15
Trends across Programs.....	17
Services Offered.....	17
Health Versus Energy Focus	18
Documenting Health and Energy Outcomes	19
Communities Served	20
Building Types Served	21
Funding Sources.....	21
Program Administration.....	22
Best Practices and Recommendations	23
Develop Partnerships	23
Stabilize Funding	23
Promote Replicability	23

Evaluate Buildings for Health and Ensure Healthy Outcomes..... 24

Maximize Energy Savings..... 24

Conclusions 25

References..... 26

Appendix A. Nomination Form 29

Appendix B. Expert Advisors/Judges..... 33

Appendix C. Evaluation Rubric 34

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Executive Summary

The buildings we live in have a direct effect on human health. Air pollution, allergens, cold drafts, excessive heat, and pests can all exacerbate a number of health problems including asthma and other respiratory diseases, chronic obstructive pulmonary disorder, cancer, and cognitive function. Some programs aim to mitigate these indoor health risks while also saving energy. ACEEE has created the Health and Energy Linked Programs (HELP) Awards to recognize their exemplary and innovative practices and design.

ACEEE solicited program nominations from across the country and convened a group of public health and energy efficiency experts to advise on methodology and select the winners. We recognized programs based on the following:

- Reach (size of geographic region and number of participants)
- Potential for replication
- Sustainability of funding
- Innovative design and/or implementation strategies
- Participant health outcomes
- Participant energy savings
- Lasting improvements in the targeted sector

We gave out six awards:

- Overall Excellence: Zero Energy Modular (ZEM) Program
- Overall Excellence: Green & Healthy Homes Initiative (GHHI) Asthma Reduction Program
- Overall Excellence: Bronx Healthy Buildings Program
- Innovative: SystemVision™
- Uplifting Communities: EnergyFIT Philly
- Reach: Vermont One Touch

The ZEM Program serves the state of Vermont. It builds zero net energy modular homes using materials that are better for human health than traditional building materials. Based in Baltimore, the GHHI addresses the connection between unhealthy houses and unhealthy occupants through education and energy efficiency. The Bronx Healthy Buildings Program works with tenants and property owners in multifamily buildings to improve residents' energy savings, health, and safety. SystemVision™ builds new homes in North Carolina. The program offers guarantees for heating and cooling energy use and for comfort. EnergyFIT Philly seeks to cut energy costs and improve the quality of home health and safety in Philadelphia. The program includes weatherization, education, and bill payment assistance for enrolled households. Vermont One Touch works with low-income residents throughout the state. One Touch and several state agencies collaborate in facilitating energy upgrades and education as well as health and social services.

We identified several trends among program nominees. While most programs function in a particular city or state, a few exported their model and expanded to multiple locations across the country. Many of the programs also concentrate on the residential sector exclusively or in addition to other sectors. More than half of the nominated programs offer a

home energy audit, home health assessment, or both. Despite publicly stated goals, however, few programs are actually tracking, measuring, or evaluating the health and energy outcomes for program participants.

We also observed various practices that can strengthen existing programs. We recommend that programs seek and secure sustainable and diverse funding sources. Programs should track health and energy use both before and after interventions to determine their progress. Establishing specific health and energy saving objectives at a program's outset can help focus efforts and make the best use of resources. Finally, developing collaborative relationships with state agencies and community-based organizations can yield broader reach, greater access to resources, and expanded program participation.

Introduction

People spend approximately 90% of their time in buildings (EPA 2017). Given this fact, the indoor environment can have a substantial impact on human health (GSA 2017). Inefficient and malfunctioning appliances not only waste energy but may also degrade air quality through incomplete combustion or improper venting. Leaky windows and poor insulation can lead to cold drafts and extreme temperatures in a home during summer and winter months, which can trigger asthma attacks and exacerbate other respiratory illnesses (AAFA 2017; American Lung Association 2018). Poorly sealed building envelopes make it easier for pests and moisture to infiltrate; both can harm respiratory health through mold growth and the introduction of allergens and disease. Energy efficiency can mitigate all of these risks and make homes healthier (Francisco et al. 2016; Leech, Raizenne, and Gusdorf 2004; Wallner et al. 2015; Wilson et al. 2014). Energy efficiency measures can reduce asthma attacks and mitigate other respiratory illness symptoms such as chronic obstructive pulmonary disease (COPD) and bronchitis (Breysse et al. 2011; Breysse et al. 2014; Osman et al. 2010; Rose et al. 2014). Beyond respiratory health, studies have shown that energy efficiency improvements can lead to cardiovascular and mental health benefits as well (Lloyd et al. 2008; Ahrentzen, Erickson, and Fonseca 2016). Figure 1 summarizes these benefits.

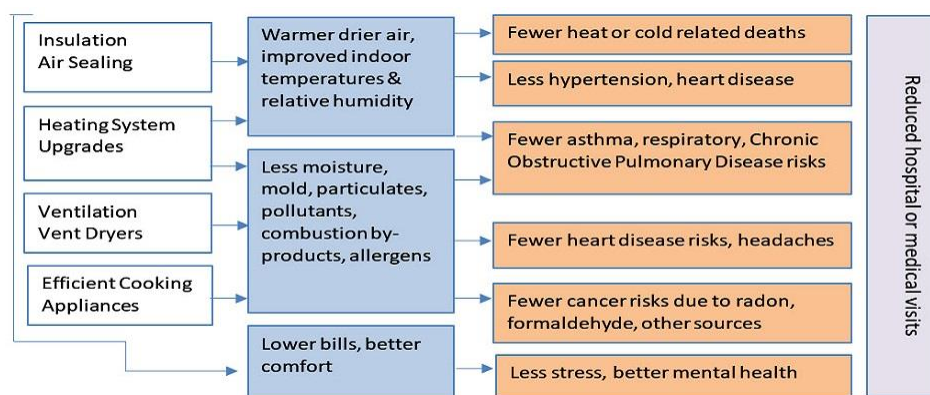


Figure 1. Occupant health benefits of residential energy efficiency. *Source:* E4TheFuture 2016.

In the United States, 53% of the building stock is more than 35 years old (Zhao 2017). In some cases, buildings were constructed with hazardous materials such as lead and asbestos (Mayo Clinic 2016, 2017). Over time, equipment and building systems begin to malfunction, which can expose inhabitants to dangerous health and safety threats. For example, in approximately 4 million US homes, children – who are particularly vulnerable – are being exposed to high levels of lead (CDC 2017; Mayo Clinic 2016).

Energy-efficient buildings perform differently than other buildings. They are tightly sealed (and ventilated) to prevent ambient air pollution and excessive moisture from entering through cracks in attics, basements, windows, and other openings. Because they are well insulated, climate controlled air stays at a temperature that is comfortable for occupants throughout the entire building. Improvements such as these reduce the amount of energy needed to keep occupants comfortable and also lower energy bills. There are also nonenergy benefits (NEBs) associated with these interventions (Hawkins et al. 2016; Noris et al. 2013).

In fact, comfort and health are the most common reasons individuals choose to make their homes more energy efficient (Shelton Group 2017; Sussman and Chikumbo 2017).

Health professionals and community advocates across the country are working to design and implement programs that will improve building function while also reducing health and safety risks. One of the most promising ways to maximize these multiple benefits is to both take a holistic or systems approach – that is, to think of opportunities not in isolation, but rather as interdependent and connected internal and external factors – and apply building science knowledge to improve the way a building meets the needs of its occupants. These programs can be designed to ensure that installers and contractors perform energy efficiency upgrades and use measures to maximize energy savings while also emphasizing the welfare of building occupants. For example, excessive moisture and mold growth can be identified and remediated prior to sealing a building envelope. Buildings also can be treated for pests and have any pest-related debris removed prior to sealing. Additionally, to maintain adequate fresh air levels, emphasis can be placed on properly ventilating and air sealing a building (EPA 2010).

Here, we recognize several programs across the country that are taking more of a systems approach by simultaneously tackling energy waste as well as health and safety in buildings. These exemplary programs are receiving the first ever ACEEE Health and Energy Linked Programs (HELP) Awards. Although many of the programs have similar goals, they vary in their approaches and offerings. Some offer asthma education or upgraded energy-efficient appliances, while others focus on a household's income level, a specific neighborhood, or a certain building type. Regardless of their specific focus, these and many other well-designed programs are leveraging health interventions and energy efficiency to maximize benefits for households, schools, and workplaces across the country.

