Actuaries Institute

Research Note 2

There has been a lot of discussion about COVID-19 deaths in Australia, and a lot of speculation about deaths from other causes – but what do the statistics show?

Total deaths in Australia – what do they look like for 2020?

Karen Cutter, Jennifer Lang and Richard Lyon

September 2020

Research Note

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About the authors

This research note has been written by Karen Cutter, Jennifer Lang and Richard Lyon.

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Karen worked as a consulting actuary in the general insurance field for 25 years before taking a career break a few years ago. Finding herself at a loose end during lockdown in March, she developed an interest in COVID-related matters. Karen has authored a number of professional papers and has served on the GIPC and other Institute committees.

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Jennifer is a non-executive director and actuary. With more than 25 years of corporate and consulting financial services experience, she is an advocate for the insights actuaries can add to a wide variety of issues. She is Convenor of the Actuaries Institute's COVID-19 Working Group and a member of the Actuaries Institute's working group on Climate Change. In her spare time she writes her popular actuarial blog *actuarialeye*.

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Richard is an actuary at TAL, where his role now includes advising the company on the impact of COVID-19. He is a co-author and co-editor of the Actuaries Institute's textbook *Understanding Actuarial Management: the actuarial control cycle* and is a former member of the Institute's Council. He has also served on several Institute committees, working groups and taskforces.

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Total deaths in Australia – what do they look like for 2020?

There has been a lot of discussion about COVID-19 deaths in Australia, and a lot of speculation about deaths from other causes. What do the statistics show?

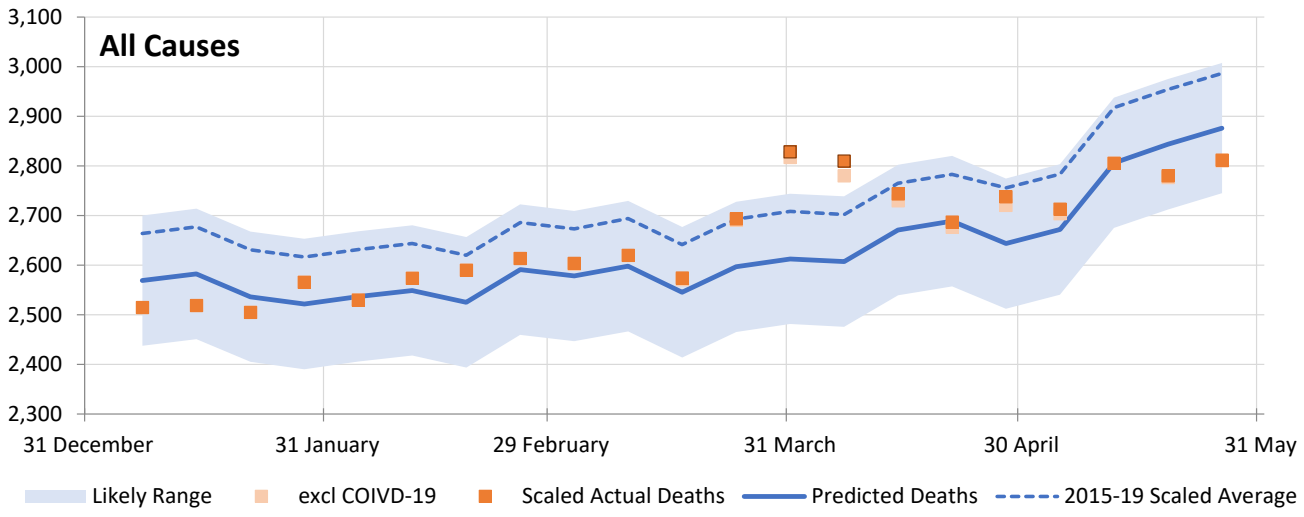
Adjusting for population changes and late-reported 2020 deaths, we can see that Doctor-certified deaths (around 88% of total deaths) have generally been reasonably close to trend in the first 21 weeks of this year, with the clear exception of late March / early April.

- Data from NSW indicates almost zero prevalence of influenza since early April. In that time, deaths from respiratory disease have been lower than expected in Australia. We expect that the number of deaths over winter 2020 will be lower than prior years, both where respiratory illness is the primary cause of death and where it is a significant contributing factor.

For Coroner-referred deaths where data is available:

- There is some evidence of fewer deaths from traffic accidents as result of the lockdowns, although the numbers involved are small.

Weekly scaled actual and predicted Doctor-certified deaths – 2020



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting

Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

- While we cannot be definitive, we expect that more people probably died because of COVID-19 during the first wave of cases (in March and April) than was reported at the time. This is likely to be because those people were not tested for COVID-19, so the cause of their illnesses was not known at the time.

- Some of these extra deaths were probably reported as pneumonia, diabetes and possibly stroke, as deaths from these causes were higher than expected during that period and all of these causes of death are related to COVID-19 in some way.

- Deaths from dementia were also high during that period. We wonder whether some of these are also undetected COVID-19 deaths, although we also suspect that our simple adjustments might not model expected dementia deaths as well as other causes.

- Deaths from suicide in Victoria so far this year (to late August) appear to be similar to those in previous years. This is welcome news, particularly as Victoria experienced a more stringent lockdown than the rest of Australia during the first wave and has been the only state subject to a lockdown during the second wave.

Overall, apart from the spike in the early lockdown period and the expectation of a benign flu season, we have found no evidence that deaths in 2020 are significantly higher or lower than would be expected in a normal year. We note, however, that lockdowns may have caused people to avoid seeking medical attention or from attending their regular medical checks, and this might lead to future ill health or higher mortality. Any impacts are unlikely to be observed in the data so far. This is a possible longer-term effect that we may see in the next year or two.

What data is out there?

The main source of death statistics in the public domain in relation to 2020 is the ABS release *3303.0.55.004 Provisional Mortality Statistics, Australia, Jan-May 2020*, showing the numbers of deaths in Australia for each week in 2020 compared with prior years (the 'ABS May data'). However this data is based solely on Doctor-certified deaths, so does not include any deaths that have been referred to a Coroner (e.g. suicides, transport and other accidents, assaults, medical complications, other unexpected deaths where the cause of death is unknown). The following table shows the number of Doctor-certified versus Coroner-referred deaths for 2015 to 2018.

The ABS data on Doctor-certified deaths is not complete as it excludes Coroner-referred deaths, i.e. those not immediately attributable to natural causes.

