

Non-Energy Benefit Assessment Practices for Housing Interventions: Guidance for Weatherization and Energy Efficiency Programs

For over 10 years the Green & Healthy Homes Initiative has implemented and evaluated housing intervention services, including efforts to measure how home-based energy efficiency, weatherization and related healthy homes services can confer non-energy benefits at the individual and community level and drive significant savings by improving economic, health and environmental outcomes for residents of affordable housing. Non-energy benefits (NEBs) are defined as the wider socio-economic outcomes that can arise from energy efficiency improvement, aside from energy savings. Specific examples of NEBs at the household level include improvements in housing stability, health, comfort and energy security; in addition, building owners experience less operation and maintenance costs, increased asset values, and decreased vacancy.ⁱ

In 2009, in partnership with HUD, the CDC, and the Council on Foundations, GHHI launched a multi-city initiative to leverage lead hazard control, healthy homes, and energy efficiency and weatherization efforts. HUD and the CDC awarded GHHI a \$1.4 million contract to provide technical assistance to twelve cities and two tribes. Since that time, additional GHHI sites have been established in 20 communities. HUD has reported that GHHI's innovative model of aligned, holistic housing interventions led to 597,000 homes remediated comprehensively between 2009 and 2016.

Based on these experiences and evaluation of the comprehensive benefits of efficiency investments in housing, GHHI has developed guidance and responses to common questions that weatherization and efficiency providers have about the evaluating their programs' NEBs. This document is updated regularly to add information in response to commonly asked questions about related topics. GHHI can also provide examples of assessment forms and evaluation reports to support understanding and adoption of the evaluation practices described.

In the 1980s and 1990s when many weatherization and efficiency programs were established, providers considered NEBs to be hard to measure and were therefore not included in many common evaluation practices and cost-benefit measures. Research on the health and economic benefits of residential efficiency programs has increased since this time and become more reliable, and evidence on monetary value of services is also increasing. Currently, leading agencies in the efficiency and housing fields advocate for NEBs evaluation to be included in program models because these data points help evaluators better capture the full value of weatherization and efficiency assistance to families, communities, and utility providers.ⁱⁱ

Quick Links Related GHHI Publications	Release Date
The State of Equity Measurement: A Background Review for Energy-Efficiency Programs (published by the Urban Institute)	2019
Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-Energy Benefits in the United States	2018
Weatherization and its Impact on Occupant Health Outcomes	2017
Non-Energy Benefits of Energy Efficiency and Weatherization Programs in Multifamily Housing: The Clean Power Plan and Policy Implications	2016
Identified Barriers and Opportunities to Make Housing Green and Healthy Through Weatherization	2010

Frequently Asked Questions about NEBs Evaluation

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1. What are Non-Energy Benefits of Energy Efficiency?

Non-energy benefits are “the wider socio-economic outcomes that can arise from energy efficiency improvement, aside from energy savings.” Other names or ways to describe NEBs include multiple benefits, co-benefits, non-energy impacts, and net benefits. NEBs can reference several different measurements of impact, including specific outputs of repairs (i.e. improved indoor air quality), short-term outcomes (i.e. energy savings and improved family economic security), and long-term impacts (i.e. sustained asthma control and improved school attendance and performance). Benefits can also be captured at multiple scales from individual households to national levels.ⁱⁱⁱ

2. What are Social Determinants of Health and how do they relate to NEBs?

The U.S. Department of Health and Human Services defines Social Determinants of Health (SDOH) as the conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks. Because population groups so often experience and interact with places based on social factors (for example, racial homogeneity of neighborhoods in the United States due to multiple types of segregation), physical and social determinants are deeply intertwined. To learn more GHHI recommends referencing the [Healthy People 2020 website](#) and to support communication efforts about SDOH using guidance developed by the [Robert Wood Johnson Foundation](#).

