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Robyn Kruk
Panel Chair
COVID-19 Response Inquiry

Dear [redacted]

I'm an academic within the School of Psychology at the University of Queensland. While I obviously have concerns about the mental health impact of pandemics, I'm writing as I'm more concerned about the psychological biases that make it hard for most of us to think clearly about the risks from pandemics. I think those biases will make it easy for us to prioritise the wrong things when we try to support industry and business (Terms of Reference #5). I also think it may lead us to under-value the most important types of health response measures (Terms of Reference #1) and preventative health measures (Terms of Reference #2).

In short, our biases will lead us to focus too much on pandemics that closely mirror COVID-19, and significantly under-prepare for the risk of pandemics that are worse. The 'Availability' bias makes us overemphasise risks that easily come to mind like COVID-19, overshadowing less salient but more devastating threats.[1] 'Hindsight Bias' can falsely assure us that future pandemics will be predictable and similar to past events, leading to complacency. 'Scope Neglect' makes it hard for us to *feel* the difference between a pandemic with a fatality rate of 0.1%, 1%, and 10%,[1] when the latter would cause a complete breakdown of civilization. 'Overconfidence' bias means our brains round down small risks of catastrophic pandemics to zero.[1] We cannot round down a small risk to zero. A 1% chance each year of a pandemic killing 10% of Australia is an 'expected death toll' 25 times higher than our annual road toll.[2] For these reasons, the federal government must focus on preventing catastrophic outcomes. I think it can best do that by supporting businesses and industry to: 1) create pandemic-proof personal protective equipment, and 2) invest in better indoor air quality.

In the context of Terms of Reference 5, support for industry, including in the context of labour shortages, I recommend that the Inquiry consider the paper by MIT academics and the Geneva Centre for Security Policy titled "Securing Civilisation Against Catastrophic Pandemics".[3]

The paper begins by unpacking ways that pandemic risk is increasing—in particular the possibility of engineered pandemics. The paper also makes a useful distinction between "stealth" and "wildfire" pandemics, which has deep implications for our policy response.

Importantly, the paper goes on to explain that in a pandemic worse than COVID-19, workers who operate critical infrastructure may die or refuse to attend the workplace. If that happens, a modern interconnected society would rapidly collapse. The second-order consequences from a lack of electricity causing cascading failures in other critical sectors would far exceed the immediate consequences of the virus. Imagine your local hospital without electricity or clean water.

When the Inquiry thinks about support for industry, the primary goal of that support should be keeping the lights on during a future, worse, pandemic. If critical infrastructure fails, other questions like financial support or community support rapidly become irrelevant or impossible.

Among the various recommendations, Gopal et al argue that "pandemic-proof personal protective equipment" (P4E) is essential to dealing with the risk of failing critical infrastructure. The argument for P4E is that essential workers (such as those critical to providing food, water, power, law enforcement) need the confidence that they can continue to work without endangering themselves and their loved ones. The paper provides requirements for what this kind of equipment would need to look like.

The paper also includes discussions about definitions of essential workers, ways of preparing the workforce and supply chain, and a discussion of social and technological approaches to slowing the spread of future pandemics.

I recommend that the inquiry read Securing Civilisation Against Catastrophic Pandemics and treat it as a foundation stone for other recommendations.[3] That is, our first priority has to be actions that take these worst-case scenarios off the table. Action against other elements of the terms of reference are only possible and impactful if we can be confident that we're in a position to prevent a social collapse. I appreciate these risks are hard to imagine—many Australians won't, or won't like imagining them—that's exactly why the federal government must take responsibility for preparing against them.

Another key area the Australian government should invest in is better Indoor Air Quality (IAQ). Australians spend at least 90% of their time indoors and every year, Australians fall ill as a result of exposure to airborne pathogens while indoors. Worse still, respiratory transmission is a primary transmission route for pandemics. Therefore, reducing respiratory transmission will not only result in less illness for Australians but also safeguard us against the next pandemic. In addition to proven approaches and technologies, there are promising, effective, and scalable interventions, such as Ultraviolet germicidal irradiation (UVGI), which Australia could be supporting in the hopes of deployment before the next pandemic.

