

You will die, but the carbon will not; its career does not end with you.
Jacob Bronowski, mathematician (1908–1974)

BUILT ENVIRONMENT

Does Poor Housing Raise Diabetes Risk?

Poor housing may increase the risk of developing diabetes mellitus among middle-aged black Americans, suggests research published in the 15 August 2007 edition of the *American Journal of Epidemiology*. What exactly causes this link, however, remains to be explained.

“Many factors linked with the development of diabetes, such as obesity or the use of alcohol or smoking, are commonly present in the lives of people living in poorer housing,” explains first author Mario Schootman, chief of the Division of Health Behavior Research at Washington University in St. Louis, Missouri. But when his team adjusted for these factors, living in a poorly maintained house remained a significant risk for diabetes in its own right. In contrast, the quality of the neighborhood overall was not associated with increased risk.

According to the American Diabetes Association, diabetes already affects some

7% of the U.S. population and 13.3% of non-Hispanic blacks, with 90% of these cases comprising type 2 diabetes. The prevalence of diabetes could double by 2050—even triple among blacks, says Schootman. To better understand why this is so, the environmental context in which individuals live, work, and play needs to be taken into account, but until now no work has focused on the effect of neighborhood and housing conditions, factors that have been associated with other health problems including depression.

The researchers interviewed 644 middle-aged subjects enrolled in the African American Health Study who lived in either a poor inner-city area of St. Louis or a less impoverished suburb of the city. At the time of initial interview, no subject declared having been diagnosed with diabetes (the interviewers did not ask specifically about type 1, type 2, or other types of diabetes), although 10.3% went on to develop some form of the problem within three years.

During the first interviews the researchers took note of the respondents’ neighborhood and personal housing conditions. Neighborhoods were rated on a

four-point scale ranging from excellent to poor depending on the general condition of the houses, the amount of ambient noise, general air quality, the state of repair of the streets, and other factors. Individual respondents’ housing conditions were similarly rated, on the basis of the physical condition of the interior, cleanliness, and the quality of the furnishings.

“We then looked for an association between these conditions and the development of diabetes among the study subjects,” explains Schootman, “and found every housing condition rated fair to poor, as well as the overall housing rating, to be associated with around a doubled risk of developing [diabetes].”

When the researchers used regression analysis to identify factors that might mediate this association—including household income, level of education, marital status, social support, access to medical care, health behaviors, body mass index, hypertension, number of medications used, and many other possibilities—none was found to be responsible.

Hilary Thomson, a research scientist at the Social and Public Health Sciences Unit of the U.K. Medical Research Council, remarks, “The authors have provided a thorough analysis and critique of the data, and it is difficult to think of additional important factors that might be responsible for this association, although it would be interesting to know of any interactions between the pathways. It would also be interesting to know what sort of interventions could be recommended.”

“Better housing variable scores, which are associated with a reduced odds ratio for developing diabetes, may identify resilient families who not only work to maintain their homes, but have good diets and exercise regularly,” suggests Philippa Howden-Chapman, program director of the Housing and Health Research Programme at the University of Otago in Wellington, New Zealand. “Also, housing attributes may be important, whether multilevel inner-city apartments or stand-alone suburban houses, in influencing availability of fresh food and places to exercise.”

Schootman agrees that the situation is complex. Whether other ethnic groups living in poor housing conditions face the same problem remains to be seen. —Adrian Burton

Scott Houston



Scope of influence. With diabetes possibly tripling among black Americans in the next two decades, it is essential to understand the full range of risk factors, which a new study suggests may include housing.

OCCUPATIONAL HEALTH

Shift Work–Cancer Debate Goes On

Working the night shift disrupts the normal circadian rhythms of the body. This work pattern has been linked in some studies with cardiovascular disease, metabolic syndrome, and various cancers. Other findings to date have been either conflicting or of borderline significance. The debate goes on, with a study published online 7 September 2007 ahead of print in the *Scandinavian Journal of Work, Environment and Health* finding no evidence for an association between shift work and risk for any cancer, with the possible exception of thyroid cancer.

