

# Healthy Energy-Efficient Housing: Using a One-Touch Approach to Maximize Public Health, Energy, and Housing Programs and Policies

Kate Kuholski, MSEd; Ellen Tohn, MCP; Rebecca Morley, MSPP

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Housing conditions such as leaky roofs, peeling paint, structural problems, chronic dampness, improperly vented combustion appliances, and poor ventilation can cause injury, illness, and increased energy consumption. Homes with moderate and severe housing hazards are more likely to be occupied by families with limited incomes because of the lack of affordable housing choices. As a result, children and older adults in these communities face disproportionate impacts from these housing hazards, including higher asthma and injury rates, greater prevalence of lead poisoning, and higher household energy burdens. Programs and policies addressing home health and energy issues have historically operated in categorical silos, which in turn cause fragmented service delivery and inefficient use of scarce resources by the agencies providing these services. A “one-touch” approach for home interventions that strategically integrates public health and energy efficiency has many potential direct and indirect benefits. Also, this approach plays an important role in housing policy due to the increasing support for green housing and residential energy efficiency.

**KEY WORDS:** energy efficiency, environmental health, healthy homes, housing, public policy, social justice, weatherization

## ● The Burden of Unhealthy Housing

In 2007, nearly 13 million low-income persons “paid more than half their monthly income for rent, lived in severely substandard housing, or both.”<sup>1</sup> Chronic exposure to allergens in the indoor environment from mold, pets, mice and rats, cockroaches, and dust mites is associated with asthma. Indoor moisture sustains mold,

pests, dust mites, and bacteria. Indoor air pollutants have also been associated with the development and exacerbation of asthma. Lead toxicity affects the brain and neurodevelopmental processes, and its effects are irreversible. Lead paint dust is the primary source of exposure in homes, rather than pieces of lead-based paint or lead in soil. It is known that lead disrupts processes regulated by calcium and changes synapse formation. Even at quite low levels (2.5-10  $\mu\text{g}/\text{dL}$ ), deleterious effects of lead can be detected. An inverse relationship between blood lead concentration and arithmetic and reading scores was observed for children with blood lead concentrations less than 5  $\mu\text{g}/\text{dL}$ .<sup>2</sup>

Between 1985 and 1997, home injuries accounted for almost two-thirds of all fatal unintentional injuries occurring to US children and adolescents, with mean residential death rates for children and adolescents varying markedly by age, race, and geographic location. Falls are the leading type of residential injury for children. The primary residential hazards associated with falls are lack of safety devices such as grab bars, safety gates, or window guards; structural defects in the home; and insufficient light on stairs and other areas.<sup>2</sup>

Low-income renters and people of color are more likely to live in these homes in poor condition with moderate or severe physical problems that can harm health<sup>3,4</sup> (Figure 1). For example, lead poisoning and asthma can lead to the need for medicine,

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**Author Affiliations:** University of Delaware, Newark (Ms Kuholski); Tohn Environmental Strategies, Wayland, Massachusetts (Ms Tohn); and Rebecca Morley, National Center for Healthy Housing, Columbia, Maryland (Ms Morley).

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**Correspondence:** Rebecca Morley, MSPP, 10320 Little Patuxent Pkwy, Ste 500, Columbia, MD 21044 (rmorley@nchh.org).

hospitalization, or death.<sup>2</sup> In both urban and rural areas, housing inequality present an environmental justice issue.

By and large, everyone pays—sooner or later—for the negative impacts of substandard housing on health, education, and welfare. Taxpayers and employers pay for the direct health care costs for childhood illnesses and disabilities, particularly among lower-income children.<sup>5</sup> Moreover, prospects for new and sustained economic growth are threatened when today's children, also tomorrow's workers, are physically, mentally, and/or intellectually impaired by the health and safety hazards in the home. Uncontrolled asthma is a leading contributor of missed school days for children, and the neurological damage from lead poisoning may result in reduced IQ and increased aggression.<sup>2</sup> Such impacts have additional consequences on family members if parents or guardians cannot make a living because of caring for their affected children.