Table 1: Doctor-certified versus Coroner-referred deaths for 2015-2018

Deaths categories	Year				Average	Proportion
	2015	2016	2017	2018		
Doctor-certified Deaths[1]						
Cancers	44,800	45,200	46,000	46,700	45,700	29%
Ischaemic heart diseases	15,900	15,700	15,500	14,400	15,400	10%
Dementia including Alzheimers	12,300	13,000	13,900	13,800	13,300	8%
Cerebrovascular diseases	10,200	10,000	9,900	9,500	9,900	6%
Diabetes	4,300	4,400	4,600	4,400	4,400	3%
Chronic lower respiratory conditions	7,400	7,600	8,000	7,4t00	7,600	5%
Influenza and pneumonia	2,800	3,100	4,100	2,900	3,200	2%
All other	39,500	40,400	42,200	40,500	40,700	26%
Total	**137,300**	**139,400**	**144,100**	**139,700**	**140,100**	**88%**
Coroner-referred Deaths						
Specified diseases noted above	7,500	5,900	3,900	5,300	5,700	4%
Other diseases	3,600	2,500	2,200	2,700	2,800	2%
External causes						
Accidents (falls, poisonings, drownings)	5,400	5,700	5,600	5,800	5,600	4%
Transport accidents	1,400	1,500	1,400	1,300	1,400	1%
Suicide	3,100	2,900	3,100	3,000	3,000	2%
Assault	280	250	180	230	240	0.2%
Medical complications	170	170	110	50	130	0.1%
Other external causes	300	260	360	350	320	0.2%
Total	**21,800**	**19,100**	**16,800**	**18,800**	**19,100**	**12%**
% of all deaths	**14%**	**12%**	**10%**	**12%**	**12%**	
All Deaths[2]	**159,100**	**158,500**	**160,900**	**158,500**	**159,300**	**100%**

[1] based on date of occurrence of death
[2] based on date of registration of death

Note that the ABS doesn't report Coroner-referred deaths, so we have deduced them as the difference between total deaths and Doctor-certified deaths. This is not strictly correct, because Doctor-certified deaths are compiled based on the date the death occurred, and total deaths are based on the date the death was registered. However, 95% of Doctor-certified deaths are registered within three months of occurrence, and almost all Doctor-certified deaths are registered within five months of death, so we don't expect it will make much difference.

Table 1 shows that the ABS May data is probably missing around 10% to 14% of all deaths (around 19,000 deaths per annum).

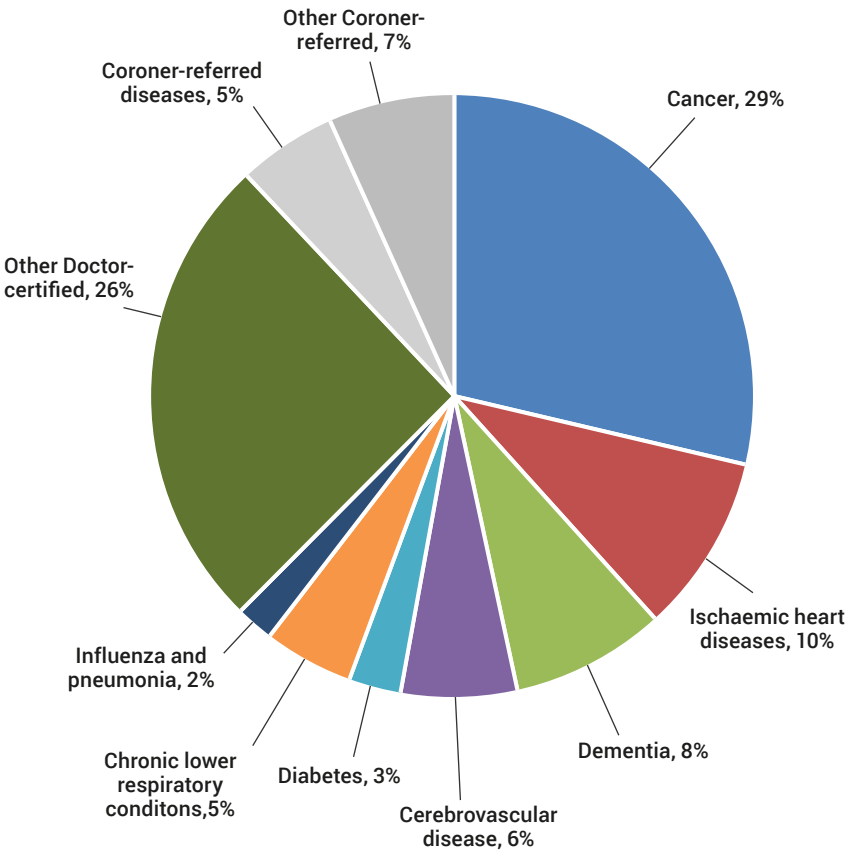
For the specified diseases included in the ABS May data, the following table shows the proportion of total deaths that Doctor-certified deaths represent.

Almost all cancer and dementia deaths are included in the ABS May data. Around 95% of deaths from other specified diseases are included except for ischaemic heart disease (heart attack, coronary heart disease) where around 82% of deaths are included. This is not surprising given the unexpected nature of many deaths from heart disease and hence their referral to the coroner.

Table 2: Doctor-Certified deaths percentage

Doctor-Certified Deaths	Proportion of Total Deaths per Year				
	2015	2016	2017	2018	Average
Cancers	97%	99%	100%	99%	99%
Ischaemic heart diseases	80%	82%	83%	82%	82%
Dementia including Alzheimers	97%	99%	101%	99%	99%
Cerebrovascular diseases	94%	95%	97%	96%	95%
Diabetes	92%	93%	96%	93%	94%
Chronic lower respiratory conditions	93%	94%	96%	94%	94%
Influenza and pneumonia	92%	92%	95%	94%	93%
All other	92%	94%	95%	94%	94%
Total	**86%**	**88%**	**90%**	**88%**	**88%**

Causes of Death in Australia 2015-2018



The approximately 19,000 deaths referred to the Coroner in any one year include around 5,000 deaths from the specified diseases included in the ABS May data, plus around another 2,500 deaths from other diseases, i.e. they are resolved as deaths from natural causes. The remaining 11,000 or so Coroner-referred deaths are from 'external causes'. In a small portion, the cause of death remains unknown even after the coroners' investigations are completed.

Data is available on road deaths, which form the majority of transport accident referred deaths, accounting for around 1,200 deaths per year (source: *Road deaths Australia – July 2020*, Bureau of Infrastructure and Transport Research Economics (BITRE)).

The Victorian Coroner has also recently released suicide statistics for that state (source: *Coroners Court Monthly Suicide Data Report, Report 1 – 27 August 2020*, Coroners Court of Victoria). Each year, Victorian suicides account for around 720 deaths, out of a total of around 3,000 in Australia.

So there remains a gap of perhaps 17,000 deaths in 2020, or just over 10%, (based on previous years) for which there is currently no publicly available information.

Doctor-certified Deaths

The following Table 3 shows the weekly Doctor-certified deaths for each year 2015 to 2020. To examine underlying trends in the data, we have adjusted deaths from prior years to allow for both population growth and the ageing of the population. Also, the ABS May data is provisional and subject to change, with recent weeks expected to increase as more deaths are registered; allowance has been made for this delayed reporting. These adjustments are shown in the following tables along with the total number of adjusted deaths in each year and the adjusted deaths to 26 May of each year.

