



Healthy Homes Vermont 2020

EFFICIENCY VERMONT R&D PROJECT: HEALTHCARE PARTNERSHIPS

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Introduction

The Vermont Healthy Homes Story

Many Vermonters in low-income households are at a greater risk of health problems than are high-income households. This is due, in part, to the condition of the buildings in which they live. The nexus between energy efficiency in buildings and improvements in health (especially respiratory health) is now *the* essential rationale for justifying societal investments in improving housing conditions for vulnerable populations. Both the health care and energy sectors agree that improving housing conditions is a high priority. They also have historical and ongoing support for the rationale from the social services sector.

After demonstrating a successful partnership among those three sectors in 2018, Efficiency Vermont expanded its energy-plus-health collaboration in 2019 and 2020 to involve more locations, more partners, and specific health conditions. Together, the partners are applying their respective funding sources and human resources to pave the way for more positive health outcomes. The path to those outcomes connects energy-plus-health assistance to people at risk of respiratory illness, trips / falls, and other conditions exacerbated by substandard housing conditions.

Collectively the partners are testing innovative energy-plus-health collaboration pilots and whether these models may be scaled to a cost-effective component of energy efficiency programs statewide. Their structure and activity also offer a template for other jurisdictions.

This report addresses the progress achieved in 2020. [Healthy Homes Vermont 2018](#) and [Healthy Homes Vermont 2019](#) offer historical background on the development of the energy-plus-health program at Efficiency Vermont.

Efficiency Vermont Healthy Homes Vision and Goals

Efficiency Vermont established the Healthy Homes Vision in 2017:

Through energy efficiency, Vermont homes are safe, affordable, comfortable, durable, and resilient. These attributes result in improved population health and a reduction in greenhouse gases.

The following Healthy Homes program objectives support the vision:

- 1. Providing cost-effective services that improve indoor environmental quality while reducing energy burden**
- 2. Increasing benefits through strong healthy-home collaborations and partnerships**
- 3. Providing creditable and valued leadership in the health / energy nexus**
- 4. Creating a clear policy, advocacy, and regulatory strategy for healthful, affordable homes.**

To meet program objectives and support this vision, Efficiency Vermont used its partnerships with the Vermont Office of Economic Opportunity (OEO)

Weatherization Assistance Program (WAP), the Vermont Department of Health, community organizations, and hospitals to establish a Healthy Homes Program. The program incorporates the following specific aims:

- Integrate healthy-home principles and resources into all of Efficiency Vermont’s residential program designs and services
- Build a culture of healthy homes in Vermont by raising awareness with consumers, health care providers, and building contractors on the connections among indoor environmental quality, energy efficiency, and health.
- Launch pilots testing how a collaboration among health care providers, weatherization programs, community service programs, and Efficiency Vermont can use a [Weatherization Plus Health](#) service approach for customers with chronic respiratory illness and/or in-home fall hazards improving housing quality and indoor air quality, and tracking health outcomes from these services.
- Quantify the health-related non-energy benefits of weatherization retrofits.¹
- Identify health-specific and indoor environmental quality-specific products with opportunities for energy efficiency improvements.
- Create new tracking procedures for measuring and reporting indoor air quality before and after energy efficiency services.
- Establish sustainable funding models for energy-plus-health residential interventions.



Efficiency Vermont follows the U.S. Centers for Disease Control and Prevention (CDC) and the National Center for Healthy Housing (NCHH) in defining a *healthy home* as one that is: dry, clean, safe, well ventilated, pest free, contaminant free, maintained, and thermally controlled (Figure 1).

Principles: U.S. Department of Housing and Urban Development
 Graphic: airmid

Figure 1. Principles of healthy homes.

Efficiency Vermont supports utility ratepayers in meeting their energy goals *while also ensuring that home energy upgrade projects consider the eight principles of a healthy home.*

¹ At the time of this research, non-energy health-related benefits are being discussed within Track 2 of the Vermont Public Unity Commission (PUC) Avoided Cost Proceeding (PUC Case No. 19-0397-PET).

Progress Update: The Healthy Homes Pilots

Efficiency Vermont conducted three pilots from 2018 through 2020, with participant enrollment ending in summer 2020. The statewide efficiency program launched a fourth pilot in 2020. Despite COVID-19 delays, all four pilot collaborations continued offering services through 2020.

These pilots have quantified the effects of energy-plus-health measures on patients, health care providers, and weatherization service providers. The objective has been to expand Vermont-specific evidence related to the intersection of energy efficiency and health, so that this evidence can inform future State policy and program decisions.