GHHI’s research has aligned analysis of social determinants of health related to housing conditions that shows families that are more likely to be negatively impacted by SDOH are also more likely to live in unaffordable, unhealthy and inefficient housing, and be economically confined to neighborhoods that limit their ability to make choices related to health and housing quality. Increased awareness of SDOH for implementers of residential efficiency programs helps utilities

and other service providers understand and prepare to address health and safety issues that exist in relation to housing inefficiencies.^{iv}

3. How do NEBs and evaluation of NEBs benefit utility providers?

When residential households participate in weatherization and efficiency programs, the housing unit has improved efficiency, health, and safety measures installed. The outcomes related to these measures include reduced energy costs, increased household economic security (ability to cover monthly living costs), and fewer tradeoff choices for families (such as reduced spending on food and healthcare to cover energy costs). When ratepayers have increased economic security, they are better able to regularly cover monthly expenses, which reduces demand for utility assistance programs and the number of delinquent accounts for utility providers. At program scale, better control of energy demand for utilities results in fewer days of peak demand on energy infrastructure and better control of capital costs.^v

There are three primary ways in which NEBs evaluation benefits utility providers.

- Measurement of the cost-benefit of NEBs in residential efficiency programs supports a more robust comparison of all programs in a utility’s energy reduction portfolio, which helps planning of how program resources should be allocated across a portfolio.
- If more cost-benefits are captured by including the monetization of NEBs measured, utilities will be able to represent the value of the combined efficiency and health and safety repair services to utility regulators.
- Evaluation results that show health and economic benefits to participating households can be used for program marketing, customer relations, and other community engagement efforts.^{vi}

4. What weatherization practices are linked to health benefits?

GHHI has identified 10 primary weatherization and efficiency program intervention services that are directly linked to health benefits. You can find details of specific hazards and the repair services related to hazard reduction in *Achieving Health and Social Equity through Housing: Understanding the Impact of Non-Energy Benefits in the United States*. A summary chart is below:

<p style="text-align: center;">Indoor Air Quality</p> <ul style="list-style-type: none"> • Combustion gas reduction and increased ventilation • Volatile Organic Compound exposure control • Radon hazard control • Environmental Tobacco Smoke reduction 	<p style="text-align: center;">Comfort & Safety</p> <ul style="list-style-type: none"> • Increased thermal regulation and comfort • Prevention of injuries and falls • Improved fire safety
<p style="text-align: center;">Indoor Environmental Asthma Triggers and Allergens</p> <ul style="list-style-type: none"> • Reduction of biological hazards (i.e. mold, dust mites) and unsanitary conditions • Performance of integrated pest management 	<p style="text-align: center;">Lead-Safe Weatherization Practices and Lead-Based Paint Hazard Control</p> <ul style="list-style-type: none"> • Lead abatement and hazard reduction performed through weatherization services (window replacement, etc.)

5. How can weatherization and energy efficiency programs implement NEBs evaluation in the field?

Capturing NEBs in program evaluation usually involves a combination of pre-intervention and post-intervention assessments of conditions of the housing unit and household members' social, health, and economic characteristics. When planning program service delivery, GHHI recommends enabling weatherization and efficiency service providers to work with partnering organizations to perform a comprehensive assessment of the housing unit. Auditors can also be cross trained to perform comprehensive evaluations. Ideally auditors/inspectors would partner with a healthy home educator (i.e. community health worker, certified asthma educator) who would provide case management, SDOH screening, and complete household surveys to track participant-level performance measures and outcomes. Programs should document education provided as well as housing maintenance needs assessed and mitigated. Case management and aligning assessment efforts so they are coordinated and streamlined makes family participation more feasible (reducing their time away from work or family care obligations). Once data collection services (before and after housing interventions) are complete, utilities or evaluation partners can measure various outputs and outcomes of the work performed to determine any health or economic benefits can be attributed to the program interventions. Here are some examples:

Intervention Service	Output	Outcome	Impact
Repair/replacement of unvented heat pumps, gas heating, or wood burning stoves	Reduced exposure to combustion gases	Improved indoor air quality	Lower incidence of carbon monoxide poisoning, respiratory illness
Radon hazard control (coverage of exposed ground)	Radon levels Numbers of homes with radon hazards	Drop in radon levels in home	Reduction of lung cancer cases attributed to radon
Increased thermal regulation (insulation and ventilation)	Days indoor climate is above or below a standard range	Improved indoor climate control and air quality	Reduced cases of thermal stress (heat stroke and hypothermia)
Improved fire safety (repair faulty wiring, installation of smoke alarms)	Number of fire hazards identified	Reduced fire hazards	Lower fire related injuries, hospitalizations, and deaths
Performance of integrated pest management	Frequency of reported pest sightings	Reduced exposure to toxins related to pests	Lower incidence of allergic reactions and asthma exacerbation and related outcomes
Lead abatement and hazard reduction (window replacement)	Number of windows replaced	Lower levels of lead dust and chips	Lower incidence of childhood lead poisoning and related outcomes

To learn more about this program design model, workforce training opportunities, or evaluation practices please visit ghhi.org.

