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What is your submission based on? I am making this submission based on my professional knowledge, qualifications or experience or on behalf of a group or organisation

What is your area of professional expertise? Users of data - various professional expertise and backgrounds within our group

If you are lodging your submission on behalf of a group or organisation, what is the name of the group or organisation?

Your Submission

In your experience, what areas of the bushfire emergency response worked well?

See attached document

In your experience, what areas of the bushfire emergency response didn't work well?

See attached document

In your experience, what needs to change to improve arrangements for preparation, mitigation, response and recovery coordination for national natural disaster arrangements in Australia?

See attached document

Is there anything else you would like to tell the Royal Commission?

See attached document

Do you agree to your submission being published? Yes I agree to my submission being published in my name

Supporting material provided:

RC submission FINAL.pdf

Submission to Royal Commission into National Natural Disaster Arrangements

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Introduction

We thank you for the opportunity to make this submission on Australia's preparedness for, and response to, natural disasters.

We make this submission as a group of individuals passionate about using data for social good. We see a significant opportunity for this to occur in relation to air quality as a result of bushfires and bushfire mitigation measures. Exploration of this potential is the focus of our submission. The views expressed here are ours alone and do not necessarily represent those of our employers, professional associations or any other associated bodies. This submission builds on points already made in a short article written by one of us during the height of the crisis.[1]

This submission engages with two points of the Royal Commission's terms of reference ("TOR"):

- **(b.)** Australia's arrangements for improving resilience and adapting to changing climatic conditions, what actions should be taken to mitigate the impacts of natural disasters, and whether accountability for natural disaster risk management, preparedness, resilience and recovery should be enhanced, including through a nationally consistent accountability and reporting framework and national standards;
- **(f. i.)** ways in which Australia could achieve greater national coordination and accountability — through common national standards, rule-making, reporting and data-sharing — with respect to key preparedness and resilience responsibilities, including for land management and hazard reduction measures;

The 2019-20 bushfire season was significant and devastating, but the full effects are not widely recognised, nor acknowledged in official statistics. Notably, in addition to loss of homes, wilderness areas, human and animal lives as a direct result of fire, we experienced widespread poor air quality. Poor air quality causes deaths and other detrimental health effects, but this is not recognised in the official mortality figures for the season, nor was it a clearly observable part of the management and mitigation strategies used by authorities.

[1] https://www.actuaries.digital/2020/01/15/smoke-kills-so-why-arent-we-counting-it/

We consider that this gives the nation significant room for improvement, both in terms of strategies for resilience and mitigation during a disaster (TOR item (b)) and in the use of co-ordinated, nationwide data and analysis to inform strategies, notably in relation to hazard reduction burning (TOR item (f. i.)).

Deaths are Significantly Understated, as Deaths from Smoke are Significant

It is now generally reported that there were around 30 deaths caused by the 2019-20 bushfires, though the exact figure varies by source and time period included.[2, 3] However, these statistics only seem to count the obvious and direct cases. The real mortality figure must be substantially higher as there is generally accepted evidence of air quality impacting mortality, and the bushfires dramatically worsened the air quality for a large proportion of the Australian population, for a significant period. Notably, major capital cities were repeatedly blanketed in smoke.

It was reported that Sydney experienced air pollution 11 times higher than the 'hazardous' threshold[4]. Canberra was affected even more severely.[5] An elderly woman's death in Canberra - shortly after stepping off a plane - was reportedly caused by bushfire smoke, as was a death of a young woman from asthma in Glenn Innes.[6] It seems unlikely that these were isolated cases.

There are well-established methodologies for estimating the incremental deaths arising from poor air quality, which can be rapidly applied to emerging data. Recently published research (Borchers Arriagada et al. 2020[7]) estimated 417 incremental deaths across several states from smoke during this bushfire season. To validate this, and for our own general interest, we have attempted our own independent analysis for New South Wales alone, following a similar approach to Broome et al 2016[8]. We obtained results of a similar order of magnitude – a central estimate of 156 incremental deaths for this single State from 1 November 2019 to 29 February 2020. A visual summary of our results can be seen below, which displays the central estimate of incremental deaths per 10,000 people within each of the Australian Bureau of Statistics' 'Statistical Area 2' boundaries. Visualisations are credited to Emma Vitz.

