

Health and Safety Barriers to Weatherization Study

Executive Summary:

Health and safety problems often cause barriers that prevent full weatherization from being completed in homes that could otherwise achieve significant energy savings. Common health and safety barriers include elevated CO levels or gas leaks, mold, friable asbestos, vermiculate insulation that may contain asbestos, and knob and tube wiring. The Health and Safety Barriers to Weatherization Study aimed to evaluate the scale and nature of these problems in Connecticut, assess where they are most likely to occur, determine whether data about these problems is being effectively collected and tracked, and what might be some strategies for minimizing health and safety barriers to weatherization.

Based on a review of existing studies carried out in Connecticut, interviews with key stakeholders, and a detailed qualitative and quantitative survey administered to vendors working for EnergizeCT in United Illuminating's service territory, the main findings of this study are:

- Health and safety problems constitute a significant barrier to weatherization, estimated by vendors as causing the cancellation of between 10% to 35% of all EnergizeCT Home Energy Solution (HES) and Home Energy Solution-Income-Eligible (HES-IE) jobs. Vendors say that the problems are found more often in HES-IE homes. Addressing these problems will increase the number of Connecticut homes that are weatherized and will have a significant impact on public health. EnergizeCT, together with all relevant partners, including DEEP, PURA, DPH and DOH must commit to working together to incorporate health and safety remediation into weatherization work.
- Asbestos causes the most health and safety related cancellations, followed by CO and/or gas, then mold. These problems are mostly found in low-income housing, particularly housing in central urban areas built before 1950.
- According to vendors surveyed, other than gas leaks, health and safety problems are almost never remediated such that they can revisit the home and weatherize. At the time the study was completed, identification and remediation of health and safety problems was not effectively integrated into EnergizeCT programs, with no standardized process for identifying health and safety problems, or following-up with resolving those problems, including providing links to financing options. Recently (as of May 2016) steps have been taken to improve the tracking and follow up process. The new health and safety reporting and follow up mechanism must be monitored to ensure that it results in clear reporting of report health and

safety problems with the necessary detail to enable follow-up. The data must be standardized so that it can be analyzed and changes tracked over time.

- Vendors suggest that existing financing options are not attractive to customers. Some of those who could benefit from funds do not qualify for financing. Where residents are tenants they have no legal right to remediate and landlords have little incentive to invest where tenants pay energy bills, particularly in neighborhoods with depressed housing prices where greater energy efficiency may not increase the property price or rental rate.
- Currently, there is inadequate funding to cover either the cost of remediating health and safety problems, or the cost of identifying the problems in the first place or coordinating an effective response when they are found. Additional funding must be secured to pay for the costs both of coordinating remediation and the remediation itself.
- Money alone will not solve the problem; careful thought and consultation with all stakeholders is necessary to develop an effective process of identifying health and safety problems, providing effective remediation options, and coordinating the response when problems are found. Lessons learned from the CTEHHI project must be summarized and shared widely to inform future programming both for Connecticut and programs around the nation.
- Collaboration between weatherization programs and local municipal departments, such as those responsible for code enforcement, is difficult to put into practice, but is essential and must be pursued. For example, UI has pursued the New Haven code enforcement department since the summer of 2016 with very little response. UI understands the importance of collaboration with code enforcement departments and continues to reach out in hopes of formalizing a partnership.
- Concerns on the part of the utilities to protect customer confidentiality seriously limits the extent to which a coordinated response to health and safety problems can be put in place, involving multiple entities and/or agencies (such as the Department of Public Health, the Department of Housing, and municipal agencies). This may be overcome in some instances by obtaining customer permission to share information, but in practice such permission is rarely obtained. This problem will likely only be overcome through legislation to authorize release of information.
- It is unclear how many homes that have been through the programs have undergone only partial weatherization due to health and safety barriers (these homes receive courtesy measures only). Currently information about what proportion of homes only receive partial weatherization is not reported (or at

least it is not made publically available). Simply reporting all jobs as 'completed', regardless of actual measures implemented, is misleading. Reporting mechanisms must be clear about what measures have been implemented.

Background:

Energize CT, Connecticut's comprehensive ratepayer funded energy efficiency program, targets residential, commercial, non-profit and municipal buildings. Residential buildings are targeted mostly through the Home Energy Solutions (HES) and Home Energy Solutions – Income Eligible (HES-IE) programs. HES-IE targets residents with income at or below 60% of the State Median Income (SMI), the household eligibility cap for energy assistance. Additional funds are available through the US Department of Energy Funded Weatherization Assistance Program (WAP), administered through local CAP agencies under a plan developed by the CT Department of Energy and Environmental Protection (DEEP). The state has passed legislation requiring weatherization of 80% of CT residences by 2030 (though there is no clear definition of weatherization in the legislation).

Health and safety problems can cause barriers that prevent full weatherization from being completed in homes that could otherwise achieve significant energy savings. Common health and safety barriers include: elevated CO levels/gas leaks from improperly installed or maintained furnaces, hot-water heaters and kitchen appliances; mold due to moisture/improper venting; friable asbestos pipe wrap; vermiculate insulation that may contain asbestos; knob and tube wiring. These barriers prevent weatherization from being completed in the following ways:

- Elevated CO or gas leaks, or mold: no air sealing or insulation can be done as a home with these problems must have as much air flow as possible. Lighting and water measures only can be installed.
- Friable asbestos or vermiculate insulation containing asbestos: the blower-door test cannot be done as the test may release particles of asbestos into the air. Air-sealing can be done without the blower-door test, but it is less effective and savings cannot be measured.
- Knob and tube wiring: air-sealing can be completed, but no insulation can be installed until the wiring is confirmed inactive, in order to avoid a fire risk.

We do not know for certain how many jobs are curtailed or cancelled in Connecticut due to health and safety barriers, nor the cost of remediation so that weatherization can proceed. Anecdotal information suggests that as many as 20-35% of homes that could potentially be weatherized are not due to the above-mentioned health and safety barriers¹. Such problems may be more likely to arise in low-income homes, due to lack of resources for maintenance, and the high percentage of rental properties where landlords may not know about such

¹ Data collected in New Haven after the completion of the survey on which this report is based found that 19% of jobs were canceled due to health and safety barriers, though this figure is not disaggregated by HES/HES-IE program.

problems, or are unwilling to pay for repairs. Tenants do not have a legal right to make or authorize repairs even when the tenant could afford to do so.

Given the extent to which health and safety barriers may prevent weatherization from being completed, we must address those problems if Connecticut is to meet the 2030 goal of 80% of homes weatherized. If, as is likely, health and safety barriers are more likely to arise in low-income homes, then remediation of those problems is also essential to ensure equitable outcomes. Such problems may be part of the reason why Connecticut's low-income homes are significantly less likely to be weatherized than other homes (for example, only 15% of a sample low-income single family homes comply with an established weatherization standard, versus 29% of non-low-income homes²). In addition, particularly given the large number of homes that EnergizeCT reaches, compared to those that the Department of Public Health can reach directly, addressing these health and safety barriers through energy efficiency programs will make a significant public health contribution, reducing illness and premature deaths related to exposure to heat and cold, fire risk, carbon monoxide poisoning and asthma³.

Many other states face the problem of health and safety barriers preventing residential energy efficiency work from being completed. For example, a study by the Baltimore based Green and Healthy Homes Initiative into 12 Weatherization Assistance (WAP) programs around the country found that approximately 13% of all jobs were cancelled due to health and safety barriers⁴. In response to the prevalence of health and safety barriers, various guides have been prepared to ensure that energy efficiency programs do not implement measures in homes with health and safety problems to avoid worsening those problems; see for example the EPA protocol and the Lawrence Berkeley National Laboratories Guide⁵. Renew Boston, one of the foremost comprehensive weatherization programs in the country, has prepared a package

² NMR Group 2014, Single Family Weatherization Baseline Assessment, Final Report. Available at <http://www.energizect.com/sites/default/files/R5-Connecticut%20Weatherization%20Baseline%20Assessment-FINAL%2006-04-14.pdf> (page 17). Note that of the 180 homes visited in this study, 9% (16 homes) had asbestos or vermiculite present and an additional 4% (seven homes) had mold present.

