

## **Science Supports Practical Steps To Make U.S. Housing Healthier**

Researchers have understood for centuries that our homes can harm our health.<sup>1,2</sup> Indeed, thousands of peer-reviewed studies have identified a multitude of health and safety risks in our homes that cause injury, illness, and death. Over the past decade, the body of scientific evidence has grown substantially, as scores of new studies have assessed a range of health and safety hazards in housing, identified sources and pathways of exposure, established dose-response relationships, and quantified risks.

However, the most notable advance in the past decade is the consensus that has emerged among leading experts on the significance of health hazards in housing and, even more importantly, the effectiveness of a range of corrective measures. Solid evidence and the judgment of leading researchers across many fields identify practical steps to make American housing healthier and safer, in many cases through measures that are relatively simple and low cost. This paper reviews the state of the science and argues that broad implementation of maintenance and repairs to prevent and reduce health and safety hazards in housing is in everyone's interest.

### **Growing Consensus on the Significance of Health and Safety Hazards in Housing**

As evidence of multiple health and safety hazards in housing continues to mount, experts in the U.S. and abroad have recently reached consensus on the significance of important risk factors.

- A 2000 Institute of Medicine report recognized the following six factors in homes as asthma triggers: secondhand smoke, dust mite allergens, mold allergens, cockroach allergens, rat and mouse dander, and pet dander.<sup>3</sup> Asthma is a complex disease, with both genetic and environmental factors, but these conditions in housing play an important role.
- In 2004, another Institute of Medicine panel found that children who live in homes or attend schools with moisture and mold problems have twice the risk for asthma and other respiratory problems.<sup>4</sup>
- In 2005 and 2011, the World Health Organization examined more than a dozen risk factors and developed comprehensive estimates of the significant health burden of inadequate housing as measured in disability adjusted life years and avoidable fatalities.<sup>5</sup>  
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- The U.S. Census American Housing Survey makes clear the prevalence of a wide range of conditions in housing that pose health hazards as well as striking disparities by race

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<sup>1</sup> Schoenauer N. 6000 years of housing. New York/London: W.W. Norton & Company, Inc.; 2000.

<sup>2</sup> Chadwick E. Report on an enquiry into the sanitary condition of the labouring population of Great Britain and on the means of its improvements. London: Clowes and Sons; 1842.

<sup>3</sup> Clearing the Air: Asthma and Indoor Air Exposures. Institute of Medicine. 2000.

<sup>4</sup> Damp Indoor Spaces and Health. Institute of Medicine. 2004.

<sup>5</sup> Report on the WHO Technical Meeting On Quantifying Disease From Inadequate Housing, Bonn Germany, November 28-30, 2005, World Health Organization Regional Office for Europe, published April 2006.

<sup>6</sup> Environmental Burden of Disease Associated with Inadequate Housing. World Health Organization. 2011.

and income, which account for some share of health disparities, and possibly a significant share.<sup>7</sup>

## **Hazards in Housing Add Billions to National Health Care Costs**

The evidence shows that health and safety hazards in our homes add billions of dollars to national health care costs, as the following examples make clear:

- Unintentional injuries in the home cause more than 21 million medical visits per year at a cost more than \$222 billion per year; falls in the home account for more than \$60 billion per year alone;<sup>8</sup> and each broken hip costs \$37,000 on average.<sup>9</sup>
- Approximately 7 million children aged 0 to 17 in the United States have asthma, with poor and minority children suffering a greater burden of the disease.<sup>10</sup> Asthma persists into adulthood and the costs to society are high: medical expenses associated with asthma are estimated to be \$50 billion annually.<sup>11</sup>
- Radon in homes is the second leading cause of lung cancer, responsible for 21,000 deaths per year year.<sup>12</sup>
- Indoor exposures to air pollutants are 2-10 times higher than outdoors,<sup>13</sup> contributing to a host of acute and chronic diseases including asthma, hypertension and stroke, neurological effects of pesticide and lead exposures, and the effects of carbon monoxide exposure – from flu-like symptoms to fatalities.

## **Many Low-Cost Measures Effectively Reduce Health and Safety Risks in Housing**

Just as importantly, advances in science over the past decade have demonstrated the effectiveness of a range of interventions to reduce risk factors in housing.

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<sup>7</sup> Jacobs DE. Environmental Health Disparities in Housing. J Am Public Health Assoc 2011 Dec;101 Suppl 1:S115-22.

<sup>8</sup> The State of Home Safety in America: Facts about Unintentional Injuries in the Home. Home Safety Council. 2004.

<sup>9</sup> American Academy of Orthopaedic Surgeons: <http://orthoinfo.aaos.org/topic.cfm?topic=A00101>

<sup>10</sup> Akinbami, L.J., Mooreman, J.E., Bailey, C., Zahran, H., King, M., Johnson, C., & Liu, X. Centers for Disease Control and Prevention, National Center for Health Statistics (2012). Trends in asthma prevalence, health care use, and mortality in the United States, 2001-2010. Retrieved from <http://www.cdc.gov/nchs/data/databriefs/db94.pdf>

<sup>11</sup> Centers for Disease Control and Prevention (2011, May). Asthma in the U.S. Vital Signs. Retrieved February 13, 2012, from <http://cdc.gov/vitalsigns>

<sup>12</sup> Assessment of Risks From Radon in Homes. US Environmental Protection Agency. 2003.