[2] https://www.dailytelegraph.com.au/bushfiresupport/fathers-son-newlyweds-21-lives-lost-to-nsws-deadly-bushfires/news-story/0ba931abc7ce3f1bac820429873b75c2

[3] https://www.theguardian.com/australia-news/2020/jan/24/bushfires-death-toll-rises-to-33-after-body-found-in-burnt-out-house-near-moruya

[4] https://www.theguardian.com/australia-news/2019/dec/10/sydneys-air-11-times-worse-than-hazardous-levels-as-australias-bushfires-rage

[5] https://www.theguardian.com/environment/2020/jan/01/canberra-experiences-worst-air-quality-on-record-as-south-coast-bushfires-rage

[6] https://www.theguardian.com/australia-news/2020/jan/17/choking-point-how-australias-bushfires-have-left-its-citizens-struggling-for-air

[7] Borchers Arriagada, N., Palmer, A.J., Bowman, D.M., Morgan, G.G., Jalaludin, B.B. and Johnston, F.H. (2020), Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia. Med. J. Aust.. doi:10.5694/mja2.50545

[8] Broome, R., Johnston, F., Horsley, J. and Morgan, G. (2016), A rapid assessment of the impact of hazard reduction burning around Sydney, May 2016. The Medical Journal of Australia. 205. 407-408. 10.5694/mja16.00895

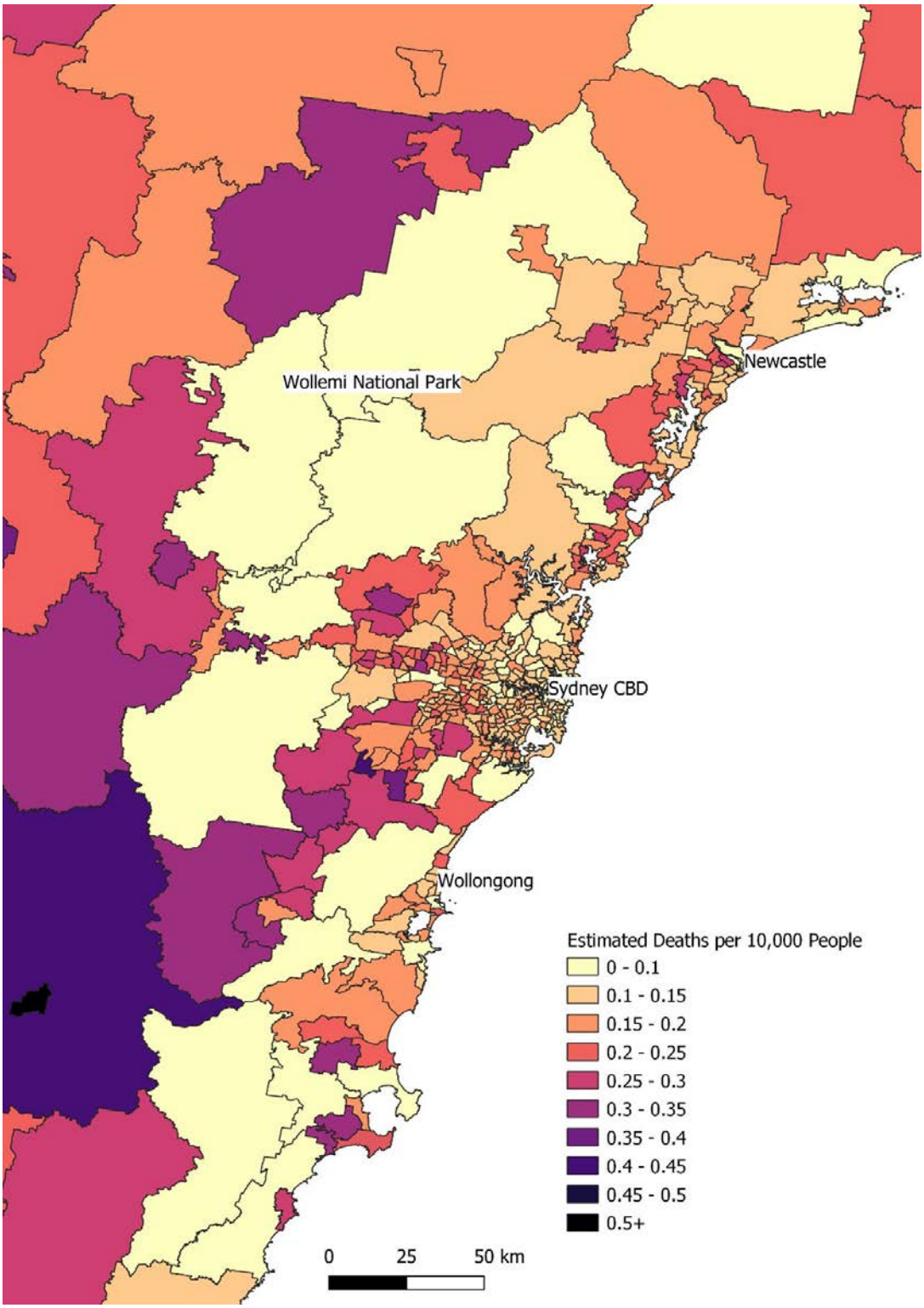

Figure 1: Estimated deaths per 10,000 people by SA2 region. Our analysis estimates that smoke from the 2019-20 bushfire season caused many deaths along the New South Wales coast.