Several research studies have calculated the economic cost of specific environmental factors on childhood illnesses, disabilities, and health status. These costs include expenditures for health care and other treatments for children, and in most cases, they include additional costs in adulthood for cancer treatments and lost productivity, for example. Landrigan et al<sup>6</sup> very conservatively estimated that certain childhood environmental diseases annually cost the United States \$54.9 billion per year (1997 dollars). Studies from Washington State, and Minnesota, estimated state costs of environmental disease at \$1.875 billion,<sup>7</sup> \$1.57 billion, respectively.<sup>8</sup>

### **Inefficient homes increase the health and economic burdens for families**

Energy efficiency and public health connect at multiple levels. Cold, drafty homes in the winter or hot, stuffy homes in the summer may contribute to illness or death because of the resulting home environmental health hazard or temperature extremes.<sup>9</sup> Leaky, drafty homes can contribute to moisture and mold issues and attract pests. If not properly maintained, gas-powered furnaces may emit carbon monoxide leading to illness or death.<sup>9</sup> A home without proper ventilation can cause excess heat morbidity and mortality. The population at risk for living in homes with environmental health hazards is similar to those living in homes with high-energy burdens.<sup>9</sup>

Health is also indirectly impacted when families pay a disproportionate share of their income for energy bills. Low-income households are struggling to pay a higher percentage of their income to energy bills.<sup>10</sup> A high housing cost burden has been associated with lower general health status,<sup>11</sup> high malnutrition,<sup>12</sup> and

more iron deficiency.<sup>13</sup> A study that examined poor children in northern states found that the children had lower caloric intake during the winter than children in higher-income levels.<sup>14</sup> Related research found that seniors in northern states are more likely to go hungry in late winter/early spring, and seniors in southern states are more likely to go hungry in summer because of increased cost of energy.<sup>15</sup> Similarly, research shows that low-income children living in families who receive benefits through the Low-Income Home Energy Assistance Program, that subsidizes utility expenses, had more consistent growth patterns in the winter than other low-income children.<sup>16</sup>

In *Forecast Burdens*, the US Census Survey of Income and Program Participation Survey of “Measures of Material Well-Being” found that in 2001, the “majority of those with un-affordable energy bills also experienced hunger (‘critical food insecurity’) or skipped medical or dental care.”<sup>16</sup> Thus, the health benefits of energy efficiency to low-income families can be particularly significant because the income saved is often redirected to essential needs including food, medical insurance, and health care.<sup>17</sup>

### **Government mandates, incentives, and funding to increase residential energy efficiency have skyrocketed, presenting new opportunities and challenges**

Housing consumes more than one-fifth of US energy.<sup>18</sup> The opportunities for significant household and societal benefits from residential energy efficiency measures are large yet difficult for many homeowners to realize on their own, particularly in low-income households. As a result, Congress, state legislatures, utilities, and local governments have launched a virtual cornucopia of mandatory and voluntary programs and policies. Table 1 provides examples of federal, state, and local energy programs.<sup>37</sup> For example, the state of Delaware strengthened its building code to require the most recent version of the International Energy Conservation Code for newly detached 1- and 2-story family dwellings. Also, the state of Delaware will require all new residential buildings constructed after December 31, 2025, to be zero-net-energy capable. A complete database of state incentives for renewables and energy efficiency is found at [www.dsireusa.org](http://www.dsireusa.org).<sup>19</sup>

With the sharp rise in energy prices, the foreclosure crisis, the steep recession, and the high priority the Obama administration has placed on energy efficiency, in 2009 Congress appropriated an unprecedented \$16 billion in new funds for energy efficiency and renewable energy projects, with an emphasis on home energy retrofits in 2009. These funds include multibillion dollar increases for the Low-Income Home Energy

**TABLE 1 ● Examples of federal, state, and local energy efficiency programs and incentives**

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Federal energy efficiency programs

- The federal Weatherization Assistance Program.<sup>22</sup>
- The Residential Energy Efficiency Tax Credit and Residential Renewable Energy Tax Credit (part of Energy Star’s numerous home-oriented programs).<sup>32</sup>
- US Department of Agriculture loan guarantees and grants for retrofitting rural housing.<sup>33</sup>
- Energy-efficient mortgages through Federal Housing Administration and the Veterans Affairs, among others.<sup>34</sup>

State and local energy-efficiency programs

- At least 53 energy-efficient building codes.
- At least 20 states that prioritize meeting or exceeding state energy codes in their low-income housing tax credit-qualified allocation plans.<sup>35</sup>
- At least 30 state tax credits for energy-efficiency measures.
- More than 600 government and utility energy audit, rebate, loan, and grant programs.<sup>36</sup>