Methodology

This is the first time ACEEE has conferred the HELP Awards. The project was patterned on previous ACEEE exemplary programs projects (Nowak et al. 2013; Young and Mackres 2013; York, Kushler, and Witte 2005, 2008).

We began by engaging a panel of public health and energy experts to serve both as advisors during the project development phase and judges for the nominated programs. Based on feedback from the advisory panel, ACEEE staff created a nomination form to collect information about eligible programs and an evaluation rubric to evaluate nominated programs (see Appendices A and B).

Any program that targets both human health and energy savings was eligible. We distributed the call for nominations via an email list of more than 20,000 contacts and through a blog post on May 16, 2017 (Hayes 2017). We also worked with several organizational partners and networks to ensure that the call for nominations was shared widely. The nomination period was open for one month.

We received more than 60 nominations from across the United States and abroad. Excluding duplicate and incomplete submissions, ACEEE received information on 49 programs. The

nominated programs served various sectors including single-family homes, multifamily homes, schools, and commercial buildings.

ACEEE reviewed and imported the information from each nomination form directly into an evaluation rubric. With input from the advisory panel, ACEEE identified essential program characteristics such as design, results, evaluation methods, and overall impact. The advisory panel considered the following questions:

- Does the program produce significant improvements in health outcomes for participants?
- Does the program produce significant energy savings for participants?
- Does the program produce lasting improvements in the targeted sector?
- How well does the program demonstrate innovative design and/or implementation techniques that achieve positive results?
- How effective is the program's reach (size of geographic region and number of participants)?
- How sustainable or reliable is the program's funding?

ACEEE grouped all nominations into two tiers: submissions that provided comprehensive, clear, and relevant responses to the questions above (the top tier) and those that did not (the bottom tier). Working with the advisory panel, ACEEE identified the 16 programs from the top tier that best met the nomination criteria. The advisory panel then assessed and scored these programs. The panel selected awardees based on high marks on the scoring rubric (see Appendix C) as well as on consensus achieved via discussion.

Once scores were assigned, ACEEE staff worked with the advisory panel to formulate four categories that described the strengths being recognized in the award-winning exemplary programs:

Overall Excellence. This category is for programs that demonstrate efficacy in most or all criteria in the nomination form. They exhibit a clear focus on both health and energy efficiency.

Uplifting Communities. These programs focus on a specific neighborhood or locality. They demonstrate the ability to bring partners together and affect positive change in a community.

Innovation. Programs in this category exhibit original or unique methods. They demonstrate promising results or positive future impact. They may be pilot projects, single building projects, or projects that operate city- or statewide.

Reach. Programs in this category demonstrate transferability to similar settings in other localities or states, serve a broad demographic or region, or serve a large number of people.

In the following discussion, we highlight not only the award-winning programs but also trends we observed across programs. We also describe practice and design elements included in these successful programs.

Award-Winning Programs

ACEEE's 2018 HELP awards are as follows:

- Overall Excellence: Bronx Healthy Buildings Program
- Overall Excellence: Green & Healthy Homes Initiative (GHHI) Asthma Reduction Program
- Overall Excellence: Zero Energy Modular (ZEM) Program
- Uplifting Communities: EnergyFIT Philly
- Innovative: SystemVision™
- Reach: Vermont One Touch

We describe each of the winning programs in the following sections.

OVERALL EXCELLENCE: BRONX HEALTHY BUILDINGS PROGRAM

Northwest Bronx Community & Clergy Coalition

Program at a Glance	
Location: Bronx, New York	Community: Urban
Sector: Residential (multifamily)	Services: Home health assessment, weatherization, education
Website: www.northwestbronx.org	Contact: Sandra Lobo Executive Director (347) 224-3293 sandra.lobo@northwestbronx.org

Program Description

Established in 2015, the Bronx Healthy Buildings Program serves multifamily households in the Bronx, New York. Using data analysis, program administrators together with their program partners target residential buildings with high incidences of asthma-related emergency room visits and hospital admissions associated with the built environment. The analysis consists of a data overlay that contains information from several sources including asthma patient records from the Montefiore Medical Center's electronic medical records system, heat complaints and housing violations from the NYC Department of Housing Preservation and Development, and building owners on the waitlist for the Northwest Bronx Community and Clergy Coalition (NWBCCC) Weatherization Assistance Program.

Program representatives engage the targeted residents to determine interest in the intervention. They also foster non-adversarial relationships between residents and property owners to ensure collaboration as the program proceeds. Once targeted households express interest, community health workers conduct home visits to perform health and environmental assessments. The health workers give hypoallergenic pillowcases and mattresses to participants with asthma and connect them with smoking cessation resources. They also provide other safety and health measures including smoke and carbon monoxide detectors and mold remediation. To deal with pests, they fix holes, eliminate pest food and water sources, manage garbage, and apply pesticides as necessary. Finally, health workers provide informational materials on indoor air quality (IAQ) hazards, mold, and lead, as well

as on energy saving and water conservation. They also offer training on the social determinants of health, leadership, and community organizing.

This health and safety work goes hand in hand with energy efficiency. Working with NWBCCC's weatherization program, Bronx Healthy Buildings staff members perform energy audits and analyze fuel usage in the targeted households. Based on the findings from the assessments and analysis, they install energy efficiency upgrade measures including low-flow sink and shower fixtures, fluorescent and LED light bulbs, smart power strips, and efficient appliances. The program also hires Bronx-based contractors to implement structural repairs including the following:

- Upgrading electrical fixtures
- Installing radiator vents
- Replacing windows
- Installing insulation of pipes, roofs, and sidewalls
- Performing air sealing

Contractors may also upgrade heating and hot-water systems, both to save energy and to replace unsafe units.

To track the program's effectiveness at reducing utility bills and morbidity related to chronic illnesses such as asthma, administrators conduct three different evaluations before and after work is performed. First, they compare healthcare cost and usage before and after the intervention. Second, they examine self-reported data from participants such as general health, respiratory health, education, the home's condition, and the residents' sense of agency related to their health and environment. Third, they track electricity, oil, natural gas, and water usage.

This program has served hundreds of Bronx residents, helping them save up to 18% and 20% on their gas and electric bills, respectively. The program reports that its integrated pest management components have reduced allergens and other asthma triggers, resulting in reductions in avoidable hospital admissions (91%), avoidable emergency department visits (65%), and avoidable school absenteeism (65%) caused by respiratory illness.¹

The Bronx Healthy Building Program is primarily administered by the NWBCCC. Montefiore Medical Center and the New York City Department of Health and Mental Hygiene are the co-facilitators; other program partners (among the 14 total) are the Emerald Cities Collaborative, New York Lawyers for the Public Interest, and New York City Councilman Ritchie Torres.

The Bronx Healthy Buildings Program is funded by BUILD Challenge – a consortium of organizations that aim to encourage “communities to build meaningful partnerships among hospitals and health systems, community-based organizations, their local health

¹ These results are extracted from information submitted on nomination forms. The data used to determine these outcomes are not publicly available.

department, and other organizations to improve the overall health of local residents” (BUILD Health Challenge 2017). The program also receives funding from Bronx Partners for Healthy Communities and the US Department of Energy (DOE) Weatherization Assistance Program (WAP).

The advisory panel considered this program for several HELP Award categories including Overall Excellence, Uplifting Communities, and Innovation, ultimately selecting Overall Excellence. This program received high marks from the advisory panel for its

- Extensive collaborative relationships
- Community education component
- Integrative approach to health, the built environment, and energy savings

OVERALL EXCELLENCE: GREEN & HEALTHY HOMES INITIATIVE ASTHMA REDUCTION PROGRAM

Green & Healthy Homes Initiative®

Program at a Glance	
Location: Baltimore	Community: Urban
Sector: Residential (single and multifamily homes, nonpublic housing)	Services: Resident education, energy audit, home health and environmental assessment. Housing interventions include weatherization, energy efficiency, lead hazard reduction, healthy home, rehabilitation.
Website: www.greenandhealthyhomes.org/	Contact: Ruth Ann Norton President and CEO (410) 534-6447 ranorton@ghhi.org

Program Description

Created in 2008, the GHHI program model uses a holistic approach to help thousands of households in more than 25 GHHI sites nationwide. GHHI offers participants in either single- or multifamily homes several health and energy services through an integrated process that produces comprehensive interventions.

