The Green and Healthy Homes Initiative (GHHI)

Introduction

Ruth Ann Norton, executive director of the National Coalition to End Childhood Lead Poisoning (CECLP), founded the Green & Healthy Homes Initiative (GHHI) in order to leverage newly available federal funds from the American Recovery and Reinvestment Act of 2009 (ARRA) for weatherizing low-income housing. Norton saw in these funds the opportunity to reach beyond the successful lead abatement programs that had been the focus of CECLP and to tackle some of the broader problems affecting the homes and health of low- and moderate-income families. GHHI, a public-private partnership, was designed to coordinate the efforts of the many agencies and organizations that were focused on creating “green and healthy homes,” i.e., homes that were energy efficient and free from health and environmental hazards. (See Exhibit 1 for organizations involved at the national level.) In a recent interview, she described what GHHI brought to the green movement, and the challenge of creating a sustainable movement for green and healthy homes.

HUD has long sponsored a “Healthy Homes” program but it was progressing slowly. Meanwhile “Green” alone has had a difficult time finding traction, especially in lower-income communities. The benefit of putting Green and Healthy together for low-income communities is because people will invest money, time, effort, even inconvenience, if they can see the immediate benefit to their child. If their child can sleep through the night or experience less ER visits, these are visual changes.

GHHI took a holistic approach to improving homes in low-income communities by combining federal, state, local, and philanthropic resources efficiently and comprehensively. Initial results from Baltimore, the site of GHHI’s first intervention, indicated that GHHI’s integrated intervention—using a single, trained work crew for all repairs—saved more than 25% of the cost of doing the needed repairs separately, while increasing worker earnings and improving the health and decreasing energy costs for home occupants.

However, as of June 2011, the ARRA funding was winding down, and Norton was looking for other, sustainable sources of financing.

The monetary returns on green are not well understood, so we are focusing on the monetary returns on health. We would like to approach state Medicaid programs and ask them to reimburse GHFI interventions where we have evidence-based assessment. We
hope to convince states that it is better to spend $21,000 for a GHHI intervention than paying for the individual go to the ER and rack up $43,000 per year in medical expenses.

GHHI had pilot projects in 15 sites but many more cities and towns around the country had submitted applications to participate. Recently, the Centers for Disease Control (CDC), one of the key federal agencies collaborating in GHHI, put out a request for proposals from cities and towns for CDC funding to develop GHHI strategies for their communities. They got 64 applications for six funded spots. Dr. Mary Jean Brown, Chief of Lead Poisoning Branch, CDC, commented,

GHHI has captured people’s imagination, but there hasn’t been the funding to fully implement the vision. It is really disheartening to have so little money when there are so many people that recognize the need for this program and are eager to do it.

The Home Environment and Health

Homes built prior to 1978 (when lead paint was banned in the U.S.) are likely to contain lead-based paint, which can be present in the form of chips, dust, or particles in the home. It is well-established that exposure to lead, whether through ingestion or inhalation, has detrimental neurodevelopmental consequences, particularly for children. Lead exposure can lead to anemia, nervous system dysfunction, hypertension, kidney damage, decreased fertility, increased risk of miscarriages, low birth weight and premature deliveries, neurological impairment, behavioral effects, and death. CDC currently defines an elevated blood lead level (BLL) as 10 µg/dL or higher. Elevated BLLs are associated with hyperactivity, impulsivity, and attention deficit hyperactivity disorder (ADHD), as well as aggression, delinquency in schoolchildren, and higher arrest rates in young adults. However, recent studies have shown that even BLLs below 10 µg/dl are associated with lower IQ scores, behavioral problems, decreased attention and visual spatial abilities. No blood lead threshold for these effects has been identified for children.

Poor indoor air quality in the home can also cause health problems. The U.S. Environmental Protection Agency (EPA) has identified indoor air pollution as one of the top four environmental health risks in the country. In the U.S., individuals spend the majority of their time (90%) indoors, where some pollutant levels may be 2–5 times higher than outside. Common biological contaminants include mold spores, dust mites, droppings and body parts from cockroaches, rodents and other pests or insects, viruses, and bacteria, many of which are small enough to be inhaled. Pest- and mold-related allergens can trigger asthma attacks as well as other bronchial-related complications. Children, the elderly, and people with respiratory problems, allergies, and lung diseases are at particularly high risk for health complications from these allergens.

