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Understanding the impact of lockdowns on short-term excess mortality in Australia

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ABSTRACT

During 2020 and 2021, Australia implemented relatively stringent government restrictions yet had few COVID-19 deaths. This provides an opportunity to understand the effects of lockdowns and quarantining restrictions on short-term mortality and to help provide evidence in understanding how such public health policies can impact on health. Our analysis is based on preliminary mortality data collected by the Australian Bureau of Statistics. Rates were estimated by disease and over time and compared with mortality statistics in the period 2015–2019. Comparing deaths in 2020-2021 with 2015–2019 show the annual mortality rate (per 100 000 people) fell by 5.9% from 528.4 in 2015–2019 to 497.0 in 2020–2021. Declines in mortality are across many disease categories including respiratory diseases (down 9.4 deaths per 100 000), cancer (down 7.5 deaths per 100 000) and heart disease (down 8.4 deaths per 100 000). During 2020 and 2021, Australian age-standardised mortality rates fell by 6%. This drop was similar for men and women, and was driven by a reduction in both communicable and non-communicable causes of death. Such evidence can help inform public health policies designed to both control COVID-19 and other infectious diseases.

SUMMARY BOX

- ⇒ Analysis of short-term excess mortality suggests that lockdowns are not associated with large numbers of deaths in Australia.
- ⇒ This decline in short-term mortality was due to declines in both communicable and non-communicable causes of death.
- ⇒ Google mobility data indicates that the drop in deaths tracked reductions in movement outside the home.
- ⇒ Virtual working and other online activities may be a means to reduce mortality from both communicable and non-communicable causes of death.

INTRODUCTION

A recent commentary[1] in this journal has highlighted the ongoing debate about the overall impact of 'lockdowns' which they define as a restrictive set of non-pharmaceutical interventions aimed at preventing spread of COVID-19. An important element of this debate is the impact of these measures on overall mortality. While lockdowns have proved effective in reducing transmission[2] and deaths from COVID-19[3] some have argued it comes at a high cost. For example, signatories of the Great Barrington Declaration[4] argued that 'Current lockdown policies are producing devastating effects on short and long-term public health… [including]… worsening cardiovascular disease outcomes, fewer cancer screenings and deteriorating mental health'. The Declaration called on governments to end stay-at-home orders, and focus on building herd immunity in the broader population.

One of the countries that is highlighted in the commentary[1] is Australia, which had lockdowns without experiencing large numbers of COVID-19 cases and deaths in the first 2 years of the pandemic (this changed in 2022, after lockdowns were lifted). By the end of 2021, Australia had fewer than 100 COVID-19 deaths per million people, less than one-sixth of the worldwide death rate.[5] Yet while Australia's COVID-19 death rate was relatively low during that period, its movement restrictions were relatively stringent. Across 34 advanced nations, Australia had the seventh-most stringent lockdown in 2020 and 2021 (see online supplemental appendix 1). In those years, Australia is unusual in having both a low death rate from COVID-19 and stringent lockdowns.

While previous international comparisons noted Australia 'did not have large numbers of excess deaths',[6] the country has not been included in many previous international comparisons due to incomplete data. To address this gap, we explore excess deaths in Australia using recently released mortality data collected by the Australian Bureau of Statistics. This allows us to understand both disease and temporal patterns, which provide insights into short-term impacts of lockdowns on mortality.

Our analysis is based on provisional mortality data collected by the Australian Bureau of Statistics. For all-cause mortality, these data cover the full universe of deaths. For cause-specific mortality, the data cover only doctor-certified deaths (excluding the 11%–14% of deaths that are certified by a coroner).[7] Full details of our data are provided in online supplemental appendix 2. Our analysis compares deaths in 2020-2021 with deaths in the period 2015–2019 using age-standardised death rates. Following the Australian Bureau of Statistics, we refer to this as 'excess mortality', but it is important to acknowledge that it represents only a simple comparison of two time periods. In this sense, our measure of excess mortality differs from the WHO's measure of excess deaths, which also takes into account factors such as the average ambient temperature. As well as looking at the entire period, we also study mortality rates by week, enabling us to analyse the relationship between mortality and population mobility.

To better understand the fall in mortality, it is instructive to look at how it tracks government lockdowns and population movements. For this purpose, we use one indicator of the impact of lockdowns, Google Community Mobility reports,[8] which show daily mobility trends in six categories of places: grocery and pharmacy, parks, transit stations, retail and recreation, residential, and workplaces. For each category, these figures are expressed as a deviation from the baseline in early-2020, and account for day-of-week effects. More detail about these data are provided in online supplemental appendix 2.