Based at GHHI’s site in Baltimore, GHHI’s Asthma Reduction Program targets households with children ages 2-14 who have asthma. Participants are referred to GHHI by local community partners and medical providers and are enrolled in the program through GHHI’s client intake coordinator, who confirms client eligibility.

Once enrolled, the program begins with an initial phone interview to gather information for baseline data. This is followed by an in-home assessment consisting of a health assessment by GHHI’s environmental health educator and an environmental assessment and energy audit by GHHI’s environmental assessor. The health assessment is conducted with the client to assess any conditions that are contributing to negative health outcomes and to devise a plan to assist the client with asthma trigger reduction and other objectives. The environmental assessment identifies asthma triggers, household injury risks, and other home-based environmental health hazards such as mold, radon, and asbestos. Following the

assessment and development of a comprehensive plan, program managers coordinate the various braided funding sources and connect participants to appropriate professionals who can perform the suggested work in the home.

GHHI uses energy efficiency and weatherization measures combined with lead hazard reduction, healthy homes (asthma trigger reduction, injury prevention, and other hazard reductions), housing rehabilitation, and resident education interventions to achieve results. Participants receive in-home resident education on asthma management and behavioral change to help reduce asthma triggers and household injury risks, as well as education on energy conservation to help reduce energy consumption and costs. Asthma-specific intervention measures include integrated pest management; mold remediation; mattress and pillow cover installation; carpet removal; kitchen, bathroom, and dryer ventilation; and installation of an air filtering system in the bedrooms of children with asthma.

The average cost of the comprehensive GHHI Asthma Program health and energy intervention is \$5,500–10,000; the program is supported by grants, and there is no cost to participants.

Program data and evaluation staff conduct health surveys with participants both before and after interventions (at 3-, 6-, 9-, and 12-month intervals) to ascertain health, school attendance, work attendance, and other family stability outcomes. GHHI uses WegoWise software for 12-month pre and post utility data analysis to measure energy consumption and any energy cost reductions. GHHI program data show that participating program households are saving an average of \$306 annually on utility bills post-intervention, in addition to medical cost savings.

Post-intervention health outcomes indicate that the participants with asthma are experiencing fewer emergency room visits, hospital admissions, and missed school days, while their parents are experiencing fewer missed workdays. Further, caregivers of children with asthma have reported a 74% reduction in uncontrolled episodes. Program data and evaluation staff have documented a reduction in childhood asthma-related hospitalizations for program participants of 65% and emergency room visits of more than 27%. As part of the Program's Healthy Homes Technical Study, funded by the US Department of Housing and Urban Development (HUD), GHHI is also capturing pre- and post-school attendance data and Medicaid cost data.

With strong support from HUD, the Centers for Disease Control and Prevention (CDC), the DOE, the National Environmental Health Association, and local and national foundations, the GHHI integrated model was launched in 2009 at 14 sites across the country. The Council on Foundations, HUD, CDC, and the White House Office of Recovery commissioned GHHI to facilitate a national leadership role on issues at the intersection of healthy homes, lead hazard reduction, weatherization, and energy efficiency.

GHHI-supported housing programs primarily serve low-income households, emphasizing homes that are occupied by children, pregnant women, and seniors, and are in need of lead hazard and asthma trigger reduction, household injury prevention measures, and weatherization/energy-efficient interventions. GHHI housing programs serve families living in areas with some of the nation's highest rates of negative health quality indicators

such as housing and health code violations, fires, deteriorated housing stock, childhood asthma emergency room visits and hospitalizations, childhood lead poisoning, and household injury. GHHI replaces stand-alone housing intervention programs with an integrated, whole-house approach. GHHI works nationally to advance innovation in the field by creating systems change, documenting cost-benefit analysis, educating policymakers, building organizational capacity at the state and local level, and creating new financing pathways such as pay for success, as well as healthcare and philanthropic investment strategies.

GHHI Baltimore is funded by several organizations including the following:

- HUD Office of Lead Hazard Control and Healthy Homes Lead Hazard Reduction Demonstration and Healthy Homes supplemental grants
- The Baltimore City Community Development Block Grant Program (CDBG)
- Maryland Department of Housing and Community Development WAP and Housing Rehabilitation Programs
- Maryland Public Service Commission Consumer Investment Funds
- Maryland Energy Administration
- Osprey Foundation
- Blaustein Foundation
- Weinberg Foundation

Other GHHI site locations across the country receive intervention-funding support from sources including the following:

- HUD CDBG program
- HUD HOME and Lead Hazard Control and Healthy Homes grants
- DOE WAP
- Health and Human Services' Low-Income Energy Assistance Program
- Local utility energy efficiency program funds
- State and local housing rehabilitation program funds
- Local and national foundation support
- State attorney general funds
- Healthcare provider funding
- Innovative intervention funding such as Medicaid and Children's Health Insurance Program

The advisory panel considered the GHHI for several HELP Award categories including Overall Excellence and Reach, and selected it for Overall Excellence. The advisory panel gave the program high marks for

- Holistic and integrated focus on energy efficiency and human health
- Provision of assistance to low-income households
- Documented data on improved health outcomes
- Monetary savings on participants' household energy bills

OVERALL EXCELLENCE: ZERO ENERGY MODULAR PROGRAM*Vermont Energy Investment Corporation*

Program at a Glance	
Location: Vermont	Community: Urban, suburban, rural
Sector: Residential (single family)	Services: Sale and rental of zero energy modular homes
Website: www.encyvermont.com/zeroenergy	Contact: Phoebe Howe ZEM Program Coordinator (802) 540-7855 phowe@veic.org

Program Description

Since it began in 2013, the ZEM Program has serviced 75 households in Vermont. ZEM builds zero energy modular homes, which produce as much energy as they consume.

The ZEM program is available to any mobile home resident or prospective homebuyer with low to moderate income in Vermont.² Efficiency Vermont – the statewide energy efficiency utility – offers financial incentives for low-income homebuyers. The ZEM Program collaborates with local affordable housing partners to conduct outreach to residents of mobile and manufactured homes as well as to prospective homebuyers of low to moderate income. The program uses word-of-mouth referrals through its network of current and prospective ZEM homeowners. If interested, program administrators connect participants with qualified professionals to initiate the process of moving into a ZEM home. The program has also collaborated with partners to redevelop blighted mobile home parks in the state by supplying them with ZEM rentals.

The new modular homes are built with

- Triple-glazed windows
- High attention to air-sealing details
- Continuous insulation with double-stud walls
- Efficient mechanical systems (e.g., energy-recovery ventilation)
- An air-source heat pump
- A heat pump water heater
- Tier 3 ENERGY STAR® appliances
- LED lighting
- Grid-tied photovoltaic (PV) solar cells with an optional backup battery

Additionally, as of 2018, more ZEM homes will be incorporating battery storage in partnership with Green Mountain Power, which receives the added benefit of load shifting. Over the past four years, the ZEM Program has saved \$486,000 ratepayer dollars on heat

² This program defines low income as 50–80% of area median income (AMI) and moderate income as 80–120% AMI

and electricity, with an estimated savings of 8,683 kWh (kilowatt-hours) and 697 gallons of propane annually per home. There are no utility costs for ZEM homeowners, aside from service fees to be connected to the grid.

Efficiency Vermont engineering staff uses energy modeling to calculate estimated energy savings. The modeling compares ZEM to a baseline HUD-code manufactured home. To back up the modeling data, program administrators also analyze actual utility data to confirm that these homes are truly reaching zero energy.

By using low volatile organic compound (VOC) materials and avoiding products containing added urea and formaldehyde, the program reduces off-gassing and improves IAQ. Enhancing indoor environmental quality gives program participants a healthier home environment. The program's health benefits include Universal Design and Americans with Disabilities Act accessible designs at no (or negligible) added cost. Ensuring that all homes meet current health and safety codes is a priority.

