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Every healthy homes program faces the challenge of showing that its activities made a difference in the lives of the clients it serves. Similarly, all programs seek to improve the quality of their activities, whether in targeting, service delivery, or efficient use of resources.

Ongoing evaluation can help programs engage in continual quality improvement and enhance the effectiveness of their interventions. As noted in Chapter 3, evaluation should be incorporated into every step of your program's operations; it should not be considered a separate or end-stage activity. In fact, much of the data needed for program evaluation are collected as part of your program's daily operations. The important lesson is to organize, analyze, and use this information effectively.

This chapter provides an overview of evaluation issues pertinent to healthy homes programs. It relies heavily on the HUD Office of Healthy Homes and Lead Hazard Control's 2010 Draft Evaluation Guide for Healthy Homes Grantees (Draft Evaluation Guide).¹ The Centers for Disease Control and Prevention (CDC) also issued a Framework for Program Evaluation in Public Health in 1999 that contains useful guidance on selecting evaluation measures, data collection strategies, and dissemination of findings.² Please refer to both documents for a more in-depth discussion of specific program evaluation issues.

Key Messages

- Evaluation is a continual process in order to achieve quality improvement. Planning for evaluation needs to begin during the program design phase.
- Planning for evaluation includes considerations of who should be part of the team, how to secure good quality data, and ways to measure qualitative and quantitative accomplishments.
- Logic models can serve as an important program planning and evaluation tool.
- Evaluation measures include process (outputs), outcomes, and costs.
- Disseminating evaluation findings is critical to program sustainability.

CDC's Evaluation Working Group website (<http://www.cdc.gov/eval/index.htm>) and its Asthma Program website (http://www.cdc.gov/asthma/program_eval/default.htm) contain other important evaluation tools.

Considerations in Planning Evaluation

All healthy homes programs have some evaluation activities and audiences in common, but there are important differences. New programs tend to focus on whether they reached their recruitment targets, if their staffing, activities, and infrastructure operated as planned, and whether program deliverables were met. Mature programs often set more ambitious goals for evaluation, such as determining the comparative costs and benefits of alternative strategies to reach target populations, and whether to expand service areas or implement new intervention strategies. Established programs may also want to look in a more nuanced way at the outcomes of their activities, such as how long the effects of interventions or behavioral change strategies last, or which intervention has the most impact on health or housing conditions.

Ultimately, the specific questions that your program seeks to answer will guide the development of your evaluation plan. Broad questions that every healthy homes program should answer as a part of their evaluation are:

- Was the program implemented as planned?
- Were program participants representative of the target populations? Who was excluded and why?
- Were the services provided implemented consistently with program protocols?
- How many participants received each of the project's services or interventions?
- Was there a meaningful improvement in the condition of the target housing units?
- Was there an improvement in the health of the target housing units' occupants?³

Operationally, evaluation assesses a program's reach, processes (practices) and outcomes (effects). Healthy homes programs should engage in a combination of process and outcome evaluations. Along with these broad questions, every program faces decisions about:

- Who should be part of the evaluation team?
- How can we assure high quality evaluation data?

- How will we measure success?
- How can we track our costs?
- How will we ensure that evaluation findings are used internally to enhance our effectiveness and ability to use resources more efficiently?
- How do we plan to communicate the evaluation findings to various audiences?

Finally, programs need a framework for assessing the overall quality of the evaluative effort. General standards for assessing the overall quality of an evaluation effort include:

- **Utility:** Are the needs of the intended users being met?
- **Feasibility:** Is the evaluation effort practical and achievable?
- **Propriety:** Is the evaluation effort conducted with regard for the rights and interests of those involved or affected by the program?
- **Accuracy:** Are the findings correct and reported with impartiality?⁴

Setting the Stage

Several factors are important to setting the stage for evaluation:

Planning. A well-designed program is the result of rigorous planning. Programs that lack a documented program plan are difficult to evaluate. Logic models are especially useful in developing both a well-designed program and a well-executed evaluation. (Logic model development will be addressed in more detail later in the chapter.)

Piloting. For an evaluation to be accurate, the intervention itself, the measurement tool, and data collection forms (e.g., instrument or questionnaire) need to remain the same throughout program implementation (such as between pre- and post-intervention data collection). While mid-course corrections may be needed, changing a protocol during program implementation may compromise interpretation of evaluation data. For this reason, it is important to pilot services, interventions and tools before conducting a full-scale evaluation.

Monitoring. Regular discussion among staff delivering services and those responsible for

evaluation is important to continually adapt program activities and data collection in accordance with the evaluation design. These meetings can identify and solve problems arising from data collection, implementation of treatments or services, or program participants.

Commitment. Meaningful evaluation requires organizational and programmatic dedication. Programs that value evaluation view it as an integral part of their day-to-day work. This is demonstrated by program leadership action to ensure the capacity and resources to carry out the evaluation. Leadership must also commit to applying the lessons learned.

