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What does the future hold for chronic disease prevention research?

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Chronic, non-communicable diseases and conditions affect millions of people worldwide and were identified in the Global Burden of Disease Study 2017 as being responsible for 73% of the world's deaths.¹ In Australia, the burden of chronic disease and associated risk factors have a significant impact in terms of health, societal and economic costs.² One-in-two Australians has a chronic disease or condition, with 87% of deaths associated with eight chronic diseases.³ Furthermore, as evidenced by the COVID-19 pandemic, the presence of chronic disease and co-morbidities can amplify the impact of existing and emerging communicable diseases.⁴

The major proximal risk factors for chronic disease include tobacco use, harmful consumption of alcohol, unhealthy diet, physical inactivity and air pollution.⁵ Other risk factors that contribute to the burden of chronic disease and poor health include metabolic risk factors (e.g. overweight and obesity, hypertension, hyperglycaemia), injuries and mental ill-health.^{3,6} Chronic disease is also exacerbated by system-wide drivers – the social determinants of health – such as inequality and poverty.⁷

In May 2013, the World Health Assembly voted to endorse the World Health Organization's (WHO) *Global Action Plan for the Prevention and Control of Noncommunicable Disease 2013–2020*.⁸ This plan sets out nine voluntary global noncommunicable disease targets for member states. These targets aim to reduce the preventable and avoidable burden of chronic disease by taking a multisectoral approach to prevention, reducing population-level exposure to the major risk factors for chronic disease, and improving health system capacity. However, despite the Global Action

Plan driving some improvements such as increased tobacco control, more work is needed to substantially reduce chronic disease risk, morbidity and mortality and improve population health on a global scale.⁹

In 2013, the Australian Government launched The Australian Prevention Partnership Centre (hereafter the Prevention Centre) as an opportunity to build and mobilise evidence, knowledge and capacity in chronic disease prevention research in Australia.¹⁰ The Prevention Centre represents a coordinated partnership model for federal, state and territory governments to invest in the long-term research required for a more effective, efficient and equitable prevention system.¹¹ The Centre was re-funded for a further five years in 2018, with additional investment through the Medical Research Future Fund 'Boosting Prevention' program.

In 2019, the Prevention Centre's lead investigators, researchers, collaborators and policy partners began to discuss what might be next for the future of prevention research, not just in Australia but globally as well. The Global Action Plan is due to conclude in 2020 and no new policy or plan has yet been announced, although noncommunicable disease prevention is one of many areas mentioned in WHO's 2019–2023 program of work.¹²

In 2019, the Australian Government also announced the development of their National Preventive Health Strategy, initially planned to be launched in 2020 but delayed due to the coronavirus 2019 (COVID-19) pandemic.¹³ The Government's consultations stimulated dialogue about prevention priorities in the 2020s and beyond. The Prevention Centre sought to add to this dialogue by considering: what are the key future questions for prevention policy; what prevention research

is needed to help answer those questions; and how can we as researchers help respond to the national and global challenge of chronic disease going forward?

To inform these deliberations, the Prevention Centre conducted a review¹⁴ (available online) of the grey and peer-reviewed literature published between 2014 and 2019. The review included a thematic analysis of the current and emerging trends in chronic disease prevention research and examined the thematic synergies across the grey and scientific literature with respect to key topics, opportunities and challenges. The identified themes were revised following feedback from members of the Centre's network, which includes more than 200 leading prevention researchers, policymakers and practitioners across Australia. The review is accompanied by an evidence brief to aid and facilitate the translation and mobilisation of the research.

In this accompanying commentary, we summarise the major trends identified in the review and consider the implications for the future of chronic disease prevention research in Australia.

Current and future trends in prevention research

Our review identified 26 topics across the grey and scientific literature that encompassed the current trends in prevention research. We grouped 18 of these topics into five major themes: food production and consumption; place and spaces; environment and health; expanded determinants of health; and personalised prevention, with eight additional topics listed separately to these themes (Box 1).

The five main themes were informed by a variety of topics identified in the literature, with examples including agriculture, diet and nutrition, air pollution, urban health, climate change, big data, precision medicine, and the

Box 1: Major themes identified in the literature on the future of prevention research.