Socioeconomic and racial/ethnic disparities in environmental housing have long been a major concern (see Exhibit 2) of advocates for vulnerable populations. There is now increased focus and scrutiny on the need to plan for fresh air intake while weatherizing and increasing the energy efficiency of homes, as a lack of proper aeration can exacerbate existing health problems and/or create new health problems by sealing in indoor air pollutants.
Need for a New Housing Approach

Over 6 million families in low-income communities currently reside in unhealthy and energy-inefficient housing.\(^1\),\(^2\) This unsafe and unhealthy housing is the source of 250,000 new cases of childhood lead poisoning,\(^3\) as well as 750,000 asthma-related emergency room visits,\(^4\) and 10,000 carbon monoxide poisonings\(^5\) per year, in addition to approximately 13 million preventable home-related injuries every year.\(^6\),\(^7\) Forty percent of asthma episodes result from asthma triggers in the home, adding up to $5 billion annually in preventable medical costs.\(^8\),\(^9\)

Lead poisoning from residential paint, food containers, children’s toys, and municipal drinking water systems is estimated to contribute to an income loss of $110–$319 billion per generation, with the main exposure to lead coming from lead-contaminated dust in and around older housing.\(^10\),\(^11\) The number of housing units with lead-based paint in the U.S. decreased by 40% between 1990 and 2000, although 38 million housing units with lead-based paint still remain.\(^12\)

2009: Beginnings of GHHI

Ruth Ann Norton was hired as the executive director of CECLP, a non-profit advocacy agency, in 1993 and began to lay the legal groundwork for eliminating lead poisoning in Maryland, where 15,000 cases of lead poisoning were occurring every year. In 1994, Norton and her staff helped pass state legislation to stiffen enforcement of lead abatement, followed by 16 other laws that empowered residents to address housing issues. When the ARRA passed in 2009, Ms. Norton applied for $150 million for lead hazard control in Baltimore; working with foundations and local agencies, CECLP was able to reach many more houses in a short period of time to mitigate lead hazards, while at the same time obtaining data on the houses and health of the residents.

At the same time, ARRA was directing $16.8 billion to the Department of Energy’s (DOE) energy efficiency and renewable energy department (which includes Weatherization Assistance Programs, energy efficiency block grants, research, etc.) to be used for home weatherization and energy efficiency retrofits.\(^13\) Norton became concerned that lead hazards were going to be exacerbated when houses were sealed up. Her data from Baltimore caught the attention of the White House which recognized that there was an opportunity to make a greater impact on improving homes by making smarter investments.

In May of 2009, the Council on Foundations, a national philanthropic nonprofit association, reached out to the White House Office of Recovery Implementation, which was responsible for coordinating government departments and agencies in disbursing the $787 billion ARRA funds to speed economic recovery. The Council wanted to discuss coordinating the dollars targeted for weatherization and energy efficiency with existing programs that targeted lead hazard reduction, such as HUD’s Healthy Homes program,\(^14\) a national initiative designed to protect children and their families from housing-related health and safety hazards.

Soon after, due in large part to their successful collaborations in Baltimore, CECLP was charged by the Council on Foundations to lead the national efforts to integrate lead hazard control, Healthy Homes programs, and weatherization and energy efficiency work. In 2010, HUD provided funding to CDC to award a contract to provide technical assistance to select sites across
The Green and Healthy Homes Initiative (GHHI)

2009–2011: Pilot Sites around the Country

A two-year pilot program to implement GHHI programs began in 2009 in 15 sites, including 13 cities—Atlanta, Baltimore, Buffalo, Chicago, Cleveland, Denver, Detroit, Flint, New Haven, Oakland, Philadelphia, Providence, San Antonio—and two tribes (Cowlitz Indian Tribe in Washington and Spirit Lake Nation Tribe in North Dakota). The pilot was intended to produce and certify over 3,500 Green and Healthy Homes over the two-year period. Each site had a lead agency responsible for coordinating existing local organizations, local, regional, and/or national funding, and for implementing the delivery of GHHI services. In Baltimore, for instance, the lead agency was CECLP.

