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As a Monash University medical student and concerned citizen, I would like outline a range of concerns regarding the preventable nature of the public health disaster consequent to the Hazelwood Mine Fire of February 2014.

Driving through Morwell and surrounding areas shortly after the fire subsided was terrifying. The charred, devastated landscape so close to people's homes spoke clearly to the proximity of danger posed by the fire to the community. Friends and colleagues working in the Taralgon Hospital and its satellite health services spoke of an influx of scared, anxious patients suffering from an array of ailments triggered by the fire.

The important work undertaken by Voices of the Valley in documenting symptomology in community members following the fire illustrates that the assault to health and wellbeing attributable to the fire and the paucity of response are on-going.

I implore the Board of Inquiry to recognise the severity of the risk posed to the Latrobe Valley and other regions in which coal-fired power is generated.

The human toll of the Hazelwood Mine Fire must resound as stark warning against the short-sighted, poorly regulated pursuit of profit in the absence of sincere concern for the wellbeing of communities.

A preventable public health disaster

The risks to the community adjacent to the Hazelwood coal mine have been ignored since the mine's conception in 1945 (Doig, 2015). An average of 300 fires per year have occurred since this time, and consecutive sets of recommendations for mitigating this risk have not been implemented (Doig, 2015).

Despite the forecast of an acute bushfire threat near Morwell in February 2014, there was little preparation to prevent the mine fire, and inadequate effort put into fighting the fire when it occurred (ABC News, 2014; Country Fire Authority). Management of the fire was compromised by a decision not to use water resources that could have been used to flood the mine in order to maintain water supply to the adjacent coal fired power station, and prevent any interruption to its operation. (Doig, 2015)

Community members are clear in their frustration at the slowness of the Department of Health in issuing a statement regarding the threat posed by the fire. Measures of PM2.5 as high as 279.7ug/m3 were sufficiently serious to

prompt evacuation advice from independent experts on 27 February 2014 (McInerny, 2014). Yet the Chief Health Officer failed to enact evidence-based protocols regarding appropriate responses to the threat to health posed by this level of air pollution, and avoidable exposure to noxious emissions of the mine fire was prolonged (Anderson, 2014).

Given the known level of fire risk, there was a failure on behalf of both government and GDF Suez to prevent the 2014 fire. The failure of GDF Suez to adequately rehabilitate the disused mine; and the failure of successive governments to require appropriate liability bonds should disasters occur have both contributed to ongoing trauma in the communities surrounding Hazelwood. (McKenzie-Murray, 2014).

As is common in areas of open-cut coal mining, the government and industry have treated the people of Morwell and surrounding regions as residents of a 'sacrifice zone' (Cottle, 2013). The interests of the workforce, the surrounding community and environment of the open cut mine at Hazelwood have been sacrificed to allow continuation of extractive processes. Indeed the recent refusal of GDF Suez to financially compensate emergency services for their efforts in fighting the fire is a stark illustration of a lack of corporate concern for the community (Arup, 2015).

Measuring deaths associated with the fire

In light of the avoidable circumstances of the mine fire, any deaths attributable to this public health disaster can be seen as no less than tragic. The sixth term of reference of the a board of inquiry into the Hazelwood Coal Mine Fire is of importance, and will require a resource intense and theoretically sound response.

11 deaths were directly attributed to the mine fire during February and March of 2014 (Barnett, 2014). The determination of death rates beyond this period will be hampered by immense methodological challenges.

As discussed in further detail below, chronic conditions such as obstructive pulmonary disease, lung cancer and heart failure attributable to exposure to the mine fire contribute to deaths long into the future.

Defining an exposed population is difficult, as over 7000 fire-fighters came into the Morwell area over the duration of the fire, and many in the Latrobe Valley at the time were holiday makers (Arup, 2015). The propensity of ash and emissions from the coal fire to travel over great distances disperses the risk of death associated with the mine fire over a great geographical distance.

For these reasons, it is imperative that close attention is paid to other markers and measures of health and wellbeing, above and beyond the rates of deaths in affected communities.

Ongoing and future risks to health

The consequences of the combustion of coal are well established in scientific literature, and the emissions from the combustion of coal are known to affect health far from the locus of combustion (Burt, 2013). Thus the impact of air pollution from the coalmines and coal fired power plants in the Latrobe Valley is not confined to the local community, but poses a threat to the health and wellbeing of the broader regional and Victorian community. This health burden from this pollution makes it an issue of national and global significance.

Coal combustion affects at least three of the nine National Health Priority Areas: cancer control, cardiovascular health and asthma. Every aspect of the life cycle of coal, including mining, preparation and combustion, is detrimental to human health (Epstein et al., 2011).Combustion of coal produces small particulates less than 2.5μm and less than 10μm (PM2.5 and PM10) as well as carbon monoxide, methane, sulphur, nitrogen oxides and trace elements such as arsenic and mercury (Carey, 2014; Physicians for Social Responsibility, 2009).

The short and long term risks of harm to health in the Latrobe Valley are ongoing, as PM10 emissions from electricity generation have increased in the Valley by 28% during the last five years and PM2.5 (dangerous fine particle) emissions increased by 27% (Environment Justice Australia, 2014). Both the World Health Organization and the International Agency describe PM 2.5 as a class 1 carcinogen for Research on Carcinogens (Loomis et al., 2013).

The respiratory risks of exposure to these particulates include the development and exacerbation of asthma and chronic obstructive pulmonary disease (COPD), stunted lung development and lung cancer. Cardiovascular risks include ischaemic heart disease, dysrhythmias and heart failure and neurological effects include ischaemic stroke and developmental delay (Physicians for Social Responsibility, 2009). European data estimates that greater than 24 deaths per TWh are directly attributable to power generated by coal – and up to 32 deaths per TWh are attributable to lignite, or brown coal, the primary raw material of combustion in the Latrobe Valley (Doctors for the Environment Australia, 2011; Markandya & Wilkinson, 2007).