³ Salls et al. 2013, Rapid Health Impact Assessment: Weatherization Plus Health in Connecticut. Available at http://www.pewtrusts.org/~media/assets/2013/04/09/weatherizationplushealthconnecticut_full_report1.pdf.

⁴ Norton 2010, Identified Barriers and Opportunities to Make Housing Green and Healthy Through Weatherization: A Report from Green and Healthy Homes Initiative Sites. Available at <http://www.greenandhealthyhomes.org/sites/default/files/GHHI-Weatherization-Health-and-Safety-Report1.pdf>.

⁵ EPA 2011, Healthy Indoor Environment Protocols for Home Energy Upgrades, available at http://www2.epa.gov/sites/production/files/2014-12/documents/epa_retrofit_protocols.pdf and Stratton and Walker 2012, Health and Safety Guide for Home Performance Contractors, available at <http://eetd.lbl.gov/sites/all/files/publications/stratton-hsguide-final-sized.pdf>.

of incentives to enable program applicants to remediate health and safety problems getting in the way of weatherization work⁶.

Considerable efforts have been made in Connecticut to try to address health and safety barriers to residential energy efficiency. The state is indeed a leader in this regard. For example, the **Connecticut Efficient and Healthy Homes Initiative (CTEHHI)** project was implemented statewide. Funded through a US Department of Energy Weatherization Innovation Pilot Project (WIPP) grant, CTEHHI provided funds for both home weatherization and remediation of a range of health and safety barriers. Homes served through CTEHHI underwent both an energy audit and a Healthy Homes Assessment. Multiple partners were involved in the project to ensure availability of expertise in both energy efficiency and health and safety, with the goal of addressing any problems found such that full weatherization could be achieved⁷.

CTEHHI funds have now been fully utilized and the program no longer operates, but efforts have been made to continue to integrate the remediation of health and safety problems into energy efficiency programming. The various partners involved in CTEHHI continue to collaborate; for example, United Illuminating provides residents of homes where a health and safety problem is preventing energy efficiency work from taking place with an application form for the Connecticut Children's Healthy Homes Project (formerly LAMPP), which may be able to help them remediate the health and safety problems. Importantly, United Illuminating also provides the resident with a waiver form that once completed, allows United Illuminating to share customer information with the Connecticut Children's Healthy Homes Project. Also, some of the various financing options available to customers to pay for energy efficiency work in their homes allow for a portion of the loan (typically 20%) to be spent on health and safety measures⁸. Finally, \$1.5 million arising from the merger between Northeast Utilities and NStar were made available for health and safety remediation, along similar lines as the CTEHHI project. This new CEHHI project was designed based on lessons learned from the DOE CTEHHI grant to help HES-IE customers with health and safety barriers that prevent weatherization. The project has a soft cap of \$10,000 per home. Funds are expected to be fully expended (in UI service territory) by fall 2017.

In 2013 a **Rapid Health Impact Assessment** was carried out in Connecticut to assess which health and safety measures should be included in state administered US Department of Energy or ratepayer funded weatherization work. The Rapid Health Impact Assessment used existing data to estimate

⁶ See more at <http://www.renewboston.org/residents/energy-efficiency/preweatherization-conditions/>.

⁷ A similar project to CTEHHI is the Couleecap Weatherization Deferral Program in Wisconsin - <https://www.wxplushealth.org/success-stories/couleecaps-weatherization-deferral-program-makes-homes-safer-and-more-energy>.

⁸ The Cozy Home loan, targeted at low to moderate-income customers, had allowed borrowers to use up to 40% of the loan for health and safety remediation. However, this loan option is no longer available.

positive health impacts of both weatherization and health and safety measures, calculating a cost-benefit ratio for a range of specific measures. The study concluded that there would be significant public health benefits in the areas of asthma and respiratory disease, lead poisoning, pest infestations, fire and carbon monoxide risks, and trips and falls, if various health and safety repairs were integrated into existing energy efficiency programming. The list of recommended repairs include “gas leaks, asbestos and vermiculite insulation, knob and tube wiring, significant lead hazards from severely deteriorated paint in pre-1978 homes, and significant moisture/mold repairs” (Salls et al. 2013 p6). The report also recommended that funding be identified to pay for those repairs (ibid p6). Additional health benefits resulting directly from weatherization itself include improved food security (resulting from lower utility bills), lower disconnection rates, less anxiety and warmer homes.

In part as a follow up to the publication of the Rapid Health Impact Assessment, **Connecticut House Bill 5133** was passed, requiring publication of a report detailing available state funds, including grants and financing options, for remediation of health and safety problems, and explaining how best to administer funding to support the stated goal of the Connecticut Department of Health’s Healthy Homes Initiative, that is, “to promote health and well-being through safe and healthy home environments”⁹. The final report found that there is currently no state funding available for healthy homes. Some federal funds are available to remediate residential health and safety problems, which are administered by the Department of Housing (DoH). The report concluded that these and any additional funds made available should continue to be administered by DoH, which could channel the funds to homes (particularly those homes that have been identified by weatherization contractors as having health and safety problems) in one of two ways;

- i) Through local municipal directors of health to respond to reports of code violations or
- ii) Through EnergizeCT programs (which may require legislative change).

In order to ensure streamlined programming, the report recommended that a standard ‘low-income’ threshold be defined. The report also recommended providing special incentives to landlords to encourage them to remediate health and safety problems, such as giving them grants or reduced cost loans provided that they continue to rent to low-income people.

Aims of the current study:

Plans for the study presented here were first formulated in early 2014, with the goal of answering the following questions:

⁹ <http://www.ct.gov/dph/cwp/view.asp?a=3140&q=443992> accessed 8/27/15.

1. What is the scale of the problem? How many of the ratepayer funded EnergizeCT's Home Energy Solutions (HES) and Home Energy Solutions –Income Eligible (HES-IE) scheduled jobs are curtailed or cancelled due to health and safety barriers? What are the numbers for the Department of Energy's Weatherization Assistance Program (WAP)?
2. What is the nature of the problem? Which particular health and safety problems arise, what weatherization opportunities cannot be addressed due to those barriers, and what would be the approximate cost of their remediation?
3. Where are the problems? Are health and safety problems associated with the following property characteristics: owner-occupied/rental; single/multi-family; building age; census tract average income?
4. If the data necessary to answer questions 1-3 above is not available, what data is currently being collected and by whom? What additional data needs to be collected, and what are the cost implications of such data collection for the program, including the vendors?
5. What funding is currently available for remediation of health and safety problems?
6. Are there any additional barriers preventing remediation of health and safety problems? For example, is there available trained manpower/resources to coordinate customer access to existing funding sources? Do existing financing options exclude customers with poor credit scores or high debt-to-income ratios? What recourse do tenants have to insist that landlords address health and safety problems? Should local code enforcement be involved and is it effective?

In practice, we were not able to address all these aims, due in part to shortage of time and manpower, and in part due to difficulties accessing the necessary data. Also, the question of available funding (item 5) was already being addressed by the above-mentioned report required by HB 5133. This study focused mainly on items 1-4, and touches on some of the questions listed in item 6, but additional research is needed to answer those questions.

Process:

The study proposal was presented to the residential committee of the Energy Efficiency Board in June 2014, after which a decision was made that two summer interns with the Department of Energy and Environmental Protection (DEEP) would conduct an initial study.