As one of the pioneer lead agencies in the GHHI program, CECLP developed a comprehensive environmental and energy efficiency home assessment tool that incorporated multiple existing housing audits. Based on this assessment, a coordinated scope of work was designed for an eligible home that incorporated all needed interventions and service providers. Funding for the work came from various sources, including: traditional federal programs and ARRA-funded programs at HUD (i.e., community development block grants); DOE (i.e., weatherization assistance programs) and Department of Treasury; state and local programs; foundation support; and rate-payer utility programs. Depending on its needs, a GHHI home might receive a different combination of Healthy Homes and/or weatherization services.

Victoria’s Experience in Baltimore

Victoria C., a single mother of moderate income who owned her own home in Baltimore and worked full-time at a state agency, described the state of her home before she found GHHI in 2009. Her son suffered from asthma, necessitating six or seven visits a year to the emergency room or his doctor’s office. Victoria described the condition of her home where her son lived as follows: mice droppings in the carpet, waterbugs in the bathroom, cracked window frames, holes in her kitchen floor, and drafts in the hallway where the floor was not tightly connected to the walls because the molding strips had been removed. The bathroom had no exhaust fan and the open water pipes were always wet from condensed water, which contributed to a mold problem. Her utility company did an energy audit and found that she was losing 60% of her heat to poor insulation and drafts in the walls and floors. Her gas and electric bills averaged $450 per month—far more than she expected. She had gone to various state agencies seeking help after being told that it would cost $70,000 to fix the energy leaks and health hazards in her home. However, her income put her just beyond eligibility thresholds for state financial assistance for home upgrades. She tried a variety of home remedies like putting plastic over the windows, spreading mothballs around to deter the mice, and using a strong bug spray to kill the water bugs, but some of these products made her son sick and left unpleasant smells in the house.

In 2009, she was referred to the CECLP, the local agency coordinating GHHI services, and a representative visited her home to do an assessment of her needs. Following the assessment, the
representative arranged to provide a variety of services through local contractors, including education sessions on how to clean and maintain her home (i.e., wash the top of the windows, buy a good vacuum cleaner with a HEPA filter and properly clean the filter, recognize signs of rodent dropping and properly dispose of them). The contractors, under the leadership of the CECLP representative, also implemented a series of home improvements. The Baltimore Department of Housing, which administers the local Weatherization Assistance Program (WAP), was responsible for coordinating much of the work. The costs of these interventions totaled $16,645 and were covered by various federal and local organizations. Since the 2009 improvements, her son has not been to the doctor or the ER for asthma problems, and he no longer needs his inhaler. Victoria’s gas and electricity bills dropped to between $103–170/month. She now tells her neighbors about GHHI and puts a sign in her yard that promotes participation in GHHI. She explained,

Neighbors don’t know how to go about doing the research and finding the help [to fix their homes]. It takes a lot of different applications, one for each program, and they often don’t speak to each other. So this is part of the problem—helping people get the information and figuring out how to help them is a huge service.

**Cross-agency Collaboration and Challenges at the Federal Level**

At the national level, GHHI leverages the partnership of HUD, CDC, and DOE, as well as CECLP and the Council on Foundations. GHHI depends on cross-agency collaboration in order to address barriers and inefficiencies for families receiving comprehensive, streamlined green and healthy home interventions. At the local level, GHHI is a multidisciplinary collaboration of local agencies providing weatherization and Healthy Homes services to provide comprehensive housing stock revitalization services (see Exhibit 3 for list of agencies and funders involved in Baltimore).

One of the primary challenges that many low-income families currently face is different income eligibility requirements and service limitations that exist for various governmental funding streams or departments. The inconsistent eligibility requirements for DOE’s weatherization funding and HUD’s Healthy Homes funding emerged as the major barriers for integrating energy efficiency and healthy homes interventions. For example, households might meet Healthy Homes’ income criteria while exceeding the income criteria for weatherization services. Households may be denied renovation services because of roof issues, yet neither Healthy Homes nor weatherization programs can explicitly address roof issues given the restrictions tied to their funding. DOE, CDC, and HUD continue to collaborate to address bureaucratic obstacles; GHHI serves as a catalyst in some of these activities and has received funding from all three agencies to advance its efforts and test innovative methods of integration.

