REPORT ON WEEKLY DEATHS IN SOUTH AFRICA

1 JANUARY – 1 DECEMBER 2020 (WEEK 48)

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Warning: The Department of Home Affairs has faced sporadic temporary office closures, particularly in areas that are more affected by COVID-19. This may affect our allocation of a death to a metro area. For example, a death that occurred in the City of Cape Town might have been registered at an office outside of the City because of a temporary closure. Closure may also cause a delay in the processing of the death registration which would result in an underestimate of the deaths in the most recent week. This accounts for the kinks in what should otherwise be a smooth increase in numbers of deaths in Cape Town and Buffalo, for example.

Glossary:

Actual number of deaths: The actual number of deaths in South Africa have been estimated from the numbers recorded on the National Population Register using weighting factors set to produce results consistent with those of the annual Rapid Mortality Surveillance Report to account for deaths of persons who are not on the National Population Register as well as those that have not been registered with the Department of Home Affairs. The estimated number of weekly deaths can be downloaded in Excel with this report from the SAMRC website: https://www.samrc.ac.za/reports/report-weekly-deaths-south-africa

Excess deaths: There is no universal definition of, or understanding of what is meant by, "excess mortality". It is a term used in epidemiology and public health that refers to the number of deaths that are occurring above what we would normally expect. The WHO uses the term to describe "Mortality above what would be expected based on the non-crisis mortality rate in the population of interest. Excess mortality is thus mortality that is attributable to the crisis conditions. It can be expressed as a rate (the difference between observed and non-crisis mortality rates), or as a total number of excess deaths."

Excess natural deaths associated with COVID-19: Generally, the number of excess deaths per week is calculated as the number of all-cause deaths in that week less the number that might be assumed to have occurred had there not been the epidemic (i.e. the counterfactual number), provided that the counterfactual is lower. However, this approach has generally only been applied to countries where deaths have been tracking the counterfactual before the onset of significant numbers of COVID-19 related deaths. The method provides a poor estimate of the numbers of COVID-19 and collateral deaths in the early stages of the epidemic when this is not the case. Thus, we estimate the numbers of COVID and collateral deaths, once a clear upward trend is evident, as the number of actual deaths less a baseline number determined as a proportion of the predicted number. The proportion is calculated such that the excess deaths in that week is equal to the confirmed number of COVID-19 deaths for that week. The cumulative number of excess deaths comprises the sum of the weekly excess plus the cumulative number of confirmed COVID deaths prior to the establishment of the clear upward trend. Where there is no clear indication of an upward trend, we have not calculated excess deaths. It is important to note that this estimate of the number of excess deaths is an estimate of the number of deaths in excess of expectation, due to the Covid-19 epidemic and not of those infected with the SARS-CoV-2 virus alone (i.e. it includes incidental deaths resulting from such things as shortage of health care and medications due to either the demands on the health systems by the virus or strategies to combat the epidemic).

Data Source

Basic demographic information for all deaths registered on the National Population Register are provided to the SAMRC on a weekly basis. Since the number of deaths has a seasonal trend, historical data from 2018 and 2019 have been used to predict the number of deaths that could be expected during 2020. Before this was done, the deaths were weighted to account for incomplete registration of deaths and those that do not have a South African ID number. The weights were calculated by age, sex, metro/non-metro and natural/unnatural cause to be consistent with the weights applied in the annual Rapid Mortality Surveillance Reports.[1]

While we have built up a good sense of the adjustment at a national level through the annual RMS reports and the National Burden of Disease Study, estimating completeness of registration of deaths below national level is challenging, particularly given limitations of data available to inform such an exercise, and has required numerous assumptions. Thus, although the resulting estimates need to be treated with a degree of caution, the difference in estimate of the cumulative excess deaths between using the NPR data unadjusted and adjusted for under-registration of deaths is well under 10%.

The Excel forecast function[2] has been used to predict values for each week of 2020 based on a linear annual trend, allowing for a seasonal effect over the year. In addition, 95% prediction intervals have been estimated for the predicted weekly number of deaths for 2020 to give a basis to assess fluctuations. The forecasts have been applied to the estimated actual number of deaths.

Graphs of the estimated weekly number of deaths, classified by date of occurrence, not reporting, up until epidemiological **week 48** (i.e. the period from **1 January 2020** till **1 December 2020**) based on the data received on 30 November 2020 are shown below. *The figures plot the estimated numbers of deaths at the start date of each week*. Data for the most recent week has been scaled up to account for the lag in processing registrations. Based on previous data, the numbers at the national level have been increased by 6.9%.