Protection of clients' interests. All evaluation staff should be familiar with and mindful of basic principles governing the protection of human subjects. Appendix 6.1 includes an overview of federal protections.

Building the Evaluation Team

The organizational structures of healthy homes programs vary. As a result, evaluation systems—staffing, communication, documentation, data review—will look different within each program. It is important that programs plan and budget for this effort appropriately. Unless restricted by grant or other agency policy, a rule of thumb is to dedicate ten percent of costs to evaluation efforts.

A key decision is to determine who needs to be involved in the evaluation and what information they need. In most programs, the bulk of the evaluation will be conducted in-house in response to grant reporting or internal agency requirements. Common staff positions and their responsibilities include the following:

Senior Program Staff/Principal Investigators. An organization's leadership team needs to be briefed regularly on the program's ability to meet deliverables, lessons learned, and implementation challenges faced by the program. Senior staff members fulfill a critical role in disseminating findings to elected and non-elected officials, the media, potential funders, and community representatives. These stakeholders need quantitative data to answer questions about scope, effectiveness, and cost of services. But they also need qualitative or testimonial data in order to "put a face on the



Tour guide plays a post-tour game with youth.

problem" or show the more intangible benefits of program activities. If research grant funding is part of the project, the Principal Investigator—whether part of the agency or a third party—needs to be engaged directly throughout the course of the evaluation in briefing senior agency staff on the progress and findings of the evaluation.

Program Managers. Program managers need timely and accurate data on program outputs (measurable activities), program outcomes (changes in health and housing conditions), and costs. Program managers need to be able to track and project performance measures throughout the life of the project, usually through the use of spreadsheets or database systems. They especially need to be able to identify deviations from what was expected or planned. This means that evaluation data should be available to the program manager on a real-time basis, and reviewed at least monthly to ensure program deliverable dates are met according to the planned time frames.

Program Service Delivery. Any staff member who is engaged in direct services (intake, outreach, home visits, assessment, and intervention) produces evaluation data and needs to be kept aware of the progress of the program. If these staff do not understand the importance and the impact of their work, the quality of service delivery may suffer. Weekly or biweekly team meetings, regular staff briefings, case review, and periodic staff retreats help to build a shared understanding and can also identify unexpected consequences or problems with implementation. Written protocols, regular chart reviews and case conferences are also

ways to evaluate and standardize the delivery of services. Research assistants and data entry staff need to be engaged in this process in order to understand the relationships between data quality and program implementation and evaluation. (A more detailed discussion of data quality issues follows later in this chapter).

Clients of the program. Some healthy homes programs establish an advisory board composed of stakeholders to participate in program planning and provide feedback on program progress and outcomes. Community-based partners and recipients of program services should be part of this advisory effort. Genuine community involvement is critical to assuring that the program stays true to its mission and services actually meet community needs. Client satisfaction surveys can also be an important tool. Moreover, the qualitative data that come from focus groups and community meetings are important for understanding the context in which services were provided.

Data analysts. Advanced expertise (such as epidemiology, statistics, or economics) may be required to determine the degree to which observed program effects occur by chance or are directly related to the program's activities. Some agencies have the capacity to conduct this analysis in-house, either directly or through partnership with other offices. These analysts need to be engaged early in program decision making so they can determine whether proposed evaluation measures have the validity, reliability, and sensitivity to meet evaluation needs. They also need access to high-quality statistical analysis tools, such as SAS[®], SPSS[®], STATA[™], etc. Finally, they need dedicated time to the project throughout the life of the initiative, not just at the conclusion of the program when an evaluation report is being produced.

Agency information management or information technology (IT) staff. Lack of computing capacity or the appropriate statistical analysis program can hinder in-house evaluation efforts. It is important that decisions about data collection and security be made early and with the involvement of IT staff. In most cases, access to a current version of word-processing, spreadsheet and database software is sufficient for most members of the evaluation team. It is important, however, that all members of the

team have the same version of these programs and are trained to use them appropriately.

Third-Party Evaluators. While most healthy homes programs do the bulk of their evaluation in-house, sometimes outside evaluators are engaged if programs lack the necessary in-house resources. Independent evaluation consultants are often located in academic institutions and may already be program partners. However, selecting an appropriate outside evaluator involves finding an individual or team experienced in both housing and health evaluation, understands your project's activities, structure, and the target population, communicates with your program in ways that you and your staff understand, is willing to spend time on site, and focuses on the evaluation questions or hypotheses that are important to you and your audience for evaluation. For more details on selecting a third party, see Draft Evaluation Guide and Project Planning and Evaluation Guidebook: a Manual for Practitioners and Managers of Self-Sufficiency Demonstration Projects.⁵

Using Logic Models to Develop an Evaluation Framework

Logic models link a program's framework to the evaluation plan. They are a visual method of describing the relationships among program elements. Some HUD and most CDC and EPA grant programs require the development of a logic model as part of the grant application, as do many private funders. While there are many guidelines for building a logic model (see Draft Evaluation Guide, Sundra et al, 2003⁶; Kellogg, 2004⁷; Project Planning and Evaluation Guidebook⁸), at their most basic level, logic models serve several purposes:

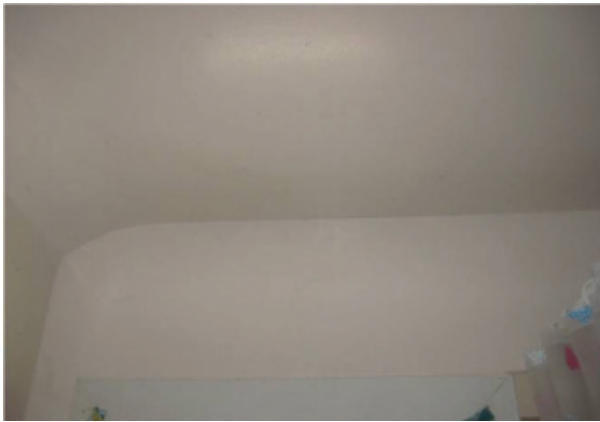
1. To identify short-term, intermediate, and long-term outcomes for the program.
2. To link expected outcomes to the program's intended activities and inputs (staff, resources, behavioral and physical interventions). Logic models challenge program designers to articulate assumptions about cause and effect. They also help to specify program milestones such as what activities must be completed before certain outcomes can be expected.⁹

Figure 6.1 Elements of a Logic Model

- Resources or inputs can be financial, human, organizational, system-oriented or community-based—the factors needed to support program activities.
- Activities include services such as education, home visits, environmental assessment and home intervention.
- Outputs are counts of activities related to recruitment/intake, education, completed housing interventions and case management.
- Outcomes and impact are changes in short, intermediate and long term measures, such as health or housing conditions.

Figure 6.2 A Proposed Logic Model Related to Healthy Homes

Program Focus	Inputs	Activities	Outputs	Short Term Outcomes	Mid-Term Outcomes	Long-Term Outcomes
Asthma Healthy Homes Pilot	Health Department Staff	Educate families about environmental triggers in the home	Number of home visits completed	Increased use of mattress and pillow covers, IPM supplies after one month	Reduction in counts of pests in units after three months	Reduction in mold and moisture conditions observed at 12-month visual assessment
	Home Visiting Programs	Conduct visual assessments	Number of referrals to partner organizations	Improvement in family Knowledge, Information, and Behavior (KIB) scores in one month	Reduction in the reported number of symptom days after 3 months	Families show long term improvement on KIB scores
	Home Inspectors	Provide supplies for dust control and pest management	Counts of supplies delivered		Reduction in the number of asthma triggers	Health insurers reimburse or pay for home visits and low cost environmental interventions
	Community Organizations	Interventions including integrated pest management (IPM), moisture control, lead hazard reduction, etc.	Number of visual assessments for pests, mold, and moisture completed	Increase number of units where family limits smoking in the home	Reduction in ER and hospitalizations at 12 months	Property owners adopt preventive policies
	Advocacy Organizations	Refer families to smoking cessation programs	Number of homes receiving specific interventions such as IPM		Increased number of units enrolled in housing rehab programs	
	Rental Property Owners	Refer families to housing rehab services to address issues beyond program scope	Number of housing inspections for housing code violations			
	Pest Management Professionals	Refer housing units to code enforcement				
	Contractors					
	Elected Officials					
	Clinicians					
	Health Insurers					
	Foundations					
Funding						
Equipment						
Supplies						



(See Appendix 6.2 for CDC’s proposed logic model for Healthy Homes Programs.)

Assuring High Quality Data

Quality improvement and credible evaluation rely on accurate, precise, and reliable data. Data quality management tools can range from simple checklists to detailed Quality Assurance Plans (QAP) that outline staff responsibilities for program oversight, data collection methods, quality control procedures, maintenance of records to support reporting and fiscal administration, and a data analysis plan.

Two data quality documents—a data collection plan and data analysis plan—are especially important to develop early in the program design and implementation stage. A written data collection plan provides direction to staff or program partners responsible for collecting information needed to evaluate the program. Input from field staff is almost always needed to produce these plans as these individuals collect most of the raw data and have unique insights from the field into the target population. Data collection policies and procedures need to be simple and clear so that project staff understand why they are collecting the information and how it will be used. Their involvement in piloting data collection tools and procedures is also highly recommended.

A data analysis plan keeps the program on track by identifying critical data elements that the evaluators will study and qualitatively evaluate for program impact. Data analysis plans should be developed in the program design phase to minimize collection of extraneous data. Similarly, preliminary data analysis needs to be conducted early in the process of implementation, once all data collection instruments are finalized. Outcome data (change in health or housing conditions) associated with interventions conducted in the first units enrolled should be analyzed as soon as possible. Waiting to analyze data until the end of the program impairs the program’s ability to make mid-course corrections when needed.