Although the ZEM program does not routinely track health outcomes, in 2016 it collaborated with the University of Vermont to conduct a qualitative survey of ZEM homeowners who had been in their home at least a year. They found that 81% of those surveyed noted improved air quality in their ZEM home relative to their previous home. They also found that 56% of those surveyed felt that the air quality in their ZEM home positively affected their health, citing easier breathing for individuals experiencing symptoms related to allergies, sleep apnea, and COPD.

The average cost of a ZEM home varies based on the home and site. Typical pricing for a two bedroom, two bath home in a mobile home or co-op park would be \$115,000. This includes the foundation, solar, delivery, and sales tax. Any other costs can be rolled into the mortgage. No down payment is required. A typical mortgage is approximately \$500 per month. For those renting a ZEM home, monthly payments are \$775-1,000 for two or three bedroom homes (utilities included). Efficiency Vermont offers an \$8,500 low-income ZEM incentive, a \$1/watt low-income solar incentive from the Vermont Low Income Trust for Electricity (VLITE), and a \$35,000 Champlain Housing Trust deferred loan. These loans are offered at 0% interest with payments deferred until the sale, transfer, or refinancing of the property. Efficiency Vermont provides the same incentive for affordable housing developers who are building ZEM rentals. There are no incentives in the form of rental assistance.

The ZEM Program is a joint initiative between Vermod, a company that designs and builds ZEM homes in Vermont; the Vermont Energy Investment Corporation, Efficiency Vermont, and the Vermont Housing and Conservation Board (VHCB). Efficiency Vermont funds the ZEM Program's day-to-day operations, while VHCB provides program-staffing support. Philanthropic support comes from the High Meadows Fund, which funded the Modular Housing Innovation Project and the first phase of the ZEM Program. Although not specifically created for the ZEM Program, homeowners also have access to additional subsidized financing and incentives from VLITE, the Vermont Housing Finance Agency, USDA Rural Development, and Efficiency Vermont.

The advisory panel considered this program for multiple HELP Award categories including Overall Excellence and Innovation. They selected Overall Excellence. The program received high marks from the panel for

- Clientele in the non-urban, low-income, modular housing market
- Affordability via financial assistance for prospective participants
- Energy efficiency systems leading to a zero energy home
- Coupling occupant health with low VOC building materials, filtration, and ventilation to improve IAQ

UPLIFTING COMMUNITIES: ENERGYFIT PHILLY

Energy Coordinating Agency

Program at a Glance	
Location: Philadelphia	Community: Urban
Sector: Residential (single family)	Services: Home health assessment, weatherization, education
Website: www.ecasavesenergy.org/energyfit	Contact: Steve Luxton Executive Director (215) 609-1423 stevel@ecasavesenergy.org

Program Description

Established in 2013, EnergyFIT Philly operated over a three-year period and offered participants structural improvements to homes such as roof repair, fixing problems that make homes eligible for state weatherization programs, and utility-funded energy efficiency programs. During its three years of operation, the program served more than 70 households.

The program used word-of-mouth referrals through its network of current and prospective homeowners, and program administrators collaborated with local contractors and government agencies to target the appropriate neighborhoods. Because EnergyFIT Philly attempted to address these problems as a system – working with an entire neighborhood block as opposed to individual homes – low-income residents in single-family housing applied to the program as a group. An independent advisory committee selected winning neighborhood cohorts to enter the program based on criteria such as the overall physical condition of the homes, the number of low-income households in the group, the percentage of participating homes on the block, and the completeness of the cohort application. If accepted, program administrators connected participants to a qualified Building Performance Institute building analyst or home energy professional quality-control inspector to initiate the structural repair process.

The energy auditor’s work included identifying all health and safety issues and issuing work orders for needed repairs to solve them; conducting a blower-door test of each home’s air exchange rate with the outdoors; and scoping out all weatherization activities needed, including for doors and windows, air sealing, insulation, and heater tune-up or replacement. The audit always included carbon monoxide (CO) testing and usually

included activating various CO-producing appliances in a worst-case scenario configuration and testing CO levels.

Program contractors employed several interventions including

- Open cell spray foam
- Cool roof coatings
- Fuel-switching high-efficiency heating and water heating equipment
- Insulation
- Repair of leaking pipes
- Masonry repair to restore the building envelope's integrity
- Elimination of gas leaks
- Repair of carbon monoxide leaks
- Elimination of mold and mildew sources
- Restoration of proper ventilation
- Pest management services

Repaired or replaced roofs received a cool, reflective elastomeric coating designed to reduce solar heat gain during the summer. Participants also received LED lighting, energy education services, and bill payment application assistance. The program was fully grant-funded, and entailed no cost to participants.

Energy benefits were tracked using utility data (with participant permission) over the course of the year and were weather-normalized by an Energy Coordinating Agency (ECA) staff analyst. EnergyFIT Philly serviced dozens of households and saved an average of 35.5% and 22% on natural gas and electricity bills, respectively. The program also documented a 21% reduction in indoor humidity among participating households.

Improved IAQ and indoor environmental quality also resulted in demonstrated reductions in triggers of chronic disease, especially chronic pulmonary conditions, for program participants. ECA installs HOBO™ data loggers in each home, tracking indoor temperature and humidity data. High relative humidity is a critical indicator for mold growth and pest populations, which are major drivers of poor IAQ, which can affect residents with chronic respiratory illnesses. The actual health data of individual participants was not tracked, measured, or evaluated as ECA did not have funding to engage a qualified health organization in that work. Other health benefits included lowered second-floor temperature through the summer due to the cool roof application, which decreases heat-related health risks such as dehydration and heat stroke.

EnergyFIT Philly was facilitated by ECA, a regional nonprofit organization dedicated to assisting low-income households with energy efficiency solutions. Among the program's several funders were Philadelphia's Housing Trust Fund, private foundation grants, the DOE WAP, and utility low-income conservation program funding.

The advisory panel considered this program for several HELP Award categories including Overall Excellence, Innovation, and Uplifting Communities. They gave it the Uplifting Communities award. The program received high marks for

- Forward-thinking approach to addressing upstream structural problems in homes
- Focus on holistic environmental and human health
- Expansive work with entire communities as opposed to individual homes

INNOVATIVE: SYSTEMVISION™

Advanced Energy

Program at a Glance	
Location: North Carolina	Community: Urban, suburban, rural
Sector: Residential (single- and multifamily)	Services: Appliances and equipment provision, home construction consultation, weatherization
Website: www.systemvision.org	Contact: Maria Mauceri Program Manager (919) 857-9053 mmauceri@advancedenergy.org

Program Description

Established in 2001, SystemVision™ builds healthy, safe, comfortable, durable, energy-efficient, and affordable homes for low-income families in North Carolina. The program targets low-income single and small multifamily homes (e.g., townhomes, duplexes, or quadplexes).

Advanced Energy (AE) trains and mentors nonprofit builders (e.g., contractors and subcontractors) to work on new construction to meet SystemVision standards. Training and mentoring may include classroom-style and/or field training, depending on the need. SystemVision also engages with contractors via ongoing one-on-one technical support (e.g., emails, phone calls, and site visits) as needed. The nonprofit builders get involved with the program through the North Carolina Housing Finance Agency (NCHFA) loan pool programs. NCHFA offers loan pool participants a reimbursement if they choose to certify their homes as SystemVision. Homeowners must meet the income requirements (below 80% AMI) to receive NCHFA funds. In some cases, a nonprofit developer will put out an RFP and a for-profit builder will win the proposal; in such cases, AE works directly with the for-profit builder.

SystemVision program administrators do not market the program, but engage with the nonprofit developers or with for-profit builders hired by nonprofits. Participants are introduced to the program through the NCHFA's loan pool. Prospective participants may also self-refer to the program.

All participating contractors are trained in how to apply energy-efficient construction methods. AE's network of energy raters conduct performance and diagnostic testing on homes. The program saves energy and lowers utility bills through interventions such as sealing the building envelope and ducts, and increasing the efficiency of heating, ventilation, and air-conditioning (HVAC) systems.