Sub-national statistics have been compiled for the provinces and metros by allocating the deaths according to the Home Affairs office where the death was registered. It is assumed that most of the deaths within an area are registered at an office in the same area. The numbers of deaths from **natural causes** are reported for each province and each of the metros**.**

Estimating the number of COVID-19 and collateral (i.e. deaths arising as a result of the impact of SARS-C0V-2 epidemic and the management of this on the provision of health care) deaths is not straight-forward. In developed countries this is measured using the extent that deaths due to all causes exceed what might be expected had the epidemic not occurred. For various reasons this is not the best way of estimating COVID and collateral deaths in South Africa, particularly in the early weeks of the epidemic.

For a start, unnatural deaths are a higher proportion of all deaths in South African than in developed countries, and reduced significantly as economic and social activity became more limited, particularly in lockdown stage 5. Thus, it was decided to limit our focus to the numbers of deaths from natural causes.

Further, it was observed that during lockdown the number of deaths due to natural causes fell well below the predicted number. The weekly numbers tracked the lower prediction interval, probably due to the impact of lockdown and non-pharmaceutical interventions (NPIs) on the spread of non-COVID communicable diseases.

[1] Dorrington RE, Bradshaw D, Laubscher R, Nannan N (2020). Rapid mortality surveillance report 2018. Cape Town: South African Medical Research Council.

[2] The Excel function implements is the Holt-Winters triple exponential smoothing (the AAA sub-method).

Thus, using the predicted value as the base would understate the impact of the COVID-19 epidemic, identify no COVID or collateral deaths until the week starting 17 June, when there were already over 2,000 confirmed COVID deaths. It was therefore decided to take as the expected number of deaths a proportion of the predicted number, that matched the proportion[3] in the week prior to week when there was a clear rapid increase in numbers (e.g. the week starting on 6 May for Cape Town, Western Cape and nationally), and the number of cumulative COVID and collateral cases was set to the number of confirmed cases for that week. Continuing to use this adjusted base until late June is supported by the observation that the number of natural deaths in the provinces less affected by COVID-19 continued to track lower than predicted numbers through to the end of June. However, following the emergence of COVID-19 in most of the provinces, and with uncertainty about the counterfactual following the seasonal winter peak in numbers of deaths, the baseline was transitioned to the predicted number of deaths by the end of July.

In week 36, a further minor adjustment was made to the baselines for the Western Cape, Cape Town and hence the country as a whole in order to for the fact that the excess deaths had declined below estimates of confirmed and suspected COVID deaths as measured by the Western Cape Department of Health. Instead of trending to the predicted value by the end of July, the baseline trends to 92%, 88% and 99% of the predicted value for the three respectively applied from week 30 onwards. **In week 46, the baseline for the Cape Town, the Western Cape and hence the country as a whole were set to the predicted value from week 39** in order to allow for the fact that the excess deaths appeared to be too high relative to the confirmed number of deaths after this.

The estimated numbers of excess natural deaths are reported in **Table 1,** relative to this revised base, and thus an estimate of the numbers of COVID (including COVID-related) and collateral (deaths resulting from efforts to avoid transmission and deaths from the virus) deaths. These are the numbers indicated on the graphs. It is important to point out that although it is probable (given the timing and the age distribution of these deaths) that the bulk of these numbers of 'excess deaths' are likely to be due to COVID-19 it is unclear at this stage what proportion are COVID deaths and what proportion are collateral deaths.

Table 2 provides estimates of 'excess mortality' using the measure employed more generally, based on all-cause deaths, an aggregate of the changes in both natural and unnatural deaths.