The interns' study explored the flow of the HES and HES-IE programs to identify gaps and opportunities for addressing barriers, and also compared data collected by Energize CT vendors, WAP vendors, and the Department of Public Health (DPH)'s Healthy Homes initiative. The interns also estimated the

prevalence of health and safety barriers in Connecticut homes, using national and regional American Housing Survey (AHS) data, finding that health and safety problems are much more likely to occur in low-income homes. No energy efficiency vendors were contacted as part of this study. The interns' findings entitled "Addressing Weatherization Barriers: HES-IE & WAP *Getting Ready for Data Collection*" were presented at the September 15th, 2014, meeting of the DPH's Healthy Homes Initiative. Key recommendations relevant to health and safety barriers included:

- Incorporate health and safety measures into energy assessment, possibly through a 'one-touch' energy efficiency/healthy homes visit and/or providing energy efficiency vendors with healthy homes training
- Develop a pre-screening tool to flag possible health and safety problems in advance of scheduling energy assessments
- Develop a standardized mechanism to deal with health and safety problems
- Include health and safety problems in all customer education efforts
- Improve tracking and sharing of health and safety data
- Leave work orders open until health and safety problems are remediated and ensure that vendors are appropriately incentivized to return to homes after customer remediates H&S barriers
- Provide funding for remediation of health and safety problems
- Appoint a coordinator to help with outreach, seeking landlord approval, coordinating with other programs (such as Community Action Agencies)
- Provide additional support to customers to help them access resources to remediate health and safety problems
- Include health and safety as well as weatherization in the Quality Assurance and Control process

The second phase of the research (presented here in this report) was carried out by a Yale School of Public Health Masters student, Hannah Kaneck, and Annie Harper, the manager of the Yale Community Carbon Fund, a project out of Yale University's Office of Sustainability. This second phase collected data from energy efficiency vendors, to incorporate their on-the-ground knowledge.

Before starting the second phase of the research, a series of meetings were held with relevant stakeholders, including DEEP, DPH, the Public Utilities Regulatory Authority (PURA), United Illuminating, which administers EnergizeCT programs in the south-west area of Connecticut (initial contact was made with Eversource – formerly Connecticut Light and Power – which serves a much larger area – but they did not respond to requests to participate). Meetings were also held with a group of EnergizeCT vendors to get their input into the research design.

During these initial meetings two key barriers to incorporating assessment and remediation of health and safety problems into the HES and HES-IE programs were highlighted.

The first barrier is financial. There is inadequate funding to pay for both the direct costs of remediating health and safety problems, and the cost of adding additional assessment processes and data collecting tracking requirements to vendor workloads. The CTEHHI project paid vendors \$137 per healthy homes assessment completed; it would not be realistic to expect vendors to collect this information and enter it into data monitoring systems without compensation. It may not be legitimate to use ratepayer funding to pay for such data collection. United Illuminating staff pointed out that if each HES/HES-IE job in the previous year had cost an additional \$137, 300 less homes would have been served by the program. An additional, related problem is the additional costs that would be incurred if vendors started to complete visits at all homes with health and safety barriers, even where those visits don't result in energy savings. Currently if vendors suspect that a home will have so many health and safety problems that they will not be able to do any work, they sometimes 'walk-away', with no site visit recorded. They lose the site visit fee (\$175) in such cases, but it often does not make business sense for them to complete the visit when they know there will be no energy savings. If vendors were expected to enter and assess all homes, regardless of health and safety problems, that fee would be paid in more cases so increasing costs. It is important to note that UI discourages 'walk-aways' and encourages vendors to install at least lighting, domestic hot water measures, and obtain appliance and home specifications at a minimum so that the vendors can get paid an administrative fee for going into the customer's home.

The second barrier regards customer confidentiality concerns. Ensuring customer privacy is of paramount concern to the utilities. It took many weeks to develop and agree on a confidentiality agreement between Yale University and United Illuminating giving the vendors permission to share address level data with the researchers (the intent was never to publicize that address level data, but rather to analyze and collate it, and present findings at the census tract level to avoid compromising customer privacy¹⁰). An approved exemption from the Yale University Institutional Review Board (IRB) was also sought and obtained for the research.

The utility's concerns around customer privacy present a serious barrier to future possible coordination of energy efficiency and healthy homes work. DPH would like to tap into the large customer base served by EnergizeCT to maximize their access to homes that need health and safety work. However, the utility companies are resistant to sharing their customer's information with DPH, as DPH's database may not be subject to as strict confidentiality requirements as the utility's own customer database. While the utility's concerns are

¹⁰ The census tract level data recently provided by the Companies as per the Electric and Natural Gas Conservation and Load Management Plan Compliance Items 8 & 9 shows how such data can be provided without compromising customer privacy.

reasonable, an inability to share customer data in this way seriously limits the potential to maximize synergy between EnergizeCT and the DPH Healthy Homes Initiative.

EnergizeCT vendors also had confidentiality concerns, insisting that their participation in the research remain anonymous, such that they could be frank about any perceived shortcomings in the program and not fear any repercussions. United Illuminating agreed that any vendor identifying information could be removed from any data collected from those vendors before being shared with United Illuminating, or anyone else, or publicized in anyway.

Methodology:

A survey was developed (see appendix 1), reviewed by the Human Subjects Committee of the Yale University Institutional Review Board (IRB) and given exemption status for use, after which it was administered by phone to vendors. Vendors were informed in advance about the survey, both through communication from the trade association to which most vendors belong, the Home Performance Alliance of Connecticut (HPACT), and with individual calls made to each vendor (repeated calls were made to inform vendors about the survey and to schedule calls). Each survey participant was informed about the aims of the study in advance, including an explanation of the measures taken to protect their and their customer confidentiality, and they provided verbal consent. The calls were recorded, transcripts were made, and all identifying information about vendors/areas where they work removed. A total of 30 vendors were contacted, or messages left on their voicemail. A number of the vendors on the list provided were no longer operating. Ten of those contacted answered brief questions about their data tracking systems, and a total of 7 completed the survey in its entirety.

About half of the vendors surveyed reported that they work all over the state; the remaining half work primarily in one or another region (since 2015 all vendors have been required to offer services statewide). Smaller vendors visit as few as 10 or less homes a week, with the larger vendors visiting as many as 80 customers a week. In total the vendors surveyed reach approximately 300 homes per week.

The surveys asked both quantitative and qualitative questions about the vendors' experiences in the field with health and safety problems. In addition vendors were asked to provide any health and safety data they track.

Data Tracking Practices and Systems:

All the vendors say they track health and safety issues, both to report them to the utilities that administer the program and for their own purposes, to be able to call customers back in the future and to understand their reasons for high cancellation rates. However, some vendors mentioned that there is little internal motivation to measure health and safety barriers accurately as they are already well aware of what the most common problems are.

At the time of the survey, vendors reported using a variety of data tracking systems, some computer-based, some paper. There was no standardized terms used/fields for reporting health and safety problems, such that data from all vendors could be collated/aggregated. Any such aggregation would require going through every entry to 'clean it up' and create standardized fields, which would take months of work. Even within individual vendor tracking systems, they typically do not use strictly standardized terms to report health and safety problems; for example carbon monoxide levels may be reported as CO for one home or carbon monoxide for the other. Cleaning up this data even for a single vendor would be a lengthy process. Recently vendors have been required by the EnergizeCT program to track health and safety barriers, using a standardized system, which should improve both understanding of the rates of and reasons for health and safety cancellations, and responding to and remediating problems when they are found. Since May 2016, UI has begun to capture health and safety data within their system to get a better picture of the various health and safety issues in customer homes. UI did this in hopes of bringing additional awareness to the health and safety barriers that the HES-IE program encounters in order to help get Connecticut residents sustainable health and safety funds.