Table 3: Doctor-Certified deaths 2015-2020

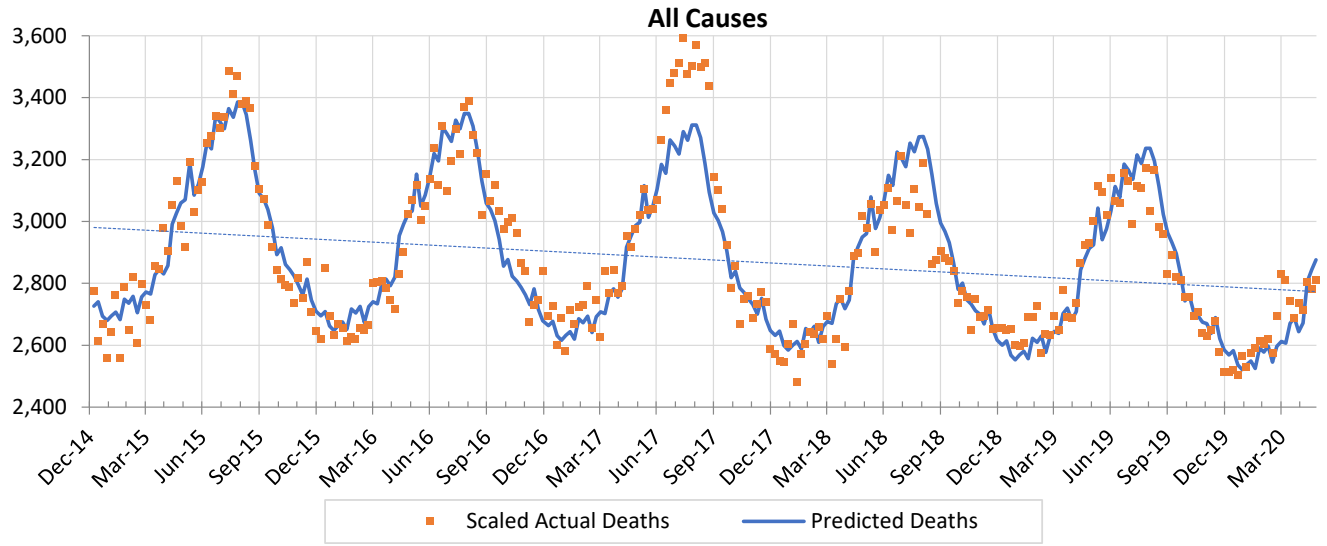
Year	Doctor-Certified Deaths	Population (m)	Population Adjusted Deaths	Age Mix Adjustment	Age Mix Adjusted Deaths	Delayed Reporting Allowance	Total Adjusted Deaths	Adjusted Deaths to 26 May
2015	137,278	23.6	148,206	1.041	154,219	0	154,219	58,396
2016	139,397	24.0	148,333	1.033	153,258	0	153,258	57,351
2017	144,104	24.4	150,795	1.025	154,571	0	154,571	57,787
2018	139,676	24.8	143,898	1.017	146,345	0	146,345	55,921
2019	144,008	25.2	146,009	1.008	147,245	0	147,245	56,663
2020	55,047	25.5	55,047	1.000	55,047	764	55,811	55,811

We have predicted Doctor-certified deaths in 2020 by fitting multivariate linear regression models to the 2015 to 2019 weekly deaths (after adjustments) for each cause of death. The explanatory variables are year and month, and the death data has been normalised to allow for the shape and heteroskedasticity of the weekly deaths. We have also derived 5th and 95th percentiles around these predicted numbers, to indicate the range of reasonable variation. One week in 20 is expected to show deaths above this range and one week in 20 should be below the range.

While unadjusted deaths are rising (as shown in the Doctor-certified deaths column above), after adjusting for population and age mix, we can see a trend of mortality improvement since 2015. This is consistent with our expectations and general experience and is demonstrated in this chart:

Week ending	Registered Deaths	Late Reporting Allowance	Percent Loading	Adopted Deaths
Prior	33,610	115	0%	33,725
7-Apr-20	2,778	31	1%	2,809
14-Apr-20	2,713	30	1%	2,743
21-Apr-20	2,646	40	2%	2,686
28-Apr-20	2,678	59	2%	2,737
5-May-20	2,632	81	3%	2,713
12-May-20	2,723	82	3%	2,805
19-May-20	2,642	138	5%	2,780
26-May-20	2,625	187	7%	2,812
Total	**55,047**	**764**	**1%**	**55,811**

Weekly scaled actual and predicted Doctor-certified death 2015-2020



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting

Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

Focusing on 2020, we can see that, up to the end of May, Australia has had fewer Doctor-certified deaths than 2015-2019, scaled for population and age changes. This reflects the overall decreasing trend in mortality in Australia.

The graph below shows the weekly Doctor-certified deaths for:

1. 2020, taken from the ABS May data

2. 2020 excluding reported COVID-19 deaths. Doctor-certified COVID-19 deaths are included in the ABS May data although they are not shown separately. We have sourced COVID-19 deaths from https://www.covid19data.com.au/ and have assumed that all such deaths are Doctor-certified.

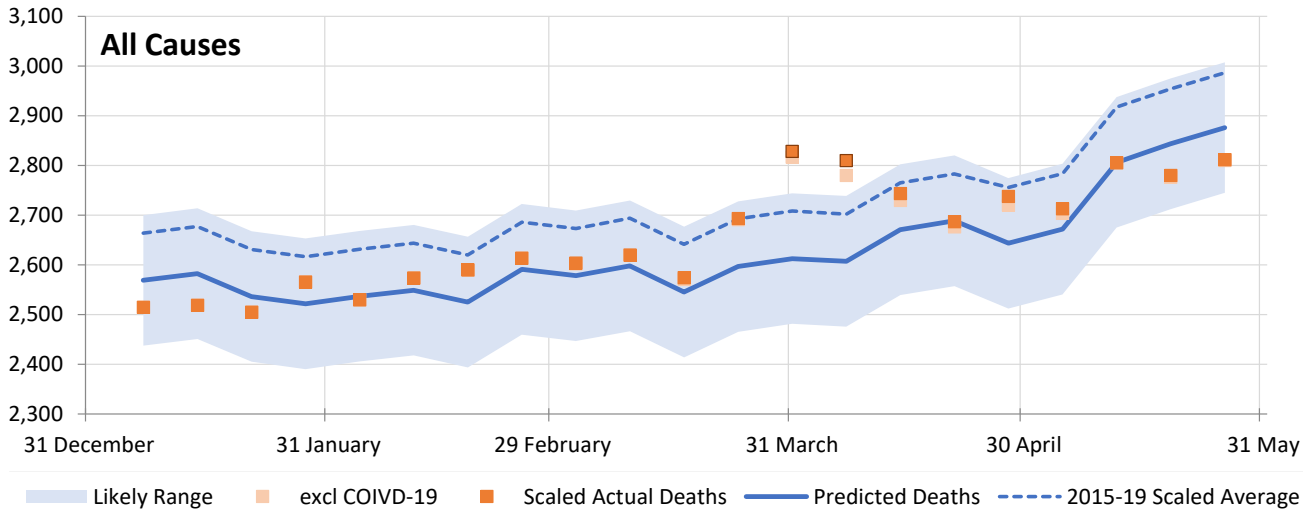
3. The average of 2015 to 2019, after the adjustments noted above.

- the second week of April was also higher than expected (by around 75 deaths) and similar to the 2015-19 average.

These four weeks coincide with the first peak of infections and deaths from COVID-19 in Australia. However, official COVID-19 death statistics only record 56 deaths in those four weeks and clearly do not explain the higher than predicted numbers of deaths.

Has the pandemic, or public health measures to deal with the pandemic, indirectly caused other deaths, because people are unable or unwilling to visit hospital for other illnesses? If the extra deaths in the four weeks from mid-March to mid-April were indirectly caused by public health measures such as lockdowns causing increased deaths, we believe that deaths would have remained above predicted levels during late April and May. Lockdowns in the two most populous states were not lifted until mid-May, and deaths had substantially fallen by then. As such, we conclude that the peak of deaths in mid-March to mid-April was probably not due to indirect deaths as a result of the pandemic, although this is a possible longer-term effect that may emerge in the next year or two.