**The CDC and Lead Poisoning Prevention**

The CDC has long been involved in eliminating lead in the home environment through a combination of using the judicial system to enforce housing codes and educating general contractors on the hazards of lead paint and the best methods of remediation. However, the CDC is not authorized to be involved in home construction projects, and community nurses who
might be involved in identifying and initiating remediation of lead poisoning cases are often unable to intervene in the home for other visible health hazards such as a lack of smoke alarms, leaky roofs, dust and mold, or poor ventilation.

Dr. Brown explained how the CDC became involved in GHHI:

Currently there is a wave of interest and money for weatherization programs. However the weatherization programs of the 1970’s tightened up the building envelope but sealed in a lot of harmful pollutants. It was very important that ARRA funds not result in poor indoor air quality and poorer health. CDC worked with HUD, DOE and other agencies to make sure that ARRA funds used for weatherization did not result in poor indoor air quality and poorer health for residents. GHHI was an effective advocate in this area.

It’s been very eye-opening for government to think about working with foundations and to learn each other’s vocabulary and perspectives. GHHI is on the ground and can be more influential with local officials to push the initiative and implement the necessary steps. The GHHI local coordinator often reports directly to the local mayor; when the mayor says to the housing authority and community development people that all the programs need to cooperate, they do.

CDC Lead Poisoning now interacts with GHHI on many levels because it funds 35 state health departments for lead poisoning prevention. GHHI funding allows these departments to do things other than just lead.

Brown also noted that CDC’s public health surveillance and monitoring capabilities could be a resource in carrying out an evaluation of GHHI for purposes of demonstrating the health effects and/or a cost-benefit analysis.

**Housing and Urban Development (HUD) and “Healthy Homes”**

Matt Ammon, Deputy Director of the Office of Healthy Homes and Lead Hazard Control at HUD, has worked on making homes healthier since 1996. HUD funds home interventions to eliminate lead paint and other housing-related health hazards, working closely with CDC and other federal partners. Recently, with the involvement of DOE to make housing more energy efficient, HUD has broadened its partnership with DOE around housing interventions for addressing health hazards in addition to lead paint. Between the two agencies, they complete interventions in 100,000 homes per year, leading to great opportunities for learning from each other.

Ammon views GHHI as the next step in the advancement of the Healthy Homes model. GHHI seeks to increase the opportunities to leverage federal dollars with private dollars, respond to local needs, and convene local political interests around healthy and energy efficient homes, all of which helps localities pool resources to make smarter investments in housing resulting in positive health outcomes. He notes:

Local participation is essential and where the decisions should be made... And we should be there to listen and respond to their needs in a manner that addresses barriers, creates flexibility, and promotes innovation and cost savings.
However, he acknowledged that the GHHI interventions could use more quantitative and qualitative analysis of the cost-effectiveness and benefit of outcomes.

**The Department of Energy (DOE)**

Julie Hughes, Senior Policy Advisor of the Office of Energy Efficiency and Renewable Energy at DOE, described the role that DOE plays in housing:

With the passage of the ARRA, DOE had billions of dollars for weatherizing low-income homes; many other federal agencies (e.g., HUD, EPA, CDC) wanted DOE to expand the extent to which it performed health and safety improvements in homes. However, while DOE had more funding than before, the parameters of its regulations—and the restrictions that come with them—did not change. The purpose of the Weatherization Assistance Program (WAP) is to improve the energy efficiency of homes in which low-income individuals reside, decreasing energy costs for those who are in greatest financial need, while also increasing the energy efficiency of the nation’s housing stock. To maintain consistency with its mission, only a portion of DOE’s funding can be used to address health-related issues in a home. Primarily, funds for health and safety are intended to correct issues when not addressing the issue would mean you could not otherwise perform weatherization.