- Food production and consumption (n=4)
- Place and spaces (n=4)
- Environment and health (n=3)
- Expanded determinants of health (n=4)
- Personalised prevention (n=3)
- Other (n=8)

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commercial and legal determinants of health. Additional topics not grouped into these major themes included systems thinking, mental health, multi-sectoral approaches to prevention, and implementation and evaluation challenges.

In summary, the review findings suggest a broadening of the scope and scale of prevention, emphasising the importance of moving beyond 'silos' in sectors and disciplines to produce more effective and sustained chronic disease prevention. They suggest the need for continued application of systems and complexity thinking in prevention research. Indeed, much of the scientific and grey literature we reviewed used – implicitly or explicitly – a systems approach to better address the dynamic and inter-dependent nature of chronic disease risk factors and determinants. The literature also considered the nature and characteristics of systems as entities in themselves, such as food systems and transport systems.

Our report also identified challenges for the future of prevention research, such as how to generate meaningful evidence for prevention that moves beyond describing the 'what' of the problem toward the domain of solutions where we implement and evaluate the 'how'. The empirical challenges of prevention research are also complicated by the persistent structural and systemic inequities in health and chronic disease. Furthermore, this complexity is increased when adding in the politically contested nature of prevention. Political or ideological contestations about health affect the ability to develop, implement and evaluate preventive interventions that address those structural and socioeconomic drivers of chronic disease and poor health.

While many of the topics and themes identified in the review could be grouped in different ways, they reflect a range of emerging opportunities and challenges that have important implications for the future of prevention research. We consider these implications below.

New ways of thinking for chronic disease prevention

Changing the systems that create disease: moving beyond the '4x4 approach'

In 2013, WHO's Global Action Plan adopted a '4x4 approach' to articulate the goals of

chronic disease prevention. This approach focused on the four chronic diseases with the greatest burden of disease – cardiovascular disease, cancers, chronic respiratory diseases and diabetes – and the four behavioural risk factors linked to those diseases – tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol.⁸

Critiques of the '4x4 approach' identified in the review argue that the prevention of chronic disease requires more comprehensive, whole-of-society or systems strategies. Such strategies must look beyond four types of chronic diseases and risk factors outlined in the Plan, and instead focus on the 'causes of the causes' of chronic disease.¹⁵⁻¹⁷

We suggest that a 'causes of the causes' approach to chronic disease represents new ways of thinking about prevention, requiring the adoption of new concepts and tools from other sectors and disciplines. These concepts and tools include multisectoral and intersectoral collaborations beyond health, using complex systems thinking and typologies, looking at the ecological and planetary intersections with health, and expanding the determinants of health to include social, legal, economic and commercial determinants of health.

Looking more systemically at chronic disease is important given the complex interplay between the many different risk factors, determinants and outcomes. One such example of this interconnectedness is increasing physical activity levels and reducing air pollution through improved urban design and a healthier built environment.¹⁸ It requires thinking about these risk factors within the context of a broader system and developing multisectoral and intersectoral partnerships to achieve system-wide change.

Our review found a renewed interest in reframing prevention through an approach of 'preventive medicine for the planet and its people'.¹⁹ This approach links prevention of chronic disease with sustainable development and ecological systems, an approach that has also been identified by several *The Lancet* commissions in recent years.²⁰⁻²² An alignment of chronic disease prevention with environmental sustainability in the scientific literature complements shifts found in the grey literature, such as the United Nations' Sustainable Development Goals (SDGs) adopted in January 2016.²³ The SDGs represent the opportunity to

integrate human and planetary health but require new ways of working, more ambitious interdisciplinary research and funding, and improved implementation.²²

In addition, there has been more interest in the use of law and broader social and economic policy for prevention, as evidenced by the *The Lancet* commission on the legal determinants of health²⁴ and the growing body of literature looking at the use of law and regulation in preventing chronic disease.²⁵⁻²⁷ During this time, the commercial or corporate determinants of health have also developed as a distinct body of research within prevention; this literature particularly focuses on how industries harmful to health have influenced chronic disease research and policy.²⁸

2020s and beyond: What's next for Australian prevention research?

A holistic, systems-based approach offers new opportunities for chronic disease prevention research in Australia. This approach would build on existing capabilities and expertise while incorporating new forms of evidence, methods, solutions, partnerships and sectors.