Weekly scaled actual and predicted Doctor-certified deaths 2020



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting

Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

Our model allows for the improving mortality trend and predicts that deaths in 2020 would be lower than the 2015-19 average. Actual deaths this year have been broadly as expected based on this model, except for the period from mid-March until mid-April:

- the week ending 24 March was considerably higher than predicted (by around 100 deaths) and equal to the 2015-2019 average

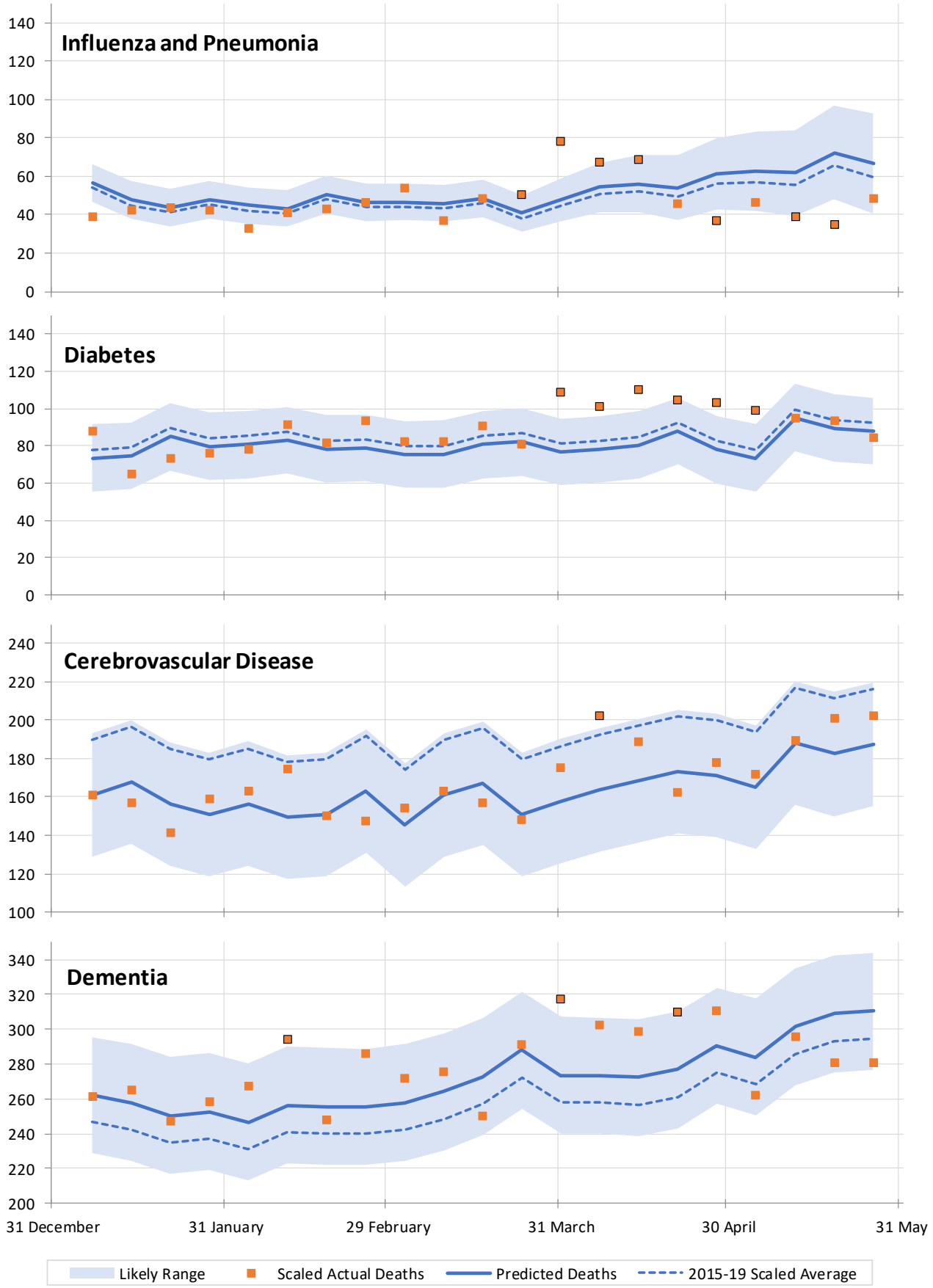
- the last week of March and first week of April each had much higher deaths than predicted and well above the 95th percentile. Each of these weeks had around 200 more deaths than predicted, and around 75 more deaths than the 95th percentile

So, what did cause the March/April peak in non-COVID-19 deaths? Have official statistics excluded some people who had COVID-19 but did not test positive (noting that testing was limited in Feb-April and only available to those who had travelled overseas or were a close contact of an existing case)? An examination of deaths by cause of death can help us answer this question.

The following series of graphs show the same information as above, but for each of the causes of death included in the ABS May data, plus 'all other'.

Potential Extra COVID-19 Deaths

Weekly scaled actual and predicted Doctor-certified deaths – 2020



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting
Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

The statistically significant spike in deaths in late-March / early-April 2020 is reflected in four causes of death, as shown in the previous charts.

Deaths from influenza and pneumonia were within a reasonable range of predicted numbers up to the week ending 17 March. For the next four weeks, deaths were significantly higher than predicted, being at or above the 95th percentile. It seems highly likely that these are pneumonia rather than flu. We understand that COVID-19 often presents as similar to pneumonia, so perhaps some 'pneumonia' deaths were undetected COVID-19 deaths? Since mid-April, deaths from these causes have been lower than predicted, most likely as a result of very little prevalence of flu – in turn, due to measures taken to reduce the spread of COVID-19.

Diabetes deaths were similar to predicted numbers up to 24 March. Over the next six weeks, deaths from diabetes were significantly higher than predicted, being generally above the 95th percentile. Diabetes is a known comorbidity of COVID-19.