Recent events have helped DOE reevaluate which health and safety measures were eligible under its regulations and program parameters and how to maximize grantees’ ability to address health and safety. DOE commissioned the National Renewable Energy Laboratory, who contracted with the National Center for Healthy Housing, to produce a report on what obstacles were identified by state DOE grantees and local agencies doing the work. Grantees who were interviewed indicated a lack of clarity with the DOE’s health and safety rules. In response, DOE convened its Health and Safety Committee to clarify allowable health and safety practices that affect whether or not weatherization of a home is possible. As an example, radon testing is considered a gray area. If you identify it, you have to mitigate it, but the cost of radon mitigation often exceeds WAP health and safety budgets, and there is no source of funding allocated for radon mitigation. The committee clarified that radon testing was eligible, but mitigation methods are not [using DOE funding]. While the clarified guidance has not created a funding mechanism for radon mitigation, it has resulted in WAP providers performing more radon testing, which makes occupants more informed, and it has highlighted a major policy gap that exists at the federal level and which federal agencies are now working to solve.

When Ruth Ann Norton approached Hughes to persuade her of the important role DOE could play, Hughes went to her boss to find out how to make that possible. She now spends 30% of her time on GHHI and other agencies engaged in incorporating health into energy efficiency. She reflects:

What people don’t appreciate about government is our resources are stretched very thin, and while it is many government employees’ nature to solve as many problems as possible, a balance must be struck between flexibility to go the extra mile and consistency that keeps the program true to its mission and maximizes its intended impacts. In government, it can be difficult to undertake special projects—but it is not impossible, and a significant number of creative, motivated public servants do it
routinely. An interagency working group is up and running on Green and Healthy, which has really got the agencies talking and collaborating. And while it is beneficial to talk about the importance of addressing issues holistically at a federal policy level, it is impossible to actually fix the problems unless action is taken at the program level. That’s where the rubber meets the road and the impact is made.

GHHI has been a helpful catalyst and example of innovation, to which government agencies can look for best practices. In fact, the Department of Energy awarded GHHI a grant under its Weatherization Innovation Program, for precisely that purpose. GHHI’s ability to focus on a handful of communities and to test strategies for bringing multiple parties to the table is helpful for us to see. Federal government has the ability to spread best practices throughout its nationwide network—the breadth and depth of impact that a program like the Weatherization Assistance Program has on people’s lives is enormous. Funding the best practices to share is critical.

**Evaluation of GHHI: How to measure the “dose” of green and healthy interventions?**

As some of the GHHI sites have moved into the implementation stage, there has been growing interest in evaluating the effect of these interventions and relating it to costs. However, it is common for households to need and/or receive widely different combinations of energy efficiency and Healthy Homes services. One challenge, then, is defining a standardized “dose” of the intervention.

Costs per unit also varied considerably; for instance, for three homes receiving GHHI services (lead hazard reduction, healthy homes, energy efficiency, and weatherization interventions) in Baltimore in 2010, the total cost ranged between $12,000 and $17,000. The Healthy Homes component of the total cost ranged between $1,500 and $4,000.

Dr. Megan Sandel, Medical Director of the National Center for Medical-Legal Partnership at Boston Medical Center, explained that the dose of housing interventions (which can include pulling up the carpet, installing ventilation fans in the bathroom, providing a vacuum cleaner, education on how to use the vacuum properly, installing an air conditioner, and providing integrated pest management services) has been explored in research, with integrated pest management and proper use of vacuum cleaners with a HEPA filter shown to be essential activities to improving health outcomes. However, she notes:

> We are still defining the “dose” of green and who will be benefitting from these interventions (e.g., children, adults, elderly).

**Potential Sources of Future Funding for GHHI**

GHHI coordinates existing funding streams and partners in an effort to increase cost efficiency and save money on a system-wide scale. However, sustainability of GHHI is a concern, given that ARRA funds are finite and that virtually all federal, state, and local government agencies are facing substantial budget pressures now and for the foreseeable future.
Norton was considering strategies that would encourage either The Centers for Medicare and Medicaid Services (CMS)—the federal agency in charge of setting standards for the Medicaid program—or the state Medicaid agencies that administer the programs in each state, to consider paying for the costs of healthy homes. Medicaid could directly pay local agencies providing “healthy home” GHHI services to Medicaid beneficiaries, or it could reimburse Medicaid beneficiaries for making eligible “healthy home” investments in their residences.