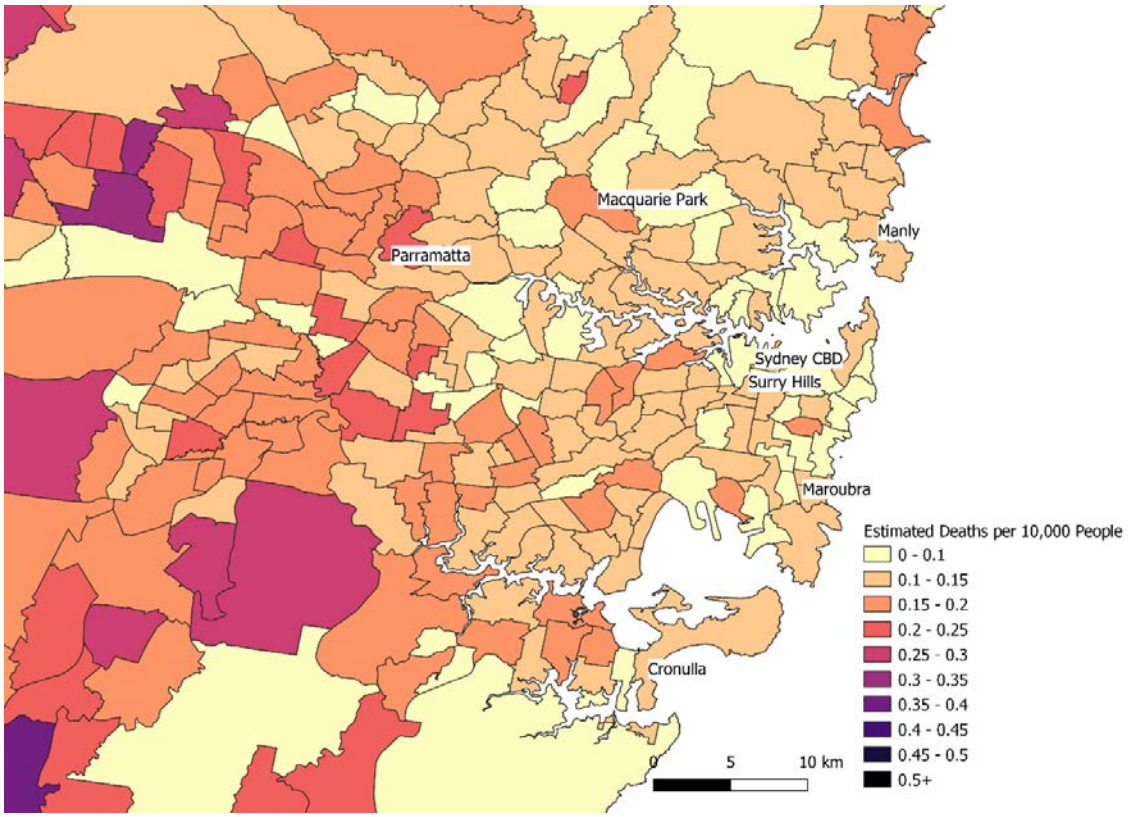

Figure 2: Estimated deaths per 10,000 people by SA2 region – Sydney focus. The estimated mortality rates in Sydney were lower than other parts of the state, but the denser populations in metropolitan areas amplifies the total number of estimated deaths.

Such estimates are inherently uncertain, and the figures for some of the regions illustrated above are further distorted by extremely small populations in some areas (notably some of the national parks), and lack of nearby air quality data. However, supported by the overall similarity of our estimates with the work of Borchers Arriagada et al., we can say with a high degree of confidence that the effect on public health from smoke was significant, and smoke likely caused many times more deaths than those directly attributable to the bushfires and captured in official statistics.

We now consider several proposals in light of this observation, for the consideration of the Commission.

Our Proposals

1. Official Mortality Statistics Should Include Estimated Smoke Deaths

Our first proposal is a simple and obvious observation from these estimates: the official mortality statistics for the bushfires should incorporate such estimates, in order that the true impact of the event is acknowledged. This respects all those who died as a result of the event, many of whom are currently unrecognised in the statistics.