MORTALITY TRENDS

Table 1 shows that the annual age-standardised mortality rate (per 100 000 people) fell from 528.4 in 2015–2019 to 497.0 in 2020–2021. This represents a 5.9% fall in the mortality rate. This figure is similar for males and females (for an explanation of why the percentage change for persons is slightly smaller than the figure for either males or females, see online supplemental appendix 2). Looking at causes of death, we find declines in mortality across the board. In absolute terms, the mortality drop is largest for respiratory diseases (down 9.4 deaths per 100 000), cancer (down 7.5 deaths per 100 000) and heart disease (down 8.4 deaths per 100 000). In proportional terms, the mortality drop is largest for respiratory diseases (down 20.5%) and the respiratory disease subcategory of influenza and pneumonia (down 41.8%).

Strikingly, while Australia experienced an average of around 600 influenza deaths each year in 2015–2019, influenza claimed fewer than 50 lives in 2020. In 2021, fewer than five Australian deaths were recorded from influenza (see online supplemental appendix 2 for details).

In figure 1, we analyse the seasonal nature of these effects, plotting weekly deaths across the year. During 2015–2019, the weekly death rate shows a marked seasonal effect, rising from around 9.5 deaths per 100 000 in summer to around 11.5 deaths per 100 000 in winter. By contrast, the years 2020–2021 saw less seasonality in Australian deaths, with the weekly mortality rate averaging around 9 deaths per 100 000 in summer and 10 deaths per 100 000 in winter.

Figure 2 shows the six mobility trends indicators, with a horizontal line depicting the baseline. As these data show, the COVID-19 pandemic significantly reduced visits to retail and recreation, parks, transit stations and workplaces, and substantially increased the amount of time spent in residences. The decreased time in public places and workplaces coincided with the two lockdown periods: April–May 2020 (when all Australians were

Table 1 Australia's 2020–2021 mortality reduction

	Age-standardised deaths per 100 000 people			
	2015–2019	2020–2021	Change	Change (%)
Persons	528.4	497.0	–31.4	–5.9
Males	625.8	587.8	–38.1	–6.1
Females	443.0	416.5	–26.4	–6.0
Respiratory diseases	45.7	36.3	–9.4	–20.5
Influenza and pneumonia	10.1	5.9	–4.2	–41.8
Chronic lower respiratory conditions	25.0	20.5	–4.4	–17.7
Cancer	155.5	148.0	–7.5	–4.8
Ischaemic heart diseases	47.1	38.8	–8.4	–17.7
Cerebrovascular diseases	30.6	25.7	–4.9	–15.9
Dementia	40.8	40.9	0.1	0.3
Diabetes	14.5	14.5	0.0	–0.1

Source: Authors' analysis, based on Australian Bureau of Statistics, Provisional Mortality Statistics. Cause-specific mortality is based only on doctor-certified deaths.

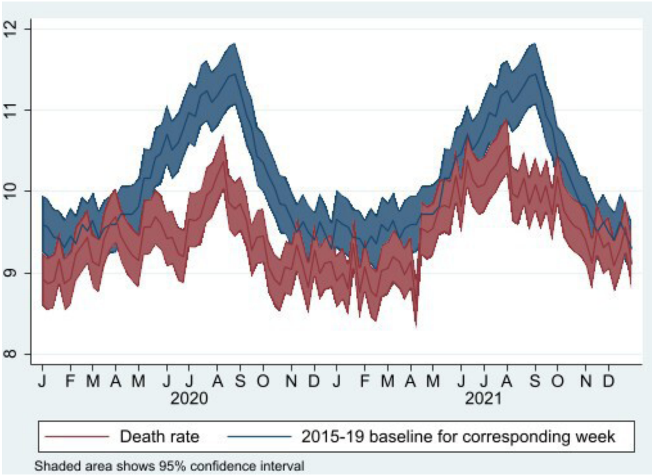

Figure 1 Australia's weekly death rate per 100 000 (age-standardised).

under lockdown) and August–September 2021 (when two-thirds of Australians were under lockdown). Visits to grocery stores and pharmacies show a slightly different pattern: spiking as Australians stocked up at the start of lockdowns, and steadily rising over the 2 years (perhaps reflecting increased demand for medicines).

Alongside these mobility indicators, we show the share of the Australian population under lockdown. We also show how age-adjusted mortality compared with previous years. To do this, we take the age-adjusted death rate for each week in 2020 and 2021, and estimate the ratio of that mortality rate to the mortality rate for the corresponding week in the period 2015 –2019. Thus, a ratio of 1.1 indicates that the death rate was 10% higher than in prior years, while a ratio of 0.9 indicates that the death rate was 10% lower than the historical average. This chart shows that the death rate fell sharply as social distancing increased. By mid-2020, the death rate was around 10% below its historical average. The death rate then returned close to its historical average in late-2020, before dropping (that is, improving) in late-2021, a period in which Australia's largest two states were under lockdown.