SystemVision staff members perform a field inspection at each home to ensure that it complies with program standards. Each inspection occurs after framing and insulation are complete (but before drywall). Just before closing, the house then receives an inspection in which staff members ensure that all other items are completed. They then conclude with performance tests such as blower door, duct blaster, ventilation, and pressure balancing.

Before the builders begin construction, AE reviews the plans and HVAC load calculation to confirm compliance. Program administrators estimate energy use once construction is complete. If the energy usage surpasses estimated levels or room temperatures are not consistent with the thermostat settings, the program reimburses the household for the overage in their energy costs and assists with troubleshooting the root cause of the problem. The program also offers participants two-year guarantees for comfort as well as heating and cooling energy use.

SystemVision does not currently track health outcomes but does include measures aimed at improving the health and durability of the home. These measures include installing whole-house filtered ventilation systems and moisture management, which reduces triggers related to respiratory illness.

To date, SystemVision has served more than 5,000 homes. The program is free to homeowners, but the builder pays a fee to AE for the certification. If the homeowner meets NCHFA's criteria, the builder receives reimbursement funds that cover AE's fee as well as the cost of installing the additional measures required by the program standards. NCHFA offers mortgage options to loan pool members, who then have the opportunity to participate in SystemVision. This loan pool includes an option for down payment assistance for low-income households. Program staff collaborated with the local utility company to collect energy and billing data, but had not finished analyzing this information before this report was published.

AE administers this voluntary program in partnership with NCHFA, which is responsible for the mortgages. NCHFA incentivizes builders to participate in SystemVision provided they are already using NCHFA's low-income loan program.

The advisory panel considered SystemVision for several HELP Award categories including Overall Excellence, Reach, and Innovation, and selected it for Innovation. The program received high marks for

- Longevity
- Dual focus on health and energy efficiency
- Holistic attention to the home and its occupants
- Expansive state coverage
- Proactive interventions

REACH: VERMONT ONE TOUCH*One Touch*

Program at a Glance	
Location: Vermont	Community: Urban, suburban, rural
Sector: Residential (single family)	Services: Education, home health assessment, lead abatement, weatherization
Website: www.dcf.vermont.gov/oeo	Contact: Geoff Wilcox State Weatherization Program Administrator (802) 241-0943 geoff.wilcox@vermont.gov

Program Description

Established in 2014, the Vermont One Touch Program is a joint initiative between One Touch, the Vermont Office of Economic Opportunity, and the State of Vermont's Weatherization program. The program seeks to provide low-income households with energy upgrades as well as health and social services. One Touch is the first program in the nation to offer home health assessments in all state-led weatherization projects.

Households are automatically enrolled in One Touch if they qualify for any of the other state housing or energy assistance programs such as weatherization or lead abatement. All such state programs have varying income qualification guidelines. To streamline services, One Touch and the state government use a common referral system. A One Touch program administrator or collaborating partner gives participants a referral to the necessary services via One Touch's electronic referral system. A home visitor for each program is responsible for the One Touch checkup and any applicable referrals.

Program participants first receive the One Touch Check Up, which is an energy and health assessment performed by a program energy coach. These coaches spend time visiting the household to assess household demographics including ages of the residents, whether or not any residents are currently pregnant, and whether any have pre-existing chronic health conditions. The program also assesses asthma triggers, lead hazards, the functionality of CO and smoke detectors, and fall hazard risks.

General health screening includes asthma, lead, developmental issues, mobility issues, fall hazards, smoking cessation, parenting concerns, and health insurance navigation. The program offers myriad services including energy audits, lead abatement, and installation of ramps and grab-bars to prevent trips and falls. Other interventions include weatherization measures such as air sealing, insulation, heating system repairs or replacements; carbon monoxide testing; combustion safety testing; and ventilation upgrades. Five local Vermont weatherization subgrantees perform the audits and analyses, and then complete the energy work. All clients receiving the One Touch referral also receive energy efficiency upgrades. The program's energy coach provides participants with information on how to reduce energy use.

In addition, program participants automatically receive referrals to education programs on lead, tobacco smoking, health insurance acquisition, and asthma. The program also offers participants access to the Vermont Quit Line, a state-run smoking cessation service for residents of all income levels, and the Lead Paint Program, a lead education and abatement program.

One Touch is free for program participants. The program is funded by the Vermont Weatherization Home Assistance Program Fund, which is funded by a tax on heating fuels sold in the state. One Touch has served more than 1,300 Vermonters, saving single-family households an average of 15% and all building types 18% on energy bills. Program administrators use a web-based Weatherization Data Management system called *Hancock Energy Software* to track, measure, and evaluate energy outcomes. The program had not been tracking specific health benefits at the time this report was published, but has recently begun groundwork to add this component.

The primary partners are the state of Vermont and the One Touch program, which is directed by Tohn Environmental Strategies. Vermont One Touch's health partners include

- Vermont Health Department
- Children's Integrated Services
- Area agencies on aging
- Vermont Center for Independent Living
- University of Vermont Medical Center
- Burlington Women, Infants, and Children (WIC) Program

Energy partners include

- Burlington Electric
- Efficiency Vermont
- Capstone
- Community Action of Southwest Vermont
- Champlain Valley Office of Economic Opportunity
- Northeast Employment & Training Organization
- Southeastern Vermont Community Action
- Vermont Gas

Housing partners include

- Burlington Housing & Lead
- The Community and Economic Development Office
- City of Burlington
- Vermont Housing & Conservation Board
- Burlington City Code Enforcement
- Central Vermont Community Land Trust
- COVER Home Repair, Inc.
- NeighborWorks of Western Vermont
- Rural Edge

- Windham Windsor Housing Trust
- Winooski City Code Enforcement

The bulk (85%) of Vermont One Touch's funding comes from the state of Vermont's weatherization program. The DOE supplies the remaining 15% of the program budget.

The advisory panel considered this program for multiple HELP Award categories including Innovation and Reach, and chose the latter. The program received high marks for

- Integrative and collaborative relationships with government and nonprofit entities
- Use of energy coaches
- Simplicity of referral mechanism
- Provision of health education

Trends across Programs

In addition to identifying exemplary programs, the nomination process allowed us to collect information on common practices across programs. These trends reveal frequently provided services, common funding sources, types of participants and communities, building sectors, and energy and health outcomes.

SERVICES OFFERED

While each program is unique, they offer many common services. Of the nominated programs, more than half (28 of the 49, or 57%) offer some form of pre-evaluation of current building performance such as an energy audit and/or a home health assessment. These initial evaluations typically collect information about energy use as well as health and safety concerns. Conservation Consultants, Inc.'s (CCI) Grassroots Green Homes (GGH) in Pittsburgh, for example, tests for levels of lead, mold, radon, and so on prior to any other work being done on a home. Once home repairs are completed, GGH repeats the testing to assess improvements.

Some programs offer a comprehensive support package, while others provide a specific, singular type of assistance. Comprehensive programs for an existing building include pre- and post-assessments of building performance, funding for building upgrades, free energy-efficient appliances, and labor for installation of energy, health, and safety measures, as well as follow-up testing related to energy use, air quality, or other factors. GGH is an example of a comprehensive program and offers the following measures:

- A home health assessment
- Thermometers
- Hygrometers
- Refrigerator coil cleaning
- Door sweeps
- Weatherstripping
- Air sealing
- Insulation
- Testing and abatement interventions for mold, lead, and radon

- Education
- Training led by an energy coach

Some programs focus on narrower programmatic assistance, offering only educational workshops. For example, the Council of the Southern Mountains in West Virginia hosts an interactive website and mobile app as a stand-alone tool to help homeowners identify opportunities to reduce energy waste and improve health and safety in their homes.

Table 1 lists 10 nominated programs and their services as described in the nominations submitted to ACEEE.