We must then observe that this estimate is significantly greater than the current reported number of deaths from the bushfires. Additionally, many people in the community would've experienced serious detriments to health. This surely means that, in considering what actions should be taken to mitigate the impacts of natural disasters, in line with item (b) of the TOR, the Commission must investigate resilience measures that could mitigate the effects of smoke. Official publication of the estimated deaths is a sensible first step in encouraging such mitigation.

Whilst the analysis of Borchers Arriagada et al. 2020[9], similar studies, and our own recent analysis is retrospective, the general methodology is amenable to real-time publication of an estimate. It would be fairly trivial for a government agency to produce such an estimate using daily air quality observations, and incorporate this into ongoing statistical reporting during the event. Such real-time publication of the impact of smoke could provide a powerful signal to encourage adaptive behaviour.

2. National Standard of Air Quality for Open Air and Sporting Events, and Public Buildings

Whilst smoke is potentially deadly, the effects can often be mitigated relatively easily through adaptive behaviour during an event. Notably: staying indoors with doors and windows shut, avoiding exercise, and using air purifiers or filters. Similar advice on adaptive behaviour is published by government agencies, for example NSW Health[10]. Fundamentally, this adaptation seeks to ensure air quality is kept to a minimum standard, and that the body is not unduly stressed, for example via exercise.

Given these simple adaptive steps which could be taken, we were disappointed at the relative absence of public messaging during the event in relation to smoke, which was in stark contrast to the repeated strong messaging concerning travel to fire affected areas. We observed friends and colleagues exercising, sporting events continuing (including children's competitive sport), and open-air events proceeding without warnings or mention of smoke hazards. Those of us with children observed school classrooms with open doors, filled with smoky air, and children told to be outside during breaks – including those with chronic conditions like asthma. Undoubtedly, this failure to adapt our behaviour to poor air quality caused hospitalisations and deaths.

We believe it is inconsistent for government to recommend travel restrictions to fire affected areas in order to protect lives, but to also continue to allow such behaviour during extreme smoke conditions, when the negative health effects are known and predictable.

Hence our second proposal: a nationally coordinated standard should be constructed for open air and sporting events, giving unambiguous guidance as to the recommended standard of air quality required for the event to proceed. Similarly, schools and other public buildings should have clearly defined adaptive measures dependent on air quality readings – such-as closing of doors and windows and use of air conditioning. Compliance with these standards should be mandatory and linked to recent published data – not at the discretion

[9] Borchers Arriagada, N., Palmer, A.J., Bowman, D.M., Morgan, G.G., Jalaludin, B.B. and Johnston, F.H. (2020), Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia. Med. J. Aust.. doi:10.5694/mja2.50545

[10] https://www.health.nsw.gov.au/environment/air/Pages/aqi.aspx

of an event co-ordinator or manager. For sporting and open-air events, the setting of an appropriate threshold should have regard to health and mortality expectations of both players/participants and spectators, traded off against the economic and disruptive consequences of an event cancellation.

3. *Improvements in Air Quality Data*

One challenge we have observed in estimating the impact of smoke on health is that published data is inconsistent across the country. Generally, air quality stations are not widespread outside of major cities, and published data is not always up-to-date or may be difficult for the public to access.

Hence, our third proposal is the creation of clear, national standards of air quality data for public consumption, and the creation of additional air quality sensors across areas of regional Australia with current poor coverage. Noting the recent significant drop in sensor prices and modern automation of data capture, we expect this to come at negligible cost to the public purse. This will allow more accurate and timely data, for analysis and for general public consumption, supporting our other recommendations and good public health.

4. *Smoke Considerations Should be Included in Cost-Benefit Analysis of Fire Management Strategies*

Finally, the effects of smoke should be incorporated into any weighing of the costs of fire management strategies against their benefits. Notably, both hazard reduction burning and bushfires produce smoke, and the adverse health effects of the smoke should be considered when evaluating the efficacy of hazard reduction burns – a point made by Broome et al[11]. The evaluation of the efficacy of hazard reduction strategies must include incremental deaths (and other negative health effects) arising from smoke – both those avoided by the mitigating effects of hazard reduction burning and those created by it.

Conclusion

Smoke had a significant effect on the population during the recent fire season. On several critical dimensions, this effect was likely to be far greater than that caused by the fires directly. We encourage the Commission to seriously consider the effects of smoke when formulating its recommendations.

We thank you for the opportunity to provide input into the important work of the Commission.

[11] Broome, R., Johnston, F., Horsley, J. and Morgan, G. (2016), A rapid assessment of the impact of hazard reduction burning around Sydney, May 2016. The Medical Journal of Australia. 205. 407-408. 10.5694/mja16.00895