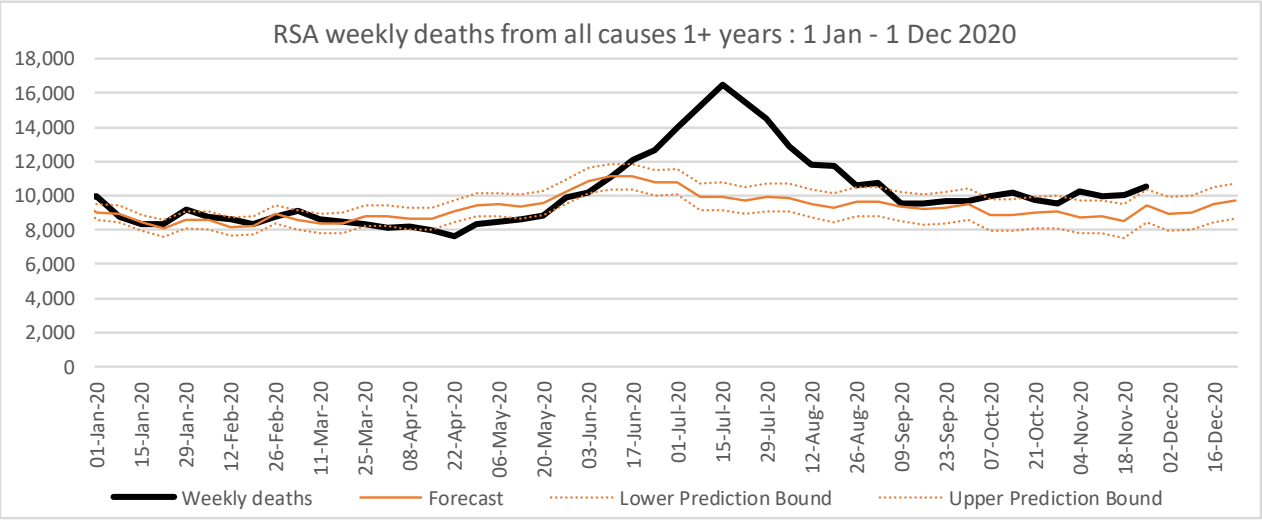
Births were not registered by the Department of Home Affairs during lockdown stage 5. This means any that die before the backlog is processed will not be placed on the National Population Register and thus that the deaths of these births will not be captured. **This report presents the estimated weekly deaths of persons 1 year and older**. Registered births are again being added to the Population Register, but either there remains a backlog in processing or a lower proportion of births are being registered since lockdown. Once we have confidence that registration of deaths is back to previous levels, we will include deaths under age 1.

As the numbers of actual deaths approach the baseline/counterfactual number there are bound to be small fluctuations in excess deaths (the difference between the two) around zero. In keeping with the apparent practice elsewhere, where excess deaths fall below the baseline in any week, the excess for that week will be taken as zero.

[3] With a small adjustment to ensure that the number of COVID deaths matched the numbers of confirmed cases for that week.

Trends

- The weekly number of deaths of persons 1+ years of age from all causes continued to track just above the upper prediction bound in the week **25 Nov – 1 Dec** with **10,058** deaths from all causes.
- The weekly number of deaths from natural causes remained slightly higher than the upper prediction bound in the week **25 Nov – 1 Dec.**
- During the period, **6 May – 1 December 2020**, there have been **54,053** excess deaths from natural causes of persons 1+ years old when using the revised base accounting for lower mortality during lockdown. For people 1-59 years the excess is **19,001** and **34,946** for people 60+ years.
- **Table 1** shows the estimated excess number of natural deaths in metro areas and the provinces. In the week **25 Nov – 1 Dec**, there were **1,169** excess natural deaths of persons 1+ years.
- Deaths from natural causes in the **Eastern Cape** have continued to increase well above the upper prediction bound with **1,295** excess natural deaths experienced in the week **25 Nov – 1 Dec**.
- Natural deaths in the 2nd surge in **Nelson Mandela Bay** peaked in the week **18 – 24 November**: there were **351** excess deaths in the week **25 Nov – 1 Dec** compared with **445** in the previous week.
- However, the number of natural deaths in **Buffalo City** continued to increase, with **162** excess deaths in the past week compared with **112** in the previous week.
- Natural deaths in the **Western Cape** have been increasing over the past five weeks and have reached the upper prediction bound during the week **25 Nov – 1 Dec**. The number of natural deaths in the **City of Cape Town** has also increased but remains within the prediction bounds.
- Natural deaths in all the remaining provinces were close to their predicted number.
- The number of deaths from unnatural causes followed the typical increase observed at the end of the **November,** very close to the predicted number.