Medicaid provides health insurance coverage to low-income populations through a federal-state program. CMS sets the standards for basic benefits, eligibility, and provider payment methods. CMS also funds from 40–60% of the program costs through “matching” state spending—if a state spends $1 of its own money on a Medicaid recipient, the federal government will “match” it with somewhere between 80 cents and $1.20.

The level of “match” is a function of state income levels (poorer states got a higher match). States are allowed to enhance and/or expand the basic benefit package and eligibility, but they must pay for the enhancements without the federal matching funds. Additionally, states are allowed to vary their provider payment methods as long as the resulting expenditures are “budget-neutral” relative to the federally-defined payment methods. Several states have put into place variations on capitation-based payment systems, which pays providers or private health plans a per-member per-month amount to cover most or all services required by the Medicaid beneficiary. Providers and health plans paid by capitation must provide all basic Medicaid benefits within their capitation amounts, but are also allowed to pay for services that are not covered if they help the beneficiary maintain their health in a cost-effective way.

James Glauber, medical director of Neighborhood Health Plan, a Medicaid HMO in Massachusetts, described some of the issues that affect capitated Medicaid managed care plans’ internal supplemental coverage decisions:

We are free to spend premium dollars on services outside the scope of “covered benefits.” However, we can’t claim these as medical expenses in our reporting to MassHealth (Massachusetts Medicaid), which in turn is used to calculate future premiums. Moreover, we are increasingly constrained in having such flexibility when our year-over-year premium from the state has not kept up with medical expense trends. We are struggling to pay for what we are contracted to be paying for. We sometimes do pay for services that we consider medically necessary that are excluded benefits. A more typical example is that the MassHealth Essential program (state coverage for long-term unemployed adults not eligible for traditional or “basic” Medicaid) does not have a home health or skilled nursing facility benefit. We sometimes approve these simply because the member needs the service.

Payment for environmental remediation is not within the scope of covered benefits. In an increasingly cost-constrained environment we are typically reluctant to cover services that go beyond the scope of covered benefits... We try to draw a clear line against covering such things, for both transparency and equity of benefit administration reasons. Also many housing problems, especially for members in either rental properties or public housing, are the responsibility of the landlord or the appropriate housing authority if they represent code violations. We have social care managers that work with members,
even sometimes visiting their homes, around housing issues. However, their role is limited to education, advocacy, and referral to community programs and/or governmental agencies and programs that may benefit the member’s situation beyond their “medical benefits.”

From a social health perspective, I believe that Healthy Homes, quality public education, safe neighborhoods are more important determinants of long-term health than the things we do in physician offices or managed care plans. But can/should a managed care plan invest in these areas to improve member’s health? Bear in mind that a MassHealth member is not wedded to a particular managed care plan. Unlike commercial enrollees, a MassHealth member can switch between plans on a DAILY basis...and sometimes do.

Dr. Megan Sandel of Boston Medical Center, a provider to Massachusetts Medicaid HMOs, commented:

The biggest problem is that we fund these things through silos, so you would incur cost on one end (the energy-saving end) and see cost-savings on the medical side. Even the basic healthy housing benefit is a hard enough sell to have [Medicaid] cover those benefits. “Green” services probably wouldn’t get funded, since the primary benefit would be energy savings, and the secondary benefit would be health. It would also be difficult because people change insurances, and for Medicaid to see a return on investments, it has to be seen very quickly (9–10 months), whereas for health benefits through housing, it may take 5–10 years to see significant improvements.

Dr. Sandel also noted that often the landlords of substandard housing can be forced to make the investments needed, particularly when the landlord was a public authority. For instance, in Boston, roughly half of the housing violations identified through code enforcers are incurred by the Boston Housing Authority (BHA). She thought it made more sense to have the city work with the BHA and Code Enforcement to mitigate the health and energy problems of their housing than to try to get a state Medicaid agency to help pay for healthy housing.

