



Indoor Work Environments and Health: A Research Agenda

In 1996, a consensus process involving NIOSH and over 500 stakeholder groups and individuals developed the National Occupational Research Agenda (NORA). NORA identified 21 priority areas for research, including one on “indoor work environments.” Indoor work environments are nonindustrial, non-agricultural indoor workplaces, such as offices and schools. They contain almost 70% of the nation’s workforce. The NORA Indoor Environment Team, a multidisciplinary group of leading scientists, building professionals, and representatives of labor, building owners, and other stakeholders, works to identify and foster research that will lead to more healthful indoor work environments.

The Indoor Environment Team estimates that modest improvements in the indoor environments where 89 million Americans work could prevent cases of respiratory infection, exacerbations of asthma, or allergies among 6-10 million workers annually. Improvements in these environments could also reduce frequently experienced building-related symptoms among 8-30 million workers. The potential economic benefits from reducing these adverse health outcomes are estimated at billions of dollars for workers and employers annually, including over \$1 billion from reductions in costs of health care and over \$6 billion from reductions in sickness absence and performance impairment. These estimates of health and economic benefits, based on the limited available data and reasonable assumptions, are inexact, but nonetheless indicate that the magnitude of benefits could be large.

The team has identified three interrelated categories of high priority research needs:

Understanding the causes and prevention of building-related health effects.

Analysis of estimated health and economic impacts identified three critical classes of health effects

influenced by indoor environments and potentially experienced by very large populations:

- *building-influenced communicable respiratory illnesses, such as influenza and common colds transferred from person to person*
- *building-related allergies and asthma*
- *nonspecific building-related symptoms, such as mucous membrane irritation, headaches, and fatigue typical of so-called “sick building syndrome.”*

For each class of health effect, research is needed to identify critical indoor exposures, understand the relationships of these exposures to health effects, and develop effective prevention strategies.

Advancing the science and technology of indoor environments and buildings.

Research is needed to better understand how the design, operation, and maintenance of buildings and the activities of occupants affect the concentrations of critical indoor pollutants. Research to improve technology for maintaining healthy indoor environments is also needed, including research to develop better methods and tools for assessing indoor exposures. Research findings in this area would increase the ability to cost-effectively design and operate buildings that do not adversely affect the health of occupants.

Identification and evaluation of strategies to reduce barriers and increase incentives for health-protective building practices.

This research priority is based on recognition that, in addition to improved scientific knowledge, better implementation of available knowledge is essential to achieve desired health and economic benefits.

The following table provides estimates of the potential benefits of this research:

**Estimated Potential Benefits from
Research on Indoor Work Environments and Health**

Health Effect	Affected Indoor Workers	Potential Reduction in Health Effects	Potential Annual Economic Benefits
Communicable Respiratory Illness	52 million	10% to 14% (5-7 million infections prevented)	\$3 to \$4 billion
Allergies and Asthma	18 million (allergy) 4.7 million (asthma)	6% to 15% (1 to 3 million exacerbations prevented)	\$0.2 to \$0.6 billion
Building-Related Symptoms (e.g., sick building syndrome)	35-60 million	20% to 50% (8 to 30 million workers protected)	\$4 to \$70 billion

For description of methodology, see Mendell MJ, Fisk WJ, Kreiss K, et al., "Improving health of workers in indoor environments: priority research needs for the National Occupational Research Agenda," American Journal of Public Health 2002, v. 92: pp. 1430-40.

The next steps to improve health and productivity in the nation's workforce through research on indoor work environments are to:

- Leverage existing resources for research through partnerships among government agencies and other organizations that share interests in public health, work environments, energy use, and business productivity
- Expand resources available for research by developing common interests and information among organizations that share goals of improving the nation's health, productivity, and economic competitiveness

- Recruit and train scientists with multi-disciplinary expertise and communication skills into this challenging research area.

Because an increasing majority of America's workers are in the indoor job sector, research that can improve health and performance in these environments is critical to the country. The potential benefits for productivity and competitiveness of the workforce could provide very large returns on research investments.

A more complete description of this research agenda is available. For additional information, contact: Jean Cox-Ganser, PhD (phone 1-304-285-5818 or email jjc8@cdc.gov).



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For additional information, contact NIOSH at 1-800-35-NIOSH (1-800-356-4674)
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