Table 1. Sample services by program

Program	Locations served	Services
Energy Savings Plus	Des Moines, Iowa	Appliances/equipment provision, energy audit, weatherization
Energy Upgrade California Home Upgrade	Southern California	Energy audit, financing, weatherization
Grassroots Green Homes	Pittsburgh	Appliances/equipment provision, education, energy audit, health assessment, weatherization
Healthy Homes Initiative	Rutland County, Vermont	Appliances/equipment provision, energy audit, home health assessment, weatherization
Home Energy Solutions - Income Eligible	Connecticut	Appliances/equipment provision, energy audit, financing, weatherization
Mass Save Home Energy Services	Massachusetts	Education, energy audit, financing, weatherization
New Jersey Comfort Partners Program	New Jersey	Energy audit, structural repair, weatherization
The Knoxville Extreme Energy Makeover Program	Knoxville	Education, energy audit, weatherization
Two Shades of Green	New York City	Education, financing, structural repairs, technical assistance
WarmChoice®	Several Ohio counties	Appliances/equipment provision, weatherization

HEALTH VERSUS ENERGY FOCUS

Well-designed comprehensive programs can simultaneously save energy and improve health. Examples include installing insulation to regulate indoor temperatures and improve occupant comfort (DOE 2017a), adding weather stripping to a door connecting a home to a garage to reduce exposure to hazardous vehicle emissions (DOE 2017c), and sealing holes in a building's facade to limit cold air drafts and disease-carrying pests such as rodents or insects (EPA 2005).

The Bronx Healthy Buildings Program and GHHI are examples of programs that put a strong emphasis on both health and energy. Each program has positive, documented results of improved health and reduced energy waste. Both programs target residential housing — focusing on homes with children at high risk for asthmatic episodes — and offer mold, lead, and pest abatement as well as education via a program coach or advocate.

Likewise, CCI's GGH program measures several health indicators including radon, particulate matter, mold, and lead as part of an initial home inspection. This program uses these measurements to determine which energy efficiency measures to employ. Post-intervention, staff members measure these same indicators to determine whether the actions taken improved participants' living conditions.

Other programs emphasize either improved health or energy savings as their primary goal. In these cases, programs often highlight other positive outcomes as co-benefits rather than core targets. For example, the American Lung Association's Master Home Environmentalist© program in Washington State primarily emphasizes respiratory wellness. To achieve this, it addresses environmental health hazards such as mold, mildew, dust mites, and ventilation issues.

Another approach involves targeting participants who will most benefit based on health diagnoses. The Healthy Home Program at Children's Mercy in Kansas City targets patients who come to the hospital's emergency room or after an admission due to a respiratory event such as an asthma attack. The primary goal of the program is to improve the physical well-being of their patients. The energy audits, recommendations, and implemented measures are a co-benefit for this and similar programs.

Conversely, initiatives like the Knoxville Extreme Energy Makeover (KEEM) and WarmChoice® in Ohio are primarily home weatherization assistance programs (WAPs). KEEM is designed to increase comfort and energy efficiency while reducing costs and health and safety risks for participating households. As with most traditional WAPs, KEEM's focus is saving energy and lowering utility bills (benefits.gov 2018). Any positive health outcomes as result of the interventions are co-benefits or nonenergy benefits.

The same is true of WarmChoice. This utility program uses a number of strategies to maximize energy savings including targeting high-energy-use households and offering building envelope improvements, duct repair, and repair or replacement of defective or inoperable heating systems.

DOCUMENTING HEALTH AND ENERGY OUTCOMES

Measuring health indicators and energy savings is important to demonstrate that a program is achieving its intended results. As a part of the nomination process, we requested information on the health benefits and energy savings achieved by programs. Of the nominated programs, 28 (57%) recorded some degree of energy outcomes and 10 (20%) tracked health outcomes, but only 2 (4%) provided both energy and health data. So, while many programs claimed to have outcomes data, most did not supply it; several programs noted that the evaluation process was still ongoing.

Only two programs – the Bronx Healthy Buildings Program and GHHI – submitted supporting documentation for their respective health outcomes. Both programs reported reductions in hospital admissions, emergency room visits, and days of school and/or work missed due to respiratory illness.

Of the 28 programs that reported annual energy savings, 21 offered at least basic evidence. Electricity savings were the most common savings reported, followed by natural gas. We could not make direct, accurate comparisons across programs as several submissions had incompatible measurement units, targeted different building types, and so on.

COMMUNITIES SERVED

Approximately half of the nominated programs are located in the northeast United States, with a concentration of programs in Connecticut, Rhode Island, and Vermont. While some nominated programs focused their efforts at the national (12%) or state level (35%), others focused on a specific city (22%) or neighborhood (4%). Most nominated programs (61%) operate in a broader range of communities including urban, suburban, and rural, while 22% serve only urban areas. The remaining 17% operate in locations such as greater metropolitan areas that include a city and nearby suburbs, but do not extend to rural areas. No program identified rural areas as its only or primary clientele. Figure 2 shows the locations of all programs nominated for HELP Awards.

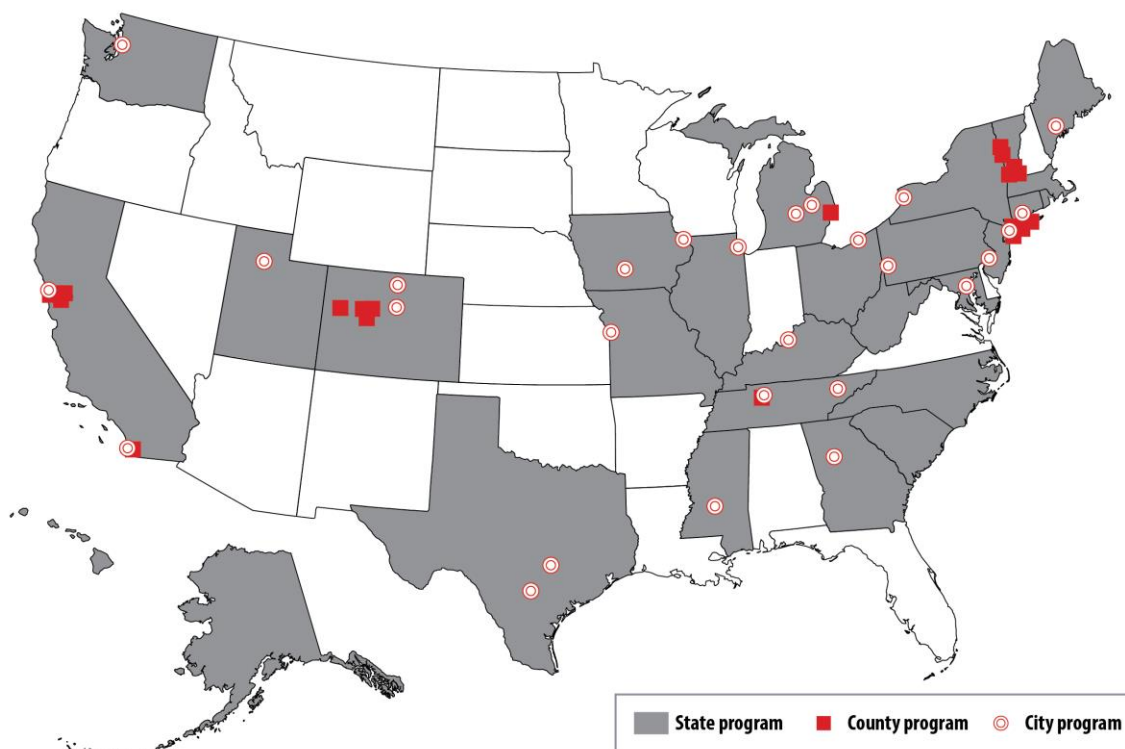


Figure 2. Locations of nominated programs

Some programs focus on a specific demographic. For example, approximately one-third (37%) target low-income populations. Other programs focus on senior citizens, families in general, or families living with specific health conditions such as asthma. The Healthy Home Program at Children's Mercy in Kansas City, Missouri, for example, screens children visiting hospital emergency rooms or admitted to the hospital to identify those with a high risk of respiratory illness. Program administrators then refer the patient to the hospital's internal Environmental Health program, where a physician prescribes a home health assessment.

BUILDING TYPES SERVED

Programs often focus on specific building types or sectors. For example, Vermont's ZEM Program focuses on newly constructed modular single-family homes, while Iowa's Energy Savings Plus Health Program concentrates on Des Moines Public School (DMPS) system facilities. Most programs (94%) target existing buildings (with interventions such as retrofits) rather than constructing new buildings. Only three programs addressed new construction in some way.