Best Practices

Strategies for good data collection, data entry, and data management include:

3. To establish program boundaries to prevent “mission creep.” Knowing what cannot be accomplished through project activities is often as important as specifying what should be accomplished, especially if community expectations for a program are high.

Sundra et al. suggest that building a logic model can start from left-to-right (specification of activities → outcomes) or right-to-left (specification of outcomes → identification of inputs and activities). In the left-to-right approach, each link in the model is accompanied by the question, “Why?” (such as Why is this input needed for a planned activity? or Why will this activity produce the expected short-term change?).¹⁰ In the right-to-left approach, the critical question is “How?” (such as How would asthma rates be influenced by the intermediate outcomes expected from a particular activity?). By working left-to-right and right-to-left, program evaluators begin to identify potential weaknesses in program design, as well as activities that may be extraneous to accomplishing program goals.

- Clearly written protocols, policies, and procedures.
- Thorough training of staff to assure high levels of accuracy in data entry, protection of confidential client information, and data security.
- Periodic refresher training for all staff on protocols, policies and procedures. Cross-training and periodic assessment of inter-rater reliability of data collected by different staff members to assure consistency is recommended.
- Use of data collection instruments with known validity and reliability whenever possible.
- Implementation of double data entry (in which two individuals enter the same data and then reconcile discrepancies). Data entry staff should also be trained to inspect their work for missing data and errors.
- Routine checks for data quality and completeness by program managers.
- Site visits by supervisors who periodically accompany staff on home visits to assess whether services are being delivered according to program protocols.
- Regular data cleaning by running simple statistical reports (e.g., counts, frequencies) and correcting out-of-range values.
- Familiarity with the laboratory quality control measures and chain of custody requirements if environmental sampling is conducted. It is important to assure that the laboratory used meets certification requirements, such as the National Lead Laboratory Accreditation Program (NLLAP—<http://www.epa.gov/oppt/lead/pubs/nllap.htm>) and the Environmental Microbiology Laboratory Accreditation Program (EMLAP—<http://www.aihaaccreditedlabs.org/AccredPrograms/EMLAP/Pages/default.aspx>).
- Security of physical data (i.e., locked and secured files).
- Security of electronic data (i.e., password protection or limited access to data, regular backups of data).

Figure 6.3 Standard Program Forms Used for Evaluation

- Program intake forms (household characteristics, housing characteristics, and housing conditions)
- Environmental assessment forms
- Resident interviews (also referred to as Environmental Questionnaire)
- Environmental sampling
- Construction forms (documenting treatments and costs)
- Health indicator questionnaires
- Health measurements (physiologic measures)
- Program tracking tools (reports of community outreach efforts, trainings, and number of attendees)

Source: Draft Evaluation Guide, p. 23.¹¹

Common Problems

Some data management and analysis practices to avoid:

- Failure to use available data management tools appropriately, such as hand-counting data rather than using electronic spreadsheets.
- Poor record management, such as storage of records in multiple locations and lack of version control on data collection instruments.
- Failure to clearly state criteria to interpret a result, such as what constitutes “high” or “low.”
- Failure to consider and report alternative explanation of findings.
- Failure to limit conclusions to the situations, contexts, and period for which the data are applicable.

In-depth discussion of data quality and a QAP template can be found at http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_36504.doc, and in the Evaluation Guide.

To implement the Healthy Homes Surveillance System at CDC, the Healthy Homes and Lead Poisoning Branch developed the Healthy Homes and Lead Poisoning Surveillance System (HHLPPS) application. HHLPPS is a web-based surveillance system used primarily in state health departments. Local health departments will be able to access the application through a web browser. State and local health departments will use HHLPPS to track home-related risk factors and interventions, and to report to CDC. Other programs may also use HHLPPS, but it may require upgrades to their systems' hardware and software. The application is provided at no charge.

Figure 6.4 Sources of Qualitative and Quantitative Measures

Program evaluation information and data can come from documents routinely produced by the program:

- Grant proposals and quarterly reports
- Newsletters, publicity materials and press releases
- Meeting minutes and administrative records
- Registration and enrollment forms
- Publications and journal articles
- Prior evaluations
- Asset and needs analyses
- Client satisfaction surveys
- Databases
- Reports held by funders or partner agencies
- Websites
- Graphs, maps, charts, photos, and videos
- Feedback collected at meetings or interviews with key individuals, including clients and non-participants, staff, general public, key informants, critics, staff of other agencies, representatives of advocacy groups, policy-makers, funders, and federal, state, and local health and housing officials.¹²

Measuring Success

Defining the intended audiences of the evaluation helps to determine what measures to use and how to best to report the findings. If the audience is interested in program activities and efficiency in service delivery, a process evaluation may be appropriate. If the audience is interested in change in behaviors, or health and housing conditions, more outcome measures are needed. Increasingly, all programs are required to demonstrate that program funds are used efficiently and effectively. Most healthy homes programs use a combination of evaluation strategies and measures.

