

Cost-benefit analysis of improving indoor environmental quality in the workplace.



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Objective: To review the epidemiological and economic evidence available on the linkage between Indoor Environmental Quality and Health

Introduction:

Since the first studies in the early 80s that showed the effectiveness of smoking cessation programs on workers' wages and business profits there has been an increasing number of studies evaluating the economics of occupational health interventions. Low quality indoor environment can lead to: increased infectious respiratory disease, higher rates of asthma and allergies, increased prevalence of people suffering from sick building syndrome, and reduced productivity. Evidence from medical studies shows that the impact of Indoor Environmental Quality (IEQ) on cost and productivity at work is high. A study conducted by Driscoll *et al.* in 2005 estimated that globally there were 386 000 deaths and nearly 6.6 million DALYs lost due to exposure to occupational airborne particulates in the workplace. The ageing of the workforce is posing further challenges and helping workers remain in employment by providing healthier working environments is pivotal. In the Irish economy for example, it has been estimated that the cost of occupational injury and illness is € 3.6 billion which is 2.5 % of the GNP. In Europe in 2000 the cost of workplace accidents amounted to 55 billion which is 0.64% of the GDP for the EU15. In Britain, according to the European Agency for Safety and Health at Work, the cost of work accidents and work related ill health was substantial costing employers between 5.1 to 10.2 £ billion in 2001-2002.

Aim of the study:

The primary purpose of this study is to review the epidemiological and economic evidence available on the linkage between IEQ and health.

Three effects of occupational health interventions will be considered:

- Impact on economic productivity
- Impact on health status
- Impact on expenditures patterns

In particular this analysis focuses on two interventions: improved indoor ventilation, and use and maintenance of air filters.

Methods:

Using evidence from epidemiological studies this analysis aims to quantify the potential benefits from improved indoor environmental quality from ventilation and filtration, and further to place a monetary value on these health benefits and compare them with the cost of implementing the interventions. We will adopt both an employer perspective and a health and social service perspective to evaluate whether improving indoor ventilation and air filtration in the workplace is cost beneficial even without government incentives.

Practice

Despite mounting evidence suggesting the importance of improving IEQ in the workplace no national research effort has been undertaken to provide a scientific basis for improving health by improving the indoor environment. Economic evaluation can answer two main questions: first what is the burden of work related health costs? Second: are workplace interventions such as ventilation cost-effective?

Despite the increasing evidence of the costs of poor IEQ in the workplace companies will increasingly ask for evidence on the cost effectiveness of workplace intervention to evaluate if these are worth the money invested. Current building codes generally regulate only the design and the construction of the building. The main objective of building owners is to keep cost low through design construction equipment and maintenance but do not consider indoor air quality. Cost saving strategies however may cause later adverse consequences for employers and in the end turn out to be cost increasing.

This economic analysis will provide a transparent basis for setting standards to improve indoor environmental quality and building science and translate this knowledge into practice.

Sources of Indoor Air Pollution	Health and other outcomes arising from low IEQ	Strategies to improve IEQ
Asbestos	Infectious respiratory diseases	Source control
Biological Pollutants	Asthma and Allergy	Improve ventilation
Carbon Monoxide (CO)	Sick Building Syndrome	Air cleaner
Formaldehyde Pressed Wood Products	Influence productivity	Thermal control
Volatile Organic Compounds (VOC)		Cleaning
Lead		
Nitrogen Dioxide (NO2)		
Radon		
Second-hand smoke		
Stoves , heaters , fireplaces		

The net benefit analysis from different perspectives:

Economic evaluation of the potential net benefit of occupational health interventions can be conducted using different perspectives. According to the perspective selected we can compute different benefits. We will adopt both a industry perspective and health and social service perspective (as recommended by the NICE). This will establish the extent to which interventions to improve IEQ are cost beneficial for employers, and also how cost beneficial they are as investments in health.

The Table below reports the categories in which the benefits of occupational environmental health interventions can be divided:

Perspective	Type of Benefits
Health Service resource	Reduction in cost for treating IEQ related diseases
Third party payer	Reduction in payments to health care providers
Patient	Reduced morbidity and mortality Reduced out of pocket cost Increased productivity
Family and carer of the patient	Reduced time caring Reduced out of pocket payments
Industry	Increased competitiveness because of greater efficiency Reduced sick leave of employees Reduced medical expenses
Other Government Ministries	Reduced running cost of maintenance Reduced cost of emergency services
All consumers	Non health benefits(quality of water, amenities etc)

Source WHO 2001

Future

Economic incentives for the enterprises to ensure safe and healthy working conditions have proved to be more effective than strict regulations. By showing the net-monetary benefit achievable with improved indoor air quality this study will promote more cost-effective allocation of resources to improve poor indoor air quality, to the benefit of workers, employers and the NHS that bear the cost of poor indoor air quality.