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Assistance Program, the Weatherization Assistance Program (WAP), the State Energy Program, and Energy Efficiency and Conservation Block Grants, as well as \$1.25 billion for energy retrofits and green investments via the US Department of Housing and Urban Development Capital Housing Fund and Assisted Housing Stability Program.<sup>20</sup> Estimates suggest that upwards of 2 million housing units will be made energy efficient in the next 3 to 5 years as a result. Additional support for home energy retrofits will be available, should Congress pass further legislation<sup>21</sup> to address 2 of President Obama’s highest policy priorities: climate change and energy supply and demand.<sup>21</sup>

● **American Recovery and Reinvestment Act of 2009**

American Recovery and Reinvestment Act of 2009 made important changes to WAP extending the program’s reach:

- Increased the maximum household income eligibility from 150% to 200% of federal poverty guidelines or 60% of the state’s median income.
- Increased the assistance level per dwelling average expenditures for labor, weatherization materials, and related matters from \$2500 to \$6500.
- Increased the maximum percentage of WAP funds that can be used for training and technical assistance from 10% to 20% of total program funds.<sup>21</sup>

These changes offer a greater number of families access to more extensive housing and energy upgrades that can and should include health and safety upgrades.

The increased allocation of funding for training provides added support for training in these activities.

**The health benefits of integrated energy and health programs**

Based on the shared burden and mutual benefits, there is a natural opportunity to connect energy efficiency upgrades and health. There are several possibilities, but one near-term opportunity is through the Department of Energy’s WAP. The program operates through 50 state energy offices that work with 900 local agency grantees. Funds are for single, multi, and mobile owner-occupied and rental homes.<sup>22</sup> The goal of WAP is “to reduce energy costs for low-income families, particularly for the elderly, people with disabilities, and children through installation of energy efficiency measures, while ensuring their health and safety.”<sup>23</sup> The WAP participants not only save money on energy bills, but also gain an average of \$900 from reduced water costs, shut-off fees, transaction costs and lost wages, and increased property values.<sup>23,24</sup>

Many of the homes targeted by WAP are also at high risk for housing-based health hazards. Forty-nine percent of households receiving energy efficiency interventions, mainly through WAP, have “one or more family members who have disabilities or are elderly and with special needs and 90 percent of WAP clients have incomes less than \$15,000, and two-thirds earn less than \$8,000 per year.”<sup>23</sup>

In addition, WAP already has policies that require minimum health and safety program components, which enable programs to address carbon monoxide issues, repair moisture problems that prevent effective insulation from being installed, and pursue a range of other activities, provided the total costs are within program guidelines. The WAP typically evaluates the house structure, holistically considering air movement/pressures, humidity and temperature, heating and cooling, insulations, combustion safety, indoor air quality, mold/moistures, and combustion performance testing. The WAP requires inspection of furnaces ensure their energy efficiency; this includes testing for carbon monoxide.

Finally, conditions that can make it difficult to successfully weatherize or insulate a home—such as moisture issues or poor structural conditions—can also have adverse health consequences. Fixing the moisture or mold issues, as well as structural causes of deteriorating leaded paint, can both render a home “ready” for energy upgrades and address a health concern. Windows that are in poor condition may need to be addressed to successfully weatherize a home as well as address the conditions that result in deteriorated leaded paint hazards.<sup>25</sup> In a study of WAP homes in Maine, 20.4% of

homes with moisture/mold issues were occupied by a resident with asthma compared with 4.6% of homes without moisture/mold issues. Thus a home with a moisture/mold issue is more than 300 times more likely to have a resident with asthma than a home without moisture/mold issues.<sup>26</sup>

**The unintended consequences of categorical programs**

Many conventional energy upgrades, unfortunately, can harm the occupants’ health risk, often unwittingly. For example, “tightening” a home without countermeasures for adequate outside air exchange can degrade indoor air quality and increase risk factors associated with asthma, allergies, and other respiratory ailments.<sup>28</sup> Changing the pressure dynamics in a home when it is air sealed can, in some cases, have the potential to trap poisonous gases (eg, radon) in homes. Efforts to install insulation in walls can also disturb lead-based paint creating lead hazards.<sup>27</sup> Many energy retrofits even overlook simple, no-cost or low-cost interventions like reducing the water heater temperature to 120°, which saves energy and reduces the risk of scalding or addressing broken downspouts and gutters that are creating interior moisture issues linked to breathing problems. A one-touch holistic approach could help integrate the categorical programs and reduce unintended consequences.