As described in Chapter 4, there are numerous validated assessments and tools that can be used to evaluate the effectiveness of healthy homes interventions. Appendix 4.1 adapted from the Evaluation Guide provides links to these tools, describes the tools' comprehensiveness, indicates if a tool has been validated, and comments on ease of adaptation and burden of use.

Process Evaluation Measures

Process evaluation measures program reach (i.e., who the program has influenced or touched), activities and services, and documents program operations. The goal of process evaluation is to fully understand how a program is implemented. Process evaluation answers the questions:

- Did the program serve its intended audience (as defined and characterized by the level of environmental health risk and by demographics)? How many people were served? How many were not served and why?
- Were services delivered as planned, within target timeframes and budget, and in a way that left recipients satisfied?

Process evaluation provides information to make mid-course corrections, if needed, to enhance a program's success (see Figure 6.5). It reviews information on the characteristics of families or residents receiving program services and analyzes a program's performance against established benchmarks (deliverables) that reflect the intended goals. Benchmarks need to be established for each program phase and shared with project staff and partners.

Any changes to program operations or interventions should be systematically documented. This can be done through program staff meeting summaries or coalition meeting minutes that communicate challenges, accomplishments, and changes in strategic direction. The documentation can then be used to compile a lessons learned document on conclusion of the program.

Process evaluations typically focus on the outputs of program operations. These measures typically come from data collection forms and protocols established to track activities within each program phase, such as intake forms, scopes of work, visual assessment forms, environmental questionnaires, environmental sampling documentation, health indicator forms and questionnaires, and program service delivery tracking tools.

Outcome Evaluation Measures

Outcome evaluation focuses on the degree to which any change in health status or housing condition is attributable to a program's services or interventions. The purpose of this type of evaluation is to measure the impact or the effect of the program and identify changes or benefits to clients due to program participation.

Outcomes are directly tied to program goals. Changes in attitudes, values, knowledge, skills, behaviors, health status, and indoor environmental quality are examples of outcome measures. Outcome evaluation determines if your program is providing the right services to bring about the changes that you want to see in your target population's health and their housing.

If your program wishes to attribute improvements in health and housing conditions to your interventions and not to chance, you will need to pay special attention to statistical methods and your evaluation design. This is addressed in detail in the Draft Evaluation Guide and in Appendix 6.3. HUD's 2007 evaluation of its healthy homes grantees found the majority of Demonstration grantees employed a pre-/post-intervention design using the results of the visual assessment and participant surveys to measure the effects of interventions and changes to attitudes and behaviors before and after intervention.¹³ In general, strengths of the pre/post design include

Figure 6.5 In Newport, Rhode Island, Process Evaluation Leads to Changes in Interventions, Referrals, and Policy

Healthy Residents, Healthy Homes Coalition was dedicated to using coordinated health, housing and social service responses to reduce the burden that asthma placed on families and individuals living at the Newport Housing Authority. The coalition included the Newport Housing Authority, local health and social service providers, Rhode Island state health officials, and regional organizations.

The evaluation team met weekly to review progress. The team included all staff who did home visits and the maintenance staff from public housing. One benefit of this approach is that different interpretations could be gleaned from the same data. For example, consistent mold and moisture problems in bathrooms led the maintenance staff member to suggest a change to the interventions: use porcelain pedestal sinks near bathtubs rather than cabinet-style sinks that are susceptible to moisture intrusion if water splashed out of the tub.

Regular reviews of the data also showed that at baseline 51 percent of the family housing and 29 percent of senior or disabled housing units had at least one family member who smoked in the home. Smoking in homes was common. Participants requested referrals to smoking cessation services in large numbers, but the program had no health partners to provide those services. This led to identification of new partners for smoking cessation. On the housing intervention side, it also led to recognition that a policy change could reduce exposures to ETS throughout the properties and provided the basis for a new Housing Authority initiative—a smoke-free housing policy.

simplicity and the ability to use data routinely collected in the field. However, the design is susceptible to biases that make it difficult to determine whether changes in observed outcomes are affected by confounding factors such as other outside events, individual growth and development, and the process of being observed.¹⁴

