

## Key Questions: Environment and Housing Quality



Metropolitan Design Center

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DESIGN FOR HEALTH is a collaboration between the Metropolitan Design Center at the University of Minnesota and Blue Cross and Blue Shield of Minnesota that serves to bridge the gap between the emerging research base on community design and healthy living with the every-day realities of local government planning. This Environmental and Housing Quality Key Question is part of a series with a focus on identifying and interpreting evidence-based research linking public health with planning.

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## Overview

The characteristics of the environment where one lives or works can have a number of potential effects on human health. Where one lives, the places where one's children play, and other factors may expose individuals to significant health risks and pollutants. These risks may be associated with nearby land uses, traffic-related exposures, previous activities on a site, building materials, and quality of housing.

The effects of exposure to pollutants in the environment and home include a range of human-health problems, including lung diseases, lead poisoning, cancer, reproductive issues, birth defects, headaches, and fatigue. Lead poisoning can lead to short-term symptoms, such as loss of appetite and reduced attention span, for example, but also longer-term effects in adults and children, including brain and nerve damage, as well as hearing and vision impairment. Children are susceptible to other impacts, including hyperactivity, liver and kidney disease, and developmental delays (US EPA 2007). Standards exist for unacceptably high lead levels and are monitored by the National Health and Nutrition Examination Survey (NHANES). Other-housing related exposures include indoor asthma triggers (mold, mildew, cockroaches, dust mites), environmental tobacco smoke, noise-induced annoyance, injuries, and house fires (Milstead and Miles 2006; Miles 2005a; Miles 2005b).

While planners are limited as to how they influence the interiors of housing units, they do play a substantial role in covering these human-health issues in relation to development standards expressed through development review, site review, and environment impact assessments. Beyond regulation, planners have the opportunity to work with public health to incorporate human health objectives into housing plans and policies (Miles 2005a). As with the rest of this Design for Health project, we are primarily concerned with the link between environmental and housing quality and human health rather than broader ecological effects.

While air and water are the primary conveyances for pollutants, exposure can also occur through

contaminated soil and direct exposure to toxins and chemicals in the environment. For more information about air and water, please visit [www.designforhealth.net](http://www.designforhealth.net). As mentioned above, there are also a variety of other exposures in the housing environment that influence human health. There is some evidence that these impacts are inordinately borne by racial minorities and those with low incomes (Lanphear et al. 1998). Bullard's (1996, 1990) work on environmental justice provides both case studies and empirical evidence of the disproportionate impacts on disadvantaged populations. Several studies have found that poor communities and/or communities of color are more likely to live near and be exposed to environmental hazards, however, findings on whether it is race, class or both factors that determines these findings have been mixed (Mohai and Bryant 1991; Bowen 2002). Additionally, how and to what extent this affects the health of these communities has not been well-documented and is complicated, because it is difficult to sort out other compounding factors associated with living in poverty (e.g., access to healthy foods) that contribute to health issues (Sexton and Adgate 1999).

Methods to assess the impacts of housing and one's environment on health include blood tests, health examinations and household surveys (e.g., Lanphear et al. 1998; Lanphear and Roghmann 1997) and dust and soil analyses (e.g., Farfel et al. 2005). To assess the impacts of living near hazardous land uses or contaminated sites, examination of health data can be used to assess the impacts on nearby population (e.g., Jarup et al. 2002, Elliott et al. 2001). For information on major data collection efforts, visit the World Health Organization's European Regional Office at [http://www.euro.who.int/Housing/activities/20020711\\_1](http://www.euro.who.int/Housing/activities/20020711_1). It includes information on the Large Analysis and Review of European housing and health Status (LARES) where two goals included creating a more comprehensive data base for evidence and helping local authorities identify human health and housing conditions in their communities (World Health Organization Regional Office for Europe 2007).

## Things for certain (or semi-certain)

- Residential sources of lead, found in lead-based paint and lead-contaminated dust and soil can increase lead levels in children's blood. Children in low-income and minority families are particularly susceptible.

*Example:* A study of 205 children in Rochester, New York, found that those who were Black, living in a single-parent family and residing in rental housing had higher levels of lead-contaminated house dust and increased lead levels in their blood. Time spent outdoors, which increases the likelihood that children will put soil or dirt in their mouths, also was associated with children's blood-lead levels (Lanphear and Roghmann 1997).

*Example:* Using the same survey data noted above in a different analysis, researchers found elevated blood-lead levels in 39 percent of children who were exposed to paint surfaces in poor condition, compared to only 15.4 percent of children who lived in environments where the paint was rated as good quality. The research also showed an association between race and parental education levels, with Black children and those whose parents had lower education levels having higher blood levels (Lanphear et al. 1998).

