HEALTH AND INDOOR AIR QUALITY CHALLENGES

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EXTENDED ABSTRACT

The quality of the air that we breathe inside our homes, offices, schools and other public or private buildings is an important determinant of healthy life and people's well being. Indoor air pollutants, either infiltrating from the outside or produced by indoor sources, are associated with a wide range of both acute and chronic health outcomes. These include respiratory symptoms, asthma, effects on the nervous system, cardio-vascular diseases and lung cancer [1].

However, the relationship between conditions in indoor environments in general, and indoor air exposure in particular, and health is still poorly understood. Moreover, the range in indoor exposures of individuals is large, and therefore the assessment of the population exposure to indoor air pollutants occuring in indoor settings is difficult. Relevant data for the quantification of the burden of disease from exposure to the various indoor air pollutants are scarce. While first attempts to quantify the impact of built and indoor environments indicate that there is a significant health burden, quantitative relationships remain uncertain to a large extent [2]. Intensive research on emerging health risks of exposures in indoor environments continues to provide better basis for policy making and sound source management. Meanwhile, the public health significance of "well known" indoor air exposures, such as carbon monoxide and environmental tobacco smoke, remains. The education of the general public on the sources of air pollution in their indoor environments and the situations under which important exposures may occur is an ongoing challenge.

Effective housing policies and risk management for indoor air quality is multifaceted and requires integrated, concerted action by public authorities, industry and individuals at the national, regional and in some cases even international levels. A few successful interventions aiming at improving housing conditions and/or reducing exposure to indoor pollutants have been published in the literature. Of relevance for the reduction of chemical and biological agents, the few interventions with sufficient evidence to demonstrate their effectiveness are smoke free policies, integrated pest management, lead hazard control, moisture intrusion elimination, radon gas mitigation through active soil depressurization and multi-faceted tailored asthma interventions [2, 3, 4, 5, 6, 7]. However, in general, data on the effectiveness of interventions to reduce exposure, and subsequently show measured improvements in health, are rare. Furthermore, the attribution of benefits to a particular intervention is challenging, especially since the health effects of air pollution are typically related to long-term exposure to several co-pollutants, most likely coming from multiple sources. In addition, rehabilitation projects often tend to focus on one or a limited number of housing factors and may, if not carried out with adequate consideration of the building context, even have

negative side effects on health and wellbeing. One example is the conflict arising from energy efficiency measures that can increase the risk of indoor air pollution by reducing ventilation rates [8].

There is a complex relationship between indoor environmental quality, energy efficiency, environmental sustainability, and human health [9]. The residential sector has one of the highest potentials for energy efficiency [10]. In Europe, buildings account for roughly 40 to 45% of total energy consumption [11]. They also contribute a great proportion to ambient air pollution, mainly through emissions from combustion sources such as domestic wood stoves [12]. The building sector also globally emitted close to 18% of direct carbon dioxide from energy combustion in 2008, with 11% due to household use of grid lectricity and district heating, and the remainder due to emissions at household level (e.g. cooking and heating with gas, coal, oil, etc.) [13]. There are therefore co-benefits to addressing healthy housing through good building practices that go beyond the sole positive, direct impact on health.

In the absence of clear definitions and guidelines on healthy buildings, professional judgment of the experts and consensus-based decision making therefore plays an important role in establishing guidance that can be used to indicate acceptable levels of population exposure. Based on expert advice, WHO started developing guidelines for indoor air quality in 2006, addressing three distinct groups of issues. WHO guidelines for biological indoor air pollutants (dampness and mould) were published in 2009 [14]. As well, WHO published pollutant-specific guidelines for nine selected pollutants in 2010 [1]. Finally, indoor air guidelines for household combustion of fuels for cooking, heating and lighting are currently being developed. They will also provide recommendations for household fuels and technology use that will enable a move towards the air quality guidelines. If these guidelines are sensibly applied as part of policy development, indoor exposures to air pollutants should decline and a significant reduction in adverse health effects should follow.

Further work by WHO addresses the dimension of inequalities in relation to housing and built environments, assessing the differences in exposure associated with sociodemographic determinants such as age, sex, income or education. Unfortunately, there is a scarcity of data for such inequality assessments although the available data on housing-related inequalities (e.g. damp homes, thermal comfort, noise, exposure to environmental tobacco smoke or sanitary equipment) indicate that large exposure differentials exist across the WHO European Region. Giving two examples, the data suggest that within the EU, the lowest-income population reports having no bath or shower at home 13 times more often than the richest while 16 million people in relative poverty cannot afford to heat their homes in winter. It is only realistic to expect that similar inequalities will exist for indoor exposures related to chemical substances, but currently there is little data on such indoor exposure in general and basically no data that allow stratification by socioeconomic or demographic factors [15].

In conclusion, indoor air pollution is an important contributor to the burden of disease of the population, but there are many limitations in the quantitative assessment of its impact on human health. There is a need for a stronger scientific evidence base to convince policy makers of the importance of the issue and the need for preventive action to benefit health. Policies for healthy housing and best practices for source control are necessary to reduce the health risks from indoor air pollution to a minimum.

KEYWORDS
Indoor air quality; health; exposure; housing interventions; guidelines

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