New partnerships and collaborations

The repositioning of chronic disease prevention as an endeavour focused on system-wide change has its challenges for researchers, particularly in terms of implementation, evaluation and translation.¹¹ These challenges will require researchers, policymakers and practitioners to work collaboratively across a wide range of sectors and disciplines, using systems thinking to guide their efforts, and informed by the best available evidence gained from a wider variety of sources.

For example, working in partnership and collaborating with other sectors such as the private sector will mean prevention researchers must consider appropriate controls around managing conflicts of interest and industry engagement.²⁹⁻³² Some have noted this is a confusing and challenging area for public health researchers to navigate outside of tobacco control.³³

New partnerships and collaborations might also mean applying research methods from other disciplines, such as law, economics, environmental and political science. Some of the Prevention Centre's more recent work includes using public health law to analyse prevention decisions,³⁴ applying economic

tools to measure and assess the value of prevention,^{35,36} and researching community attitudes about government intervention for prevention to support and inform decision-making by the Centre's policy partners.³⁷

Prevention researchers in the future will need to continue to work across and between different academic disciplines, as well as building new strategic alliances and partnerships with governments, communities and non-government groups to promote long term, collaborative, policy-relevant research. Examples of such research can be found here in Australia,¹¹ in Canada³⁸ and the UK.³⁹

Looking at the 'co-benefits' of prevention

Like climate change, chronic disease is a global emergency causing significant harm to human health. Both of these health emergencies are part of a 'syndemic' – a 'synergy of epidemics' – which are co-occurring together due to common drivers and factors.^{20,40} The massive threat to human health posed by chronic disease and climate change requires large-scale systems change at a local, national and global level. Addressing these twin threats is a challenging prospect for the 2020s and beyond.

However, the reframing of prevention to include environmental 'co-benefits' is an opportunity for prevention research. Many in the health sector in Australia are deeply concerned about the climate emergency and its impact on population health, as evidenced by the 2019 *Medical Journal of Australia – Lancet Countdown* report on climate and health.⁴¹ Australia is the only country to have conducted its own national report and indicators on climate change and health, and the national collaborations formed to conduct this work provides unique opportunities for further investigation and world-leading innovation in climate and health research. At the time of writing, we await the Western Australian Government's response to the novel Chief Health Officer Inquiry into Climate Health, another first.⁴²

Effective solutions and interventions for the dual, interrelated problems of chronic disease and climate change will need to focus on: urban planning, liveability and the built environment; food systems; biodiversity loss; air and water pollution; transport; energy and a transition away from fossil fuels.^{20,43} This will involve researchers and policymakers

working across multiple sectors outside health, combining investments in different areas and calculating health, environmental and economic impacts.⁴⁴ The Prevention Centre has been contributing to this through supporting a significant program of research focused on measuring urban liveability.^{45,46}

Other areas of investigation that offer significant health and environmental co-benefits include improving regulation and governance of food supplies to support food security, improved equity and environmental sustainability.^{20,21} Similarly, forecasting the impacts of transformational change of local transport systems could help with policies that aim to reduce air pollution and carbon emissions while also increasing population-level physical activity.⁴⁷

Providing the infrastructure needed for effective inter-sectoral prevention research

Looking ahead, this means the next generation of prevention researchers and practitioners will need a wide range of skills including systems thinking, communication and collaboration capabilities and a sense of 'transformational ethics' that prioritises equity.⁴⁸ It is worthwhile asking how our schools of public health and government agencies in Australia are developing the infrastructure for our graduates, researchers and professionals to upskill, practice and research effectively using health in all policies approaches or working inter-sectorally; for example, in the nexus between climate and health, or the relationship between physical and mental wellbeing.

As noted above, another major challenge for the future of prevention research is moving beyond the 'what' to the 'how'. Our review indicated that a significant, ever-growing body of research in prevention continues to describe the problem and/or speculate on possible solutions. We have much less empirical evidence about what works, where, why and for whom.

With the increasing use of complex systems approaches, prevention and public health research are being reshaped to look beyond single interventions and measures of effectiveness.⁴⁹ For example, macro-level policy interventions in prevention require greater flexibility in evaluation, using other types of experimental methods outside the traditional evidence hierarchy of clinical trials to generate meaningful evidence.⁵⁰

Rethinking methods of evaluation⁵¹ and implementation for prevention^{52,53} have allowed us to move beyond the 'what' of describing the problem of disease, and start analysing the 'how' of changing the system.