Figure 6.6 Common Program Outputs

- Program Outreach and Community Education
 - ▶ Number and type of presentations
 - Audience (health care personnel, parents, contractors, educators, community, rental property owners, tenants, owner-occupants). Audiences can be divided into public and professional.
 - Number of individuals reached
 - ▶ Number of health fairs
 - Number of interactions (participants, names recorded on sign in sheets, requests for follow up information)
 - Pieces of literature distributed
 - ▶ Number of housing units reached through door-to-door canvassing
 - ▶ Number of media events
 - Paid vs. unpaid
- Program Referrals
 - ▶ Number of referrals from medical providers
 - ▶ Number of referrals from community-based organizations
 - ▶ Number of requests for information and enrollment associated with different media placements
 - ▶ Number of referrals by healthy housing programs to other housing programs
 - ▶ Number of referrals by healthy housing programs to other health or social service programs
- Families/Individuals Recruited
 - ▶ Demographics of participants and nonparticipants
 - ▶ Level of housing risk in units of participants and non-participants
- Case Management/Care Coordination and Education
 - ▶ Number of children tested for lead exposure
 - ▶ Number of home visits
 - ▶ Number of families receiving educational intervention
 - ▶ Number of referrals provided to families for supportive health and social services
 - ▶ Number of referrals to other services completed and not completed
 - ▶ Number of families receiving cleaning supplies
- Home Assessment
 - ▶ Number of questionnaires administered
 - ▶ Number of homes with assessments conducted
 - ▶ Number of homes with environmental samples collected
 - ▶ Number of environmental samples collected
- Housing Unit Remediation
 - ▶ Number receiving enhanced ventilation and moisture control interventions
 - ▶ Number receiving integrated pest management
 - ▶ Number receiving lead hazard reduction
 - ▶ Number of fire alarms and carbon monoxide detectors installed
- Work Force Development Activities
 - ▶ Number of contractors recruited
 - ▶ Number of contractors recruited from the target population and area
 - ▶ Number of individuals trained

Use of a control group provides a stronger basis for analyzing program effects. Control groups are groups of housing units or individuals that are comparable in terms of location, condition, residential characteristics or demographics but do not receive program services or interventions. Randomized control trials, in which participants are randomly selected and assigned to a treatment or control group, are the “gold standard” for experimental research designs.

Use of control groups and randomized designs is generally confined to research and is rarely used for evaluating programs. Ethical issues associated with the use of control groups in housing intervention research are reviewed in a publication by the NAS/IOM.

Health and Well-Being Outcomes

Health outcomes commonly tracked by healthy homes programs are listed in Figure 6.7.

Figure 6.7 Common Health and Well-Being Outcomes

- Lead poisoning
 - ▶ Reduction in post-intervention blood lead levels of resident children < 6 years of age
- Asthma
 - ▶ Decreased symptom severity
 - ▶ Increased number of symptom-free days
 - ▶ Improved child and caretaker quality of life
 - ▶ Reduced number of missed school and work days
 - ▶ Reduced number of emergency department visits and hospitalizations
 - ▶ Decreased medical costs
 - ▶ Reductions in use of rescue medication
 - ▶ Reduced number of unscheduled doctor or clinic visits
- Unintentional injuries
 - ▶ Reduced number of emergency department visits and hospitalizations
 - ▶ Decreased medical costs
- Changes in knowledge, attitude and behavior
 - ▶ Increased evidence of smoking outdoors or participation in smoking cessation programs
 - ▶ Increased storage of food in pest-proof containers
 - ▶ Increased use of lead-safe work practices
 - ▶ Use of more effective cleaning practices

Housing Outcomes

Allergen, pest and moisture control are complex processes that often depend on structural changes in the home and behavioral changes by the residents. All housing interventions (treatments) are appropriate for outcome evaluation. Commonly tracked housing outcomes are listed in Figure 6.8.

Cost Measures

Fiscal accountability requires that programs use their funding in the most efficient and

Figure 6.8 Common Housing Outcomes

- Change in level of pest infestation
- Change in concentrations of common allergens (e.g., dust mite, cockroach, mouse in floor dust)
- Change in number and type of injury hazards and other indicators of home safety
- Changes in number and concentration of contaminants in air or other media
- Reduction in lead-based paint hazards
- Reduction in mold or moisture-damaged materials
- Presence of a working smoke or carbon monoxide detector after 12 months
- Reduction in radon levels
- Improved ventilation
- Increase in the number of homes where smoking is not permitted indoors

transparent way possible. Increasingly, healthy housing programs have been asked to produce per capita service delivery costs as a way to justify continued or new funding and as a basis for selecting service delivery methods. Mason and Brown's (2010) publication on estimating costs for housing-related interventions to prevent specific illnesses highlights five types of cost studies employed in the public health and housing sectors. These include:

- **Cost-of-illness (COI)** studies that quantify the public health burden created by an illness by including all medical, non-medical, and productivity costs associated with an adverse health outcome.
- **Cost analysis (CA)** studies that focus on the costs of implementing an intervention, and may also document the costs saved as a result of the intervention (or the net costs after subtracting the total program costs from the cost of illnesses).
- **Cost-effectiveness analyses (CEA)** that calculate the ratio of net costs (as defined above) per improvement in health associated with the intervention (such as the costs

Figure 6.9 In Seattle: Outcome Evaluations with Demonstrated Health and Housing Benefits