Data availability: Each vendor surveyed was asked whether they would be willing to share their tracking data, to enable the researchers to perform a quantitative analysis of the scope, nature and location of health and safety barriers. Unfortunately only three vendors provided their information to the researchers, and of those three vendors only one provided comprehensive job completion and cancellation data¹¹. Only one of those three vendors serves both HES and HES-IE customers. Of the vendors who did not provide the data, three of them said it would take too long to extract and organize the relevant data and that they did not have the time/available staff to do it. One vendor said they were not prepared to share the data due to confidentiality concerns.

A key finding from this process is that vendors do not gather the type of data necessary to produce a useful analysis of the scope, nature and location of health and safety barriers. Even when they do collect useful data, it is not extractable easily enough or in a form useful for research.

Survey findings:

¹¹ The data provided by these vendors did not include any customer identifying information; all names and addresses were removed.

Weatherization curtailment/cancellation due to health and safety problems.

Blower door test: During the phone call interview vendors estimated that they are unable to perform the blower door test in between 10% and 50% of homes visited. Vendors serving both HES and HES-IE customers noted that the number is significantly higher for HES-IE customers; they estimated that 10-15% of HES customers cannot have the blower door test, rising to 35-50% for HES-IE customers.

Health and safety related cancellation rates: Total cancellation rates vary significantly from vendor to vendor, but cancellations due to the most commonly found health and safety problems (asbestos like material - ALM - including vermiculate, gas leaks/elevated CO, or mold) were reported at roughly similar levels. Most vendors estimated that around 20% of total leads are cancelled due to these problems. Vendors serving both HES and HES-IE customers estimated that about 10-25% of all HES jobs are cancelled due to health and safety reasons, whereas about 25-35% jobs of all HES-IE jobs are cancelled for those reasons.

2014 tracking data provided by three of the survey vendors showed the following:

| | Vendor 1 | | Vendor 2 | Vendor 3 |
|-------------------|----------|--------|----------|----------|
| Program | HES | HES-IE | HES | HES |
| Cancellation rate | 40% | 15%* | 36% | 11% |

* note that while the cancellation rate for HES-IE jobs was considerably lower for this vendor, many of the 'completed' jobs included only partial weatherization (some air sealing), and often only light bulbs and water measures, no weatherization at all, ('courtesy measures') due to a health and safety problem. We were unable to collect data about how many of the completed jobs were partial.

Of the three main problems identified vendors estimated that ALM causes the cancellation of 8-15% of all jobs, CO and/or gas cause cancellation of 5-10% of all jobs, and mold causes cancellation of 4-10% of all jobs. All problems are more common in HES-IE homes. For example, one vendor reported that while approximately 10% of HES jobs are cancelled due to ALM or mold, that figure rises to approximately 25% for HES-IE jobs.

The fourth most significant barriers to weatherization are hoarding and pests (vendors reported that these two problems tend to be found in the same homes). Vendors estimated that between 0-5% of all cancellations are due to these problems, which are more common among HES-IE customers in rental accommodation; pests are most common in multi-family buildings. Vendors

noted that people with a serious hoarding problem are unlikely to willingly sign up for the program. Knob and tube wiring is found in 0-3% of jobs (more common in HES-IE homes). It does not prevent audit completion but does impede follow up insulation.

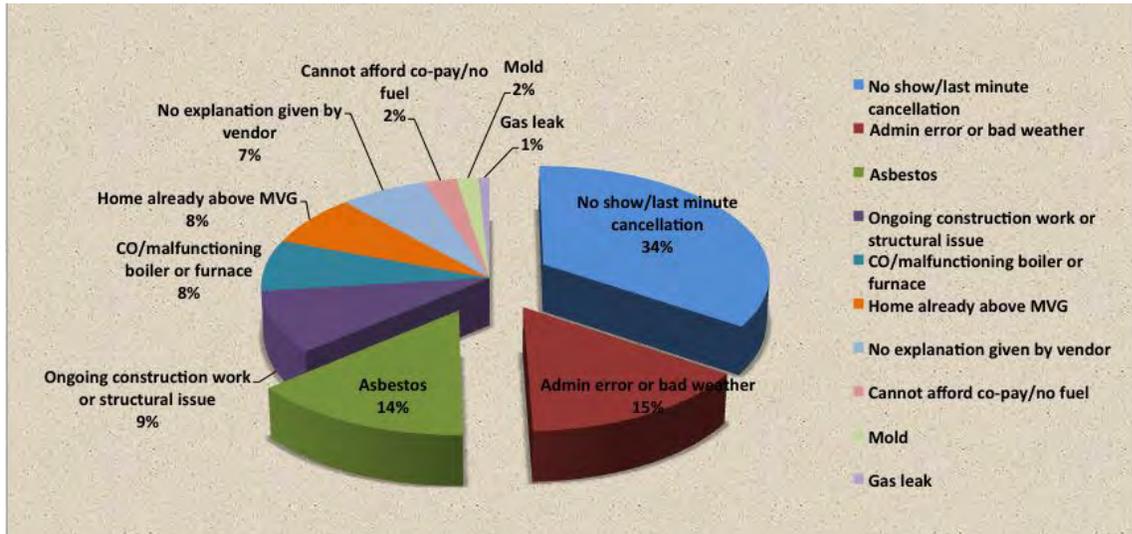
The remaining two problems, open sewage lines and excessive cigarette smoke, cause cancellations in only 0-2% of cases. One vendor said they occasionally have to cancel visits when a home has ongoing construction work such that there are openings in the structure of the building, which prevents them from conducting the blower-door test.

Tracking data provided by the three vendors showed the following reasons for cancellation:

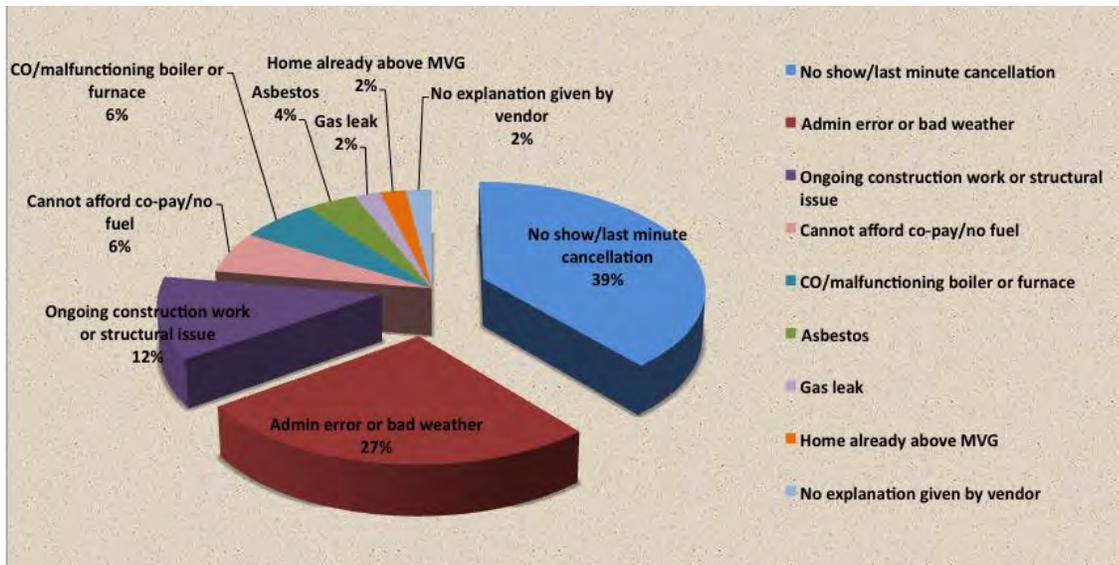
| Reason for cancellation | Vendor 1 | | Vendor 2 | Vendor 3* |
|---------------------------------------|----------|--------|----------|-----------|
| | HES | HES-IE | HES | HES |
| No show/last minute cancellation | 34% | 39% | 1% | - |
| Administrative error/ bad weather | 15% | 27% | - | - |
| Ongoing construction/structural issue | 9% | 12% | 14% | - |
| Cannot afford copay/no fuel | 2% | 6% | - | - |
| CO/malfunctioning boiler or furnace | 8% | 6% | 22% | - |
| Asbestos | 14% | 4% | 16% | 73% |
| Gas leak | 1% | 2% | 27% | 18% |
| Mold | 2% | - | 15% | 9% |
| Home already below MVG | 8% | 2% | - | - |
| No explanation given by vendor | 7% | 2% | 5% | - |