The study included about 3.2 million Swedish citizens who worked at least part-time. About 4.0% of the men and 0.4% of the women reported being shift workers, meaning they worked a rotating schedule or their schedule included working between 1:00 and 4:00 a.m. Occupations were categorized depending on the percentage of people engaged in shift work.

The researchers classified shift workers as people working in an industry with at least 40% shift workers (the exposed group). They compared the cancer incidence among this group to that of groups in which fewer than 30% declared themselves shift workers. The final results for these two groups showed no relationship between shift work and an increased risk of developing cancer. When the analyses were restricted to 70% of workers who said they worked rotating or night shifts, there was a 35% increase in the incidence of thyroid cancer for men only (the sample size for women was too small to achieve statistical significance).

The coauthors acknowledge their study had serious limitations, beginning with the fact that individual jobs were aggregated according to the degree of shift work reported by workers in each occupational category. "Because exposure was measured by the percentage of shift workers in a particular occupation rather than by individual shift worker, the relationship of cancer to individual exposures could not be directly determined but had to be inferred from the exposure of the occupational group," says lead author Judith Schwartzbaum, an associate professor of epidemiology at The Ohio State University.

Some circadian scientists are adamant that shift work history should be based on individual exposures, not on aggregate measures according to occupation category. "Because of the likelihood of substantial amount of misclassification of the exposure

of interest [i.e., night shift work], these results are not compelling evidence of the absence of an association," says epidemiologist Scott Davis of the Fred Hutchinson Cancer Research Center. However, the study found no evidence for an effect of shift work even when the study's classification of shift workers included only 30% of nonshift workers and the comparison group was restricted to occupations with 100% non-shift workers.

Cancer epidemiologist Richard Stevens of the University of Connecticut Health Center adds that the study's null findings seem particularly dubious given consistent positive findings from numerous studies that were based on what he terms much better exposure assessment exposure data. Yet coauthor Maria Feychting, an epidemiologist based at the Karolinska Institute in Stockholm, Sweden, counters, "There are large differences between [earlier] studies in how exposure was defined, particularly how long duration of exposure is needed before an increased risk is evident; some studies find an increased risk already after a few years of exposure, whereas other studies require twenty to thirty years of shift work before any risk increase is evident."

Several of the studies with positive findings are also based on aggregate measures of exposure, and although misclassification of the exposure is likely a problem in such studies, Feychting says, publishing only those with positive findings would give a false impression of consistency. She adds, "Whether there is an association between shift work and cancer is to me still an open question and further studies are needed."

The study was also unable to control or adjust for known risk factors for cancer except for marital status and socioeconomic status. "Such factors represent potential confounders in the present study and may help explain why the current findings are inconsistent with the majority of published studies, a half-dozen of which have suggested an increase in breast cancer risk among female shift workers," says Davis. Schwartzbaum concurs but also counters that results in previous studies did not change materially after adjustment for known risk factors.

"What's needed at this point is a large cohort study including women from various occupations and prospectively collected individual information on working hours as well as potential confounding factors," says Feychting. She suggests that future studies should also include detailed analyses of working hours, not just whether employees work multiple shifts, because shift work does not necessarily involve working hours during the night. **–M. Nathaniel Mead**

Mercury Trackers

A first-of-its-kind whole-ecosystem study shows that atmospheric emissions of mercury from coal-fired power plants and other sources end up in fish in as little as three years. The study, published online 27 September 2007 ahead of print in the



Proceedings of the National Academy of Sciences, traced mercury's movement through a test watershed, yielding critical information for better understanding how the element distributes through ecosystems. The paper's authors predict that reductions in mercury emissions could translate into reduced fish methylmercury loads within a decade.

Social Environment and Asthma

A paper in the 1 October 2007 edition of the *American Journal of Respiratory and Critical Care Medicine* supports a two-way link between asthma and a child's social environment, as evaluated using a standard instrument. Social environment was defined in terms of family support (the degree to which parents understand, value, and care about children) and neighborhood factors including crime and violence. Less family support correlated with children having higher levels of IgE, eosinophils, and IL-4, inflammation markers associated with poorer asthma outcomes. Neighborhood problems were linked with behavioral influences on asthma, such as early initiation of smoking, exposure to secondhand smoke, and poor adherence to asthma medications.