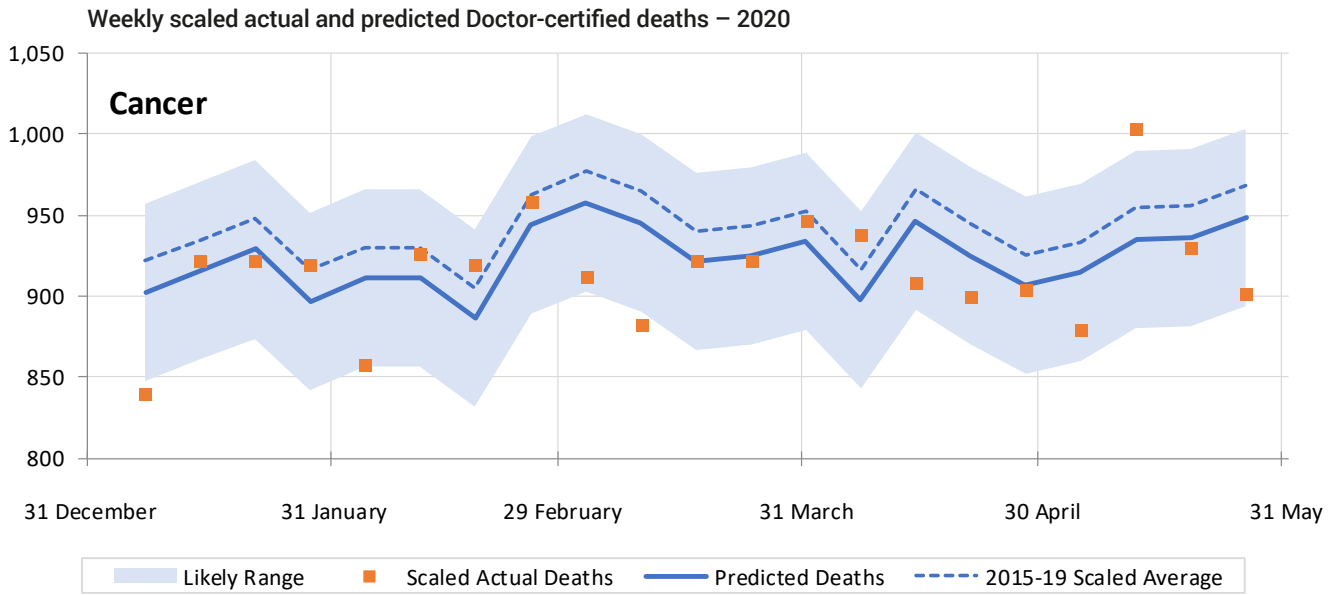
Deaths from cerebrovascular disease (mainly strokes and brain haemorrhage) have generally been reasonably close to predicted numbers. The exception is the three-week period from 31 March to 14 April, where deaths from this cause were higher than predicted, and above the 95th percentile for the week ending 7 April. Information from Monash University indicates that brain scans for stroke fell quite dramatically in the week ending 31 March (down by around one third). This may indicate people were not presenting to hospital with stroke as early as they normally would, possibly due to fears of visiting healthcare settings. For a disease where time is of the essence, this may be a contributor to the much higher number of stroke deaths than usual over this three-week period. We also note that stroke is a known complication of COVID-19.

Deaths from dementia were within a reasonable range of predicted numbers up to 24 March and were then close to or above the 95th percentile for the next four weeks. This was when first-wave COVID-19 infections and deaths were peaking (noting that dementia primarily affects the elderly who are also at heightened mortality risk from COVID-19). Have some COVID-19 deaths been missed here? If so, it's hard to believe that there would be many, since many of these deaths would have taken place in nursing homes. Experience of outbreaks in nursing homes suggests that COVID-19 would likely have spread quickly and widely in any home and would therefore have been detected. We think it more likely that our simple linear trend calculations don't model dementia deaths as well as those from other causes. Deaths from dementia have since fallen below predicted numbers.

It has been common around the world for some COVID-19 deaths not to have been counted in official statistics, particularly in the first wave when testing resources were scarce. This article from the Economist (https://www.economist.com/graphic-detail/2020/07/15/tracking-covid-19-excess-deaths-across-countries) shows other countries where this has occurred.

Cancer deaths do not yet appear to have been particularly affected by the pandemic, with deaths in 2020 generally within a reasonable range of predicted numbers. Importantly, to the extent that deaths are caused by delayed diagnoses or missed treatments due to people avoiding health care settings, these are unlikely to show up in the data by the end of May.

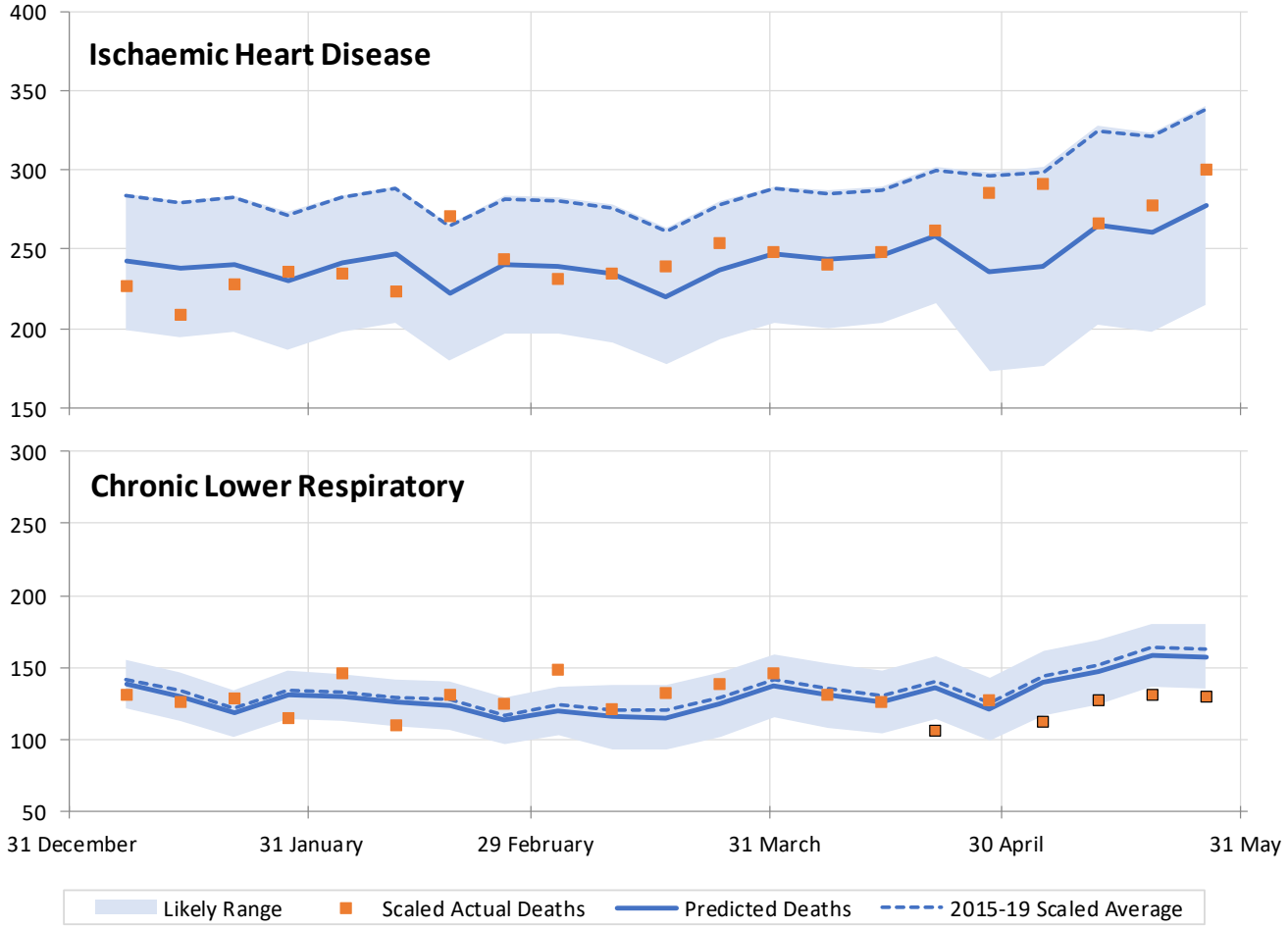
Deaths from Other Specified Causes



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting
Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