Although we did not restrict program nominations based on building type, approximately 80% of all nominated programs serve residential buildings exclusively or in addition to other types. Of the programs working in the residential space, most served both single- and multifamily housing, rather than one or the other.

FUNDING SOURCES

Of the 49 nominated programs, 40 submitted their funding sources. Of these, 18 (45%) received funding from a single entity, while 22 (55%) were supported by more than one organization. Federal, state, and local government agencies were the most common program funders, followed by electric and gas utility companies. Government funded all or part of 24 programs (60%), while utilities funded all or part of 22 programs (55%). The next largest funder group was private investors, who funded 16 programs (40%). These contributors included private individuals, banks, and corporate sponsors. Figures 3–5 offer various views of the funding sources.

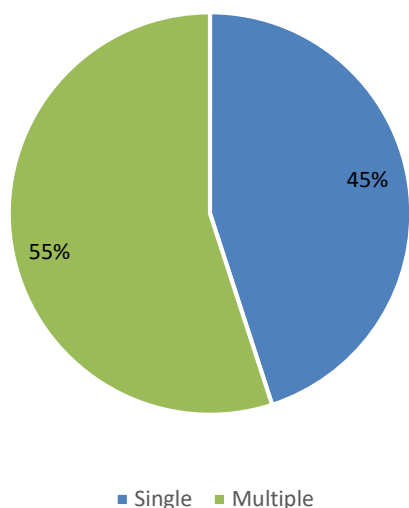


Figure 3. Programs with single vs. multiple funding sources

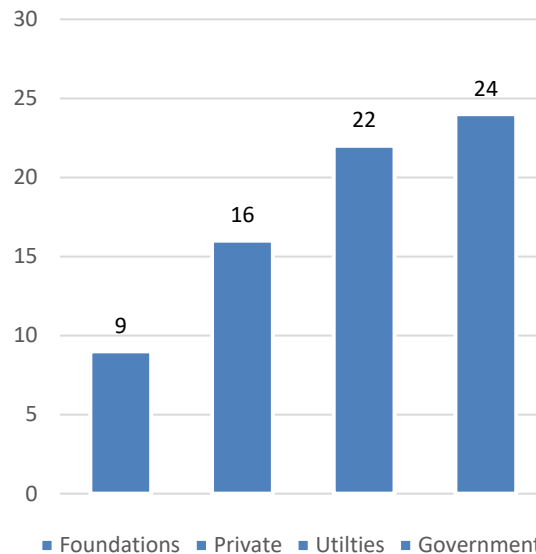


Figure 4. Number of programs funded by funding type

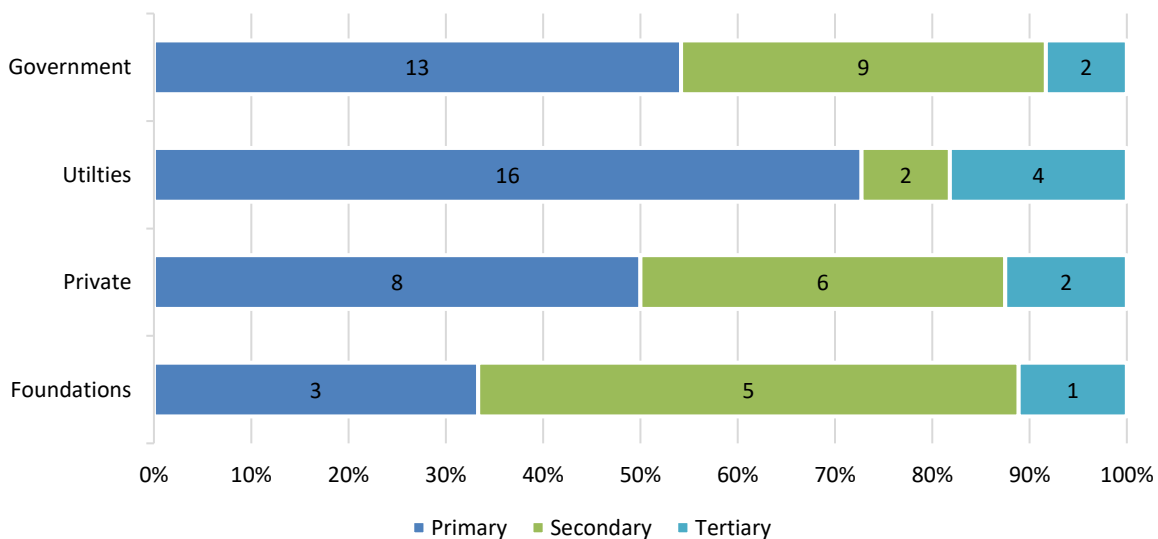


Figure 5. Sector distribution of funders

PROGRAM ADMINISTRATION

Nonprofits administer the largest portion (47%) of nominated programs, running 20 programs (41%) exclusively and co-leading 3 (6%) with other organizations. These nonprofits focus on areas such as energy efficiency, environmental justice, sustainability, healthcare, and home health and safety. Electric and/or gas utility companies also administer some of the nominated programs, and governments administer 10 (2 federal, 5 state, and 3 city).

Best Practices and Recommendations

Many of the common practices discussed in this report could be incorporated into existing programs or considered during a new program's design phase. The DOE's Better Buildings Residential Program Solution Center has extensive resources for residential energy efficiency program design and implementation based on experiences across the country (DOE 2017b). We now discuss recommendations for improving the effectiveness of existing programs.

DEVELOP PARTNERSHIPS

Developing partnerships with organizations that provide services or work within targeted communities can help expand an existing program's reach. Partnerships can also help ensure that the program meets the needs of the community it is trying to serve. Further, partners can offer additional services that might not be available through a program. The Vermont One Touch and the Bronx Healthy Buildings Program are examples of programs that leverage several collaborative relationships with state agencies, hospitals, and other local organizations to serve program participants more comprehensively.

STABILIZE FUNDING

While a single funding source may be easier to manage, having diverse funders can help stabilize a program's financial security and provide an opportunity to expand its services. If a program has only one financial sponsor and that contributor suspends support, the program may need to shut down. EnergyFIT Philly and the ZEM Program are good examples of programs that have incorporated multiple funding sources. Programs such as Community Energy Services Corporation's Home Repair Program in the San Francisco Bay Area has demonstrated sustained funding and service for 15 years.

PROMOTE REPLICABILITY

Easily replicated programs have many benefits including that they can be deployed to serve larger numbers of people in different locations and markets. Proven models can also lower upfront costs and decrease risks associated with the trial-and-error typical of developing a new enterprise. In addition to Vermont, the One Touch Program has spread to several cities and states such as Nebraska, New Hampshire, Minnesota, North Carolina, and Massachusetts (One Touch 2014). The GHHI, which began in Baltimore, is now in 15 states and continuing to grow (GHHI 2017). Notable design elements common to both programs include a direct emphasis on residential housing, collaborative relationships with local government agencies and organizations, and financial and administrative support from the state and federal governments.

Programs that move to new areas are not always carbon copies of the original. A program's foundation and philosophy may remain but be supplemented with unique components to better utilize available resources and serve a different demographic. GHHI, for example, has programs in Chicago and San Antonio that collaborate with local universities, whereas the GHHI programs in Lansing, Michigan, and Dubuque, Iowa, do not currently have such partnerships.

EVALUATE BUILDINGS FOR HEALTH AND ENSURE HEALTHY OUTCOMES

Many traditional weatherization and home retrofit programs offer participants pre- and/or post-intervention assessments. Doing assessments before any work occurs helps identify the greatest opportunities for improvement. The ability to compare outcomes to baselines for participants across a program also helps administrators and funders ensure that programs are achieving intended outcomes and identify ways to make programs better.

The HEAT Squad program in Vermont, for example, has pre-approved home performance contractors execute audits that investigate the safety of appliances and electrical wiring; gas and CO leaks; the airtightness of windows, doors, and ductwork; and the condition of heating and ventilation systems. The auditor then sits down with the homeowner for a personal consultation to discuss recommendations based on the assessment results.

