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Submission to the Commonwealth Government COVID-19 Response Inquiry

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Thank you for the opportunity to provide a submission regarding the Commonwealth Government COVID-19 Response Inquiry.

About the Centre for Safe Air

The Centre for Safe Air is a Centre of Research Excellence funded by the National Health and Medical Research Council. The Centre brings together more than 20 researchers at the forefront of fields relating to air quality and health. Our vision is for a healthier community through cleaner air, underpinned by evidence-informed policy and practice. Our report, Safer Air Healthier Communities, summarises extensive evidence illustrating the effectiveness of interventions to improve air quality in Australia. Given this remit, the focus of our submission is airborne transmission of COVID-19 and the effectiveness of interventions to reduce airborne exposure.

Overview

COVID-19, like other respiratory viral infections, is primarily transmitted in small airborne particles that carry the virus and are emitted during all human activities related to respiration (1). Particles are emitted during speech, coughing, sneezing, exercise or also quiet breathing. The particles are small enough to remain airborne for prolonged periods, especially in poorly ventilated indoor environments, and be transmitted long distances. Hence, the presence of one or more people with COVID-19 in an indoor environment places all persons who share the air in that indoor space at risk of infection. Airborne transmission is the main mechanism of transmission of COVID-19, including 'super spreader' events (1,2). Despite confusing and sometimes misleading public health messages (3), preventive measures to mitigate the airborne transmission of COVID-19 became an important and effective part of the public health response to COVID. These measures included mask mandates, restrictions on indoor gathering, requirements for enhanced ventilation for indoor settings, and air filtration in health care facilities, schools, aged care facilities and other high risk indoor environments. However, these were essentially emergency measures.

The most effective interventions to reduce the severity and cost of future pandemics involve continuously improving indoor air quality (IAQ) for all Australians, with co-benefits for reducing the health and economic burden of indoor air pollution more generally. Hence, the Centre for Safe Air calls for the Commonwealth Government to:

1. Establish a consistent national regulatory infrastructure for *Clean Indoor Air for Australians* working with the States and Territories through the National Cabinet.
2. Establish an interdisciplinary panel of experts, including scientists, engineers, architects, and medical and public health professionals tasked with developing a foundation for IAQ standards that can be legislated and enforced.
3. Legislate National IAQ standards, and mandate that all new buildings are designed to meet the standards.
4. Review and improve building design and engineering standards, regulations and codes to enable compliance with the IAQ standards.
5. Invest in improved air quality in high-risk indoor settings such as health care facilities, schools, aged care facilities and detention/correctional facilities.
6. Fund research to assess the feasibility, effectiveness, and safety of alternative strategies for prevention of airborne transmission.
7. Reduce outdoor air pollution—especially fine particulate matter (PM2.5)—that increases the severity of COVID-19 symptoms.

The above recommendations are based on the analysis and evidence presented in *The Medical Journal of Australia* (4), and became part of the recommendations from the House of Representatives Standing Committee on Health, Aged Care and Sport (5):

"The Committee recommends the Australian Government establish and fund a multidisciplinary advisory body including ventilation experts, architects, aerosol scientists, industry, building code regulators and public health experts to […] oversee an assessment of the impact of poor indoor air quality and ventilation on the economy with particular consideration given to high-risk settings such as hospitals, aged care facilities, childcare and educational settings [and] lead the development of national indoor air quality standards for use in Australia."

Review of measures to reduce airborne exposure

In this submission, we summarise the evidence for interventions to reduce indoor transmission and provide advice to inform future preparedness.

Indoor Air Quality Standards

To ensure good IAQ for Australians and minimise the risk of airborne infection transmission in shared indoor spaces, we need IAQ standards that can be enforced (6). Here we focus only on the aspects of the legislation related to the transmission of infections and discuss the possible basis for such regulations, their feasibility and a unique opportunity to start the process with the lessons learned during the pandemic.

