

FRAMING PAPER

Healthier Homes, Stronger Families: Public Policy Solutions to Advance Healthy Housing Symposium

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Sponsored by:

The Enterprise Foundation
&
The National Center for Healthy Housing

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The Enterprise Foundation. Since 1982, The Enterprise Foundation has helped America's low-income families with their struggle out of poverty by providing decent homes, access to steady employment, quality child care and safer streets. Working with a network of 2,500 community organizations nationwide and through its 15 local offices, The Enterprise Foundation has leveraged close to \$5 billion in investments and donations to help build almost 160,000 affordable homes and help nearly 40,000 hard-to-employ people find jobs since 1982.

The National Center for Healthy Housing. The National Center for Healthy Housing (NCHH) carries out research, demonstration, and evaluation projects to determine more effective ways to prevent, identify, and control housing-related health hazards and to translate that knowledge into action. With a generous start up grant from the Fannie Mae Foundation, The Enterprise Foundation and the Alliance for Healthy Homes founded NCHH in 1992 to develop and promote practical measures for reducing childhood lead poisoning, while preserving affordable housing. Today, NCHH's focus is twofold – to eliminate childhood lead poisoning by 2010 and to provide leadership of the broader "healthy homes movement," which seeks to improve the health of children by promoting safer and healthier home environments.

Annie E. Casey Foundation. The Annie E. Casey Foundation was established in 1948 by Jim Casey, one of the founders of United Parcel Service, and his siblings, George, Harry, and Marguerite, who named the philanthropy in honor of their mother. The Foundation's first grants provided support to a camp for disadvantaged children in Seattle, Wash., the home of the Casey family. Since its inception, the Annie E. Casey Foundation (AECF) has worked to build better futures for disadvantaged children and their families in the United States. The primary mission of the Foundation is to foster public policies, human service reforms, and community supports that more effectively meet the needs of today's vulnerable children and families

I. Introduction

Housing has long been recognized as a factor in the health of its occupants and a determinant of health inequality. Housing as a neglected site for public health action has been identified in a number of recent national reports. These reports highlight that indoor and outdoor housing conditions, as well as the material and social aspects of housing, and local neighborhoods have an impact on the health of occupants (Howden-Chapman, 2004). Efforts to measure the specific impact of housing quality on health outcomes and the effectiveness of housing-related health interventions have advanced dramatically in recent years, although much work remains.

The age-old concept of safe, decent, and sanitary housing has reemerged as the relatively new field of “healthy housing.” Healthy housing takes a holistic view of the entire home environment, emphasizes the interrelationship of health problems in housing, and advocates comprehensive solutions to them. It also encompasses the use of products and materials that, at a minimum, do no harm to human health, and ideally improve it. The field benefits from a network of public health practitioners, academics, researchers, community-based organizations, and national policy and advocacy organizations. Policymakers at all levels of government and members of the private sector also are recognizing the importance of housing’s impact on human health.

II. Overview of this Paper and the Healthier Homes, Healthier Families Symposium

On June 2, 2004, the National Center for Healthy Housing (NCHH) and The Enterprise Foundation will convene a symposium of healthy housing leaders from the disciplines mentioned above to initiate development of a healthy housing public policy agenda. Certainly much has been done to date to articulate and advance healthy housing policies. NCHH and Enterprise affirm that work, and participate in much of it. It is our hope that the symposium will establish high priority policies that a broad cross section of healthy housing stakeholders will endorse, advocate and work to achieve, both individually and in coalition with others.

This paper is intended to set the stage for a substantive dialog on June 2. It suggests high-level goals for healthy housing research, policy approaches (e.g., regulatory and market-based), and community-based solutions. The symposium will feature panel discussions in each of these areas, in which healthy housing leaders from around the country will discuss their activities as they relate to one or more goals. We hope a rich discussion with all participants in the symposium will follow each panel presentation. As you prepare for the symposium we ask that you consider the priority goals proposed in this paper. Are they the right goals? If so, what workable strategies could be implemented for achieving them? If not, what other goals should be considered?