The Sustainability Challenge

Some of the challenges faced by GHHI in funding, scaling up, and long-term sustainability stem from the fact that its approach is a relatively new one, even though some of its component parts have been evaluated. For instance, Exhibits 4 and 5 summarize the most recent relevant evaluations of home-based asthma intervention programs and their impact on health care utilization and cost. Norton pondered the state of the current evidence on GHHI effectiveness, the need for future evidence and how to obtain it, and the target audiences for which the evidence should be designed.
Exhibit 1: Organizations Involved in GHHI at the National Level

**Primary partners funding national work**

- **Federal Healthy Homes Work Group**
  - HUD
  - CDC
  - Environmental Protection Agency (EPA)
  - Department of Energy (DOE)
    - Office of Energy Efficiency & Renewable Energy
  - Senior Policy Advisor: Julie Hughes

- **Housing & Urban Development Department (HUD)**
  - Office of Healthy Homes and Lead Hazard Control
  - Director: Jon Gant
  - Deputy Director: Matt Ammon

- **Centers for Disease Control & Prevention (CDC)**
  - Lead Poisoning Prevention Branch
  - Chief: Mary Jean Brown, ScD

- **National Coalition to End Childhood Lead Poisoning (CECLP)**
  - Executive Director: Ruth Ann Norton

- **Council of Foundations**

- **White House Office of Recovery Implementation**

**Local partnerships**

**Contract workers**

**Residents**

**GHHI sites**
**Exhibit 2:** Percentage of Housing with Severe or Moderate Physical Problems by Race, Ethnicity, and Income: American Housing Survey, 1989–2001

**Exhibit 3:** Organizations Involved in Implementing and/or Funding Intervention for a GHHI Intervention in Baltimore

1. Department of Housing & Urban Development (HUD) Office of Healthy Homes and Lead Hazard Control
2. Department of Energy (DOE) Weatherization Assistance Program (WAP) (existing funding)
3. Department of Energy (DOE) Weatherization Assistance Program (WAP) (supplemental ARRA funding via Maryland Department of Housing and Community Development)
4. Baltimore City Community Development Block Grant and Community Services Block Grant Programs (ARRA funding)
5. Annie E. Casey Foundation
6. Osprey Foundation
7. Blaustein Foundation
8. Rebuilding Together Baltimore (non-profit agency)
9. National Coalition to End Childhood Lead Poisoning (CECLP)
10. Civic Works (Baltimore’s urban service corps and an AmeriCorps program)
**Exhibit 4:** Asthma Control: Home-based Multi-trigger, Multicomponent Environmental Interventions Summary Evidence (Only Including Randomized Controlled Trials Results)\(^{39}\)

<table>
<thead>
<tr>
<th>Lead Author (Year)</th>
<th>Characteristics of child study populations**; Number of subjects in study</th>
<th>Home Intervention**, Study Duration</th>
<th>Outcome Measures†</th>
<th>Absolute % Change relative to control group</th>
<th>OR relative to control group, 95% CI and p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter (2001)</td>
<td>AA, LI, AD 104</td>
<td>EE, ER 18 months</td>
<td># hospitalizations/year # ED visits/year # UO visits/year Combined visits and hospitalizations/year</td>
<td>-0.02% 0.03% -0.2% -0.51%</td>
<td>N/A</td>
</tr>
<tr>
<td>Eggleston (2005)</td>
<td>AA, LI, ADMD 100</td>
<td>EA, EE, ER 12 months</td>
<td>% children with asthma acute care visits, past 3 months</td>
<td>6.0%</td>
<td>N/A</td>
</tr>
<tr>
<td>Kercsmar (2006)</td>
<td>AA, LI 62</td>
<td>EA, EE, ER, SM 12 months</td>
<td>Mean # asthma acute care visits/year % population with ≥ 1 ED or inpatient visit</td>
<td>-0.63% -19.2%</td>
<td>p = 0.06 p = 0.15</td>
</tr>
<tr>
<td>Kreiger (2005)</td>
<td>LI, AD 274</td>
<td>EA, EE, ER, SS 12 months</td>
<td>% children with asthma acute care visits in past 2 months</td>
<td>-11.2%</td>
<td>OR = 0.38; CI (0.16, 0.89) p = 0.026</td>
</tr>
<tr>
<td>Evans (1999)</td>
<td>AA, LI, ADMD 1033</td>
<td>EA, EE, ER, SM, SS 24 months</td>
<td>Mean # unscheduled visits at 12 months; % children with hospital visits, past 12 months</td>
<td>-0.21% -4.1%</td>
<td>CI (-0.62, 0.20); p = 0.32 CI (-8.75, 0.36); p = 0.071</td>
</tr>
<tr>
<td>Morgan (2004)</td>
<td>AD with previous asthma ED or hospital visit in past 6 month 937</td>
<td>EA, EE, ER 24 months</td>
<td>Mean # ED visits/year at 12 months Mean # UO visits/year at 12 months Mean # combined visits/year at 12 months # with ≥ 1 asthma hospitalization/year at 12 months</td>
<td>-0.15 -0.21 -0.35 1.6%</td>
<td>p = 0.17 p = 0.11 p = 0.04 p = 0.56</td>
</tr>
<tr>
<td>Kreiger (2009)</td>
<td>LI, AD 309</td>
<td>CC, EA, EE, ER, SM, SS 15 months</td>
<td>% with asthma acute care visits/past 3 months</td>
<td>-5.4%</td>
<td>OR = 0.69; CI (0.38, 1.26) p = 0.228</td>
</tr>
</tbody>
</table>