Deaths from Other Specified Causes

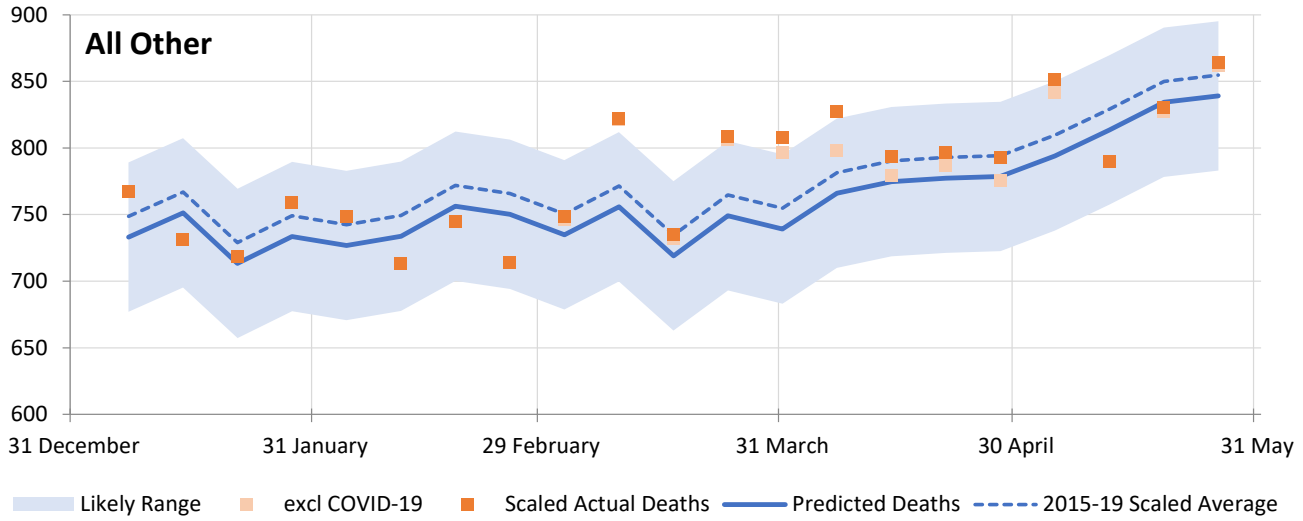
Weekly scaled actual and predicted Doctor-certified deaths – 2020



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting
Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

All Other Deaths

Weekly scaled actual and predicted Doctor-certified deaths – 2020



Actual deaths are scaled to 2020 allowing for population growth and change in age profile; 2020 deaths include allowance for late reporting
Predicted deaths come from the linear trend in each week's scaled deaths in 2015 to 2019

Deaths from ischaemic heart disease (primarily heart attack and coronary heart disease) are close to expectations in 2020, continuing the downward trend in mortality from this cause.

Deaths from chronic lower respiratory conditions in 2020 were broadly similar to predicted numbers until the most recent four to six weeks, where they have been lower. Like flu, we expect that this is related to the measures taken to contain COVID-19.

All other Doctor-certified deaths appear to be generally fairly close to predicted levels, although they are relatively high for most of March (both including and excluding known COVID-19 deaths).

Summary of Doctor-certified deaths

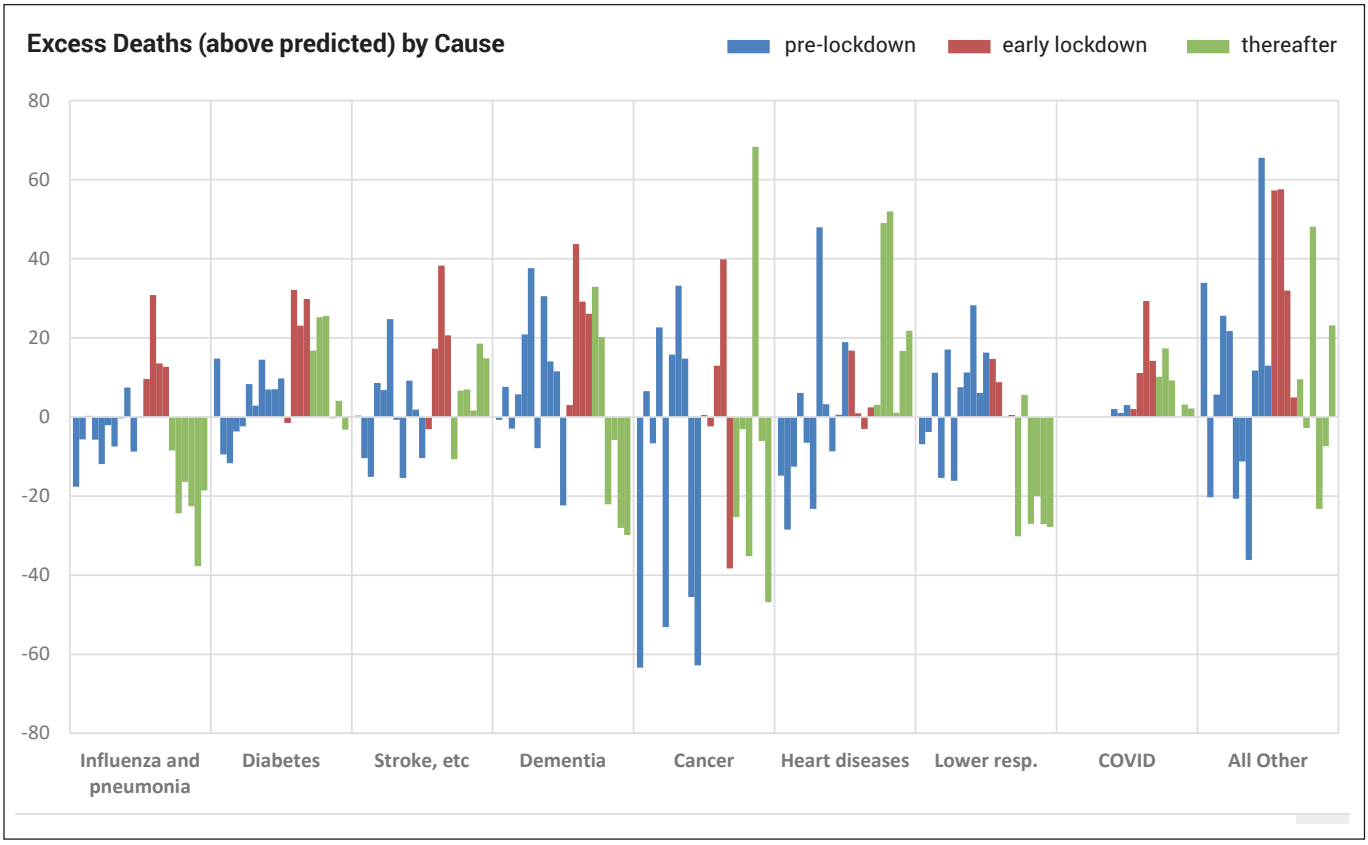
To summarise Doctor-certified deaths by cause to the end of May 2020:

- Deaths from cancer, ischaemic heart disease and lower respiratory conditions were generally similar to predicted levels.
- Deaths from dementia (primarily impacting the elderly), cerebrovascular disease (a known complication of COVID-19), diabetes (a known comorbidity of COVID-19), influenza/pneumonia (potentially mistaken from COVID-19) were similar to predicted until around mid-March. For around the next 3-6 weeks, deaths from these causes have all been higher than predicted. This is suggestive of additional undiagnosed deaths due to COVID-19 during the first wave, or deaths where COVID-19 may have been a contributing factor.
- Deaths from all other causes (including COVID-19 itself) have been generally similar to predicted levels, although they were relatively high for most of March.
- Deaths from lower respiratory diseases and influenza/pneumonia were lower than expected in May. This is due to far lower levels of most respiratory disease in Australia.
- Deaths from dementia and, to a lesser extent, cancer have also been lower in May. It is possible that this is also connected to the low levels of respiratory disease, since the cause of death in the ABS data is the primary cause of death.