Seattle's Breathe Easy healthy homes project (BEH) renovated 35 units in a public housing authority development to reduce asthma triggers. Interventions included improvements to building ventilation and energy efficiency, use of building materials with limited potential to outgas, treatments to assure smooth and cleanable floors, smoke-and pet-free policies, extensive client education on reducing asthma triggers, and asthma case management services provided by Community Health Workers. Evaluation data were collected at the initiation of the one-year CHW intervention in the old home and at one year after the move into the renovated housing units. A 2010 evaluation report compared pre- post data on 34 residents of BEH to a comparison group of 68 participants in an earlier year-long asthma-project who received the same CHW education model but whose units did not receive structural repairs. Clinical evaluation criteria included a detailed assessment of asthma severity, medication and health services use, administration of the pediatric quality of life tool, skin test

sensitization, and pulmonary function tests. The pre-post comparison for BEH residents showed statistically significant changes (that is, results beyond what would be expected by chance) in:

- Increases in the number of symptom-free days;
- Reductions in number of urgent care visits;
- Reductions in measured asthma triggers in house dust in the home; and
- Improvements in pulmonary function.

Comparison of the BEH residents to the control showed that the BEH group improved more on most measures, but there were few statistically significant differences apart from reduced nighttime symptoms. However, the mean number of environmental triggers in the BEH homes at one year were significantly reduced, with a modest construction cost of \$5000–7000. The authors suggest that these costs can be recouped in a relatively short time through the potential cost savings in asthma care costs and missed work and school days.

Source: Takaro, TK, Krieger, J, Song, L, Sharify, D and Beaudet, N. 2011¹⁶

associated with symptom-free days). This is used to assess the relative efficiency of two or more interventions.

- **Cost-utility analysis (CUA)**, a type of cost-effectiveness analysis in which the health outcome measure includes quality-adjusted life years (prolonged life and quality of life).
- **Cost-benefit analyses (CBA)**, the "gold standard" that compares the costs and consequences (positive and negative) of intervention strategies.¹⁷

Typically, healthy homes programs use cost analysis and cost-of-illness, and link these monetary values to program outputs. Most programs will not have the expertise to perform the more intensive economic analyses. (Refer to the Evaluation Guide for more details on these issues.)

However, Mason and Brown note that all programs need to be thoughtful in determining

the audience perspective for looking at the costs associated with different outcomes. Since low-income families typically bear more of the adverse health outcomes associated with poor housing, a societal perspective on costs and benefits, rather than one that focuses on who pays for specific services at a local or state level, may be more equitable. Moreover, intangible costs, such as social justice, may be hard to monetize and include in the analysis, but are important.¹⁸

Healthy homes programs need to develop a cost-tracking system that includes the costs of implementation not only by activity, but ultimately on a per unit and intervention level. Quantifying the cost of service systems or program activities needs to include all direct labor costs, fringe benefit and indirect costs, educational, office and field supplies and materials, travel, and laboratory analyses. Examples of programmatic costs to track and quantify are illustrated in Figure 6.11.

Figure 6.10 In Phoenix: Lessons Learned from Outcome Evaluations Improve the Next Round Research

From 2003—2006, the Phoenix Healthy Homes Demonstration funded a study of respiratory and injury risk-reduction in 67 homes. Residents were low-income, primarily Hispanic, home-owners with at least one child in the home under age¹⁵. The program targeted for recruitment families with children with a diagnosis of asthma through the Phoenix Children's Hospital, Phoenix Head Start, Arizona Department of Health Services' Childhood Lead Poisoning Prevention Program, and the City of Phoenix Neighborhood Services Department's Housing Rehabilitation Section. A multidisciplinary team of a health educator, bilingual home assessor, injury specialist, and a pediatric pulmonary nurse practitioner oversaw a pre-post intervention educational and assessment home visit. Interventions in the home included structural repairs, supplies and education, with a median cost of \$1,139 and an average of \$5,440 (excluding staff time). Thirty-six potential hazards were assessed including 7 potential respiratory health hazards. The total number of hazards declined from an average of 14 at baseline to 3.4 following intervention. The declines were statistically significant for 30 of the 36 potential hazards.

Of the 62 caregivers who completed the questionnaire, 97 percent reported that their homes were safer after being part of the project. Nearly all respondents reported that the health of the child with asthma was better than before the project. The average number of respiratory health hazards per home dropped from 3.3 to 0.9 from baseline to post-intervention ($p < 0.001$). Observed dust in carpets and bedding, observed dust in the heating and cooling system, poor housekeeping, musty smell, and observed cockroach infestation were hazards in 52–69

percent of the homes at baseline and were significantly reduced at post-intervention with the percent of homes with improvements ranging from 77 to 98 percent.

Injury-related hazards observed in at least 80 percent of the study homes at baseline included: no fire escape route; no functional smoke alarms; improper storage of vitamins, medications, and household products; no emergency telephone numbers; sharp objects improperly stored; and no first aid kit. All individual structural injury hazards were significantly reduced from baseline to post-intervention with improvements in 88–100 percent of the homes with hazards at baseline.