Numbers have been scaled to the estimated actual number of death and for the last week has been adjusted for delayed registrations

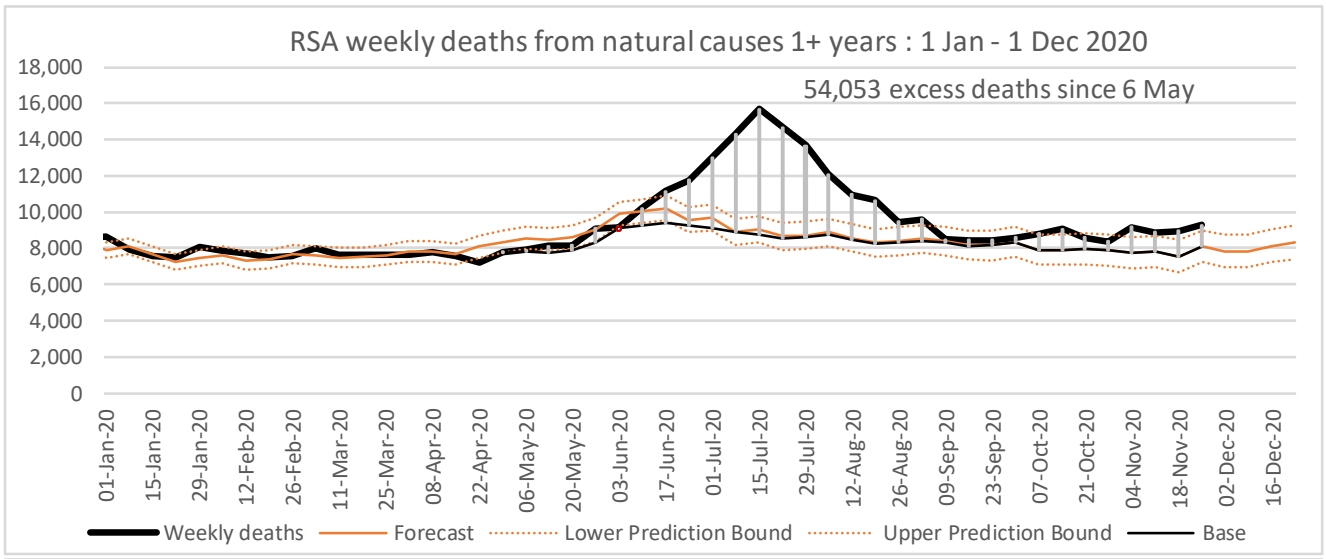
Table 1: Number of excess natural deaths of persons 1+ years by province and metro relative to revised predicted number based on the observed drop during lockdown, South Africa 2020

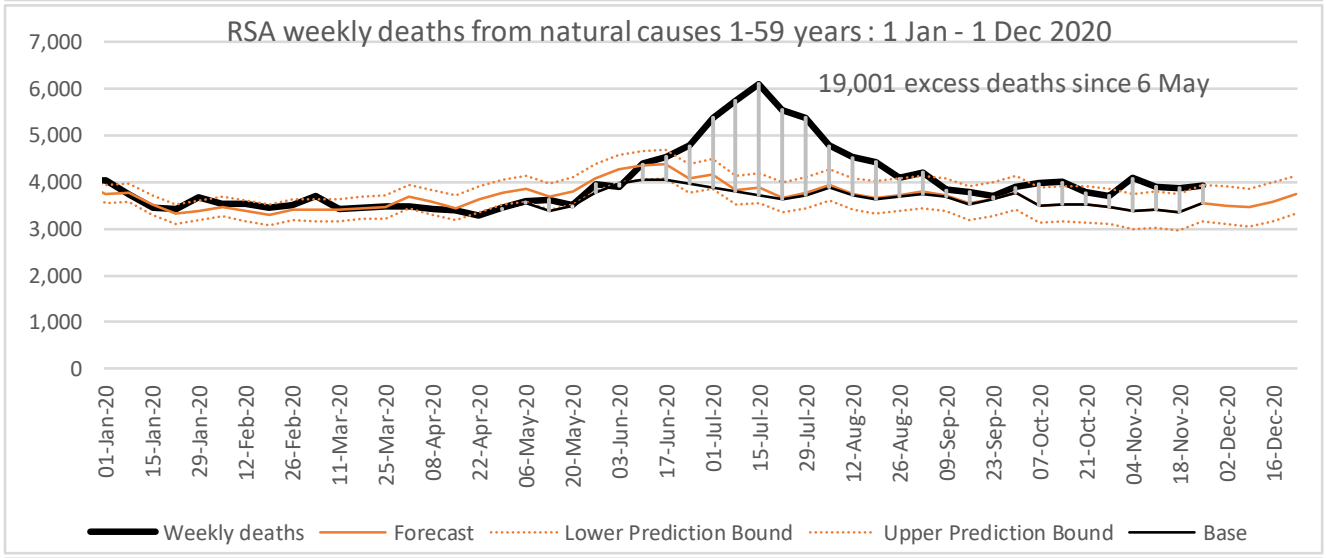
Region	Period	Excess deaths vs revised base
South Africa	6 May – 1 December	54,053
Province		
Eastern Cape	3 June – 1 December	14,961
Free State	24 June – 1 December	4,767
Gauteng	10 June – 1 December	12,739
KwaZulu-Natal	6 May – 1 December	7,775
Limpopo	24 June – 1 December	1,971
Mpumalanga	24 June – 1 December	2,723
Northern Cape	14 July – 1 December	1,646
North West	1 July – 1 December	2,713
Western Cape	6 May – 1 December	6,959
Metropolitan Municipality		
Buffalo City	3 June – 1 December	1,706
City of Cape Town	6 May – 1 December	5,113
Ekurhuleni	10 June – 1 December	3,664
eThekwini	17 June – 1 December	1,667
Johannesburg	10 June – 1 December	4,200
Mangaung	25 June – 1 December	1,169
Nelson Mandela Bay	3 June – 1 December	3,779
City of Tshwane	10 June – 1 December	2,347