<sup>13</sup> Samet, J.M., Spengler, J.D., eds. *Indoor Air Pollution - A Health Perspective*. Johns Hopkins University Press. Baltimore, MD. 1991.

- Multi-faceted treatments of asthma triggers in the home have been found cost-effective for pediatric asthma patients with a history of hospital and emergency room visits, saving \$2.42 for each dollar spent.<sup>14</sup>
- According to the American Academy of Orthopaedic Surgeons, “Most hip fractures occur as a result of a fall and most falls and injuries occur in the home. Many are preventable by recognizing the dangers and taking steps to correct known home hazards.”<sup>15</sup>
- With support from the Centers for Disease Control and Prevention (CDC), NCHH convened experts from many fields and disciplines in 2009 to review the evidence and reach consensus about a wide range of interventions.<sup>16171819</sup> These experts found “sufficient evidence” for many interventions to prevent housing-related disease and injuries, including the following:
  - Lead hazard control
  - Multi-faceted tailored asthma interventions
  - Integrated pest management
  - Mold and moisture control
  - Smoking bans
  - Smoke alarms
  - Hot water temperature control

In fairness, it deserves note that this consensus panel concluded that more field evaluation is still needed to document the benefits of other common, well-regarded interventions, such as:

- Installing handrails, grab bars, and improved lighting for fall prevention
- Reducing excessive humidity in homes
- Improving the safety of combustion appliances

Of course, additional research and evaluation of these and other health and safety hazards in homes is valuable. But the benefits of more definitive studies is no excuse to delay action to provide common sense, low-cost interventions. Researchers and practitioners understand the

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<sup>14</sup> Woods ER, Bhaumik U, Sommer SJ, et al. Community Asthma Initiative: Evaluation of a Quality Improvement Program for Comprehensive Asthma Care. *Pediatrics*. 2012; 129(3). Available at <http://pediatrics.aappublications.org/content/early/2012/02/15/peds.2010-3472>

<sup>15</sup> American Academy of Orthopaedic Surgeons’s website

<sup>16</sup> Jacobs DE, Brown MJ, Baeder A, Scalia Sucusky M, Margolis S, Hershovitz J, Kolb L, Morley, RL. A Systematic Review of Housing Interventions and Health: Introduction, Methods, and Summary Findings. *J Public Health Management Practice*, 2010, September (Suppl), S3–S8.

<sup>17</sup> Krieger J, Jacobs DE, Ashley PJ, Baeder A, Chew GL, Dearborn D, Hynes HP, Miller. Morley RL, Rabito F, Zeldin DC. Housing Interventions and Control of Asthma-Related Indoor Biologic Agents: A Review of the Evidence. *J Public Health Management Practice*, 2010, September (Suppl), S9–S18

<sup>18</sup> Sandel M, Baeder A, Bradman A, Hughes J, Mitchell C, Shaughnessy R, Takaro TK, Jacobs DE. Housing Interventions and Control of Health-Related Chemical Agents: A Review of the Evidence. *J Public Health Management Practice*, 2010, September (Suppl), S19–S28.

<sup>19</sup> DiGuseppi C, Jacobs DE, Phelan KJ, Mickalide AD, Ormandy D. Housing Interventions and Control of Injury-Related Structural Deficiencies: A Review of the Evidence *J Public Health Management Practice*, 2010, September (Suppl), S32–S41.

conditions that pose health and safety risks in homes and have high confidence in the direction of changes needed to reduce many significant risks, such as correcting moisture problems and tripping hazards.

### **Putting the Principles of Healthy Homes Into Action**

To focus attention on practical measures to reduce injury and disease, NCHH developed the Seven Principles of Healthy Homes.<sup>20</sup> The *Surgeon General's Call to Action to Promote Healthy Homes* endorsed these principles in June 2009.<sup>21</sup>

- Keep it Dry
- Keep it Clean
- Keep it Pest-Free
- Keep it Safe
- Keep it Contaminate-Free
- Keep it Well Ventilated
- Keep it Maintained

### **Conclusion**

Solid scientific evidence shows that multiple hazards in U.S. housing pose significant risks to occupants' health and safety. These hazards add billions to health care costs and disproportionately affect low-income persons living in older homes. Evidence-based housing improvements and interventions effectively reduce these risks and prevent unnecessary illness, disease, and death. Current knowledge justifies action now to implement a range of low-cost repairs to make high-risk homes healthier and safer. All American homeowners and rental property owners deserve information about the importance of property maintenance, regular visual checks, and low-cost opportunities to apply the principles of healthy homes to their own homes. Those concerned about controlling national health care costs should support efforts to put the principles of healthy homes into practice on a broad scale.

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<sup>20</sup> <http://www.nchh.org/What-We-Do/Healthy-Homes-Principles.aspx>

<sup>21</sup> <http://www.surgeongeneral.gov/topics/healthyhomes/>