The project received a second round of funding in 2009. It revised its protocol to address lessons learned during the earlier outcome evaluation. These included:

- Assigning a staff member to track families more closely and to be sure that medical data and the post-intervention home visits were conducted in a more timely manner.
- Tracking asthma and injury outcomes through objective measures and over a longer period of time to supplement parent self-reports.
- Using more pictures and demonstrations during home visits to compensate for the fact that many of the families enrolled had low literacy levels in both English and Spanish.
- More effort to assess the effect of individual interventions.
- More evaluation of the educational components of the program.

Source: Dixon SL, Fowler C, Harris J, Moffat S, Martinez Y, Walton H, Ruiz B, Jacobs DE. 2009.¹⁶

Appendix 6.4 offers an example of a cost-benefit analysis that calculates health benefits, energy savings, and increased housing value as a result of window replacement and paint stabilization, and includes a formula that can be used by your program to calculate costs specific to your locality.

Disseminating Findings

Ultimately, evaluation results are only meaningful if they are used by decision-makers and stakeholders to improve the effectiveness of programs and develop or refine policies to protect the community from housing hazards. A

Figure 6.11 Programmatic Cost Data

- Outreach and Education Costs
 - ▶ Forms and outreach materials (development and production) costs
 - ▶ Free media and paid media costs (press releases, public service announcements, marketing campaigns; staff time needed for media interviews, health fairs)
 - ▶ Public education and training offerings
- Health Intervention and Assessment Costs
 - ▶ Home visits (education, case management)
 - ▶ Visual assessments
 - ▶ Environmental sampling
 - ▶ Laboratory analysis
- Housing Intervention Costs
 - ▶ Treatment (specification) costs
 - ▶ Average cost per housing unit
 - ▶ Range of housing unit costs
 - ▶ Specific intervention costs (IPM, moisture control, lead hazard reduction, safety kits)

dissemination plan should include the provision of information to the following stakeholders:

- **Program Participants.** Specific information on the housing assessment and the outcome of the interventions should be provided to all housing occupants and owners in a timely manner. This is consistent with legal requirements that results of lead-based paint hazard testing, control treatments, and dust clearance are provided to owners (see Lead Disclosure Rule) and occupants are notified (see Lead Safe Housing Rule). Although there are few required notification standards for healthy homes treatments, it is recommended that similar information be provided to owners and occupants.

Providing a summary of what was learned as a result of the program as a whole and how this information will be used to advance healthy homes initiatives is a meaningful

way to acknowledge participation and raise awareness of the program's next steps. It is important to provide the information in a format that is clear and understandable. Guidance can be found at <http://www.plainlanguage.gov/>.

- **Media.** The media—print, radio, television, and social-media—can be used to raise awareness of the program at the onset and to lay the groundwork for dissemination of results. When planning to share information about the program and its impact with the media, it is advantageous to identify a family or families who benefited from the program who are able and willing to interact with the media.
- **Community.** Community involvement in planning, implementing, and evaluating healthy homes programs can result in more effective and sustainable programs. Sharing information about program results, their meaning, and future activities can strengthen existing partnerships, assure the community's continued support for the program, and demonstrates respect for their contributions.
- **Elected and Other Officials.** Providing outcome information to elected officials, that highlights the impact on their constituents, is an effective way to assure future support and funding for your healthy homes program. Some programs have had good results when community members served by the program deliver this information. "Report cards" that compare an elected official's district to other districts and the city and state as a whole provide meaningful contextual information.
- **Funders.** Most funders require regular program reports as a condition of financial support. When disseminating information about the program—at any stage—it is crucial to acknowledge the funding source(s).
- **Health Plans.** Insurance companies and HMOs may be interested in the costs of services and impact of interventions on use of health care (emergency room visits, hospitalization, and medication use). Some health plans are working with asthma programs to provide or reimburse for the costs of asthma case management.

- **Partners.** Sharing information about the program's outcomes, what it means for future efforts, and brainstorming next steps provides the opportunity to celebrate a program's partnerships and their importance in achieving positive change in health status and housing outcomes. This type of celebration can be used to conclude a program formally and solidify the partnership for the future.
- **Peers/Colleagues.** A robust evaluation can lay the groundwork for sharing your program's outcomes and lessons learned on a national scale through conference presentations, poster sessions, and publications in peer-reviewed literature. Academic partners who serve as external or third-party evaluators are great resources for this level of dissemination.

Recognize that evaluative information on the program also needs to be distributed in ways appropriate to the target audience. Press releases, press conferences, fact sheets, and maps are helpful for the media and elected officials. Community groups and program participants may prefer more graphics and pictures, as well as summaries in plain language. Websites provide a useful tool for dissemination to all audiences.

Chapter 6 References*

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*Websites were verified during the drafting of this document but may have changed.

¹⁷ Mason, J. and Brown, M.J. 2010. Estimates of costs for housing-related interventions to prevent specific illnesses and deaths. *Journal of Public Health Management Practice*. (Supplement):S79–S89.

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