Melnick Receives Rall Award

The American Public Health Association has awarded its 2007 David P. Rall Award for Advocacy in Public Health to Ronald Melnick, senior toxicologist and director of special programs in the NIEHS National Toxicology Program. In his 27 years at the institute, Melnick has engaged in a wide range of activities that have advanced scientific knowledge of the adverse health effects of chemical exposures and influenced public health policy making in this area. Known as an ardent supporter of more protective chemical exposure standards based on science-based evidence, his research on such chemicals as butadiene, isoprene, glycol esters, and drinking water disinfection by-products has furthered our understanding of their toxicity potential to populations.



MENTAL HEALTH

Molding a Link to Depression

The physical consequences of living in a damp, moldy house are well documented and include increased asthma attacks and other respiratory ailments, headaches, fatigue, and sore throats. People who live in moldy environments may also have more depression, finds a study of 5,882 adults living in 2,982 households, published in the October 2007 issue of the *American Journal of Public Health*.

The connection between mold and mental health surprised even the lead author, epidemiologist Edmond Shenassa of Brown University, who was skeptical of the mold–depression link suggested by smaller studies. “We thought that once we statistically accounted for physical factors like crowding and psychological aspects like not having control over one’s living environment, then the association between mold and depression would vanish,” he says. But rather than debunking the notion, Shenassa found an association between mold toxins and depression.

Shenassa and colleagues analyzed data collected by the Large Analysis and Review of European Health Status, a survey of housing, health, and place of residence compiled by the WHO in 2002 and 2003. WHO interviewers visited households in eight European cities and asked residents about depressive symptoms, such as problems sleeping and decreased appetite. They also asked whether a physician had diagnosed depression in the past year. Then they measured the level of dampness and mold in each residence and classified any discernible mold exposure as minimal, moderate, or extensive.

About 40% of the residents lived in visibly damp, moldy households, and overall their risk for depression averaged 34–44% higher than that for residents of mold-free dwellings, with moderate exposure associated with the highest increase in risk. Shenassa says there may be a tipping point where a certain critical amount of mold triggers a response that is not dose-related.

The heightened depression risk also correlated to respondents’ perceptions that a damp, moldy environment cannot be controlled, as well as to documented physical health problems linked to mold exposure. “If you are sick from mold and feel you can’t get rid of it, it may affect your mental health,” says Shenassa, who is undertaking animal studies to investigate whether mold toxins alter behavioral and biochemical brain pathways involved in depression.

Robert Gifford, a psychology professor at the University of Victoria, British Columbia, interprets the results cautiously. Considering only the highest level of mold contamination, when both physical health and perception of control were factored in, the link between mold and depression shrank to “virtually nothing,” he says. However, at minimal and moderate mold exposure, even when controlling for both mediators, there still remained a statistically significant 28–34% higher risk, says Shenassa.

“There is a small relationship between [depression and] mold and dampness, but it is impossible to say that there is a causal relationship,” Gifford says. In addition, more details about income should be explored—wealthier people can afford to clean up extensive mold contamination, whereas low-income people may be forced to live with it. “Income could be an important missing variable,” he notes. —Carol Potera