While there are limited studies of the health impacts of short term exposure to smoke from coal mine fires, much can be deduced from studies of the health impacts of bushfires which result in increased rates of cardiac arrest and exacerbations of asthma and COPD (McInerny, 2014). Other threats posed by bushfires, such as radiant heat exposure, dehydration and heat exhaustion and inhalation of toxic gases cannot be ignored in the context of mine fires. Inhalation of toxic gaseous components of smoke (carbon monoxide, cyanide gas, acids, aldehydes and oxidants) can result in local airway injury and inflammation and impair oxygenation (Demling, 2008).

Survivors of bushfires in Australia have repeatedly been demonstrated to experience higher rates of anxiety, depression and post-traumatic stress disorder (Clayer, Bookless-Pratz, & Harris, 1985; A. C. McFarlane, Clayer Jr Fau - Bookless, & Bookless). As per modelling conducted in the wake of the 2009 Victorian bushfires, the burden of emotional and psychological distress is likely to be most pronounced in vulnerable populations, and to have a particularly pronounced impact on children (Burke, 2009). The effects of these exposures on psychosocial wellbeing are longstanding (Alexander C McFarlane & Van Hooff, 2009).

Scope of response required

The Board of Inquiry acknowledges that the Morwell and the Latrobe Valley have higher rates of respiratory and cardiovascular illness than other regions in the state (Hazelwood Mine Fire Inquiry, 2014). The vulnerability of residents of the Latrobe Valley and the exposure to toxic matter as resultant to the mine fire compounds the need for expanded access the health care services in the region.

The most efficient means of addressing future threats to the health and wellbeing of both the Latrobe Valley communities and the communities across Victoria is the removal of the risk of coalmine fires. This entails the phasing out of coal-fired power generation, rehabilitation of expired mine fire areas, and at a bare minimum improvement of management and response protocols. There is a strongly held sentiment in the community that rehabilitation of the mine area should have happened long ago. Community members have also articulated a clear desire for a healthy future with clearer air and the prospect of employment security in industries that don't involve combustion of coal.

In the short term, it is imperative that communities in Morwell and the Latrobe Valley are provided with the resources to mitigate the consequences of any exposure to residual matter from the 2014 fire. Voices of the Valley have documented an unacceptable number of households still waiting for assistance in removing ash from the exterior of their homes. Ash residue must be professionally cleaned from both domestic and commercial properties; facilitated by financial assistance and access to appropriate equipment.

In the medium term, many of the health consequences of the mine fire will require rapid detection for appropriate management. To this end, the Morwell community should be supported in establishing screening and early-detection practices. There should be efforts made to increase community awareness of symptoms and signs of illness potentially associated with exposure to the mine fire, and clear pathways identified for community members to access professional assessment and support.

A lack of existing health infrastructure in the Latrobe Valley has been repeatedly identified as a concern of local residents (Hazelwood Mine Fire

Inquiry, 2014; Livingston A, 2015). In order to adequately respond to the health needs of the community now and as further consequences of the mine fire eventuate, it is of utmost importance that access to timely and appropriate health care is improved in the region. The "Health Study" to be undertaken by Monash University *must* be supplemented by clinical care; it is not enough to monitor health impacts of the mine fire without intervening in them. Any expansion in healthcare provision must be made in a sustainable manner recognisant of the chronicity of many of the likely health effects of the fire, including the potential of intergenerational trauma.

To reduce further and more severe health effects of coal-fired power Victoria must expand its renewable energy generation. Mitigation of climate change by increasing renewable energy sources will result in health co-benefits for Victorian communities, especially those in the Latrobe Valley. These health co-benefits would include reducing the burden of disease of Australia's national health priority areas, including cancer, cardiovascular health and cancer.

Climate Change and the need to transition away from coal fired power

For Australia an increase in global temperature will result in more heat-waves, which threaten vulnerable populations in our society like the young, the old and the already ill. We are already experiencing and are likely to continue to see an increase in frequency and severity of extreme weather events such as cyclones, floods, storms and bushfires which have the potential to devastate the health of communities directly as well as the health infrastructure that supports them (Intergovernmental Panel on Climate Change, 2014) .

With an increase in bushfires and extreme weather events as a result of climate change, the risk of coal mine fires also grows in Australia (Cliff, 2014).]Given the vast areas of Victoria, NSW and Qld occupied by highly flammable open cut coalmines, this is an issue of immense national significance.

The global agreement to limit warming to less than two degrees above preindustrial temperatures means coal is no longer viable or socially or environmentally acceptable as an energy source, given the catastrophic risks to human health from global warming (Hughes, 2011; Watts et al.).

Coal must be rapidly phased out a domestic energy source and an export industry for Australia, as it is in other countries.

Australia has the economic and technological tools to rapidly cut fossil fuel emissions whilst still seeing economic growth (WWF, 2015). The health co-benefits of a transition to a decarbonised economy are immense (Watts et al.).

Government intervention is required to assist in the development of new industries to replace coal and other fossil fuels, in close consultation with affected communities and alternative, low-carbon, industries. In regions such as the Latrobe Valley, which have deeply embedded historical dependencies on coal mining, it is imperative that there is support provided to facilitate the development of a new future for the Valley in which a livelihood does not come at the cost of quality of life.

Thank you for the opportunity to make this submission. Please contact me should the Board require any further information or clarification.

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