In addition to the panel discussions, the symposium is honored to have as keynote speakers United States Senator and longtime healthy housing champion Jack Reed (D-RI) and Dr. Dolores Acevedo-Garcia of the Harvard University School of Public Health, whose work considers both housing and neighborhood issues in health outcomes.

III. Overview of Healthy Housing Research

A. “The Relationship Between Housing and Health: Children at Risk” Workshop

In November 2002, the National Center for Healthy Housing, a national non-profit organization dedicated to eliminating residential health hazards to children while preserving affordable housing, convened a two-day workshop to review the state of knowledge and to help promote the paradigm shift to healthy housing. The agenda was divided into four sessions: childhood asthma and other respiratory diseases; neuro-developmental and behavioral problems; unintentional injuries; and translating research into positive actions.

Four major themes emerged from the expert presentations and panel discussions:

1. Although all the mechanisms are not well articulated, the built environment, including residential housing, is an agent of health (or illness) for children.
2. The body of research around lead toxicity and strategies for preventing and controlling lead hazards in housing can serve as a model for defining a health problem and crafting workable solutions.
3. Studies linking the residential environment and children’s health status face ethical and practical constraints, which limit the range of options available.
4. Social determinants influence who is at risk for exposure or injury, how they react to those substances or risk factors, and the efficacy of interventions.

Participants identified four global research needs requiring further consideration and resources:

1. Standardized hazard assessment techniques and hazard standards need to be developed.
2. Translational research is needed, including more rigorous, long-term studies of interventions.
3. The health impact of multiple environmental insults requires further study.
4. A broader coalition of researchers, policy makers, practitioners, funders, and advocates must be engaged to fill data gaps, support needed research and pursue policy change.

While not discussed at the November 2002 workshop, substandard housing conditions have also been shown to have mental health implications. Housing quality, including presence of pests and mold, has been strongly associated with psychological distress. Other sources of housing related stress, such as the strain of meeting rent payments, overcrowding and inability to relocate have been associated with worse health status. Taken together, these data underscore the need to consider both the physical and emotional effects of housing quality and area of residence on disease.

B. Summary of Research on Housing-Related Health Priority Areas

Since children spend as much as 80 to 90 percent of their time in the home, the home is an important source of exposure to environmental hazards. The state of knowledge of housing-related hazards varies by environmental toxicant. Knowledge about hazards such as lead and radon are based on decades of research, whereas exposure to pesticides and environmental tobacco smoke are more recent areas of study. Research and evaluation have shed light on the efficacy of various interventions to address many housing-related health problems, though not all. A recent review of published evaluations of interventions to improve health by modifying housing found that 92 percent of interventions addressed a single condition, most often lead, asthma or injury. The most common intervention tried to change behavior, environment or both. Most of the studies reported statistically significant improvements (Saegert et al., 2003).

Asthma: Asthma prevalence, health service utilization and mortality among children and young adults are increasing (Institute of Medicine, 2000). The causes of the increase in asthma are not well understood. A growing body of evidence suggests that agents and exposures found in indoor environments, housing in particular, are major determinants of asthma prevalence and morbidity. Asthma varies with race or ethnicity and urban location, with poor inner-city populations suffering disproportionately (Institute of Medicine, 2000). Much of the variability in asthma rates may be due to exposure to indoor environmental asthma triggers associated with living in substandard housing (Krieger et al., 2002).

Chronic exposure to allergens in the indoor environment, from mold, pets, mice and rats, cockroaches, and dust mites, is associated with asthma. Moisture indoors contributes to sustaining mold and pests and may be an independent factor as well. A number of indoor air pollutants also have been associated with the development and exacerbation of asthma. These include environmental tobacco smoke (ETS); nitrogen dioxide (NO₂), a by-product of high temperature combustion associated with unvented or poorly vented combustion appliances such as gas stoves; and volatile organic compounds (VOCs) products found in the home, including dry cleaning compound residues, plastics, products of combustion and paint thinners.

