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**THE IMPACT OF CLIMATE-RELATED EXTREME EVENTS ON PUBLIC  
HEALTH WORKFORCE AND INFRASTRUCTURE – HOW CAN WE BE BETTER  
PREPARED?**

## **Abstract**

It is widely accepted that the recent increase in the frequency and severity of climate-related extreme events is due to human-induced climate change and therefore is likely to increase further into the future. The increased intensity and frequency of such events can place increasing stress on an already stressed public health workforce and infrastructure. More research about increasing the resilience of the public health workforce in responding to extreme events is needed, as is recognition of the importance of public health investment in protecting the health of our populations, now and into the future.

## **Paper**

### *Introduction*

The Intergovernmental Panel on Climate Change's fifth assessment report<sup>1</sup> states with confidence that human-induced climate change is occurring and that temperatures will continue to rise, even if CO<sub>2</sub> emissions were to stop forthwith. The report also acknowledges that climate-related extreme events are increasing in frequency, severity and duration, particularly heavy rainfall events, intensification of cyclones, increases in tidal surge and fires.<sup>1</sup> This begs the question: 'are we prepared?' This is a question that public health authorities will need to face, but as health systems are increasingly stressed due to limited resources, increased demand and workforce shortages, being prepared becomes even more challenging.

Extreme events place an additional burden on health systems already under pressure due to increased demand for health care services, and as public health resources are offset against

the demands in the acute care sector.\* The impact on often already overstretched public health services may not be recognised, and additional resourcing and support may not follow.

As will be discussed later, recent Australian experiences indicate that the status quo will not be sufficient to both mount a successful public health response to climate-related extreme events and maintain a strong public health infrastructure.

### *The role of public health in disaster response*

The impact of extreme events on the health and welfare of the people affected can be minimised by the disaster response.<sup>2</sup> The public health response is integral to this disaster response, which is becoming increasingly recognised through the engagement of public health personnel in emergency response teams.<sup>3</sup> The nature of the public health response depends on the situation, but often involves responding to the impacts of disruption to the water supply, sewerage, electricity outages and shelter, management of emergency shelter and evacuation centres and waste management, undertaking surveillance and risk assessments for health impacts, and communicating with other agencies and the community.<sup>4,5</sup> These responses require working across agencies and can continue long after the event has passed.<sup>2,4</sup> While the work of other health service providers in disaster response relates to the extent of physical damage and injuries, the public health response can be stretched even when the number of injuries/cases is small, due to the need to provide public education/information, to reassure the ‘worried well’, and undertake surveillance for immediate and consequent health impacts.<sup>6</sup>

### *Responding to repeated or prolonged extreme events impacts on public health workforce and infrastructure*

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\* For the purposes of this paper, public health services refer to those health and related services that seek to prevent disease and promote health.

Depending on the size and impact of the event, the public health response to extreme events often requires considerable resources, particularly personnel. For example, in response to a large storm in the Hunter Valley, a public health emergency operations centre was instituted, a 24 hour health hotline was established, public health surveillance was enhanced, health risk assessments were undertaken, and regular proactive public communications were undertaken.<sup>4</sup> In response to the Los Angeles earthquake in 1994, public health staff from other public health centres and other programmatic areas needed to be mobilised to assist in the response.<sup>5</sup>

Repeated and/or prolonged extreme events place an additional burden on public health workforce and infrastructure. Queensland experienced sequential natural disasters in the summer of 2010/11. These were summer floods that inundated two thirds of the state followed closely by Category 5 Tropical Cyclone Yasi. To be able to effectively respond to these disasters required deployment of state and local public health staff into emergency operation centres for approximately six weeks to coordinate the public health response in the field. The capacity to respond was tested by the multiple public health risks and required additional deployment of state and local environmental health and vector control officers. Local government environmental health officers (EHOs) were similarly stretched for prolonged periods. Officers were deployed from Australian Defence Force, and other states/territories. Other Queensland Health staff and officers from other local governments were also deployed to disaster-affected areas. These events coincided with severe flooding events in two other Australian states, limiting the capacity for other jurisdictions to support the response in Queensland.

In December 2010, EHOs from the Western Australian (WA) state Environmental Health Directorate were required to assist with responding to a prolonged flooding event in

Carnarvon, which flooded the town and some Aboriginal communities, and damaged cropping farms in the region. A second wave of flooding occurred approximately four weeks later in the same community. Staff rotated through the community for approximately eight weeks, working with the local government to support local people and industry. Damage occurred to two community water reticulation systems and many individual waste-water facilities, which required assessment and reconstruction.

Also in WA, the Perth hills bushfires in February 2011 caused widespread housing and infrastructure damage requiring the state public health workforce to provide input into clean-up plans and management of hazardous materials (asbestos) and sites. Following that, the Margaret River bushfires in November 2011 caused wide spread disruption and damage, community water supplies were compromised with many plastic water delivery mains destroyed making delivery of safe water difficult and delaying return to properties. Plastic sewerage pipes and septic tanks were also destroyed, impacting on sewerage disposal and sanitation. The clean-up of damaged homes and asbestos contamination required extensive assessment and Environmental Health staff rotated through the community for four weeks.