The chart below shows excess deaths in 2020 for all causes, subdivided into three periods:

- **pre-lockdown** – 11 weeks to 17 March (blue);
- **early lockdown** – 4 weeks to 14 April (red); and
- **thereafter** – 8 weeks to 26 May (green).

It illustrates the points made previously..

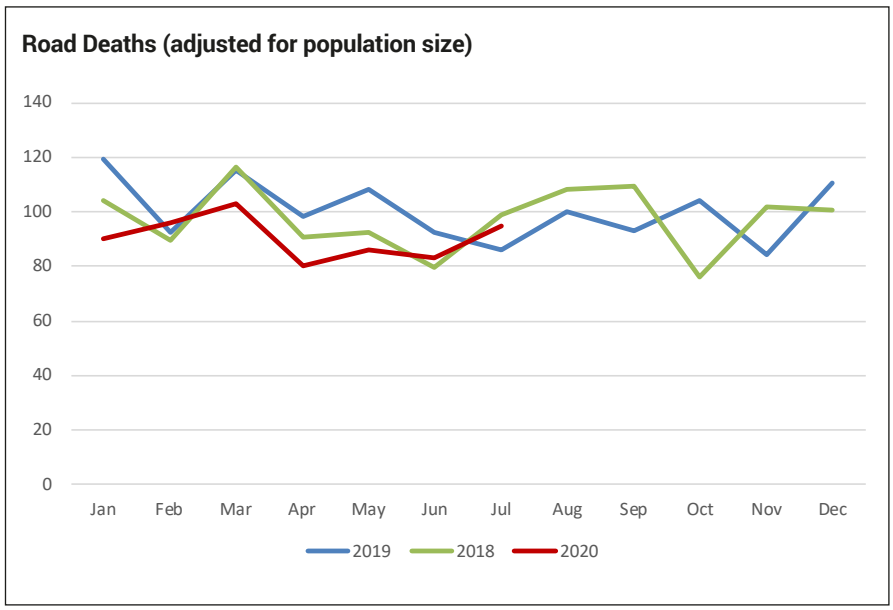


Coroner-referred Deaths

Road deaths

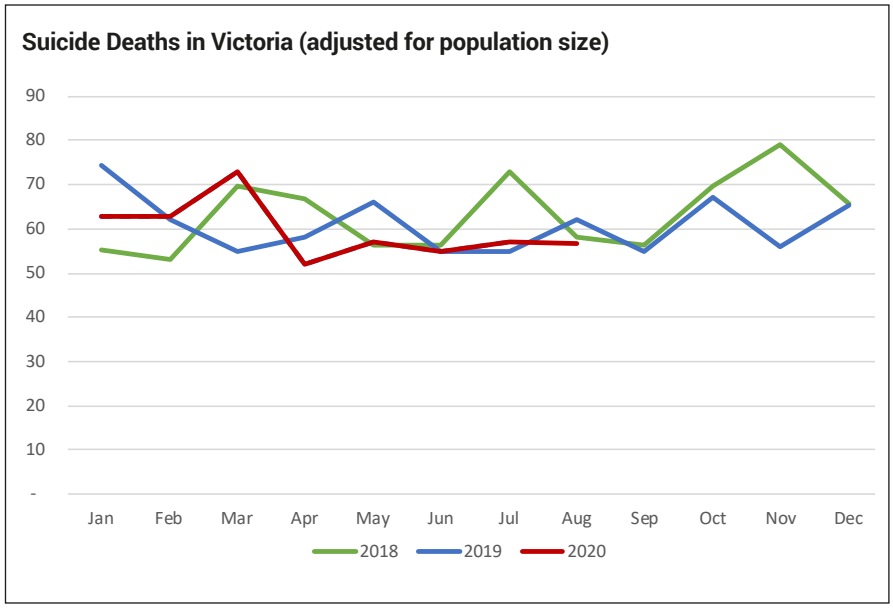
The graph (right) shows the number of road deaths in 2020 compared with the previous two years (adjusted for population size).

The number of road deaths was lower than prior years in January (possibly due to less road usage due to the bushfires) and also over March to May (during the lockdowns), noting that the number of deaths involved are small in the scheme of total deaths. For these three months combined, there are around 40 fewer road deaths than for prior years. Road deaths in June and July are similar to the two previous years.



Victorian Suicide Deaths

The Victorian Coroners Court reviews newly-referred deaths each day to identify those that are consistent with suicide and adds these to the Victorian Suicide Register (VSR). Deaths included in the VSR are regularly reviewed as coroners' investigations progress. Deaths may be removed if investigations establish that they are likely not to be suicides, and deaths may be added if new evidence consistent with suicide is gathered. As such, data may change over time. The Victorian Coroner has stated that these changes are usually quite minor and that the VSR coding team are consistently better than 95% accurate in identifying suicide deaths.



The chart above right shows the number of suicide deaths captured in the VSR in 2020 compared with the two previous years, adjusted for population size. As the data in all years is based on the date of referral to the coroner, we have not made any allowance for late reporting. We have also assumed that any reporting delays in 2020 are the same as in prior years. We have however made allowance for the number of deaths in the last five days of August 2020 (the data is as at 26 August).

There has been plenty of anecdotal evidence of the impact of lockdowns and other stresses on mental health, so we were pleasantly surprised to see that the number of suicide deaths appears not to have increased, at least not in Victoria.

The total number of Victorian suicide deaths to 26 August 2020 (466) is slightly lower than the previous two years after population size adjustments (2018: 480 and 2019: 477), and almost identical before population size adjustments (2018: 461 and 2019: 468). This is welcome news, particularly as Victoria experienced a more stringent lockdown than the rest of Australia during the first wave and has been the only state subject to a lockdown during the second wave.

We note, however, that experts consider that suicide risk reflects the cumulative effects of stressors over time. Therefore, while isolation and job losses have increased, the ultimate impact of these factors may be yet to be seen in suicide rates.

We would encourage the timely publishing of data which enables further study of these issues including the success of health measures put in place and the effectiveness in countering potentially compounding impacts from further lock-downs, potential family break-downs, and any further deterioration in income/jobs/government support.

Other Coroner-referred Deaths

In respect of other Coroner-referred deaths for which no data is currently available, we make the following broad comments:

- diseases (around 8,000 in a normal year) – we would expect any changes in these deaths to follow a similar trend as the Doctor-certified deaths i.e. a general reduction on prior years.

- Accidental deaths (around 5,700 in a normal year) – we may see an increased number of deaths from this cause based on anecdotal reports of an increased number of poisonings associated with hand sanitisers (poisonings usually account for around 1,300 deaths). There may also be an argument for an increase in accidental deaths due to people spending more time at home, which we might expect to be higher risk than the workplace.

- Suicide deaths in other jurisdictions (around 2,300 in a normal year) – while there is currently no data available on suicide deaths in other jurisdictions, it is reasonable to suppose that those deaths will not have increased overall given that the Victorian experience has shown no change. However, as we have observed in relation to the Victorian experience, this may simply be because of a delayed impact of the stressors.