The basic strategy to alleviate respiratory symptoms is to determine to which allergens a person is sensitive and then follow a set of steps to avoid those specific allergens. Since half of asthmatics have multiple (3+) sensitivities (Eggleson, 2000; Huss, et al., 2001), several actions may have to be undertaken over long periods of time. The linkage between housing-based environmental health threats and respiratory problems has only been explored in the past decade. Hence, while studies to assess the exposure have made a persuasive case for the linkage, we are just beginning to study the effectiveness of interventions to address multiple hazards. The core question is if we believe that a housing condition increases the risk of a health problem, what type and level of repair is needed to see a resulting health benefit? One study currently underway in Washington state is showing declines in asthma symptoms and health care utilization following a multi-pronged intervention in the home of asthmatic children.

Injuries: Injuries are a leading cause of emergency room visits, hospital admissions, and mortality for children in the U.S. The majority of injuries among children occur in the home (Pollack et al., 1988, Rivara et al., 1989, Scheidt et al., 1995). Falls are the most frequent cause of residential injuries to children, followed by injuries from objects in the home, burns, poisoning, and animal bites.

Over the period, 1985 to 1997, fatal home injuries accounted for almost two-thirds of all fatal unintentional injuries among U.S. children and adolescents. Mean residential death rates for children and adolescents over that period varied markedly by age. Children less than one-year of age were at substantially greater risk. Male and black children had greater risk of fatal residential injuries. Fatal home injuries demonstrated wide geographic variability and were highest in the south.

A number of actions to prevent child injuries in the home are already well known. Smoke alarms are a key means to prevent injury or death due to home fires. When homes have functioning smoke alarms, there is a 50 to 80 percent reduction in injury and death due to residential fires (National Center for Injury Prevention and Control, 2002). Each year in the United States, over 200 people die from carbon monoxide (CO) poisoning (U.S. Consumer Product Safety Commission, 2000). Common sources of CO in homes include, for example, gas and oil furnaces, boilers, water heaters, wood burning fireplaces and stoves, gas appliances, and blocked chimneys and flues. CO alarms have proven useful in preventing CO poisoning from these sources.

The prevention of scalds, non-fire burns, and poisoning has been shown to be possible in several different studies. Home design elements and consumer product design, as well as supervision, are key factors. Interventions include caretaker education and behavior change, and passive safety design. Several simple effective prevention steps are well known: locking cabinets for storage of poisonous materials, reducing the temperature of hot water heaters to 120° F., using safety devices for electrical outlets, drawers and cabinet doors, and using child-proof caps on medicines and poisonous products in the home. Research is needed about stair design to reduce falls of children. CDC is currently sponsoring research about floor compositions that could reduce the incidence and severity of falls.

Neuro-developmental and behavioral problems: A child's developing neurological system is especially vulnerable to damage from environmental toxins such as lead and pesticides (Faustman et al., 2000). The most significant neurotoxins found in residential settings are lead, pesticides, and environmental tobacco smoke (ETS) (Lanphear et al., 2000, Whyatt et al., 2002; Jordaan et al., 1999).

Lead toxicity among children, particularly in the inner city, is a well-known public health problem. The persistent concern about lead effects is magnified by the growing concern about the general impact of the environment on neuro-behavioral aspects of childhood development. Recent research suggests that there is probably no

lower level threshold of blood lead. Even at quite low levels (2.5 µg/dL to 10 µg/dL), deleterious effects of lead can be detected (Lanphear et al., 2000).

The steps needed to prevent childhood exposures to neurotoxins are founded in core public health practice and include, identifying sources of exposure, identifying unacceptable levels of exposure, developing and testing interventions, and implementing effective regulatory and screening programs. Intervention strategies include (in increasing order of effectiveness and cost) education, enforcement, and engineering controls with an emphasis on primary prevention (Breysse et al., forthcoming).

In the case of childhood lead exposure there is an extensive body literature documenting the impact that various methods of lead hazard control have on dust and blood lead levels. Low level interventions such as one time cleaning with minimal attention to the primary source of the lead has only short term effects, while more extensive interventions to fix the sources have been shown to be effective in reducing dust lead loading (Staes and Rinehart, 1995; Niemuth et al., 1998; Haynes et al., 2002; Galke et al., 2001; Tohn et al., 2003). Niemuth et al. (1998) summarized the literature from 1980 through 1998. Generally, the studies report successful reductions in dust lead levels and in blood lead levels when initially above 20 µg/dL. According to a study conducted by the National Center for Healthy Housing and the University of Cincinnati, children with pre-intervention blood lead levels as low as 10 ug/dL (the CDC level of concern) experienced substantial declines in blood lead level following lead hazard control interventions (NCHH, 2004). Previous studies had not observed substantial declines unless a child's pre-intervention blood lead level was above 20 ug/dL.