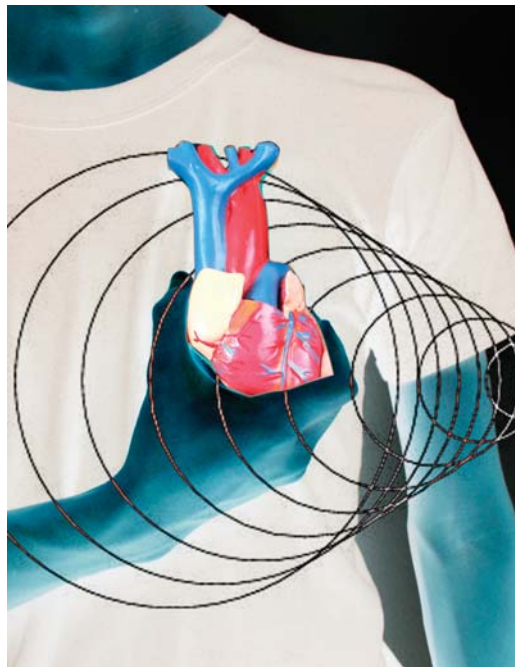
NOISE POLLUTION

The Sound Behind Heart Effects

More than 15 million Americans currently have some form of coronary heart disease (CHD), which involves a narrowing of the small blood vessels that supply blood and oxygen to the heart. Risk factors for CHD include diabetes, high blood pressure, altered blood lipids, obesity, smoking, menopause, and inactivity. To this list we can now add noise, thanks to a recent study and assessment of the evidence by the WHO Noise Environmental Burden on Disease working group. The findings, first presented at the *Internoise 2007* conference in August 2007, will be published in December.

“The new data indicate that noise pollution is causing more deaths from heart disease than was previously thought,” says working group member Deepak Prasher, a professor of audiology at University College in London—perhaps hundreds of thousands around the world. “Until now, the burden of disease related to the general population’s exposure to environmental noise has rarely been estimated in nonoccupational settings at the international level.”

The separate noise-related working group first convened in 2003 and began sifting



through data from studies in European countries to derive preliminary estimates of the impact of noise on the entire population of Europe. They then sought to separate the noise-related health effects from those of traffic-related air pollution and other confounding factors such as physical inactivity and smoking. In 2007, the group published

Quantifying Burden of Disease from Environmental Noise, their preliminary findings on the health-related effects of noise for Europeans. Their conclusion: about 2% of Europeans suffer severely disturbed sleep, and 15% suffer severe annoyance due to environmental noise, defined as community noise emitted from sources such as road traffic, trains, and aircraft.

According to the new figures, long-term exposure to traffic noise may account for approximately 3% of CHD deaths (or about 210,000 deaths) in Europe each year. To obtain the new estimates, the working group compared households with abnormally high noise exposure with those with quieter homes. They also reviewed epidemiologic data on heart disease and hypertension, and then integrated these data into maps showing European cities with different levels of environmental noise.

The noise threshold for cardiovascular problems was determined to be a chronic nighttime exposure of at least 50 A-weighted decibels, the noise level of light traffic. Daytime noise exposures also correlated with health problems, but the risk tended to increase during the nighttime hours.

ehpnet

World Resources Institute: Climate, Energy, and Transport Program

The World Resources Institute (WRI) works to advance scientifically based principles of sustainable and socially equitable development among international policy makers and institutions. One of its four central areas of work is climate protection as described at <http://www.wri.org/climate/>.

This gateway page provides recent highlights of activities including WRI analyses and statements to congressional and other federal bodies. Various sections detail international and U.S. action on climate protection, as well as WRI's numerous programs and publications related to this topic. Other sections focus on the themes of technology options, green power and renewable energy use, and information and analysis tools.

The WRI has 17 climate protection programs. These range from the GHG [greenhouse gas] Protocol Initiative to the Vulnerability and Adaptation program, which seeks to reduce environmental and human impacts of climate change. Each program page describes the program's aims and strategies, provides background and contact information, and links to publications and materials including press releases, reports, and workshop documents.

Two of the technology areas addressed by the WRI are carbon capture and sequestration (CCS) and sustainable transportation. The CCS program works to foster acceptance of these technologies among policy makers and the public, deploy a regulatory framework for CCS activities, and focus research on the most cost-effective methods. Currently 75 stakeholder organizations are involved in this initiative. The WRI Center for Sustainable Transport, known as EMBARQ, works mainly on urban issues. One of its successes has been the introduction of cleaner, more efficient buses in Mexico City, resulting in yearly carbon emission reductions there of almost 50,000 tons. On the basis of this outcome, a dozen more cities including Hanoi and Istanbul plan to duplicate this project. —**Erin E. Dooley**

“Many people become habituated to noise over time,” says Prasher. “The biological effects are imperceptible, so that even as you become accustomed to the noise, adverse physiological changes are nevertheless taking place, with potentially serious consequences to human health.”