Northeast Kingdom

In 2018, Efficiency Vermont, the Northeastern Vermont Regional Hospital (NVRH), Vermont OEO WAP, and NETO (the local WAP affiliate) launched a 10-home pilot for households with occupants experiencing one or both of the prevalent chronic respiratory diseases, chronic obstructive pulmonary disease (COPD) and asthma. Participants received energy-plus-health improvements, self-managed care coaching, and healthy home education. Energy improvements included weatherization, appliances and efficient products. Example plus-health improvements were active radon mitigation, expanded moisture management, advanced ventilation, smooth-flooring replacements of carpeting, spot HEPA room air cleaners, and appliance replacements. The strategy also offered additional supplies, as needed: HEPA vacuums, wedge pillows, pillow and mattress allergen encasements, and green cleaning supplies. The self-managed care coaching and healthy home education taught patients how to identify and improve respiratory triggers at home, use the new cleaning supplies and respiratory-friendly cleaning techniques, and proper medication use. NVRH also provided support in connecting with community services. The team administered indoor air quality (IAQ) testing and health surveys before and after the improvements.

2020 Update

The pilot ensured the completion of weatherization services for the remaining participants in 2020; the team capped the census at 9 participants in the spring, to time the pilot's completion by the end of 2020. Post-retrofit IAQ monitoring uncovered increased radon levels in some homes. The pilot team had to delay plus-health upgrades related to ventilation and radon mitigation into 2021 due to occupant illness, contractor capacity, and site challenges. For example, some sites had below-slab soil compaction and lacked gravel bedding, which limited radon mitigation). The team expects to complete the pilot in the early winter of 2021 with final IAQ testing, once homes are in winter condition.

Springfield Area

In 2019, Efficiency Vermont, Springfield Medical Care Systems (SMCS), Vermont OEO WAP, and SEVCA (the local WAP affiliate) launched a 10-home pilot for asthma patients. Efficiency Vermont designed the pilot to be similar to the first one,

implemented in the Northeast Kingdom, but did not include COPD patients. The Springfield area collaboration had received grant funding from the Vermont Department of Health to address only asthma. Once the grant funding ended, the collaboration expanded the pilot to include COPD patients, thereby expanding the eligible patient population and fully aligning the pilot with the Northeast Kingdom's.

2020 Update

Two pilot participants received weatherization services, and plus-health improvements are pending for one participant. The collaboration capped the pilot at 3 participants in the spring, primarily because of changes in health partner funding and to ensure the pilot's successful completion in 2020. Communication delays and Efficiency Vermont project staff reduction, and COVID-19 restrictions, limited the collaboration's ability to collect post-retrofit IAQ data. The team will complete final plus-health measures in 2021, along with post-retrofit IAQ monitoring.

Champlain Valley

The Vermont OEO WAP uses Vermont One Touch[®], a data collection system and service connection platform. Results from One Touch has identified weatherization recipients who are at risk for falling,² and prompted the Vermont OEO WAP to collaborate with the University of Vermont (UVM) Medical Center's Falls and Fires Prevention program. The data results also presented an opportunity for the Vermont OEO WAP to collaborate with the Vermont Department of Health Injury Prevention program, beyond sending referrals through One Touch. In 2019, Efficiency Vermont, CVOEO (the local WAP affiliate), and UVM Community Health Improvement launched a 20-home pilot for patients at risk of falling at home. Participants received stair handrails, grab bars, non-slip bath rugs and tub floor tape, improved lighting, and threshold repairs at the time of the weatherization improvements to their homes.

2020 Update

The collaboration completed energy-plus-health services for 14 pilot participants. One participant dropped out of the program for unrelated health reasons. The collaboration will complete services to 3 remaining homes in 2021. The team capped the pilot at 18 participants in summer 2020, to enable pilot completion in early 2021.

Two critical partners—the UVM Medical Center and the Vermont Department of Health Injury Prevention program—left the pilot in Spring 2020, because of funding changes and COVID-19 priorities. Efficiency Vermont will fulfill the data collection role of those partners in 2021, to stay on track for pilot evaluation.

Vermont as a Whole

The Northeast Kingdom and Springfield area pilots encountered challenges with participant eligibility. In response, UVM Medical Center Pediatric Pulmonology and Efficiency Vermont created an income-neutral pilot for cystic fibrosis and asthma patients. The program provides free Healthy Home Energy Visits and loans of IAQ monitors to patient families and caregivers referred by the UVM Medical Center.