The above four incidents occurred within a one-year period, demonstrating the potential frequency for such weather extreme events to occur within one jurisdiction and indicating the substantial burden that such events have on public health resources.

From the above it can be seen that repeated and/or prolonged extreme events may cause considerable stress on the individuals involved in the response, and could also detract from the capacity to undertake routine public health activities, such as investigating food complaints, responding to water quality incidents and infectious diseases outbreaks (that may

or may not be related to the extreme event), particularly for those officers operating at a state or regional level, as these officers may be involved in responding to different events around the region. The events that occurred in the Queensland summer of 2010/2011 impacted on staff morale and resulted in fatigue over a prolonged period of time.

### *How then might we improve?*

Globally, there is increasing emphasis on the importance of public health preparedness for extreme events as well as for public health disasters such as bioterrorism or a pandemic.<sup>2,7-9</sup> In the USA, this was supported through increased federal funding for state agencies as well as training and support from the Centers for Disease Control and Prevention.<sup>3</sup> As a result of improved planning, preparation, training and resourcing, the public health response to a major hurricane in North Carolina in 2003 was far better than the response to a hurricane in 1999.<sup>3</sup> In China, following the Severe Acute Respiratory Syndrome pandemic, considerable investment was made in the public health system's emergency preparedness through improved information systems,<sup>10</sup> and public health staff training and capacity building.<sup>11,12</sup> Increasingly it is being recognised that successful public health disaster preparedness relies on the underlying strength of the public health system,<sup>13</sup> and as such, the US government recently announced additional funding for states and territories to boost their capacity for public health response.<sup>14</sup>

Public health agencies also play an important role in assisting communities to develop adaptive strategies to increase resilience to extreme events and other climate change impacts.<sup>6</sup> While not the focus of this paper, its importance should be acknowledged.<sup>6</sup>

First responder agencies have considerable experience in developing the resilience of their staff in responding to disasters.<sup>15-17</sup> An important factor in reducing stress is to move the locus of control closer to the responders themselves and reducing the level of interference

from above.<sup>15,17</sup> Preparedness, in the form of training in multi-disciplinary teams, good organisation and joint planning facilitates responder resilience as well as the effectiveness of the response.<sup>15</sup> Appreciating staff and reducing their administrative burden are also important in reducing burnout and building resilience amongst first responders.<sup>15,17</sup>

Though much can be learned from systems in first responder agencies, it is likely that a number of the above approaches are already in place in public health agencies. However, it is the repeated and prolonged nature of the response as well as the need to continue other important health protection work unrelated to the disaster in question, which can put additional stress on public health agencies.

Effective public health disaster preparedness and response requires the application of public health systems and processes, coupled with effective command and control structures, successful agency partnerships and appropriate training, exercises and drills.<sup>3,18</sup> Capacity building requires there to be sufficient levels of trained staff, adequate infrastructure, planning, training and exercises.<sup>3</sup> As a starting point, identifying the core functions of public health and how such functions may be impacted during an emergency response is critical to managing public health workload in emergencies. One model for identifying and assessing such core functions is the US National Public Health Performance Standards program, which is based on the 10 Essential Public Health Services.<sup>18,19</sup> This has been applied in a range of different settings in the USA to assess levels of public health service provision, for example by Barron and colleagues.<sup>20</sup> This core services tool can also be applied to assess public health preparedness and response in disaster settings and to the public health response to climate change.<sup>21</sup> Beyond assessing the level of preparedness and public health service provision, the 10 Essential Public Health Services tool could also be used to identify the core services that would need to be maintained while managing the response to an extreme event

or large outbreak. This would help in decision making and priority setting, during the planning and preparedness phase, and following a response.

*Further research is essential in order to be prepared*

Further research is essential for informing future responses, as the frequency and severity of climate-related extreme events increases, especially as the investment in public health appears to be decreasing. In response to the global economic downturn, investment in public health is decreasing in Australia<sup>22</sup> and throughout Europe,<sup>23</sup> and if current funding trends continue, it will be challenging to maintain the strength of the public health system in these countries.

The nature of how we respond, how we utilise and support our public health workforce, and how we account for and manage our workload will be likely to change as we learn from our experiences, particularly in an environment of decreasing public health resources. While there is much that can be learnt from the literature about enhancing the public health response to extreme events, we can also learn a lot from recent experiences of managing the public health response to repeated and/or prolonged extreme events. Such questions as how the workforce coped with the workload and stress; what level of absenteeism ensued (both during and after the events); how the daily health protection workload was maintained during the response; the level of preparedness that was in place; and what could be streamlined to increase the efficiency and effectiveness of future responses, are important questions that need to be answered in order to increase the capacity to respond to future events.

*We need to keep investing in public health infrastructure and the research to support it.*

Public Health preparedness and response is critical to the ability to reduce vulnerability to these extreme events, as well as to respond to changing disease patterns and other impacts of



climate change. Even in a tight fiscal environment, decision makers who don't acknowledge this critical role in their resourcing decisions will do so at the community's peril.

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