* Vendor 3 carried out only a few jobs during 2014, so these findings were based on a very small sample

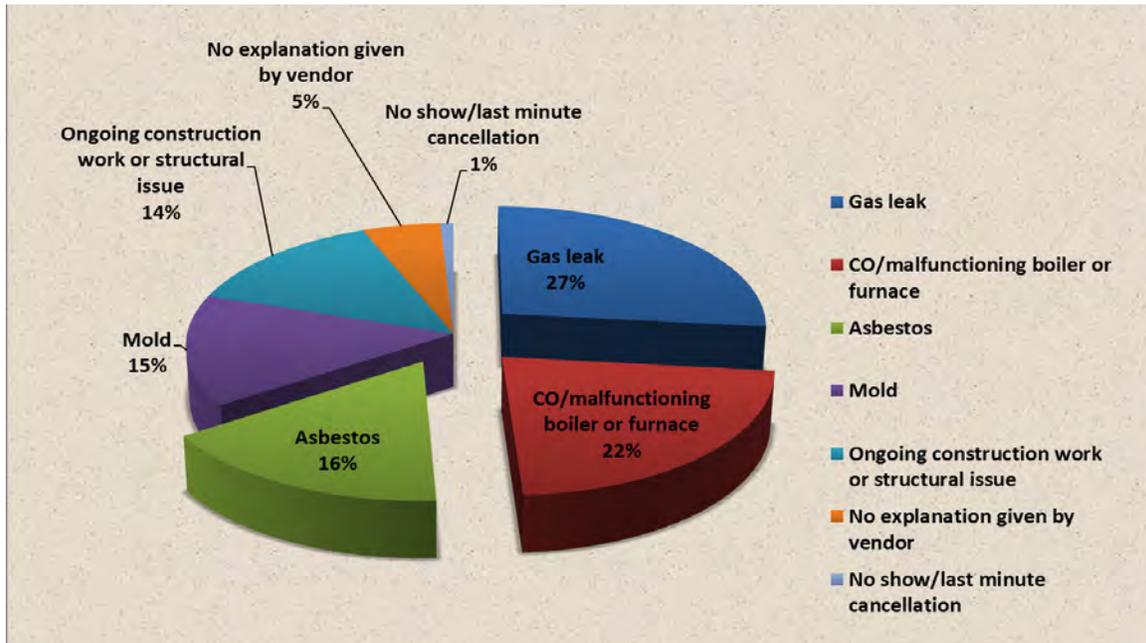
VENDOR 1: HES CANCELLATIONS



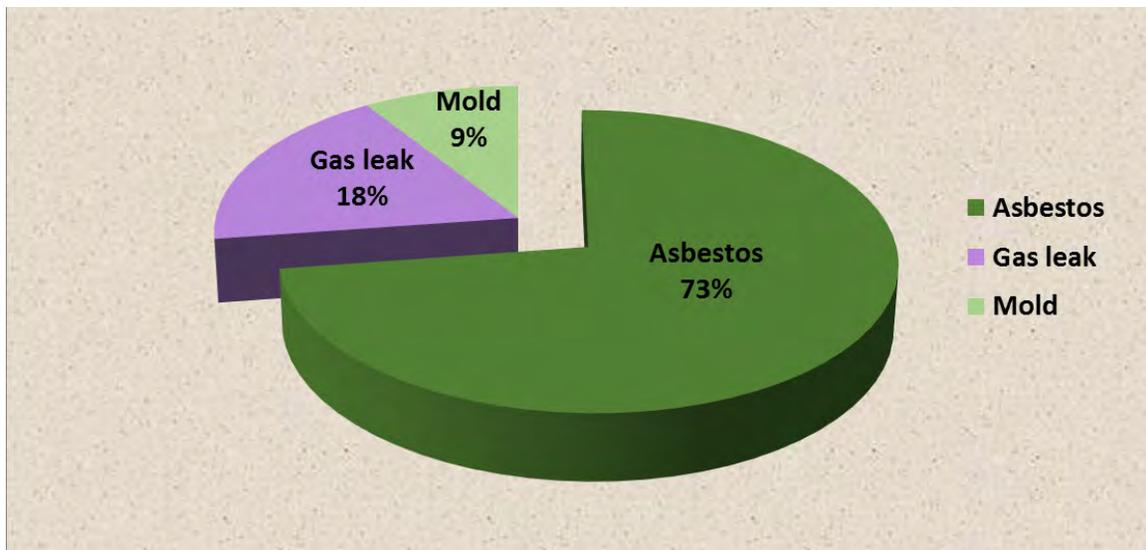
VENDOR 1: HES-IE CANCELLATIONS



VENDOR 2: HES CANCELLATIONS



VENDOR 3: HES CANCELLATIONS



It is immediately clear from the above table/charts that there is no standardized method of reporting cancellation reasons. Vendors use different categories to describe those reasons (we compiled the many different reasons given into the categories presented here), and clearly, given the discrepancy between the data from the different vendors, use different standards to assess problems found. We cannot explain the discrepancy between the number of no-shows or last minute cancellations, or administrative errors, that the vendors report.

Interestingly the single HES-IE vendor that gave us their tracking data finds that HES-IE jobs are much less likely to be cancelled than was reported during the phone interviews. It is possible (though some vendors may dispute this) that some HES-IE vendors ‘walk-away’ from HES-IE jobs when they cannot do the blower-door test/full weatherization, whereas others (such as this vendor) stay and do the courtesy measures, hence have a higher job completion rate.

Relevance of area/housing type: Vendors were asked to rate how likely they were to find health and safety problems in specific housing types/geographical areas, with 1 being the least likely and 5 being the most likely. Overall, they reported that homes built before 1950 located in central urban areas are most likely to have these problems, particularly rental properties with less than 6 units. See the results in the table below.

Table 1. Mean response from 1-5 scale, with 1 being least likely and 5 being most likely, of properties or locations having health and safety problems by type.