IV. Goals for Research to Advance Healthy Housing

Research in all these areas may be of value to policymakers. This paper suggests a few priorities for research that may be especially relevant to policymakers. Much research on the health impact of housing conditions and evaluation of interventions to prevent and remediate those impacts has been categorical in nature, focusing on single agents, such as respiratory allergens, toxins and structural hazards. Certainly such research remains important.

However, since healthy housing is fundamentally a holistic concept, research to support healthy housing policy and interventions should seek broader connections and interrelationships as well. Such research may be especially useful in formulating public policies that reinforce cost-effective strategies that support healthy housing. For example, it is common for inner city children to be exposed to lead, ETS, and pesticides both prenatally and postnatally. Healthy housing generally holds that intervention efforts should address these multiple exposures and risks simultaneously to the extent possible. Understanding how multiple unhealthy housing factors interrelate would help inform interventions. For example, moisture is generally believed to be a common cause of many healthy housing problems, including the deterioration of lead paint, mold growth, and increased concentrations of other asthma triggers such as dust mites and pests.

Even more broadly, much more must be known about the costs and health benefits of various housing interventions, including modest changes in work practices and low-cost “do no harm” strategies for maintenance, light renovation, substantial rehabilitation and new construction. Such analysis would be essential for policymakers who must decide not only appropriate policies, but also appropriate targeting of limited public resources.

Finally, the relationship between neighborhoods and health is under explored and calls for more careful analysis. Neighborhoods conditions do appear to matter, independent of individual or family-level characteristics, across a broad range of outcomes. A large number of researchers are now studying neighborhood effects on other outcomes, such as educational attainment and labor market success, and are using increasingly sophisticated multilevel models that help identify the effect of the neighborhood itself (Ellen et. al., 2001).

In light of this discussion, it seems the following are important healthy homes research objectives for consideration:

- Develop and test methods for evaluating and treating residential health hazards.
- Assess the relative effectiveness—in terms of *cost* outcomes—new construction, rehabilitation/renovation and maintenance in preventing or mitigating the effects of childhood asthma, developmental disorders, and unintentional injuries
- Assess the relative effectiveness—in terms of *health* outcomes—new construction, rehabilitation/renovation, and maintenance in preventing or mitigating the effects of childhood asthma, developmental disorders, and unintentional injuries.
- Examine the relationships between neighborhoods and health effects, and the impact of housing investment on public health.

Importantly, because the science of healthy homes continues to evolve as discussed above, policies must be crafted that promote ongoing innovation, but that prevent harm in the face of scientific uncertainty. In other words, as we learn more about what works and why, we can simultaneously take action. The ‘precautionary principle’ has been proposed as a new guideline in environmental decision-making. A 1998 consensus statement characterized the precautionary principle this way: “when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically” (Raffensperger, C. et. al., 1999). The next section discusses opportunities and options for taking such action based on what we know now.

V. Overview of Policy Tools for Achieving Healthy Housing

It is unlikely that any single policy approach can bring about corrective and preventive action across the housing stock. In addition to appropriate public subsidies, government standards, regulatory requirements, and enforcement, healthy homes practices also need to be reinforced through industry standards, recommended best

practices, consumer demand, community action, and legal strategies (Alliance for Healthy Homes, 2003).

The following section discusses market-based and regulatory approaches to policy change and provides examples of these approaches that might serve to inform the development of a healthy housing policy agenda.

A. Market-Based Approaches: Lessons Learned from Green Building and Other Consumer-Based Programs

Market-based approaches to healthy housing are of enormous importance to policymakers. More robust activity to advance healthy housing by builders, managers, and lenders could complement the investment of public resources to help solve housing-related health problems. In addition, understanding the experience of private market actors, including consumers, can help policymakers craft policies that are more reflective of and responsive to real world conditions. Finally, public policies that effectively leverage market-based approaches may be able to achieve greater scale and efficiencies than ‘command and control’ government programs.