² One Touch data. https://data.surveygizmo.com/r/541053_5bd5b84b85bb51.74060046.

These recipients must own their homes and are interested in investigating possible environmental respiratory health triggers related to energy efficiency.

2020 Update

Originally scheduled to launch in February 2020, the pilot was delayed until Fall 2020 to allow for program modifications that considered COVID protocols. These modifications included the design of virtual Healthy Home Energy Visits. Further delaying the pilot was a major cyber attack incident on the Medical Center's healthcare computer system, halting all electronic communication for several weeks.

Efficiency Vermont used the downtime to loan IAQ monitors to healthcare partner staff for use in their own homes, so that once the program launched in the fall, those staff were more familiar with the patient experience.

The program fully launched in late Fall 2020 receiving 10 referrals. Of those, 8 accepted indoor air quality monitor loans and 6 accepted virtual Healthy Home Energy Visits. The air quality data and visits provided valuable insights into the state of patient homes. This information was previously inaccessible to the healthcare providers.

The partners continue to make program refinements, and expect 40 patients to be referred to the program in 2021.

Discussion & Conclusions: Beneficial Impact

These observations build on those reported in [Healthy Homes Vermont 2018](#) and [Healthy Homes Vermont 2019](#).

Hospitals Recognize the Benefits of Collaboration

By joining these pilot partnerships, hospitals demonstrated their commitment to improving population health through upstream intervention and testing innovative healthcare delivery models.

UVM MC Pediatric Pulmonology now sees high value in tracking suspected home environmental triggers across their patient population. The collaboration hopes to pilot the use of an ICD Z code³ for identifying patients who could benefit from in-home interventions in 2021. Assuming this categorization can occur, Efficiency Vermont and collaborating research partners will use the resulting data set to modify the pilot design and future efficiency program designs. This will help the team keep track of patients who might not qualify for program offerings, but need home air quality interventions.

³ ICD codes offer data on social needs of a hospital's patient population. The Z category identifies non-medical factors that can influence a patient's health status. <https://www.aha.org/system/files/2018-04/value-initiative-icd-10-code-social-determinants-of-health.pdf>.

Positive Patient Outcomes

The pilot team will evaluate program results once the data have been collected. Efficiency Vermont expects this to occur in winter 2021 for the three WAP partner pilots. Early results indicate improvements in asthma and COPD control test scores and quality-of-life. Self-managed care coaching by health care partners provides valuable support to program participants.

Confirmed Challenges

Similar to the experience in 2018 and 2019, the collaboration had challenges in identifying and recruiting patients who met the program eligibility criteria and were interested in participating in the program.

COVID-related constraints related to accessing homes throughout 2021 delayed program progress.

Home construction techniques presented challenges to traditional radon mitigation strategies, and resulted in significant cost increases. Some participants declined or limited the intervention options, which also led to delays in implementing the program. And a contractor shortage in the state in general for certain whole-home ventilation and home-cleaning services resulted in high-demand pricing that exceeded budgeted amounts for those services.

Reductions in force at Efficiency Vermont and COVID-related staff reprioritization at the UVM Medical Center and the Vermont Department of Health led to significant delays in program implementation and evaluation.

Looking Ahead

The pilots are succeeding in establishing Vermont-specific experience with energy-plus-health program collaborations. Partner relationships are stronger as a result of the pilots, and are leading to new program designs and increased cross-referrals outside the pilot programs. Early air quality testing results and customer surveys have provided encouraging results about improvements in indoor living environments and participant quality of life. They have also presented valuable insights for improvements to energy efficiency program design.

The partners plan to complete plus-health improvements and final air quality testing on 7 homes in 2021. Patient recruitment for the UVM MC Pediatric Pulmonology pilot will continue via doctor referrals and ongoing patient tracking for potential home environmental respiratory triggers.

All current partners have agreed to continue the program through 2021, pending availability of funds. They are also interested in discussing long-term program potential, once all results are evaluated at the end of the year.

The Vermont Department of Public Service is contemplating a funding proposal to scale up the pilots and data collection, increasing the Vermont-specific evidence for energy-plus-health collaboration. The goal of this work will be to attract permanent funding from health care payers such as Medicaid and health insurance companies

in exchange for improving population health through energy-plus-health home weatherization services.

At the time of this research, the quantification and attribution of health-related non-energy benefits is being discussed as part of the Public Utility Commission Avoided Cost Proceeding (Case No. 19-0397-PET) under Track 2. The results of these pilots could provide supporting documentation for those deliberations.