- For other causes of death referred to the coroner, we cannot form a view, noting that these deaths make up only a small portion of all deaths (around 1,000 in a normal year).

On balance, we don't have any reason to expect a significant increase or reduction in total Coroner-referred deaths.

Prevalence of Respiratory Viruses in NSW

The following graphs (*see p 14*) have been extracted from Appendix C of the NSW Health *COVID-19 Weekly Surveillance in NSW Epidemiological Week 34 ending 22 August 2020*, dated 27 August 2020. The graphs are based on PCR tests for influenza, noting not all samples are tested for all viruses. The number of influenza tests conducted in 2020 has exceeded the five-year average in every week by 2 to 5 times, suggesting that people with symptoms are far more likely to get tested than in previous years.

Levels of respiratory disease in NSW have been very low or non-existent for some viruses since early April. This is likely to be the results of:

- the lack of importation of viruses from the northern hemisphere winter as Australia has been closed to international visitors since mid-March;

- the adoption of public health measures such as social distancing, handwashing and cough/sneezing etiquette by the general public since mid-March; and

- a higher than usual level of uptake of the influenza vaccine this year.

The spikes in several viruses in late March presumably reflect higher general testing rates, with the subsequent falls perhaps being the impact of lockdowns.

The graph for rhinovirus (the predominant cause of the common cold and the most common virus in humans) is interesting. There is a marked second spike that is not really seen in the other viruses. We have speculated among ourselves that it may be connected to children and other young people. The much higher level of rhinovirus in 2020 compared with previous years is likely the result of people with COVID-like symptoms being tested, whereas in past years they are unlikely to have been tested given the mild nature of symptoms. Certainly, it doesn't seem to be linked to community transmission of COVID-19, because this was essentially non-existent in NSW at the time.

The lack of a number of viruses circulating will have an obvious impact on the number of deaths due to respiratory illnesses, but may also affect other causes of death where these viruses can be a significant secondary impact on death i.e. cancer, diabetes, lower respiratory conditions. We expect that the number of deaths over winter 2020 will be lower than expected due to lower levels of respiratory disease.

Limitations

Our analysis of Doctor-certified deaths is based on the ABS mortality statistics up to 26 May. We have made actuarial adjustments to allow for changes in population numbers and age profile and to reflect the likely emergence of more reported deaths for the period as time passes. These adjustments are quite simple. In particular:

- the same allowance for late reported deaths was applied to each cause of death. Examination of late reporting by cause of death indicates that there is no discernible difference, however we only have two data points on which to form this opinion and for some causes of death the number of deaths is small hence variable;

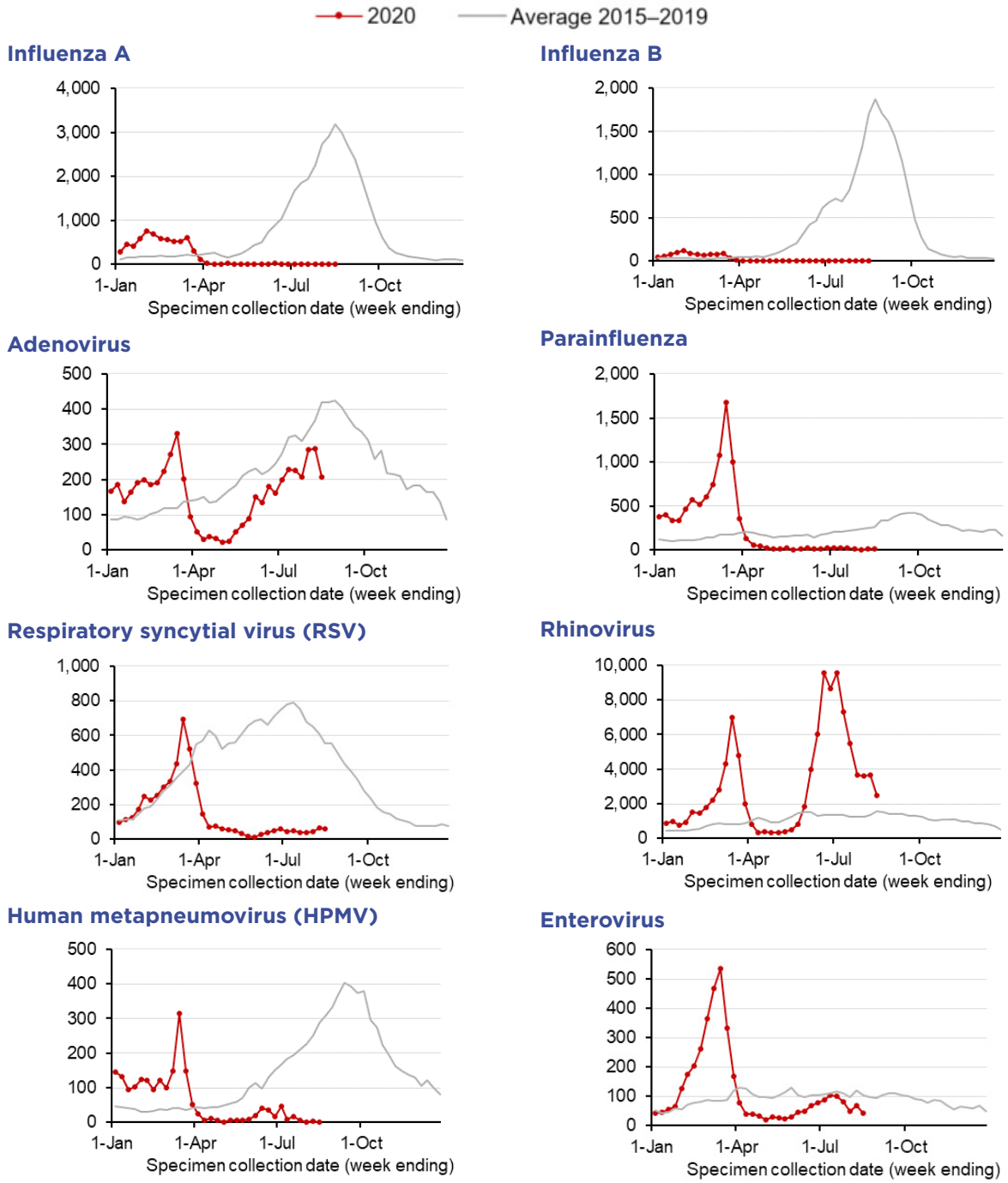
- we used total death rates to make the age mix adjustments (not Doctor-certified deaths only). The available data on Doctor-certified deaths is not supplied in granular enough age bands to allow the age mix adjustment to be carried out on these deaths only;

- the same age mix adjustment was applied to each cause of death due to limitations in the available data; and

- we have not analysed the data by state.

APPENDIX C: NUMBER OF POSITIVE PCR TEST RESULTS FOR INFLUENZA AND OTHER RESPIRATORY VIRUSES AT SENTINEL NSW LABORATORIES, 1 JANUARY TO 16 AUGUST 2020

Not all samples are tested for all of the other respiratory viruses. Therefore, data presented may tend to under-represent current respiratory virus activity in NSW.



Notes: Preliminary laboratory data is provided by participating sentinel laboratories on a weekly basis and are subject to change. Serological diagnoses are not included.

If you or anyone you know needs support call Lifeline on 131 114,

or

Beyond Blue's coronavirus mental wellbeing support service on 1800 512 348.

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