The change in paradigm that we are calling for in introducing IAQ regulations aimed at airborne infection transmission and modernising buildings to improve IAQ can be compared with the transformation of sanitation infrastructure in the UK in the 19th century (1). It wasn't an easy task to convince authorities of the need for clean water and the role of contaminated water in infection transmission. Ultimately, the authorities and the community were convinced when, during the cholera outbreak in London in 1854, British doctor John Snow persuaded town officials to remove the handle of the local water pump. Locals could not drink that water and the outbreak was contained. This changed the approach to water sanitation in Britain, and ultimately the whole world, with enormous demonstrable public health benefits and corresponding economic dividends through health care savings (7).

The cost to the society of prevention through better designed buildings and gradual improvement of ventilation in existing buildings based on IAQ standards is will be much lower than the cost of infections (1). According to some estimates, this would amount to only 1% of initial construction costs.

For IAQ standards to be implementable, buildings must be designed or retrofitted in a way to make it possible. Our paper discussed other building engineering measures in addition to ventilation (efficient and effective), including air filtration (as part of Heating Ventilation and Air Conditioning system in mechanically ventilated buildings – HVAC, or supported by stand-alone filter-based air purifiers in addition or in absence of HVAC system), and air disinfection (in particularly germicidal ultraviolet radiation -GUV); these measures support ventilation in delivering clean and healthy air to indoor spaces (8). Below we expand on one important aspect which is ventilation.

Ventilation

The most efficient way to reduce the risk of transmission, is to reduce the concentration of airborne virus that is available to be inhaled and hence cause infection (6). Adequate ventilation (9), of air in indoor spaces is the key to achieving this goal and should be at the top of the top the list of control measures. This reduces the risk for everyone and protects everyone, regardless of other individual actions (10).

It is important to emphasize that this is not only important for future pandemic preparedness but also for current epidemics of respiratory infections, due to airborne infection transmission (such as of COVID-19). Seasonal influenza and a myriad of other infections spread this way and have an immense impact on public health. Viral respiratory infections have been a major cause of morbidity and mortality in Australia for a long time (11). In just one year (2017), there were 1,255 deaths from influenza and 563 influenza deaths where pneumonia was a contributing factor. Together, influenza and pneumonia accounted for 4,269 deaths, and were the 9th leading cause of death, moving from 11th place in 2016 (10). The economic burden from all lower respiratory infections in Australia was >$1.6 billion in 2018–19 (12).

It has been demonstrated that control measures taken against COVID-19, including improvement in ventilation were even more effective against influenza, because influenza is less infectious than the wild variant of COVID-19 and even less than Delta and Omicron (13). In fact, there have been reports of significant reduction in influenza cases and mortality during times when such control measures against COVID-19 were taken (14–16). Return of influenza was reported after measures were suspended (17,18).

Masks

Masks have a dual role in preventing transmission of airborne transmission: preventing emission of infectious aerosols by a person with COVID and protecting uninfected individuals from inhaling infectious aerosols. The effectiveness of masks to reduce airborne transmission has been demonstrated in numerous international (21,22) and Australian studies (23). A well-fitted N95 (P2) respirator gives the most effective protection but, if this is not available, any mask is likely to be better than no mask. Mask effectiveness in Victoria was estimated to be 11%, with a greater impact if at least 50% of people wear a mask which has an effectiveness of at least 40% (21).

The major limitation of mask wearing is that it requires behavioural change on the part of the community. Despite the proven effectiveness of mask wearing, a representative survey of people from Australia, the UK and the US found that hand hygiene (76.4%) was a more common practice than wearing a mask (71.8%) (24). Hence, there is much work to be done in convincing the public of the benefits of mask wearing. Even with this, the lack of willingness of many people to wear masks in indoor spaces limits the role of mask wearing as a public health strategy

Reduce outdoor and indoor air pollution

The evidence base about links between population risks from COVID-19 and exposure to air pollution is growing. Reduced exposure to outdoor air pollution has been shown to reduce the severity of COVID-19 outcomes (25–27). Air pollution is an important risk factor for upper and lower respiratory tract infections. It may increase the transmission, severity, duration of hospitalisation, and mortality in people infected with respiratory viruses like influenza and COVID-19. (28) Australia is prone to severe recurrent outdoor air pollution from bushfires and, in some places, wood heater smoke. Indoor air management needs to be integrated to ensure that responses to one hazard do not counteract interventions to another hazard. HEPA filtration is a key intervention and protects against multiple hazards, including viral transmission and infiltration of outdoor air pollution.

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