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Editorial

Extreme events: how do public health systems learn and adapt?

Jean-Frédéric Levesque[a,b,c] and Mark Harris[b,c,d]

[a] Agency for Clinical Innovation, Sydney, NSW, Australia
[b] Guest Editor, *Public Health Research & Practice*, Issue 4, 2020
[c] Centre for Primary Health Care and Equity, Faculty of Medicine, UNSW Sydney, Australia
[d] Corresponding author: m.f.harris@unsw.edu.au

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Like many parts of the world, Australia has faced a series of extreme events in recent years – notable among them being bushfires and the coronavirus disease 2019 (COVID-19) pandemic. These have had and are having immediate, mid- and long-term effects which disrupt society and our health, healthcare and lives. This edition of *Public Health Research & Practice* examines some of the effects from a range of public health perspectives, and the lessons that can be learnt from these to reduce our vulnerability in future.

There are many lessons for public health outlined in this issue. Two of the papers raise issues about the interaction between human behaviour and the natural environment. Webb discusses the impact of climate change exemplified by catastrophic bushfires followed by rainfall causing an abundance of mosquitoes (and mosquito-borne viruses), which may have then been compounded by increases in people exercising outdoors during COVID-19 restrictions.[1] Merone et al. describe the public health response to a mass mortality event in bats related to an extreme heat event, which resulted in challenges caused by misinformation and well-meaning amateur bat carers.[2] Both of these papers (and of course the probable origin of Sars-CoV-2 itself) illustrate the increasing impact of humans on the natural environment and the need for a multisectoral 'one health approach' to addressing zoonotic diseases.[3]

The extreme events have had many and far-reaching impacts on health. Howard et al. describe the impact of bushfire smoke across a large region and the need to anticipate and address this in communications and individual patient care plans.[4] Killian describes the trauma and stress experienced in an isolated community during and in the wake of a catastrophic bushfire, and planning required to address this when communication systems fail.[5] Both these papers strongly emphasise the need to consider short-term impacts of catastrophes on health, as well as the longer-term and complex psychosocial impacts in public health responses.

The paper by Sutherland et al. describes the decrease in activity across most areas of healthcare during lockdown in the first phase of the COVID-19 pandemic in New South Wales (NSW).[6] This has the potential to delay both preventive health activities and early presentations with symptoms of serious illness. The disruption of cancer screening programs is explored in the paper by Feletto et al.[7] There were efforts to adapt both the methods and

targeting of these programs in response to the COVID-19 disruption. However, they required political support, flexibility, resources and clear communication. These papers highlight the very complex task of maintaining health activities that are not directly involved in the management of people with COVID-19 in times when healthcare systems risk being overwhelmed by demand, especially when healthcare settings can become places of transmission in a pandemic context.

The challenges to public health communication caused by language and poor health literacy are explored in the paper by McCaffery et al. [8] This may be an example of 'inverse care' where those with greater need are less able to respond to health education and information. Sweet et al. explore the role of public health journalism in addressing such equity issues and the need for it to be an integral part of the public health response to extreme events such as the COVID-19 pandemic.[9] The political and social dimensions of responses to extreme events cannot be underestimated.

What is the best way to learn from such events in the future? Can we develop a more adaptable health and social system? One strategy is to conduct a Royal Commission or inquiry. There have been Royal Commissions and parliamentary investigations into the bushfire response and COVID-19 outbreaks and their management in both NSW and Victoria. These are important mechanisms to ensure accountability and make recommendations to address deficiencies. However, they do not tell us how to design a better health system that can be more adaptive and responsive.

Adopting a forward-looking perspective, the paper by Clay-Williams et al. frames the health system response in terms of its ability to anticipate, monitor, respond and learn.[10] There is evidence that new ways of working are already being adopted, not only in response to the virus itself (such as contact tracing), but also in delivering care remotely using telehealth. By reflecting on various aspects of what makes a resilient system, this paper invites us to consider avenues to embed what we have learnt about resilience through extreme events as part of ongoing planning and management of healthcare and social care systems.

Ultimately, extreme events probe the gaps in many systems providing a 'stress test' for both their strengths and deficiencies. More broadly it has been suggested (by Camus, Marmot and others) that extreme events like the COVID-19 pandemic expose the fault lines in society and amplify inequalities.[11] The strengths of the public health system response include having institutions with a sufficiently large workforce trained in public health surveillance and specific expertise in managing outbreaks. Weaknesses include the fragmentation of the workforce and the limited capacity of health and human service systems especially in areas such as aged care. There have also been weaknesses in the speed with which health information is shared within the system, while the spread of public misinformation through social media has accelerated.

We need a more adaptive system that can learn from these events, adapt in real time and change to address future extreme events. Decision making needs to be sufficiently centralised or coordinated to prevent further fragmentation of responses but decentralised enough to allow adaptation to local context and needs. This decision making needs to be informed by mechanisms for learning including formal and informal structures that can integrate the experience of the health system in responding to these events with rapid analysis of research and modelling to identify how the system needs to change. In response to COVID-19, NSW Health established the Critical Intelligence Unit and Clinical Intelligence Group to advise it.[12] This has provided evidence in real time to decision makers in the immediate- and mid-term.

However there also needs to be mechanisms for longer-term learning to address the 'fault lines' in the health and human services systems which have been exposed, and the opportunities for redesign that a crisis may afford. In order to ask the right questions, the process needs to be informed by a range of perspectives from different sectors as this edition illustrates.

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Author contributions

JFL and MH jointly drafted and edited the paper. Both authors read and gave their approval to the final version of this manuscript submitted for publication.

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