For reasons ranging from financial constraints, lack of information about how housing conditions affect health, inadequate housing supply, fear of landlord reprisal and even aesthetic considerations, consumers appear to place relatively low value on health as a factor in making housing decisions, except perhaps some affluent homebuyers.

Absent strong market demand (which could be induced by public incentives or created by regulatory requirements) experience suggests that homebuilders, renovators, contractors and suppliers lack incentives to provide and ensure healthy housing, especially if they believe it has negative economic impacts on their bottom lines. Builders are generally focused on achieving and increasing profitability. Likewise, multifamily building managers are generally focused on achieving operating costs savings. Therefore, some entities may be dubious about adopting practices that may increase costs and reduce profitability.

There are abundant anecdotal examples and an emerging body of best practices that show many healthy housing principles and practices can be integrated into housing activities and that can improve durability and reduce long-term costs. There is also encouraging experience that suggests educating and training builders can change their methods of working.

There are also examples, generally in market rate housing, of substantial life cycle costs savings associated with building features that promote positive health conditions, such as good indoor air quality, energy efficiency, and other benefits. Many of these practices fall under the rubric “green building” and there is increasing interest among homebuilders and building suppliers in the issue. For example, industry standards and a scoring system, adopted in 2000, brought accountability and accelerated green building. The 4,000-member Green Building Council's Leadership in Energy and Environmental

Design program (LEED) has become a benchmark followed by developers, architects and elected officials across the USA. Its sought-after silver, gold and platinum ratings verify the "greenness" of a project (Ritter, March 2004). Similarly, the U.S. Environmental Protection Agency is developing an expanded ENERGY STAR label that incorporates the concept of a healthy indoor environment.

Some energy-efficiency and green building programs could have negative health consequences, if health and safety are not considered. Engvall, et al., (2003) found that buildings with more than one sealing measure had an increase of ocular, nasal symptoms headache and tiredness. The Weatherization Assistance Program, administered by the federal Department of Energy, provides energy-efficient housing for low-income families. Reports in the 1980s reported increased radon levels after homes were "tightened" (Cohen, B.L. et al., 1988). DOE later issued building tightness guidelines, and today Weatherization programs incorporate many health and safety measures, such as testing combustion appliances, testing the tightness of the structure, and following lead-safe work practices.

B. Regulatory Approaches: Lessons Learned from Lead Poisoning Prevention

A number of issues must be considered in determining the appropriate role for government standards and regulations in healthy homes. For instance, is there enough known about the problem and solutions such that informed regulations can be developed? Where are there knowledge gaps? How can regulations and standards be constructed to protect consumers and channel market forces? At what level(s) would regulations be most appropriate (federal, state, local)? How would a new regulatory scheme interface with existing requirements and standards? How would stakeholders be impacted by the regulations and conversely, how would stakeholders be impacted in the absence of regulations? As part of the symposium we intend to explore several of these questions to explore how best to balance regulatory and other strategies.

VI. Goals for Healthy Housing Policy

In light of the discussion above, it seems the following should be high priority goals for policy approaches to healthy housing.

- Determine the healthy housing practices for which there is sufficient evidence to require or recommend policy changes (e.g., integrated pest management, moisture control).
- Identify key instances where federal regulation is appropriate (e.g. setting health-based standards, banning un-safe practices, etc.).
- Create consumer demand for healthy housing such that it is valued on roughly equal terms with economic, locational, and aesthetic considerations for renters and buyers of affordable housing.
- Increase incorporation of healthy housing principles and practices in the construction, rehabilitation, and operation of affordable housing among contractors, suppliers,

developers, and property managers, particularly properties receiving federal assistance.

- Increase incorporation of healthy housing principles into major energy assistance programs.
- Achieve quantifiable life cycle cost savings, quality and durability, for owners and tenants of affordable housing as a result of using healthy housing principles and practices.
- Create awareness among medical providers of the importance of the home environment in health outcomes.