**One-touch approach to healthy energy-efficient homes**

Although some of the health effects of sustainable design and energy retrofitting have not been fully studied, we do know that several health and safety interventions could be easily integrated into energy retrofit work and offer significant health benefits. Well-executed energy retrofits have resulted in improvements in self-rated health, a reduction in days off from school and work, and fewer visits to general health practitioners.<sup>28</sup>

Integrated energy and health programs can reduce contaminants (such as carbon monoxide, mold, and dust), improve ventilation, reduce moisture and condensation, increase safety, and improve thermal comfort, and offer residents a healthier environment.<sup>29</sup> An analysis of the WAP found that weatherized homes were at lower risk for fires, and their residents had less respiratory illnesses.<sup>24</sup>

The public health field has made tremendous progress in how it approaches home environmental health hazards, but it often has a disease-specific focus and is limited by existing programs and policies. Those leading the work include local, county, and state departments of health, environment, energy, and hous-

**TABLE 2 ● Potential healthy homes upgrades for integration with energy programs**

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- Ensure that working smoke and carbon monoxide alarms exist.
- Repair of interior and exterior water leaks and elimination of standing water.
- Ensure that adequate ventilation for vented combustion appliances.
- Eliminate unvented combustion appliances.
- Ensure that kitchen and bath fans exhaust to the outside.
- Follow lead-safe practices in older homes and lead dust clearance testing of the work area.
- Conduct pre- and postretrofit radon testing to ensure that work does not elevate radon levels.
- Properly seal all leaks in ductwork, using products and materials without urea formaldehyde or other harmful chemicals.
- Replace lights or installing brighter ones in stairways, hallways, and walkways.
- Insulate water pipes to prevent condensation and mold.
- Ensure that the clothes dryer properly vents to the outside.
- Patch all exterior holes using pest-resistant materials.

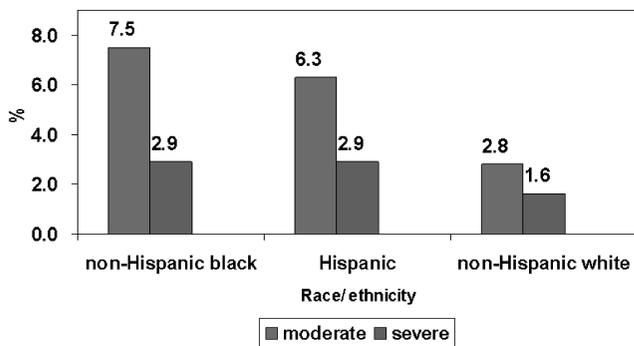
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ing; nonprofits; nongovernmental organizations; private sector; legal services; medical; and various other key stakeholders. Interventions include policy, housing code, programs, regulations, and education and outreach approaches.

Over the past several years, some local weatherization programs have embraced a “one-touch” approach that integrates the delivery of healthy housing upgrades and improved energy efficiency. This includes some localities in Maine and the Housing Authority Housing Repair and Weatherization Department in King County, Washington.<sup>30</sup> Creating healthy energy-efficient housing through a “one-touch” approach offers tremendous potential for increased efficiencies in delivery of services and may allow programs to “touch” many more residents. To date, this integration has generally involved adding a health component to weatherization and energy-efficiency work. Table 2 provides a list of potential healthy homes upgrades that could be added to energy-efficiency efforts. The corollary approach of adding an energy-efficiency component to health or housing programs is an untapped opportunity. The National Center for Healthy Housing offers trainings to new and current energy auditors on assessing and addressing home health hazards during audits through its national network of training partners to help seed and support a “one-touch” delivery of healthy energy-efficient homes. (See [www.nchh.org](http://www.nchh.org).)<sup>31</sup>

**A case study of the possibility of healthy energy-efficient homes**

Can we imagine an America where families, parents, and children receive “one-touch” responses? Today

**FIGURE 1 ● Race/ethnicity of people living in homes with severe and moderate physical problems.<sup>37</sup>**

we would meet “Sue,” a young mother, who suffered serious respiratory problems when a plumbing leak resulted in mold. She had tried without success to get her landlord to repair the leak but he took so long that she and her son got sick. Her son missed a lot of school—so the school has had to spend extra time helping him keep up—and Sue has been unable to work. Because she is not working, she has no health insurance. It is frightening to see her child struggle for a breath. When Jeremy’s wheeze is particularly bad, she takes him to the emergency department. But with the increased incentives and funding for energy upgrades and housing repair, we can imagine a different response.