To ensure that energy efficiency measures improve well-being, health outcomes should be clearly incorporated into a program's primary objectives. There are many ways to do this. Pre- and post-surveys or interviews could be conducted with program participants regarding their health status over the course of the intervention. Several programs incorporate health and safety into a building's initial evaluation. GHHI³ and the Council of the Southern Mountains ask various questions to probe these issues as part of an initial home evaluation. Other initiatives, such as the Healthy Homes program at Children's Mercy Hospital in Kansas City, target participants with specific health conditions that can be improved by increasing a home's energy efficiency. Healthy Homes, for example, evaluates IAQ, indoor moisture, allergen levels, the storage and use of household products, safety, and injury risks. It also includes recommendations on how to improve the health of the home and its occupants based on the assessment outcome.

Once the interventions have been completed, program administrators should initiate evaluations to assess their program's effectiveness. A process for measuring, evaluating, and verifying outcomes should be incorporated into program design. Such efforts were infrequent among HELP Award nominees.

MAXIMIZE ENERGY SAVINGS

Although tracking health outcomes was atypical for these programs, methods for tracking and reporting energy savings are well established.⁴ Existing programs currently provide services related to every type of building energy use. Program administrators looking to ensure that energy savings are maximized should consider a comprehensive set of measures. These measures might include addressing an inefficient or malfunctioning building envelope, window or door replacement, HVAC system (including equipment and distribution system), water heating system, lighting, and a range of plug loads that are customized for household need and building conditions. Such measures decrease energy waste, save participants money by lowering their utility bills, and reduce energy burdens.

³ See Norton and Brown (2014) for the GHHI initial evaluation.

⁴ For more information on tracking energy savings, see www4.eere.energy.gov/seeaction/evaluation-measurement-and-verification-resource-portal.

Conclusions

Programs across the United States are offering a variety of services and resources that address both health and energy use in buildings. Such programs can be tailored to serve specific neighborhoods or adaptable across the entire nation. Most of the programs nominated for the HELP Awards operate in an individual city or state and typically focus on the residential sector. Although there is considerable overlap, services nonetheless vary greatly, ranging from providing new appliances and education programs to new home construction and financing.

Some programs leverage a range of community partners and funders, locally and nationally, which lets them reach large numbers of participants and expand the services they provide. Other programs stand out because of their innovative designs, innate ability to reach broad audiences, and documented impacts on participants and communities.

In addition to better understanding how programs are affecting the public's health, we suggest further research and emphasis on evaluation, measurement, and verification of health outcomes. Better tracking can give us a deeper understanding of the influence these programs are having on participants' health and welfare. Finally, to help improve existing programs and design new ones, we recommend further efforts to share experiences, successes, and lessons learned.

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Appendix A. Nomination Form

The following nomination form solicited responses to 14 mandatory questions and 14 additional questions. Mandatory questions included contact and identifying information and basic questions about the program.

Person Submitting the Nomination

- 1) Your name:
 - 2) Your phone number:
 - 3) Your email address:
-

Basic Program Information

- 4) What is the name of the program?
 - 5) What is the program's web address?
 - 6) Program contact information (name, phone number, and email address):
 - 7) What region does the program serve? Please list localities and/or states.
 - 8) What is the program sector? (e.g., single/multifamily homes, schools, offices)
 - 9) Briefly describe the program.
 - 10) Please explain why the program is exemplary (reason for nomination).
 - 11) How does the program improve the health of participants?
 - 12) How does the program improve energy efficiency? What technologies and /end uses are targeted?
 - 13) Are evaluation data on program impacts (e.g., health, energy) available?
 - () Yes
 - () No
 - 14) Briefly describe the program's evaluation methods and results. If evaluation data are available, please cut and paste the information below. You may also cut and paste a link (URL) to the information.
-

Program Structure

15) List the lead administrating organizations or companies.

16) Number of participants served to date:

1-25

25-100

100-300

300+

Unknown

17) How does someone get referred to/involvement in the program?

18) Is there a building assessment?

Yes

No

Unknown

19) Who performs the assessment?

20) Who is responsible for finding service providers to do the recommended home improvements?

Program administrators connect participants to qualified professionals who perform the home improvements.

Program participants must find someone to do the work on their own.

Other (write in) (required):

Program Cost and Funding

21) Funders:

22) What is the approximate annual budget?

23) What are the total administrative program costs?

Program Health Outcomes

24) Does the program include documented and verified health outcomes?

Yes

No

25) What are the specific health outcomes achieved by the program?

26) What typical health conditions do program participants experience as a likely result of their household environment? (Check all that apply.)

Asthma

Allergies

Cardiovascular disease

Conjunctival (eye) irritation

Rashes

Fever, chills

Tachycardia (rapid heartbeat, sometimes leading to shortness of breath)

Headache or dizziness

Lethargy, fatigue, malaise

Nausea, vomiting, anorexia

Myalgia (muscle pain)

Hearing loss

Rhinitis, nasal congestion (inflammation of the nose, runny nose)

Epistaxis (nosebleeds)

Dyspnea (difficult or painful breathing)

Pharyngitis (sore throat, cough)

Wheezing, worsening asthma

Severe lung disease

Coughing

- Sneezing
 - Watery eyes
 - Fatigue
 - Dizziness
 - Headaches
 - Upper respiratory congestion
 - Other (write in) (required):
 - None of the above
 - Unknown
-

Program Energy Savings

27) Does the program include documented and verified energy savings?

- Yes
- No

28) Of the energy savings attributed to this program:

How much electricity is saved per year?

How much gas is saved per year?

How much water is saved per year?

Thank you!

Appendix B. Expert Advisors/Judges

Lisanne Brown works for the Louisiana Public Health Institute (LPHI) and has an MPH and PhD in epidemiology from Tulane School of Public Health and Tropical Medicine. She is currently the director of evaluation at LPHI and oversees the evaluation of reproductive health and tobacco cessation programs. Dr. Brown has more than 20 years of experience conducting applied public health research.

Barbara Gottlieb is the director of Environment and Health at Physicians for Social Responsibility (PSR), where she guides the organization's national work on climate, energy, and air quality. Prior to serving as program director, she served as deputy director in charge of PSR's program on the health threats of coal combustion. She has also been lead author or coauthor of several major PSR reports on the health effects of fossil fuels.

Mark James is the founder and president of Urban Green, LLC. He has 18 years of experience in affordable housing and sustainable development, specializing in affordable housing preservation, multilayered housing finance, low-income housing tax credits, bond financing, for-sale housing, and sustainable energy solutions including solar, geothermal, and fuel cell systems applications.

Kiyuri Naicker is an epidemiologist and researcher at the University of Ottawa. She conducts research and analysis on health surveillance and chronic disease. She currently serves as an epidemiologist for the Canadian Department of National Defense in several Southeast Asian countries.

Bruce Tonn is a professor at the University of Tennessee focusing on energy policy, environmental policy, future studies, and decision making under uncertainty. He was Oak Ridge National Laboratory's principal investigator for the retrospective and American Recovery and Reinvestment Act period evaluations of the Department of Energy's Weatherization Assistance Program.

Johnathon Wilson is the chief financial officer and director of research at the National Center for Healthy Housing (NCHH). He helped to coordinate the Evaluation of the HUD Lead Hazard Control Grant Program, the largest and most comprehensive study of lead hazard control in housing ever undertaken in the United States.

Appendix C. Evaluation Rubric

Instructions. Please supply a score on a scale of 1-3 for each of the following metrics. Use the full spectrum of scores:

- 0 Unknown
- 1 Fair
- 2 Good
- 3 Exemplary

Comments on the questions are not mandatory, though they would be helpful. Note that the overall score is on a scale of 1-5.

Program name and sector:

Metric	Score	Comments
How effective is the program's reach (geography and number of participants)?		
How replicable is the program?		
How sustainable or reliable is the program's funding?		
How well does the program demonstrate innovative design and/or implementation techniques that achieve positive results?		
How well does the program produce lasting improvements in the targeted sector?		
How well does the program produce improvements in health outcomes for participants?		
How well does the program produce energy savings for participants?		
Overall score (please rate 1-5)		
Total score		

Overall comments (please provide feedback to support the overall score):