How does mobility track mortality? In figure 3, we present scatterplots of the mobility levels (relative to baseline) against the death rate (relative to prior years). Each dot denotes the figures for a single week. These data show that higher rates of activity in retail and recreation, grocery and pharmacy, transit stations, and workplaces were associated with higher mortality rates, while greater levels of activity in parks and more time spent in residences were associated with lower levels of mortality.

The simple bivariate regressions are significant at the 1% level for retail and recreation, grocery and pharmacy, transit stations, workplaces and residences. The association between time spent in parks and mortality is statistically insignificant. Finally, we show the relationship between mortality and the share of the population under official lockdown. Consistent with the mobility data, this relationship is negative and statistically significant at the 3% significance level.

EXPLAINING THE MORTALITY DECLINE

Australia was among a small number of countries that saw a decline in overall age-standardised mortality during 2020–2021. This decline in mortality was due to declines in both communicable and non-communicable causes of death. Using Google mobility data, we provide suggestive

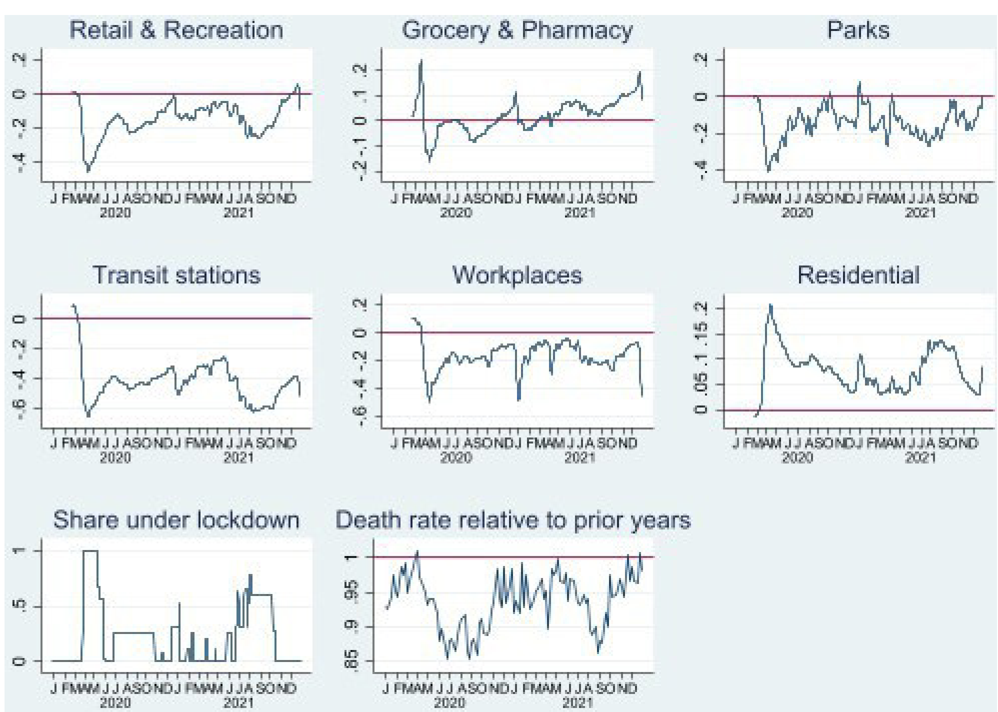

Figure 2 Trends in mobility, lockdowns and mortality.