V. Overview of Community-Based Solutions for Healthy Housing

Community-based organizations play a unique and indispensable role in advancing healthy housing. They are anchored in and accountable to the people and places most acutely affected by housing-related health problems (among many other issues). Grassroots groups also pioneer innovative approaches, ensure equity in services delivery, and mobilize community residents in the political process.

While research and evaluation of community-based healthy housing solutions is limited, many anecdotal examples and best practices have been documented, such as by the Alliance for Healthy Homes' Community Environmental Health Resource Center. Community-based organizations working on healthy housing issues have focused on the following activities: advocating for the active enforcement of local codes and state and federal laws; educating and organizing residents, including through legal aid and advocacy; building, rehabilitating and repairing housing; providing or linking services in connection with housing activities; and advocating more resources, better policies, and increased private market obligations.

Some community-based organizations—and public health researchers and practitioners—are also active on healthy *neighborhood* issues. Research has documented a host of neighborhood level-effects on health in distressed communities, independent of individual risk-level factors. These include poor birth outcomes, heart disease, sexually transmitted disease, depression, physical inactivity and all-cause morbidity (Krieger and Higgins, 2002).

Conditions common in distressed communities, such as poor air quality due to proximity to high vehicle exhaust emissions or pest infestation due to inadequate waste removal, may contribute to poor health as well. Health studies have shown that segregation is positively associated with mortality rates and certain health outcomes among African Americans (Acevedo-Garcia et al., 2003). These and other conditions, including racism and isolation, may contribute to high levels of stress, which may damage the brain and immune system. Finally, the generally deprived environments in distressed areas, features of which include lack of access to quality foods and adequate recreational opportunities, may make those areas less healthy (Epstein, 2004). Much more research is needed into the mental and physical health impact of the built environment. Encouragingly, the U.S. Centers for Disease Control and Prevention

recently convened a workshop to develop a research agenda in which participants articulated a range of key questions to consider (Dannenberg et al., 2003).

Community-based organizations employ several strategies for reducing health disparities in their neighborhoods, including increasing resident awareness, empowerment and collective efficacy; organizing, advocacy and coalition building; and assessment, research, and evaluation (Dewart Bell et al., 2002).

Many can benefit from education, but care must be taken to avoid inappropriately shifting responsibility to tenants and others who have little ability to change structural or physical conditions. Education and training should be targeted to increase knowledge and build the skills of those who bear responsibility for providing healthy housing.

Making physical improvements is only part of the solution. It is vital that economically-distressed communities, which are typically impacted by the greatest housing-related health hazards, be directly involved in designing and implementing solutions in order to build capacity and economic power within the community.

VI. Goals for Community-Based Solutions to Inform Healthy Housing Policy

Public policies to advance healthy housing should learn from and support community-based approaches. Legislators, regulators and administrators at all levels should reach out to community-based organizations in crafting healthy homes policies. The following are recommendations for high priority goals for community-based interventions to guide the advancement of healthy housing:

- Strengthen the capacity of community-based organizations to assess and address health hazards in affordable housing, through capacity building, training, and organizing.
- Inform tenants about health hazards in housing and their legal rights.
- Build skills and employment opportunities to maintain housing in low-income communities that is affordable and healthy.

VII. Conclusion: Affordable Housing Policy Priorities to Advance Healthy Housing

The primary focus of this paper and the Healthier Homes, Healthier Families Symposium is public policies expressly intended to improve health outcomes through improvements in housing conditions. Some such policies may be thought of as “health oriented housing policies.” As the discussion of community-based approaches above suggested, broader affordable housing and community development policies have health impacts as well and are important to consider to a comprehensive healthy housing policy agenda. For example, increased funding for federal Housing Choice Vouchers, a perennial priority for affordable housing advocates, may help more poor families realize the health benefits that appear to be associated with living in low-poverty neighborhoods.

Consideration of this issue raises the question about what broad-based housing policy priorities healthy housing stakeholders should support and advocate. Certainly, the

public health profession has a storied history of advocacy on housing issues. Affordable housing advocates would likely welcome with open arms an increased level of engagement by the public health community (and vice versa). There may, however, be a tradeoff for public health practitioners, researchers, and scholars in broadening their activities to advance a larger housing policy agenda if it means they must devote less of their energies to narrower health-oriented housing policies more in line with their expertise as a result. This paper does not propose affordable housing goals for healthy housing policy, but to the extent the issue generates discussion at the symposium, it could constitute an action for future work together.