The Lancet COVID-19 Commission Task Force has proposed Non-infectious Air Delivery Rates (NADR) as measurable goals for ventilation and filtration targets that protect against infectious disease transmission. Air delivery rates to different sized rooms can be compared using the normalised measure of Air Changes per Hour (ACH)–the number of times the volume of air in a room is exchanged with fresh, pathogen-free air each hour. Ventilating a room with fresh outdoor air while exhausting air in the room reduces the concentration of pathogens in the air produced by the room's occupants. Filtration and disinfection technologies can achieve comparable effects to ventilating a room with fresh air can be measured by Equivalent Air Changes per Hour (eACH) – the number of ACH required to achieve the same reduction in pathogen concentration.

Traditionally, air changeovers are achieved through opening a window or having an HVAC (Heating, ventilation, and air conditioning) system installed. The Air Safety to Combat Global Catastrophic Biorisk report summarises the cost-effectiveness of different mechanical IAQ interventions.[4] A modern HVAC system costs $135 USD per ACH, assuming it is updated to current standards for filtration and air delivery rates. However, many buildings do not have an HVAC system installed and are often not ventilated–schools, cafes and restaurants, homes, and smaller and older workplaces are just some examples of poorly ventilated spaces that we visit every day. Modern HVAC systems can be expensive or difficult to retrofit into buildings but represent an important step towards delivering non-infectious air. However, there are more cost-effective technologies that are easier to retrofit and could be widely adopted to keep Australians safe and healthy indoors. One example is portable air cleaners using HEPA filters which are estimated to cost approximately $110 USD per eACH and are simple to retrofit into buildings that are unsuitable for HVAC.

Ultraviolet germicidal irradiation (UVGI) is the use of ultraviolet light to inactivate or kill pathogens such as bacteria, fungal spores and viruses. UVGI lights in indoor spaces could decrease the number of pathogen particles in the air in a safe, scalable and simple manner. Upper room UVGI lamps use 254nm wavelength UV light to sterilise the air in the top of rooms as it circulates and cost approximately $14 USD per eACH. Far-UVC lights are a newer innovation that can bathe an occupied room in far-UVC wavelengths.[5] It uses a shorter wavelength of 222nm, which appears to be safe for skin and corneas yet it still inactivates the comparatively smaller pathogen particles.[6] Unlike other interventions, Far-UVC has potential to reduce short range and conversational distance transmission and sterilise surfaces, in addition to reducing long-range airborne transmission like mechanical

ventilation, portable air cleaners and 254nm UVGI. It is estimated to cost $15-46 per eACH, however, still requires additional R&D to make it cost-effective and scalable.

Given that we have a mix of proven approaches for a variety of buildings and promising technology, I believe Australia should be investing in the deployment of what we know works and the research and development of what we know is promising. UVGI technology has the potential to make all indoor environments safe for Australians to occupy without fear of respiratory illness at an affordable price. Through supporting research and development in this technology, Australia can lower the burden of respiratory illness and protect against the next pandemic. It can also leverage the opportunity to become a world leader in developing technology that will no-doubt be in demand later.

It might seem strange for a psychologist to be recommending technical solutions to a biological problem, but our track record shows these solutions are higher leverage for governments. We can't persuade people to drive safely all the time—we mandate all cars have seat belts, and enforce laws that all people use them. The risk of any one of us dying in a car accident is small—as is the risk of a truly catastrophic pandemic—but both are large enough for the government to take responsibility for addressing the risks. The government can save thousands of lives by enforcing road standards and laws—it could save millions of lives by preventing a catastrophic pandemic. The government will need to provide fewer mental health services to victims if it can prevent the next pandemic in the first place. Technical solutions like better pandemic proof personal protective equipment, and better indoor air quality, are evidence-based solutions the government has at its disposal, among other strategies outlined in the reports cited here. Overall, I hope the government does its best to overcome the biases that cause us to naturally underestimate catastrophic risks and focus its efforts on this kind of security.

Yours sincerely,

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