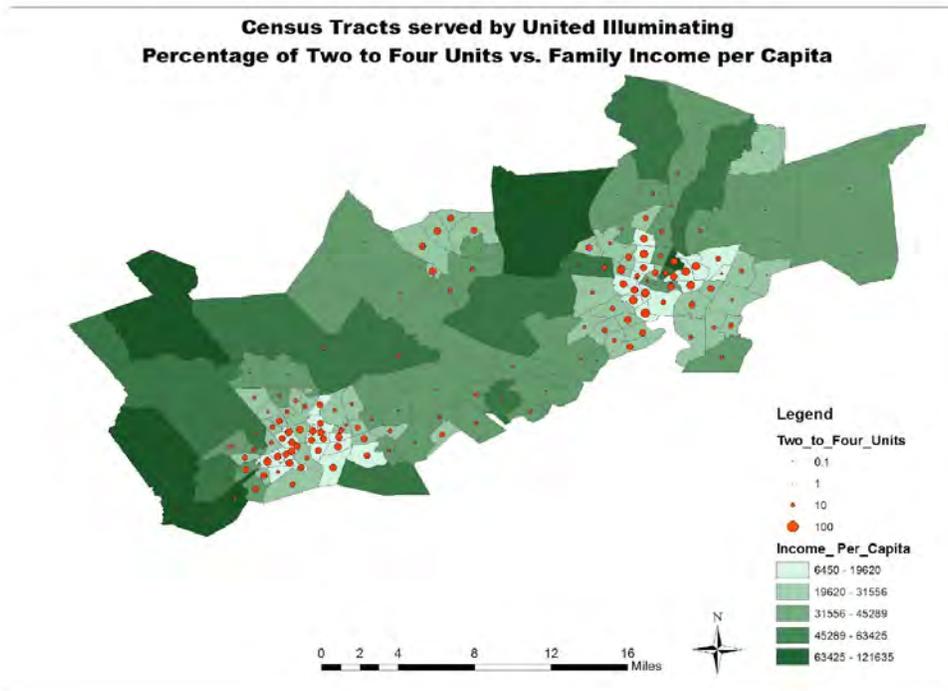
| Characteristic | Mean | Standard Deviation | Min-Max |
|-------------------------|------|--------------------|---------|
| Owner Occupied | 2.7 | 0.756 | 2-4 |
| Rental | 3.4 | 1.134 | 2-5 |
| Single Family | 2.4 | 0.535 | 2-3 |
| Multi-Family (<6 units) | 3.6 | 0.787 | 3-5 |
| Multi-Family (>6 units) | 2.6 | 1.429 | 1-4 |
| Built Before 1950 | 3.8 | 0.906 | 3-5 |
| Built After 1950 | 2.2 | 0.699 | 1-5 |
| Central Urban Areas | 3.9 | 0.378 | 3-3 |
| Suburban Areas | 1.9 | 0.607 | 1-4 |
| Rural Areas | 2.5 | 0.645 | 2-3 |

Some vendors noted that historical building patterns make a difference; for example they find very high rates of ALM in some cities, but not in others. One vendor noted that vermiculite insulation is particularly common in the Northwest corner of the state.

Vendors all reported that they go to any and all types of neighborhood, and that their teams can deal with any type of customer (though one vendor did report that technicians had occasionally faced verbal abuse). However, some of the vendors noted that certain regions of the state, or urban areas, are less profitable for them to serve due to the high number of ‘showstoppers’ that arise due to prevalence of health and safety problems and other problems that lead to cancellations or inability to conduct the blower door test. Another type of

housing that cuts into their profit margins is housing that is already relatively efficient, in particular housing with solar panels installed.

We found no correlations between health and safety related cancelations and census tract level demographics including income, race, or number of rental properties. However, the low number of available data points make it difficult to draw any statistically relevant conclusions. One thing we do know from the annual census tract level HES and HES-IE expenditure data that EnergizeCT provides is that neither HES nor HES-IE currently adequately reach 2-4 unit buildings¹². The map below of United Illuminating service territory shows that there is a high correlation between numbers of 2-4 unit buildings and low-income families in a census tract, which suggests that a failure to reach 2-4 units may indicate a failure to reach low-income groups.



Courtesy measures: Where a vendor cannot complete the blower door test, they can offer the customer courtesy measures (water saving measures, energy savings lightbulbs). Those who serve only HES customers reported that

¹² see here for article explaining this <http://trendct.org/2015/05/18/residential-energy-efficiency-in-connecticut-were-doing-well-but-could-be-doing-better/> and here for 2013 data <http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/8525797c00471adb85257d340069eb10?OpenDocument>

customers are often reluctant to accept courtesy measures given the \$99 copay for the services (presumably because when they signed up they expected something more substantial for the fee). One vendor claimed that while his/her company never 'walks away' from a job where the blower door cannot be done, he knows that other vendors do as the profit margins are lower when a blower door is not completed.

Vendors serving HES-IE customers (who pay no copay) reported that these customers were more likely to agree to installation of partial weatherization measures. Also, some vendors noted that as a HES-IE job is considered 'completed' without an associated energy score, it makes more sense for them to install courtesy measures in this program. As one vendor put it, these jobs "still count as a completed job for us because we're not judged on energy score.... It's worth their [the customer's] time and it's worth our time". There may be some confusion on this matter as UI staff explained that vendors are not penalized for non-completed HES jobs either; however, some vendors clearly believe that it does not make sense for them to offer courtesy measures in HES jobs.

Remediation of health and safety problems: Obviously the ideal response when health and safety problems are found is to remediate those problems, after which the energy efficiency measures can be installed. Vendors report that when they find ALM or mold, they provide customers with contact details of contractors specializing asbestos or mold removal. If they find a gas leak, the gas company is immediately called to the scene to assess whether there is a serious leak (one vendor noted that their gas leak detection equipment is more sensitive than those used by the gas company). If the leak is serious, the gas company either repairs it on the spot, in which case weatherization can proceed, or the equipment is red-tagged and shut down. In case of elevated CO levels, vendors contact HVAC professionals to perform a Clean Tune and Test (CTT). As long as the CTT costs less than \$350 it will be automatically covered by the program; any cost above that requires PA approval. Most vendors noted that in these cases they call the customer back to check whether the problem has been resolved, given the potential hazard. Recently (in 2016, after this survey was completed) UI instituted a second-visit fee to encourage vendors to go back to homes to check problems have been resolved and continue with the energy efficiency work.

Only one vendor said that they refer customers to programs that provide support to low-income people with housing issues including asbestos, mold and furnace problems; that vendor mentioned the LAMPP program, the Hartford Economic Development program and New Haven's Livable City Initiative. In other cases the referral may be made via the utility. UI has been working on a resources sheet for HES-IE customers but unfortunately the majority of the fund available are grants and they are expended quickly.

Most vendors provide customers with information about financing options through which 20% of the loan amount can be used for health and safety remediation. Vendors serving HES-IE customers tell them about the Connecticut Housing Investment Fund (CHIF); one vendor serving only HES customers mentioned the Smart-E loan. Vendors do not help customers make contact with remediation resources or financing providers beyond providing contact information at the time of the cancelled or curtailed audit.

Unfortunately, despite sharing the above information with customers, vendors reported that very few health and safety problems are remediated such that they can return and weatherize completely. Vendors reported that 0 to 2% (“almost none”) of cancellations due to ALM or mold are remediated such that they can go back and complete the work. However, gas leaks are often addressed on the spot or shortly after the visit – one vendor said “if the reason is a gas leak, you know, we try to get that addressed right away. So we go back and get those. If it is asbestos or mold, usually you’re talking a much more expensive remediation”. The CTT paid for by the program resolves many high CO problems, enabling the vendor to return and complete the energy audit in those cases. Some equipment, however, is so old or poorly maintained that the problem cannot be solved with a CTT, as it needs serious repair or replacement which is not offered through the program. The HES-IE program offers custom incentives for the replacement heating systems with new ENERGY STAR® models. The custom incentive however, does not cover 100% of the cost of the heating system replacement. One vendor mentioned that the regulations around unvented gas appliances are overly strict, such that they sometimes have to unnecessarily cancel jobs in situations that really are not hazardous.

All vendors mentioned that current resources available to help with remediation are inadequate, particularly for HES-IE customers. Grants that are available through various organizations are very quickly depleted. As one vendor said “It’ll be impossible to meet our goal of 80% of the homes if the problems aren’t remediated, because there are lots of homes that are just getting lights and water measures especially in IE”. Coordination is also a problem; one vendor suggested “It would be nice if there was sort of a centralized resource that we could send people to for health and safety. Something where, all the programs, but also all the contractors are aggregated into one spot, rather than just a referral basis like how we’re doing now”. Vendors keep records of customers whose homes could not be weatherized due to health and safety problems and periodically re-contact customers to find out if they have remediated the problems. They reported that they would likely have a much higher rate of successful follow up weatherization if funding were available to help customers with the cost of remediation. There does not appear to be a standard process for revisiting these customers; each vendor has their own call back system.