In conclusion, the resurgence of housing as a public health issue presents new opportunities for a broad spectrum of organizations to promote a shared public policy agenda. Among other things, additional research is needed to validate the practices that can be employed to improve health through housing. Healthy housing policy must include strategies for leveraging private sector participation, for building community capacity to take action, and for identifying the role of government in facilitating large-scale change. By highlighting and discussing a public policy agenda for healthy housing, the symposium will provide a forum for exploring areas for cross-disciplinary collaboration and for developing consensus about areas that require more investigation and areas that are ready for immediate action.

REFERENCES

- Acevedo-Garcia, D., Lochner, K.A., Osypuk, T.L., & Subramanian, S.V. (2003). Future directions in residential segregation and health research: A multi-level approach. *American Journal of Public Health, 93*(2), 215-221.
- Alliance for Healthy Homes. (2003). "Lessons Learned from Lead Poisoning Prevention." http://www.afhh.org/aa/aa_leadlessons.htm.
- Breyse, P., Morley R., Lanphear B., Galke W., Bergofsky L. "The Relationship Between Housing and Health: Children at Risk Report from a Workshop" (Forthcoming).
- Cohen, B.L; Gromicko, N. (1988). "Variation of radon levels in US homes with various factors." *J. Air Pollut. Control Assoc.* 38:2.
- Dannenberg, A.L., Jackson, R.J., Frumkin, H., Schreiber, R.A., Pratt, M., Kochitzky, C. & Tilson, H.H. (2003). The impact of community design and land-use choices on public health: A scientific research agenda. *American Journal of Public Health, 93*(9), 1500-1508.
- Dewart Bell, J. (2002). PolicyLink. "Reducing Health Disparities Through a Focus on Communities."
- Eggleston, P.A. (2000). Environmental causes of asthma in inner city children: The National Cooperative Inner City Asthma Study. *Clinical Review of Allergy and Immunology, 18*, 311-324.
- Ellen, Ingrid Gould, Mijanovich, T. & Dillman, K. (2001). Neighborhood effects on health: exploring the links and assessing the evidence. *Journal of Urban Affairs, 23* (3-4), 391-408.
- Engvall, K., Norrby, C., & Borback, D. (2003). Ocular, nasal, dermal and respiratory symptoms in relation to heating, ventilation, energy conservation, and reconstruction of older multi-family houses. *Indoor Air, 13*(3), 206-211.
- Epstein, Helen.(October 12, 2003). Enough to make you sick. *New York Times Magazine*, 74-104.
- Faustman E.M., Silbernagel, S.M., Fenske, R.A., Burbacher, T.M., & Ponce, R.A. (2000). Mechanisms underlying children's susceptibility to environmental toxicants. *Environmental Health Perspectives, 108*(Suppl 1),13-21.
- Galke, W., Clark, C., Wilson, J., Succop, P., Dixon, S., Bornschein, R., McLaine, P., Chen, M., & Jacobs, D. (2001). Evaluation of the HUD Lead Hazard Control Grant Program: Early overall findings. *Environmental Research Section, A 86*,149-156.