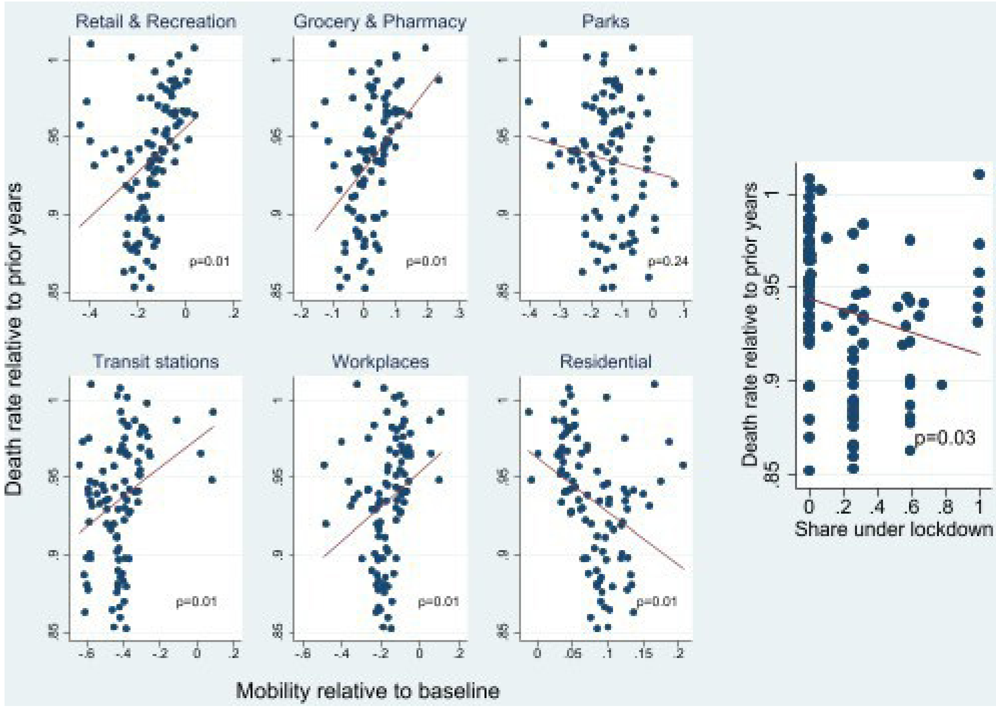

Figure 3 Mobility trends and mortality (each dot depicts a single week).

evidence that the drop in deaths tracked reductions in movement outside the home. In the short term, government lockdowns and social distancing appear to have significantly reduced overall mortality at least in the short term, which may help shape future public policy.

While the reduction in mortality from infectious diseases can explained by social distancing measures, the reduction in deaths from non-communicable conditions such as cancer and heart disease are more surprising. In the case of cardiovascular disease (which contributes to around one third of the reduction in deaths), possible explanations could be people spending greater time indoors over winter months (which are traditionally known to have high excess deaths),[9] faster access to emergency services,[10] lower pollution[11] and a reduction in cardiovascular events following influenza.[12]

Explanations for the reductions in cancer deaths are more difficult to identify and might be due to potential limitations in the coding of deaths for people with multimorbidities.[13] A recent analysis indicates that unlike other countries COVID-19 did not impact on provision of many healthcare services. For example, a recent analysis has indicated that COVID-19 pandemic did not disrupt cancer care in Australia.[14] It is possible that reductions in influenza may also have played a role, given evidence that influenza mortality rates are higher among cancer patients than the general population.[15]

It will be important to continue track mortality in countries such as Australia to see if there are long-run mortality impacts of lockdowns, for example, from the disruption of breast cancer screening services[16] or declining levels of physical exercise[17] both of which may lead to an increase in mortality rates over the longer term.

Although our analysis of overall deaths includes coroner-reported deaths, our cause-specific mortality figures are based only on doctor-certified deaths, excluding coroner-reported deaths and so exclude deaths from suicides, accidents and assaults (see online supplemental appendix 2). A recent international analysis of suicides in the early stages of the pandemic (which included data from Australia) has shown that rates 'remained largely unchanged or declined in the early months of the pandemic'.[18] Future research should look separately at suicides and homicides when full data become available.

It should also be noted that excess deaths can be calculated using a variety of different methodologies which can produce some variation in results, although consistently 2020 is a year of below average mortality for many diseases.[19] Further, the Australian Bureau of Statistics is not the only source of data on deaths. The World Mortality Dataset[20] is a valuable resource used by numerous international organisations to compare excess deaths across countries that could be used in future analyses.

Another caveat is that we are considering only the impact on mortality and do not capture the impact on morbidity from poor mental health or from family, domestic and sexual violence.[21] For example, a recent Australian study using a quasi-experimental design has shown that lockdowns were 'associated with a modest negative change in overall population mental health'.[22] Quality-adjusted life-years could be a useful broader metric, capturing both the negative and positive health impacts of home working and virtual interactions in a single measure. This could provide the basis of an evaluative framework of COVID-19 pandemic response policies.[23] Additional impacts of lockdowns such as disruption to economic activity and schooling also need to be considered.

Beyond the pandemic, it is also worth considering whether a move to virtual working and other online activities may be a means to reduce mortality from a range of diseases such as respiratory infections during the winter months. One must also weigh against the potential benefits in mortality, the impact on other aspects of health such as general well-being from social interaction. While large-scale randomised studies[24] have shown that home working can increase productivity, the potential for it as a health intervention in randomised studies has received less attention.[25] Given the mortality benefits observed here at a population level, it would worth exploring if the health and social impacts of home working and virtual activities could be evaluated using large-scale randomised trials.

CONCLUSION

Our results do provide some evidence that, at least in terms of short-run mortality, some of the concerns that led to the Great Barrington Declaration have not eventuated. Comparisons of deaths in 2020-2021 with 2015–2019 shows a drop in the annual mortality rate across many disease categories including respiratory diseases, cancer and heart disease. Hence, social distancing measures in Australia may have averted thousands of non-COVID deaths during the first phase of the pandemic. Understanding how patterns of mortality are impacted by public health interventions such as lockdowns can help provide a better evidence base for dealing with infectious diseases such as COVID-19, which is likely to remain endemic for the foreseeable future.

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