Remediation costs: When asked to estimate the cost of remediating health and safety problems, vendors suggested a range of amounts, averaging \$4,600 per home. However, vendors noted that it is difficult to generalize about remediation costs. For example, in some cases elevated CO can be resolved with a clean, tune and test for \$300 or less, or it could require replacing the entire furnace, or rebuilding a chimney, which would cost many thousands of dollars. Similarly, a mold problem may require a relatively cheap vent installation, or may require repairs to the foundation costing thousands of dollars. As one vendor put it “I mean, asbestos can be anything from a couple of pieces hanging on a pipe to asbestos on every pipe and on the duct work. So the extent of remediation varies dramatically. Same thing with mold, you know, it’s not just mold, it depends what is causing the mold. There may be foundation work that needs to happen”. Overall the vendors agreed that most problems they find could be remediated for less than \$5,000 (and some for under \$1,000), though they noted that this would leave out a significant number of problems, mostly mold and ALM, which would cost closer to \$15,000 or more to repair.

Reporting health and safety problems: Vendors said that the program reporting systems do not discourage them from reporting health and safety problems. HES jobs that are cancelled must be closed, with a reason provided. HES-IE jobs have an ‘aging report’ whereby a reason must be provided if the job is not completed after a certain period of time. However, some vendors noted that the reporting process does not adequately focus on health and safety issues, with no incentive for vendors to spend time looking more deeply into the scope and nature of those problems when they find them. As one vendor put it, “one of the problems for us is that if we find a health and safety problem we are required to, you know, stop the job, but there’s zero reimbursement for doing so....especially if it’s Home Energy Solutions, we get zero dollars, and so we just, we just paid our guys to travel an hour, go, you know, tell the customer what their problem is, what their options are, and then travel back, so we just spent three, four hours, not to mention the time scheduling it. So, we probably spent nine or ten man hours on this customer, and got zero dollars for it.... that makes it hard for contractors to do business the way they should, and keep their doors open”.

Currently health and safety problems are reported in a perfunctory way, with few or no details about the problem found, or the follow-up recommendations/actions taken. Some vendors reported that the administrative costs of reporting are already onerous, and that they would only be able to provide more detailed reports if compensated. As mentioned above, in 2016, the EnergizeCT program made it a program requirement for vendors to enter a health and safety measure for homes with barriers to weatherization, specifically homes that could not receive a blower door test or courtesy hourly air sealing. The measure captures data on the most common health and safety measures including ALM, mold, vermiculite, etc.

Vendor recommendations/other issues: As part of the survey vendors were asked to respond to a series of questions about health and safety barriers face and their assessment of how the process could be improved to address those problems. All vendors reported that health and safety problems seriously limit their ability to weatherize homes. They all agreed that better coordination with organizations that do health and safety remediation would be beneficial. They also all strongly agreed that they should be incentivized to conduct health and safety assessments in homes; in discussion the vendors elaborated that as soon as they find a serious health and safety problem in a home, that job becomes financially less viable for them, as they know they will not be able to conduct full weatherization. As a result, it is difficult for them to justify keeping teams on-site to further probe those health and safety problems. The results are presented in table 2 below:

Table 2. Mean response from 1-5 scale, with 1 being strongly disagree and 5 being strongly agree, of comments regarding HES/HES-IE program issues to be addressed.

| Comment | Mean | Standard Deviation | Min-Max |
|---|------|--------------------|---------|
| Health and safety barriers are an urgent problem that many home energy professionals and contractors face. | 4.7 | 0.488 | 4-5 |
| Health and safety barriers limit my ability to weatherize homes. | 4.3 | 0.951 | 3-5 |
| It is important that HES and HES-IE incentive structure be changed so that contractors can report jobs cancelled due to health and safety barriers. | 3.7 | 1.113 | 2-5 |
| I am willing to work with other service providers to follow up and weatherize homes that have health and safety barriers. | 4.6 | 0.787 | 3-5 |
| If an incentive was provided, I would be willing to do short health and safety assessment in each home proceeding with weatherization. | 4.7 | 0.488 | 4-5 |

Vendors were also asked to provide their input and recommendations as to how the program could improve how it addresses health and safety problems. Some of the suggested recommendations were:

- Ensure that all vendors conduct the required combustion tests at every home visited”.
- Require all homes to show an energy score at time of sale, so incentivizing people to have their homes made more energy efficient to improve their

property value. Once this is in place, those who can afford to have weatherization will pay for the work out of pocket. This will free up ratepayer funds to be spend on i) weatherization for low-income people and ii) health and safety remediation

- Find funds specifically for health and safety remediation
- Shift some of the funds currently budgeted for new construction projects to HES-IE health and safety remediation
- Integrate weatherization and health and safety remediation requirements into all available housing funds/programs, to avoid situations where thousands of taxpayer dollars are spent on building renovation/installation of new equipment but the building remains un-weatherized

Conclusions and recommendations:

We can draw some important conclusions from this study, also building on the conclusions of the earlier related studies.

As we were not able to collect reliable quantitative data from most vendors, our results regarding the scale of the problem are only rough estimates. However, it is clear that while they are certainly not the only cause of cancelled weatherization jobs, health and safety problems constitute a significant barrier to weatherization, resulting in the cancellation of anywhere from 10% to 35% of all HES and HES-IE jobs. Given the lack of data, we cannot accurately report exactly the incidence of the different types of problems, but clearly asbestos causes the most cancellations, followed by CO and/or gas, and then mold. Finally, while the lack of data prevents us from being able to draw definitive conclusions about which types of housing are more likely to have these problems, clearly low-income housing, particularly housing in central urban areas built before 1950, is where most problems arise.

By addressing these problems we will not only increase the number of Connecticut homes that are weatherized, we will also have a significant impact on public health, particular for low-income people.

At the time the survey was conducted, there was no effective, standardized system in place to identify health and safety problems, to follow-up with resolving those problems, or to track them over time. Since then, a tracking system has been incorporated into the program, which should improve the situation. The effectiveness of this system in identifying health and safety barriers, and facilitating their remediation, should be carefully monitored. Regarding funding, currently some funds are available for health and safety remediation through the merger between NStar and Northeast Utilities, but there is no sustainable source of funds for this purpose once current funds are expended. Funds are needed not only to remediate health and safety problems

themselves but also to identify the problems in the first place, and to coordinate the response.

It's important to note that partial weatherization can proceed in many cases where health and safety barriers are found. For example, if friable asbestos is found, the blower-door test cannot be completed, but most other measures can take place (other than foam for air sealing). However, without the door blower test to identify air-flow, it is difficult to perform effective air sealing. In homes with mold or CO problems it is still possible to provide energy efficient light bulbs and water-saving measures. An important finding from this study is that HES-IE homes are more likely to receive partial weatherization; HES customers are less likely to accept partial measures for the same co-pay for which they had expected a wider range of services. While any level of weatherization is welcome, HES-IE jobs must be tracked not simply as 'complete' regardless of whether a blower-door test was conducted. We need to know what proportion of HES-IE jobs include only light and water measures, or have air sealing but without a blower door test. Simply reporting the total number of HES-IE jobs completed is misleading if a significant number of those jobs only included partial weatherization.

The estimated cost of remediating the many problems found ranges from under \$1,000 for relatively quick fixes to as high as \$15,000 for more serious remediation. \$5,000 per cancellation takes place would seem to be an adequate amount to enable weatherization to proceed. The cost of identifying the problems would likely be at least \$137 per home (the amount paid through the CTEHHI program) if vendors are required to conduct a healthy homes assessment as well as the regular energy audit. It is difficult to estimate the cost of coordinating an effective response to the problem, though it would likely require a number of dedicated local coordinator positions, each focusing on a particular region or municipality.