6. Should utilities include evaluation of health and economic outcomes in their program models if they have concerns about participant privacy or customer relationships?

Participant privacy concerns and compliance with applicable privacy rules are very important considerations in evaluation planning. When utilities are engaged in collection or transfer of personal health data, they are likely subject to the Health Information Privacy and Portability Act (HIPAA). Utilities and efficiency program administrators should consult with partnering organizations about evaluation plans and work with experienced healthy homes evaluation experts to design data collection, management, and verification methods. If efficiency program implementers are working with a “Covered Entity,” they may need to execute Business Associates Agreements to comply with HIPAA. (See question 7 for more details.)

Also, when utilities are starting a new effort of NEBs evaluation, clear and transparent communication with the public, program participants, regulators, and community advocacy groups about the purpose and scope of NEBs evaluation is important to building trust with community members. To further engage the community, utilities should share any plans for disseminating evaluation results with the public or regulators and ensure that privacy protection practices are established and followed, and descriptions of privacy practices are readily available. With informed consent, utilities may be able to develop case studies that outline program best practices and share how programs are linked to positive results. Case studies can be a valuable communication tool used to enhance NEBs evaluation and support future program fundraising efforts.

7. Are NEBs evaluation projects subject to HIPAA?

Any agencies planning to evaluate health outcomes related to housing repair programs need to ensure they comply with the Health Insurance Portability and Accountability Act (HIPAA), which established national standards to protect individual health records and other personal health information. HIPAA has three primary components potentially related to NEBs evaluation:

- The Privacy Rule: This rule governs the collection, use, and disclosure of Protected Health Information (PHI). The rule applies to “Covered Entities” including health plans, healthcare clearinghouses, and healthcare service providers; and “Business Associates,” which are agencies providing services on behalf of covered entities. In some cases, Business Associates are agencies that perform healthy housing services. This rule also guides how agencies can execute Business Associate Agreements with Covered Entities to manage PHI in compliance with HIPAA and obtain authorization from clients to collect this data.
- The Security Rule: Administrative, physical, and technical safeguards to protect the confidentiality, integrity, and availability of information.

Required Data to Remove for De-Identification	
1.	Names
2.	Geographic subdivisions smaller than a state
3.	Dates related to individuals
4.	Telephone numbers
5.	Facsimile numbers
6.	Electronic mail addresses
7.	Social security numbers
8.	Medical record numbers
9.	Health plan beneficiary numbers
10.	Account numbers
11.	Certificate/license numbers
12.	Vehicle identifiers
13.	Device identifiers
14.	Web resource locators
15.	Internet protocol address numbers
16.	Biometric identifiers
17.	Full face photographic images
18.	Other unique identifying numbers or characteristics

- Breach Notification Rules: Mandatory notices to individuals and authorities that the confidentiality of PHI has been breached.

Efficiency program administrators new to NEBs evaluation may question their ability to comply with these regulations, but any health information collected through these efforts can be used if it is properly de-identified. The 18 pieces of information that must be removed from evaluation reports to comply with de-identification practices are in the side table.^{vii}

8. What evidence of monetary value of NEBs is available?

Researchers have studied the non-energy cost-benefits of residential weatherization and efficiency programs for more than 20 years, which has generated findings to support valuation of health and social outcomes of efficiency investments. One of the most comprehensive studies on this topic is the Oak Ridge National Laboratory Report [Health and Household-Related Benefits Attributable to the Weatherization Assistance Program](#), which includes monetary benefit estimates for commonly performed retrofitting measures in WAP services. These estimates can be applied to evaluation of programs in several ways, including incorporation into Cost-Effectiveness tests for utility provided efficiency programs. The SERA report [Non-Energy Benefits/Non-Energy Impacts \(NEBs/NEIs\) and their Role and Values in Cost-Effectiveness Tests: State of Maryland](#) presents details on valuation methods that can be used in this capacity.

Here are some commonly used valuations of healthcare cost reductions related environmental health improvements in housing:

- [Asthma Control](#): Each dollar invested in home-based, multi-trigger interventions has a return of \$5.30-\$14.00;
- [Injury Prevention](#): The social benefits of injuries prevented through home modifications are estimated to be at least six times the costs of the intervention;
- [Lead Poisoning Prevention](#): Each dollar invested in lead paint hazard control has a return of \$17-\$221;
- [Residential Fire Prevention](#): Installation of smoke alarms in houses with high risk of fires also yields societal cost benefits. Every \$1 invested yields a \$3.21 return on investment.