- Asthma development and exacerbation is highly influenced by outdoor air pollution from ground level ozone as well as indoor housing environment where housing is not maintained and dampness, mold, and poor ventilation is prevalent (Miles 2005).
- Dust and soil contamination are important sources of health impacts, including exposure to lead. Threats to health can persist even after polluting structures have been removed.

*Example:* A study of dust collected after demolition of several blocks of older row housing in Baltimore showed unhealthy concentrations of lead dust on exterior surfaces within 100 m (328 ft.) of the demolition sites (Farfel et al. 2005).

## Things up in the air

- Evidence is mixed as to whether or not non-whites and those with lower incomes are more likely to live near polluting industrial facilities.

*Example:* Bowen's review of environmental justice literature examined forty-two empirical studies and concluded that research is unclear about the relationship between the clustering of facilities and their health effects on minority, low-income, and other disadvantaged communities (2002, 1).

*Example:* In a study of demographic and Toxic Release Inventory (TRI) facility data for urban areas in West Virginia, New Orleans and Baltimore, it was determined that Blacks and those below the poverty level were more likely to live in close proximity to a polluting facility. These groups also were more likely to live near multiple facilities (Perlin et al. 1999).

*Example:* A study of the siting of toxic-waste and disposal facilities (TSDFs) in Los Angeles County found that areas planned to receive these facilities included residents with lower incomes and higher percentages of minorities and renters. While there was evidence that neighborhoods with these characteristics may attract TSDFs, the study found no evidence that sited TSDFs attract additional minority residents to move in (Pastor et al. 2001).

- While the paths connecting contaminated soils and dust have been identified, information about the health effects and significance of exposure to dust and soil contaminants are somewhat limited.

*Example:* A literature review summarizes the findings of various studies that point to the significance of house dust in exposing individuals to contaminated soils. The review points to the importance of dust exposure, in addition to direct soil ingestion, as a source of potential health impacts, but calls for additional research on exposure to dust and its health impacts (Paustenbach et al. 1997).

*Example:* Concerns exist about exposure to pesticides in soil as former fruit orchards are converted to residential development. The use of lead arsenate (LA) to control insects is a concern that may increase when soils are disturbed (Hood 2006; Renshaw et al. 2006).

- Noise from air traffic may cause physical and psychological problems, particularly for children.

*Example:* A cross-national, cross-sectional study of 2844 children (9 and 11 years old), in schools near three major airports in the Netherlands, Spain, and the United Kingdom looked at the effects of road traffic and air traffic on childhood development. Results showed that chronic noise exposure from aircraft impaired cognitive development (Stansfeld et al. 2005). Aircraft noise and traffic noise did not, however, affect sustained attention, self-reported health, or overall mental health (Stansfeld et al. 2005).

*Example:* A two-year study of 217 nine and eleven year olds tested the children's psychophysiological stress levels in relation to a major new airport. Data was collected before and after in both noise-impacted and non-impacted communities. Results showed that noise significantly elevates stress among children at levels below those that produce hearing damage (Evans et al. 1998).

*Example:* A literature review summarizes the findings of childhood development in relation to the built environment. One of the topics covered is the role of air and road traffic. The review details a series of studies that show that cognitive processes (e.g., long-term memory) and possibly reading levels are affected by chronic noise exposure; however, research is mixed (Evans 2006).

*Example:* The same literature review above suggests that studies show that chronic airport noise over elementary schools lowers children's self-reported psychological well being (Evans 2006).

Both examples above are marred by a series of methodological issues, however. There are concerns over the causal role of the physical environment in children's well being, in addition to concerns over self-selection (Evans 2006).

- Previous research shows an association between health impacts and living near an existing polluting (or potentially polluting) land use or brownfield site, but causal evidence linking exposure to pollutants and polluting or contaminated sites is limited.

*Example:* One study of potential health impacts among those living near 182 one-acre or larger urban brownfield sites in twenty-eight census tracts in southeast Baltimore found that residents in the area had higher mortality rates, compared to the rest of Baltimore. Mortality rates were associated with heart disease, cancer—especially of the lung and stomach—chronic obstructive pulmonary disease, influenza, and pneumonia. Nearby brownfield sites harbored a range of pollutants, including heavy metals, solvents, benzene, creosote, and plasticizers, such as polychlorinated biphenyls (PCBs), but the study did not assess the level of exposure to the pollutants (Litt and Burke 2002).

*Example:* A study in Great Britain of the effects of living near landfill sites found a small increase in the risk of lower birth rates and congenital defects for those living near landfills. The study did not assess whether exposure to pollutants from the landfills was actually the reason for the increase, however (Elliott et al. 2001).

*Example:* A similar study in Great Britain assessed the potential for increased cancer rates among those living within two kilometers of landfills, including those containing hazardous wastes. The study found that those living nearby did not have higher risks of leukemia, brain cancer, hepatobiliary (i.e., liver and bile duct) cancer, or bladder cancer (Jarup et al. 2002).

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