* Populations: LI = low income; AA = African American; AD = Asthma Diagnosis; ADMD = Asthma Diagnosis by MD; ** Home interventions: CC = Care Coordination, EA = Environmental Assessment, EE = Environmental Education, ER = Environmental Remediation, SM = Self-management education, SS = Social Services; †Outcomes: ED = emergency department visit, UO = unscheduled office visit
Exhibit 5: Home-Based Environmental Interventions that Include Home-Based Remediation of Asthma Triggers to Control Asthma in Children (Relevant Cost-Benefit Analysis)\textsuperscript{30}

(SFD = Symptom Free Days)

<table>
<thead>
<tr>
<th>Lead Author, Year/ Study Design/ Economic Method</th>
<th>Study Location/ Sample Size/ Population Characteristics/ Time Horizon</th>
<th>Intervention Description</th>
<th>Environmental Remediation/ Education Focus/ Home Visitor/ Number of Home Visits</th>
<th>Select Effectiveness Outcomes</th>
<th>Program Costs</th>
<th>Direct Medical Costs Averted</th>
<th>Full Economic Summary Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kreiger, 2005</td>
<td>King County, WA High intensity group had 100 households and low intensity had 104. Households with an asthmatic child 4-12 years age; all households were below 200% of the Federal poverty line; White (21%), Black (28%), Vietnamese (22%), Hispanic (18%) 1 year intervention and 6 months follow up</td>
<td>Home visits were conducted by community health workers. Low intensity group received: one home visit, remediation action plan, bedding covers and cases, and limited education. The high intensity group received: an initial home visit plus 4-8 additional visits, environmental assessment and action plan, education on asthma control, smoking cessation, trigger abatement/control, and resources to reduce exposure (door mats, vacuum cleaners, roach/rodent bait and assistance, and cleaning kits).</td>
<td>Moderate Environmental education Community health workers 5-9 home visits</td>
<td>High-intensity group compared to low-intensity group: reduced urgent health services (hospital admissions, ER visits, and unscheduled clinic visits) Decrease in symptom-free days Reviewers computation of incremental change in SFDs: SFD per 2 weeks at base minus at exit for low intensity was 3.9. Incremental increase in SFD due to high intensity per year is [(4.7-3.9)*26] = 20.8 SFDs per year Marginal program cost of the high intensity arm in comparison to the low intensity arm per child per year: $1,316 (total program cost was not reported) Costs included: Personnel costs including salary and benefits, supplies, rent, travel, office expenses, and other indirect charges; cost per component was not provided--partially complete information</td>
<td>Direct medical costs averted per child per year: Range $124-147 (Reviewers computation: the estimated decrease in 2-month costs between the base line and exit ranged from $258.66 to $429.81 per child, and within the low intensity group, they ranged from $238.07 to $405.36; the difference is $20.59 to $24.45 every 2 months or $124 to $147 annualized). Direct medical costs averted included: hospitalizations, ER visits, and unscheduled clinic visits. (Sources of dollar estimates: Sullivan et al. 2002, Stroupe et al. 1999, and Lozano et al. 1997 for low estimate and Washington State Medicaid Program and Weiss et al. 2000 for high estimates.)</td>
<td>Incremental cost effectiveness ratio: $56 to $57 per SFD</td>
<td></td>
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References


