Safeguarding Australia Against Future Pandemics
PM&C COVID-19 Inquiry – Submission for review
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Introduction

My submission aims to highlight the importance of Australia focusing on efforts to prevent future pandemics–rather than just preparing for them.

As a young Australian, COVID-19 has caused big changes in my life, and perhaps in my future. It impacted my education and relationships, and it felt as if my demographic–socially and economically–was less well-equipped than others to handle the hardships.

While this Inquiry should explore all the ways the government can better help individuals and communities in a future pandemic–even the best-managed pandemic could have terrible consequences. That's why I think the main goal should be pandemic prevention.

I know that each Australian jurisdiction invests heavily in hazard reduction for other natural disasters and are increasing their efforts because of climate change. However, I'm not aware of any similar investment in reducing the likelihood of pandemics, even though the risk to the average Australian seems much higher.

In that context, I'd like to raise a few issues that I think are important and could make sure we're heading in the right direction.

Point 1: Engineered pandemics are a risk worth taking seriously

Key point: The risk of engineered pandemics could be accelerated by advances in Artificial Intelligence (AI). We should think proactively about how to prevent them.

The Inquiry's terms of reference include preventative health measures. The best preventative health measure is likely to be preventing pandemics from occurring. To do this most effectively, we need to have a good understanding of how pandemics might begin.

Historically, zoonoses have been the leading cause of pandemics. This is a significant risk that government policy should address. Looking forward, Gopal et al (2023) in "Securing Civilisation Against Catastrophic Pandemics" use a range of tools to estimate the likelihood of different future pandemic scenarios. Their estimates show that dangerous pathogens leaking from labs have likely surpassed zoonoses as the key risk. Even more worryingly, they argue that maliciously engineered pandemics could become the overriding risk unless action is taken.

The reason engineered pandemics have become a critical public health concern is rapid progress in biotechnology and the rise of "dual-use" AI products. "Dual-use risks" refers to the risks generated by AIs intended to perform useful tasks if used by malicious actors. Specifically, biotechnology applications using artificial intelligence have capabilities that could amplify the ability of terrorists to harm Australians.

The US is taking dual-use risks seriously. On 25 July 2023, the US Senate Judiciary Subcommittee on Privacy, Technology and the Law took evidence about the potential risks of AI from [redacted] (CEO of Anthropic), [redacted] (Turing Award winner and the second-most cited AI researcher in the world), and [redacted] (Professor of Computer Science at Berkeley).

Committee Chair, Senator [redacted] began the hearing by highlighting these "dual-use" risks:

[redacted]

The hearings painted a concerning picture where frontier models will soon have the ability to combine with advances in biotechnology to supercharge the ability of malicious actors to do harm. [redacted], CEO of Anthropic, agreed with these concerns and called on Government to take action:

[redacted]

In response to these hearings, on 30 October 2023, President Biden made an executive order that does two main things. First, it put a timeline on US agencies to develop a framework to ensure the proper screening of synthetic DNA. With or without the additional risks of AI, synthetic DNA is likely the essential input that any malicious or negligent actor would need to engineer a pandemic. Second, it put a range of requirements on AI labs designed to ensure future AI models don't have these dual-use risks that could contribute to a future pandemic.

While many may feel that this issue is outside the scope of a preventative public health measure–the same was said of clean drinking water, the work of Florence Nightingale or many other advances in public health that came from leaders realising that a vast range of social and technological factors feed into public health. Indeed, the history of innovation in public health is a history of tackling cutting-edge problems that others neglected. AI and synthetic biology are today's versions of those historic problems.

Point 2: Early detection of novel pathogens is a key public health measure

Key point: We need systems and infrastructure that can detect novel pathogens early. We should pivot existing COVID-19 infrastructure to do this.