9. Are NEBs included in efficiency program Benefit-Cost Tests used in Evaluation, Measurement and Verification procedures?

State utility regulators define Evaluation, Measurement and Verification (EM&V) procedures for the evaluation of efficiency programs offered by utilities that are responsible for contributing to energy savings targets. While many of the standard Benefit-Cost Tests are focused on measurement of only energy savings related to the outputs of the utility for efficiency investments, there are standard tests that capture NEBs in this type of evaluation. American Council for an Energy Efficient Economy (ACEEE) has identified several state approved evaluation procedures now implemented in 19 states (see chart below).^{viii}

Table 1. Health and environmental benefits that could be included in traditional cost-effectiveness tests

Cost-effectiveness screening test	Costs and benefits included	Avoided utility environmental compliance costs	Societal environmental benefits	Societal health benefits	Participant health benefits
Total Resource Cost (TRC) Test	Costs and benefits to utility system and impacts on program participants	✓			✓
Societal Cost Test	TRC Test impacts plus impacts on society	✓	✓	✓	✓
Utility/Program Administrator Cost Test (UCT)	Costs and benefits that affect utility system operation and provision of electric and gas services to customers	✓			
Participant Cost Test	Costs and benefits to program participants				✓
Rate Impact Measure (RIM)	UCT costs and benefits plus estimates of utility lost revenues created by energy efficiency programs	✓			

10. How can residential efficiency program administrators find health evaluation partners?

Most states have several agencies to provide programming that includes a component of NEBs evaluation. Here are some common examples of such agencies:

- Public Health Departments:** State and local health departments have programs dedicated to lead poisoning prevention, healthy housing, asthma care, early child health, and other areas of focus that may enable them to provide housing inspections, health education, and other services to complement home repair services for efficiency and health.
- Federally Qualified Health Centers:** FQHCs are community-based healthcare providers that are designed to provide primary care services in medically underserved areas. They treat patients regardless of healthcare insurance coverage status, so they interact with community residents who also enroll in LIHEAP, WAP, and other utility and efficiency assistance programs. Most FQHCs offer a variety of healthcare services, including those provided by social workers and community health workers, which may enable home visiting and education support for healthy housing repair programming.
- Lead and Healthy Homes Program Administrators:** The Department of Housing and Urban Development Office of Lead Hazard Control and Healthy Homes funds state and local jurisdictions to complete lead hazard reduction and healthy homes services for low- and moderate-income households at risk for lead poisoning. In some jurisdictions programs are administered directly by the government entity, in other places the jurisdiction works with a local non-profit organization to implement the program. Lead and healthy homes programs are valuable partners for weatherization and efficiency programs, and participant enrollment and intervention services should be braided to the greatest extent possible.
- Community Action Agencies:** In many communities the local Community Action Agency operates as a central hub for participant intake for utility assistance, efficiency programs, healthy homes and lead poisoning prevention services, and related support services. The [National Community Action Partnership](#) has a search tool that allows you to find CAAs

based on address information so you can learn more about local services and potential partnership opportunities.

- **Cooperative Extension Services:** Cooperative Extensions are designed to provide rural areas access to community-based resources and continuing education services. Many state Cooperative Extension Services participate in the [Extension Healthy Homes Partnership](#) and have extension staff trained to offer healthy homes education and assessment services.

11. Is NEBs evaluation feasible if efficiency measures and health and safety repairs occur at the same time?

Evaluators often select methods for evaluation of both energy and non-energy benefits of repair projects for scopes of work with efficiency, health, and safety repairs that are based on the requirements of regulators or funders. Because most efficiency programs for low-income residential retrofits include at least some allowances on expenditures for health and safety repairs, evaluators often perform more than one type of Benefit-Cost Test so they can capture outcomes of both energy and non-energy benefits.