*A new day.* Sue calls the 311 number for her county, which has been broadly advertised in her community, and finds out that she may be eligible for funding to repair her home. The 311 operator connects her to a one-touch service agent who tells her that her landlord is eligible for the WAP and the Minor Repair Program based on her income. She is also eligible for Low-Income Home Energy Assistance Program to help her with her energy costs. The county asks whether she would like her landlord to be contacted to inform him that he is eligible for certain repairs to his unit. Sue agrees and the county contacts the landlord, Tom, following up with a letter and a brochure about the program. In the letter, the county informs Tom that some of the reported problems are potential code violations and that those need to be addressed first. In conformance with the Minor Repair Program guidelines, the landlord is provided a forgivable loan for the repairs. A Healthy Homes specialist, Jeremy, is deployed to conduct the initial inspection that incorporates an energy audit, a rehabilitation estimate, and a Healthy Homes assessment. It takes approximately 1 and a half hours to complete. At the end of the visit, Sue meets with Jeremy and completes a short action plan. The plan describes which items have been included in the work order that will be paid for by the county, a short list of items that the landlord must take care of and a short set of actions

she can take to improve the health and safety of the unit and to control energy costs. Jeremy also gives her the name of the county’s contact to sign up for health insurance and information about food stamps. He tells her that the next step is for a Healthy Homes and Energy Efficiency contractor to come to her home to handle the repairs. After that, he will return to make sure that all of the work has been done properly and to revisit her action plan as well. Jeremy tells her that he will share a copy of this information with the property owner.

*Tom, Sue’s landlord, was trapped.* A year ago, Tom’s mom died leaving him with her property, which still had a mortgage that was beyond his ability to pay. After having no luck selling the property he decided to rent it. He knew that there were some problems with the property from deferred maintenance but thought it would be a decent home for someone. Not long after Sue and her son moved in she complained to Tom that she and her son were sick. Tom felt sorry for them but did not think it was the house that caused the illnesses and in any case did not have the means to make the changes she was requesting. When he received a call from Jeremy at the county, he was angry that Sue had turned him into the government. That is the thanks he was getting for giving her an affordable roof over her head. However, Tom was pleasantly surprised that the government had some money for him to repair his mom’s old home. He thought there must be a catch. He said he would look at the “Action Plan” that Jeremy was faxing to him. The plan given below showed that Tom would only be out of pocket \$350, and the county programs would cover the remainder of the \$10000 repairs in the form of a forgivable loan.

One-touch can turn this fictitious but real situation into a win for everyone. Currently, this home would have been deferred by WAP because of health and safety concerns (thousands of homes are deferred by WAP each year due to substandard conditions). Sue could avoid her 3 trips per year to the emergency department with her son. Those trips totaled \$18000 in costs. The repairs to Sue’s home cost \$15000 and will improve the appraised value of the home for Tom.

## ● Conclusion

A “one-touch” approach for home interventions that strategically integrates public health and energy efficiency has many potential direct and indirect benefits. Programs and policies addressing home health and energy issues have historically operated in categorical silos that in turn cause fragmented service delivery and inefficient use of scarce resources by the agencies providing these services. The challenges for us with such a strong stake in national healthy housing policy include

quickly understanding the unprecedented “waves” of programs and investments in residential energy efficiency rolling across the United States, and identifying the most viable federal policy recommendations with strong potential return on investment that will lead to the incorporation of healthy housing principles. A “one-touch” approach is a potential strategy; keeping in mind that the barriers to change are so numerous that we could easily get bogged down just in capturing all of them. Agreeing on—and then collectively pursuing—meaningful federal policy change is far tougher but will help set this country on a new course.

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