Simply throwing money at the problem, however, will not be enough. Effectively integrating the remediation of health and safety problems into weatherization programs will require thoughtful planning. For example, what is the best way to identify the problems in the first place? The options are either to integrate a healthy homes screening into the energy audit, or to conduct a pre-screening of each home. Each option has pros and cons; if vendors do not pre-screen then they incur costs if a full team scheduled for a half or full day visit cannot complete the audit due to a health and safety problem. However, according to the data provided by one of the vendors, we found that no-shows/last minute cancellations are the most common reasons for cancellations. While a pre-screening appointment can be arranged at more flexible hours (such as after 5pm) as the visit is shorter, and would only require a single technician, there is a risk that if customers were required to schedule two separate appointments the cancellation rate may increase.

What is the best course of action when health and safety problems are found? The HB 5133 report offers two suggestions. The first is to provide funds to local municipalities to address the problems through their existing code violation response systems. The second is to provide funding to EnergizeCT to spend on health and safety problems, as was done in the CTEHHI program. In the long term the first option makes most sense. It would be ideal to support local municipalities in their efforts to address housing code violations, particularly given the interest that local health departments have in addressing housing problems related to public health. It also makes sense to decentralize responsibility for health and safety problems to the municipal level, given the existence of municipal funding streams that can be leveraged for health and safety remediation, and the importance of local knowledge in addressing the problems (coordinating with landlords etc.). However, in practice vendors currently do not routinely report health and safety problems that they find to the local municipal departments. If such problems were reported as code violations, residents may be reluctant to sign up for the EnergizeCT program in case they are reported. However, option two, requiring EnergizeCT to follow up with health and safety problems, puts an enormous burden on a utility level program the job of which is, at heart, to reduce energy consumption across its entire service territory, not to remediate health and safety problems in mostly low-income housing.

A key problem is data sharing and customer privacy concerns. For example, DPH may be the department with the keenest interest in addressing health and safety problems, but currently there seems to be little likelihood of the utilities softening their stance on sharing their customer data. If this problem cannot be solved, there is little chance of effective collaboration in this area. Waivers can help but it can be difficult to get customers to fill in a whole new set of documentation – though if there was reliable funding to solve the problems found this would be less of a barrier.

Summary of recommendations:

- EnergizeCT, together with all relevant partners, including DEEP, PURA, DPH and DOH must commit to working in partnership to incorporate health and safety remediation into weatherization work.
- The HES and HES-IE programs must track how many ‘completed’ jobs include only partial weatherization.
- An effective data tracking system must be developed and implemented, to ensure that vendors report health and safety problems in a standardized way with the necessary detail to enable follow-up.

- An efficient ‘deferral to referral’ pathway must be put in place to ensure that once health and safety problems are identified, there is a clear line of responsibility for following up with remediation measures. Vendors and other stakeholders should be consulted as to the best process for identifying problems and following up with remediation.
- Funds must be made available from a range of sources, to avoid placing excessive burden on any single funding source.
- Additional research should be carried out seeking answers to the following questions:
 - What lessons were learned from the CTEHHI project regarding coordinating an effective response to health and safety problems? What other projects around the country can we learn from?
 - How effectively do existing financing options enabling customers to remediate health and safety problems? Do existing options exclude customers with poor credit scores or high debt-to-income ratios?
 - What recourse do tenants have to insist that landlords address health and safety problems? Should local code enforcement be involved and is it effective?

Appendix 1: Health and Safety Barriers survey – administered to vendors working in UI service territory, Spring 2015, by Hannah Kaneck.

1. While vendors are required to work throughout the state, are there municipalities or zip codes you work in more often than others?
2. What percent of your jobs result in a complete audit, including blower door test, without any delays? (Alternative way to ask, for more data points: How many appointments/ house visits are made in one week? Of these appointments how many result in a complete audit, including blower door test, without any delays?)
 - a. HES jobs
 - b. HES-IE jobs
3. What percent of your jobs result in curtailed or partial weatherization (i.e. minor weatherization without blower door test) due to health and safety barriers?
 - a. HES jobs
 - b. HES-IE jobs
4. What percent of your jobs are cancelled (i.e. halting of audit, unable to weatherize in any capacity) due to health and safety barriers?
 - a. HES jobs
 - b. HES-IE jobs
 - i. What percent of the cancelled jobs are you able to return to after customer completed remediation to carry out a complete audit?
 1. HES jobs
 2. HES-IE jobs
5. In what percent of homes do you find the following health and safety issues that result in weatherization being curtailed, delayed or canceled (please provide separate answers for HES and HES-IE jobs if the percentages are different):
 - a. Elevated CO levels or gas leaks from improperly installed or maintained furnace or hot-water heater:
 - b. Elevated CO levels or gas leaks from improperly installed or maintained stove or heating and unvented appliances:
 - c. Mold:

- d. *Friable asbestos pipe wrap/ furnaces:*
 - e. *Vermiculite insulation that contains asbestos:*
 - f. *Knob and tube wiring:*
 - g. *Open sewage lines:*
 - h. *Pests:*
 - i. *Hoarding:*
 - j. *Excessive second-hand smoke exposure:*
 - k. *Any other not mentioned here:*
6. *If you can, provide an estimate of how much, on average, it would cost per home to remediate the most common health and safety barriers so that a complete audit could take place in most of the curtailed or cancelled jobs.*
7. *On a scale of 1 to 5, with 1 being least likely and 5 being most likely, please indicate how likely you think these types of properties or locations are to have health and safety problems:*
- a. *owner-occupied:*
 - b. *rental:*
 - c. *single family:*
 - d. *multi-family (2-6 units):*
 - e. *multi-family (6 units and above):*
 - f. *buildings built before 1950:*
 - g. *buildings built after 1950:*
 - h. *central urban areas:*
 - i. *suburban areas:*
 - j. *rural areas:*
 - k. *additional comments:*

The following questions ask about what you are most likely to do if you encounter particular situations. Please answer based on your actual experience from your day-to-day work.

8. *When you encounter high gas or CO levels in a home, what programs/ resources do you usually refer people to?*
9. *When you encounter asbestos or asbestos like material in a home, what programs/ resources for remediation do you usually refer people to?*
10. *When you encounter mold in a home, what programs/ resources for remediation do you usually refer people to?*
11. *Are there any additional programs/resources you know of that can help people to remediate health and safety issues?*

12. Are there locations, or neighborhoods that you refuse to send your technicians to due to high crime or likelihood of health and safety barriers? If yes, please describe the characteristics of those areas.

The next set of questions will ask you about the reporting of jobs that are cancelled due to health and safety barriers, as well as how you track these jobs in your internal records.

13. Does the current HES or HES-IE incentive system deter you from reporting jobs that get canceled due to health and safety barriers?

14. Do you keep a record of the types of health and safety barriers you find, and whether a job was curtailed or cancelled?
- If yes, please describe the type of information you track. What motivates you to track this information?
 - If no, we would like to learn more about why you have decided not to track this information. What would motivate you to track this information?

15. Quantitative Data: We would be very grateful if you would be willing to share any quantitative data that you have about health and safety barriers. All data would need to be scrubbed for identifying items including but not limited to name and identification/account number. Addresses can be given, and will be kept confidential, if census tract level data is unavailable.

This final section asks your opinion on how important it is to address these health and safety barriers, and what you think should be done.

16. On a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree. To what extent do you agree or disagree with the following statements:
- Health and safety barriers are an urgent problem that many home energy professionals and contractors face.
 - Health and safety barriers limit my ability to weatherize homes.
 - It is important that the HES and HES-IE incentive structure be changed so that contractors can report jobs canceled due to health and safety barriers.
 - I am willing to work with other service providers to follow-up and weatherize homes that have health and safety barriers.
 - If an incentive was provided, I would be willing to do a short health and safety assessment in each home

*before proceeding with
weatherization.*

17. Any other comments or suggestions?