But how might we further improve the implementation and evaluation of population health, preventive interventions in real-world settings and systems? How do we know what is a 'good enough' evidence base for prevention research to support and sustain effective policy action on chronic disease?⁵⁴ And how do we measure 'success' for prevention research in complex systems with multiple feedback loops, non-linear associations and epidemiological uncertainty?

We propose one solution may be 'decision-aid tools', such as systems dynamic modelling, co-designed and developed by researchers and policymakers.⁵⁵ We have seen already the impact of using food systems research for direct policy application⁵⁶⁻⁵⁸ and developing systems modelling tools that help policymakers answer challenging questions in areas such as alcohol harms,⁵⁹ childhood obesity⁶⁰ and diabetes during pregnancy.⁶¹ This kind of modelling can assist prevention researchers and policymakers to demonstrate trends, test possible scenarios and project future costs depending on different combinations of interventions and investment by government.⁶²

Other key priorities

New opportunities for prevention research are also presented by developments in big data, technologies such as wearables and smartphones, and precision medicine. However, implementing and evaluating these new preventive measures, particularly at scale, will require clearer guidance and research funding models. Appropriate safeguards and considerations regarding possible harms, unintended consequences and opportunities for population health will also need to be considered.⁶³ Furthermore, areas like precision medicine, for example, will likely not address the social gradient of health.⁶⁴

Reducing health inequities remains an ongoing and urgent priority for chronic disease prevention. Many prevention efforts and successes have achieved population-level change without enough attention to impacts on reducing health equity. This is important given that inequities in health persist in all

areas of chronic disease. Going forward, we must prioritise equity-focused research and embedding an equity lens in everything we do, such as addressing food security in Aboriginal communities⁶⁵ and supporting healthy lifestyle behaviour change for community mental health clients.⁶⁶ Engaging the public as collaborators in prevention research and knowledge production may serve as a valuable tool to enable more inclusive, acceptable and appropriate policies and programmes. If prevention research does not consciously and systematically pay attention to inequities and how to overcome them in prevention policy and practice, we will contribute to magnifying inequities rather than reducing them.

Conclusion

In the final year of the WHO Global Action Plan for the prevention of chronic disease, it is worth reflecting on the next steps for Australia. We have a major opportunity to position ourselves as a leading global citizen in the prevention of chronic disease, both in policy and research. The development of the National Preventive Health Strategy indicates commitment from the Australian Government to long-term thinking about prevention.

Investment in prevention research, like other areas of public health research, is subject to the political culture of the time. This plays out through shifts in policy and strategic directions when governments change, along with the willingness of policymakers and political leaders to invest in areas that are ideologically challenging to the political system or the electorate. The establishment of The Australian Prevention Partnership Centre in 2013, and its refunding in 2018 for a further five years, were major commitments to prevention research. But despite the cost-effectiveness of preventing poor health and disease, prevention still occupies only 1.3% of the federal health budget.³⁶

For those of us working and researching in this space, we must continue to develop a compelling case for greater investment in effective, systems-based and equity-focused prevention, supported by a model of policy-relevant research that is co-produced and collaborative. We need to build on Australia's existing expertise and success in prevention while supporting new strategic alliances and opportunities in a radically shifting landscape. As prevention researchers, we must also

continue to promote greater cross-sectoral collaboration with all levels of government, as this will help achieve our collective aims of preventing chronic disease and promoting greater health equity.

Postscript

We drafted this commentary during a period of a profound health crisis in Australia in 2020: the extreme bushfire season followed by the COVID-19 pandemic. Both crises have major implications for the future of prevention research in Australia and globally, further expanding the notion of a syndemic.

Promoting greater inter-disciplinary and cross-sectoral collaboration in public health and prevention has never been more important for fast-moving crises like novel virus pandemics or slower-moving crises such as the syndemic of chronic disease and climate change.

It is vital that as prevention researchers we are 'ahead of the curve' and willing to work in new ways if we are to build a more efficient, equitable and sustainable prevention system in Australia.

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