Similarly, Weatherization Assistance Program assessment, allocation, and reporting practices are structured to support evaluation of both energy savings and non-energy benefits. For example, the Oak Ridge National Laboratory a retrospective evaluation of WAP in 2015 and found a program wide energy savings-to-investment ratio (SIR) of 1.4 and a Benefit Cost Ratio including health and safety benefits of 4.1.^{ix}

12. What are the requirements and best practices for data management in NEBs evaluation?

Data management is an important component of overall program evaluation planning. Here are some common steps to plan for evaluation of comprehensive housing repairs and interventions:

1. **Project Workflow:** Map out each step of the program, the various stakeholders involved, and a pathway of activities based on eligibility, program status, and assessment findings.
2. **Data Dictionary:** The data dictionary is a roadmap for building and designing your data collection and project management tools. The dictionary includes lists of assessment questions, potential responses, answer response types (i.e. text box, multiple select options), and if responses are required or not. Variables can be linked to operations as well as participants and allow project managers to track funding allocations or time to complete projects.
3. **Assessment Tools:** Determine which variables from the data dictionary will be bucketed together and ensure program applications, assessment tools, and project management tools align with the workflow and your evaluation design.
4. **Training and Staffing:** Determine key stakeholders responsible for inputting data into data input forms and provide training and technical support to enable their workflow.
5. **Benchmarking:** Use data management system to generate reports and track progress toward benchmarks or goals. In planning identify which stakeholders are responsible for running the reports and the report run cadence.
6. **Quality Control:** Ensure that there are reports in place or avenues that allow for the continuous monitoring data quality (i.e. data is entered correctly, there is no missing information), assign key stakeholders to this task.
7. **Data Security:** Document data security measures in a centralized data governance document. Items included in the document should include policies and procedures related to PHI/PII security, password security, and other privacy practices.

13. How can public utility regulators use information about NEBs?

Public utility regulators, including Commissioners, can use NEBs evaluation results in multiple ways to achieve objectives related to efficiency program oversight, constituent support, and public engagement. Evaluation of NEBs in utility administered efficiency programs requires regular reporting about the assessed health, societal, and environmental benefits of programs. This information can help public utility regulators define and exhibit the full value of utility funded efficiency programs to the public. The reporting of program outcomes over time, including ratepayer benefits and community-level benefits, help regulators advocate for continuation and expansion of these programs. They can also support efforts to work with other state agencies to leverage funding for housing and efficiency investments.

14. How is the COVID-19 pandemic impacting NEB evaluation projects?

Many housing repair and efficiency programs were temporarily suspended or scaled back in response to COVID-19 control measure needs. Program capacity and production continue to be tied to local and state regulations that apply to these services. Because many weatherization and efficiency programs prioritize enrollment of households that have increased risk of COVID-19, including low-income households, older adults, and people with pre-existing health conditions that exacerbate COVID-19, virus control protocols are now essential for all programs. To protect program participants and administrative staff many service providers have started offering some virtual services for client intake, resident education, and assessments of some environmental conditions. GHHI has worked with community partners nationally to develop guidance for healthy homes virtual services, which is now available as the [Virtual Healthy Homes Toolkit](#).

ⁱ Green & Healthy Homes Initiative (2018). *Achieving Health and Social Equity Through Housing: Understanding the Impact of Non-Energy Benefits in the United States*. Retrieved from: https://www.greenandhealthyhomes.org/wp-content/uploads/AchievingHealthSocialEquity_final-lo.pdf

ⁱⁱ Ibid.

ⁱⁱⁱ Ibid.

^{iv} Ibid.

^v Ibid.

^{vi} Department of Energy (2016). *Better Buildings Solution Center: Multiple, Non-Energy Benefits of Residential Energy Upgrades*. Retrieved from: <https://betterbuildingssolutioncenter.energy.gov/sites/default/files/2016-Multiple-Non-Energy-Benefits-of-Residential-Energy-Upgrades-Single-Family-TUES.pdf>

^{vii} US Department of Health and Human Services (2020). HIPAA for Professionals. Retrieved from: <https://www.hhs.gov/hipaa/for-professionals/index.html>

^{viii} American Council for an Energy Efficient Economy (2018). *Cost-Effectiveness Test: Overview of State Approaches to Account for Health and Environmental Benefits of Energy Efficiency*. Retrieved from: <https://www.aceee.org/sites/default/files/he-ce-tests-121318.pdf>

^{ix} Department of Energy (2015). *Weatherization Assistance Program National Evaluations: Summary of Results*. Retrieved from: https://www.energy.gov/sites/prod/files/2015/08/f25/WAP_NationalEvaluation_WxWorks_v14_blue_8%205%2015.pdf