



National Center for Healthy Housing

Science Supports Action Now To Make High-Risk Homes Healthier

Researchers have understood for centuries that our homes can harm our health.^{1,2} 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 emerging consensus among leading experts about 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.³ 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.⁴
- 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.^{5,6}

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

² 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.

³ Clearing the Air: Asthma and Indoor Air Exposures. Institute of Medicine. 2000.

⁴ Damp Indoor Spaces and Health. Institute of Medicine. 2004.

⁵ 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.

⁶ Environmental Burden of Disease Associated with Inadequate Housing. World Health Organization. 2011.

- 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 and income, which account for some share of health disparities, possibly a significant share.⁷
- The risk is widely acknowledged that weatherization measures to improve energy efficiency can inadvertently create health hazards if adequate airflow and moisture control are not ensured.⁸ Steadily growing interest in energy efficiency highlights the need for safeguards to avoid exacerbating health hazards in housing.

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 \$100 billion per year alone;⁹ and each broken hip costs \$37,000 on average.¹⁰
- 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.¹¹ Asthma persists into adulthood, accounting for \$14.7 billion in direct medical costs plus \$5.0 billion in other costs per year.¹²
- Radon in homes is the second leading cause of lung cancer – 21,000 deaths per year year.¹³
- Indoor exposures to air pollutants are 2-10 times higher than outdoors,¹⁴ 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.

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

⁸ Healthy Indoor Environment Protocols for Home Energy Upgrades, Office of Air and Radiation, US Environmental Protection Agency, EPA 402/K-11/003, 2011.

⁹ The State of Home Safety in America: Facts about Unintentional Injuries in the Home. Home Safety Council. 2004.

¹⁰ American Academy of Orthopaedic Surgeons: <http://orthoinfo.aaos.org/topic.cfm?topic=A00101>

¹¹ 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>

¹² Agency for Healthcare Research and Quality: <http://www.ahrq.gov/qual/nhdr10/Chap2c.htm>.

¹³ Assessment of Risks From Radon in Homes. US Environmental Protection Agency. 2003.

¹⁴ 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.¹⁵
- 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.”¹⁶
- With support from the Centers for Disease Control and Prevention, NCHH convened experts from many fields and disciplines in 2009 to review the evidence and reach consensus about the effectiveness of a wide range of interventions.^{17,18,19,20} These experts found “sufficient evidence” that many interventions reduce 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

¹⁵ 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>

¹⁶ American Academy of Orthopaedic Surgeons’s website

¹⁷ 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.

¹⁸ 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

¹⁹ 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.

²⁰ 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.

Of course, additional research and evaluation of these and other health and safety hazards in housing will be valuable. But the promise of more definitive insights from future studies is no excuse to delay action to provide common sense, low-cost interventions. Researchers and practitioners understand the conditions that pose health and safety risks in homes, and have high confidence in the direction of changes needed to reduce many significant risks.

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.²¹ The *Surgeon General's Call to Action to Promote Healthy Homes* endorsed these principles in June 2009.²²

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

A new set of tools and training, called Healthy Housing Rehab and Repair, makes scores of measures to prevent and reduce health and safety hazards in housing more accessible and affordable than ever before. And these repairs will soon be implemented on an unprecedented scale through the *Healthy Housing Challenge*, a joint venture of NCHH and Rebuilding Together, the nation's leader in volunteer home repair. The *Healthy Housing Challenge* will build the capacity of 50 Rebuilding Together affiliates across the nation to correct health and safety hazards in the homes of thousands of low-income homeowners. In doing so, the *Healthy Housing Challenge* will demonstrate practical ways to make our homes significantly healthier and safer, attract local press and media coverage, and begin to awaken Americans to the link between our homes and our health.

Conclusion

Solid scientific evidence shows that multiple hazards that pose significant risks to occupants' health and safety are widespread in U.S. housing. These hazards add billions to health care costs and disproportionately affect low-income persons living in older housing. 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 relatively simple measures to make high-risk homes healthier and safer. All American homeowners and rental property owners deserve information about simple repairs to correct health hazards in their properties as well as the value of regular property maintenance and visual checks for moisture and other problems. Those concerned about controlling health care costs should encourage and support efforts to put the principles of healthy homes into practice on a broad scale.

²¹ <http://www.nchh.org/What-We-Do/Healthy-Homes-Principles.aspx>

²² <http://www.surgeongeneral.gov/topics/healthyhomes/>