- Haynes, E., Lanphear, B.P., Tohn, E., Farr, N., & Rhoads, C.G. (2002). The effect of interior lead hazard controls on children's blood lead concentrations: A systematic evaluation. *Environmental Health Perspectives*, 110, 103-107.
- Howden-Chapman, P. (2004). Housing standards: a glossary of housing and health. *J Epidemiol Community Health*, (58), 162-168.
- Huss, K., Adkinson, N.F. Jr., Eggleston, P.A., Dawson, C., Van Natta, M.L., & Hamilton, R.G. (2001). House dust mite and cockroach exposure are strong risk factors for positive allergy skin test responses in the Childhood Asthma Management Program. *Journal of Allergy and Clinical Immunology*, 107, 48-54.
- Institute of Medicine. (2000). *Clearing the air: Asthma and indoor air exposures*. Washington DC: National Academy Press.
- Jordaan, E.R., Ehrlich, R.I., & Potter, P. (1999). Environmental tobacco smoke exposure in children: household or community determinants. *Archives of Environmental Health*, 5, 319-327.
- Krieger, J., Allen, C., Cheadle, A., Ciske, S., Schier, J.K., Senturia, K., & Sullivan, M. (2002). Using community-based participatory research to address social determinants of health: Lessons learned from Seattle Partners for Healthy Communities. *Health Education and Behavior*, 29(3), 361-382.
- Krieger J. & Higgins, D.L. (2002). Housing and health: Time again for public health action. *American Journal of Public Health*, 92(5), 758-768.
- Lanphear, B.P., Dietrich, K., Auinger, P., & Cox, C. (2000). Cognitive deficits associated with blood lead concentrations <10 microg/dL in US children and adolescents. *Public Health Reports*, 115(6), 521-529.
- National Center for Healthy Housing and University of Cincinnati Department of Environmental Health. (2004). Evaluation of the HUD Lead-Based Paint Hazard Control Grant Program: Final Report. National Center for Healthy Housing. Columbia, MD.
- National Center for Injury Prevention and Control. (2002). *CDC Injury research agenda*. Atlanta, GA: Centers for Disease Control and Prevention.
- Niemuth, N.A., Wood, B.J., Holdcraft, J.R., & Burgoon, D.A. (1998). *Review of studies addressing lead abatement effectiveness: updated edition*. (U.S. Environmental Protection Agency EPA 747-B-98-001). Washington, DC.: U.S. Environmental Protection Agency.
- Orr, L.C., Fowler, S.J., & Lipworth, B.J. (2003). Relationship between changes in quality of life and measures of lung function and bronchial hyper-responsiveness during high-dose

inhaled corticosteroid treatment in uncontrolled asthma. *American Journal of Respiratory Medicine*, 2(5), 433-408.

Pollack, D. A., McGee, D.L., & Rodriguez, J.G. (1988). Deaths due to injury in the home among persons under 15 years of age, 1970-1984. *MMWR* 37(SS-1),13-20

Raffensperger C, Tickner J, eds. (1999). *Protecting Public Health and the Environment: Implementing the Precautionary Principle*. Washington, DC: Island Press.

Ritter, J. (March 30, 2004). Buildings designed in cool shades of 'green'. *USA Today*.

Rivara, F.P., Calonge, N., & Thompson, R.S. (1989). Population-based study of unintentional injury incidence and impact during childhood. *American Journal of Public Health* 79(8), 990-994.

Saegert, S.C., Klitzman, S., Freudenberg, N., Copperman-Mroczek, J., & Nassar, S. (2003). Healthy housing: A structured review of published evaluations of US interventions to improve health by modifying housing in the United States, 1990-2001. *American Journal of Public Health*, 93(9), 1471-1477.

Scheidt, P.C., Harel, Y., Trumble, A.C., Jones, D.H., & Bijur, P.E. (1995). The epidemiology of nonfatal injuries among US children and youth. *American Journal of Public Health*, 85(7), 932-938.

Staes, C. & Rinehart, R. (1995). *Does residential lead-based paint hazard control work? A review of the scientific evidence*. National Center for Healthy Housing (formerly National Center for Lead-Safe Housing): Columbia, MD.

Tohn, E., Dixon, S., Galke, W. & Clark, C. (2003). An evaluation of one-time professional cleaning in homes with lead-based paint hazards. *Journal of Applied and Occupational Hygiene*, 18(2), 138-143.

The U.S. Consumer Product Safety Commission. Carbon Monoxide Questions and Answers, Document #466. Available at <http://www.cpsc.gov/cpscpub/pubs/466.html>. Accessed August 2000.

Whyatt, R.M., Camann, D.E., Kinney, P.L., Reyes, A., Ramirez, J., Dietrich, J., Diaz, D., Holmes, D., & Perera, F.P. (2002). Residential pesticide use during pregnancy among a cohort of urban minority women. *Environmental Health Perspectives*, 110, 507-514.