To further assess the noise-related disease burden, the working group estimated disability-adjusted life years (DALYs) due to noise-related CHD. DALYs reflect how much the expectancy of healthy life is reduced by premature death or by disability caused by disease. This measure lets policy makers compare disease burdens associated with different environmental factors and forecast the likely impact of preventive policies. The working group estimated that in 2002 Europeans lost 880,000 DALYs to CHD related to road traffic noise.

Chronic high levels of stress hormones such as cortisol, adrenaline, and noradrenaline can lead to hypertension, stroke, heart failure, and immune problems. According to a review of the research in the January–March 2004 issue of *Noise and Health*, arousal associated with nighttime noise exposure increased blood and saliva concentrations of these hormones even during sleep. “Taken together, recent epidemiologic data show us that noise is a major stressor that can influence health through the endocrine, immune, and cardiovascular systems,” says Prasher.

Other recent support for an association of cardiovascular mortality with noise comes from a study published in the 1 January 2007 issue of *Science of the Total Environment*. The results showed an 80% increased risk of cardiovascular mortality for women who judged themselves to be sensitive to noise. “Given these findings, noise sensitivity is a serious candidate to be a novel risk factor for cardiovascular mortality in women,” says Marja Heinson-Guzejev, a research scientist at the University of Helsinki and lead author of the paper.

There is also a potential interaction between noise and air pollution, given that individuals exposed to traffic noise, for example, are often simultaneously exposed to air pollution. Prasher is currently investigating the effects of noise alone and in combination with chemical pollution.

The broader implications of chronic noise exposure also need to be considered. “Noise pollution contributes not only to cardiovascular disease, but also to hearing loss, sleep disruption, social handicaps, diminished productivity, impaired teaching and learning, absenteeism, increased drug use, and accidents,” says physician Louis Hagler, who coauthored a review on noise pollution in the March 2007 *Southern Medical Journal*. “The public health repercussions of increasing noise pollution for future generations could be immense.” —**M. Nathaniel Mead**

Spice for Life?

Each year *Escherichia coli* causes 210 million cases of diarrhea, the leading cause of infant death in developing countries. Taiwanese researchers now report in the 3 October 2007 issue of the *Journal of Agricultural and Food Chemistry* that compound 31, a derivative of the ginger constituent zingerone, blocks *E. coli* heat-labile enterotoxin from binding to cell surfaces. Ginger has long been used as a remedy for digestive problems, and the authors propose that compound 31 could someday be used to formulate cheap, widely obtainable diarrhea medicines. First, though, dosage and possible side effects in infants need to be determined.



New Bill for Environmental Health

Bipartisan legislation introduced in September 2007 by Speaker of the House Nancy Pelosi (D–CA) could boost funding for state participation in the CDC's National Environmental Public Health Tracking Program. The Coordinated Environmental Public Health Network Act of 2007 would also expand biomonitoring capabilities and data collection at the federal and state levels; establish a national service to oversee response efforts to unusual illness incidences or environmental hazards; and mandate the biennial publication of a report describing environmental and other factors with a potential impact on the nation's health. The bill is currently in committee in both the House and Senate.

A Whiff of Phthalates

U.S. sales of air fresheners have grown by 50% since 2003, with an estimated 75% of households using these products, according to the Natural Resources Defense Council (NRDC), which released a September 2007 report assessing the phthalate content of 14



different air freshener brands. Twelve of the brands tested contained phthalates, but this ingredient was listed nowhere on the label because federal agencies currently apply no such regulation to these products. Following the release of the report, national retailer Walgreens—which marketed two

of the products heaviest in phthalates—pulled its air fresheners from its shelves, meanwhile agreeing to perform independent safety tests and make phthalate-free air fresheners available to its customers.