The diagnostic and wastewater infrastructure and talent built up over COVID-19 response should not be wound down but proactively pivoted for public health. Clinical metagenomics, wastewater testing and the testing of airports, cruises and other ports of entry could provide welcome data to improve the National Notifiable Diseases Surveillance System (NNDSS) and provide a volume of samples to test routinely with metagenomic sequencing for novel pathogens. Keeping this diagnostic infrastructure 'warm' would also mean that in the next pandemic, diagnostic capability could expand more easily, which we know first-hand is essential to halting community transmission of a pathogen. [redacted] in a testimony to the U.S. House Hearing on "Biosecurity for the Future: Strengthening Deterrence and Detection" said:

[redacted]

Any early detection system must be robustly financed into perpetuity and resistant to funding cuts, and one way to do this is to have a public health monitoring system that is consciously set up to be useful both in "peace-time" and health emergencies.

I think the inquiry should familiarise itself with the diagnostics of different sampling types like:

- Clinical diagnostics,
- Wastewater monitoring, and
- Airports, cruises and other ports of entry.

It should also familiarise itself with technology developments around:

- Metagenomics (both clinical and wastewater),
- CRISPR-based diagnostics, and
- Improvements to and multiplexing of PCR and LAMP

It should also familiarise itself with the many emerging cost-effectiveness and effectiveness models, as well as obstacles on such systems in literature to inform the design of an early detection system. For example:

- The pre-print by Liu et al (2023) Quantitatively assessing early detection strategies for mitigating COVID-19 and future pandemics estimates that hospital monitoring could have detected COVID-19 1000 cases earlier. Wastewater surveillance could provide an early warning for pandemics with long incubation periods. Different pathogens would suit different early detection sampling and platforms.
- Wegryzyn et al (2022) Early Detection of Severe Acute Respiratory Syndrome Coronavirus 2 Variants Using Traveler-based Genomic Surveillance at 4 US Airports, September 2021–January 2022, Clinical Infectious Diseases provided early-warning variant detection, reporting the first US Omicron BA.2 and BA.3 in North America.
- Liang et al (2023) Managing the Transition to Widespread Metagenomic Monitoring: Policy Considerations for Future Biosurveillance, Health Security outlines a number of policy obstacles that need to be overcome for a public health monitoring system with sequencing as it's backbone to be successful over the next decades
- Research by SecureBio and MIT's Sculpting Evolution group https://naobservatory.org/ on monitoring for exponentially increasing nucleic acid sequences since viral nucleic acids that have pandemic potential also increase exponentially.
- Ghouneimy et al (2023) CRISPR-Based Diagnostics: Challenges and Potential Solutions toward Point-of-Care Applications, ACS Synth Biol explores costs associated with CRISPR based diagnostic and what this might look like in resource-poor settings.

How well we handle the next pandemic will largely be a function of how quickly we can detect and understand it. Every element of the terms of reference hangs off this. On that basis, early pathogen-agnostic detection systems need to be invested in now to get ahead of the next pandemic. With how necessary PCR diagnostics were in controlling case numbers before vaccine uptake was high, in my opinion, it would border on negligence if we don't improve our diagnostics ability before the next pandemic pathogen outbreak. I recommend the Inquiry direct the new CDC to explore the benefits of a pathogen-agnostic early detection system for both the near-term public health benefits and the long-term early detection pandemic warning system.

Conclusion

Key point: We should be focused on early detection and prevention of future pandemics.

The notable public health challenges of history have been solved by innovative people bringing new ideas and perspectives to the challenge of health. As the scope of public health has grown, so has its ability to improve longevity and quality of life.

COVID-19 has served as a warning shot for us all, and has highlighted our shared vulnerability to global pandemics. The terms of reference of this inquiry are fundamentally about doing better in the future. Given how terrible future pandemics could be–the best thing the Inquiry could do for the future is to prioritise pandemic prevention, including the novel ways pandemics could occur in the future. While that will require uncomfortable thinking about unexpected topics and emerging technologies, these are the issues that could have the biggest impact towards securing a healthier future.

Thank you.
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