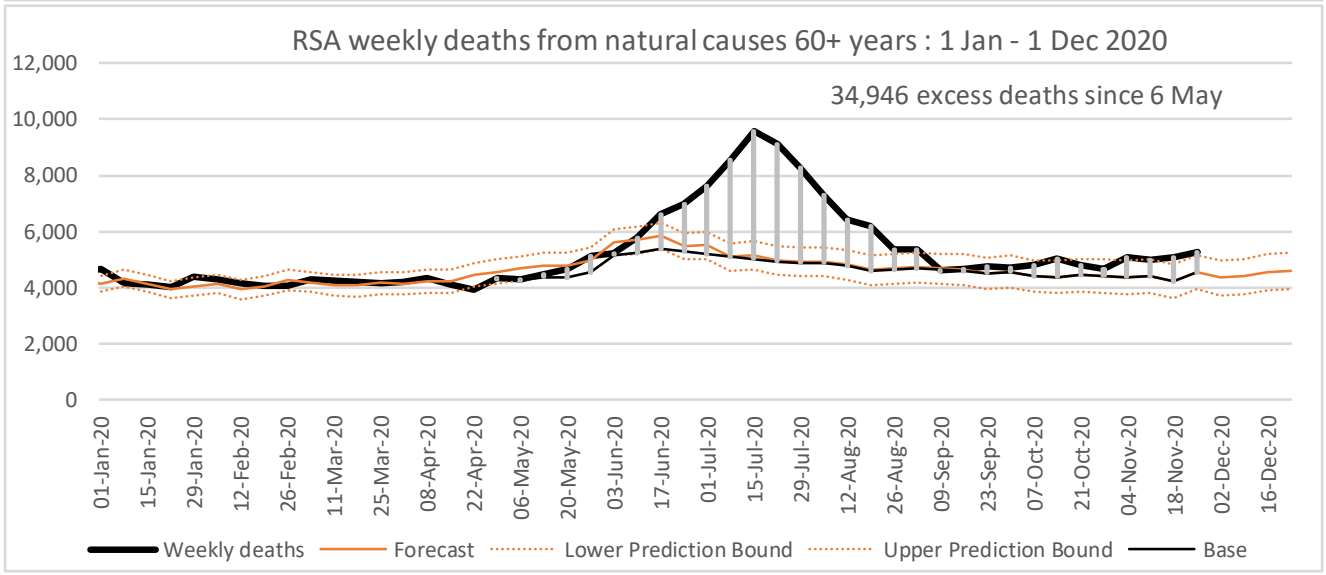
Note: Period has been determined based on when an upturn in the number of natural deaths became apparent. Parts do not sum to the whole because office closures due to Covid-19 may have led to registration of deaths at other offices which may not be in the same area, and random fluctuation at the point at which the baseline is determined.

Table 2: Number of excess deaths from all causes of persons 1+ years by province and metro relative to predicted number based on historical trend, South Africa 2020

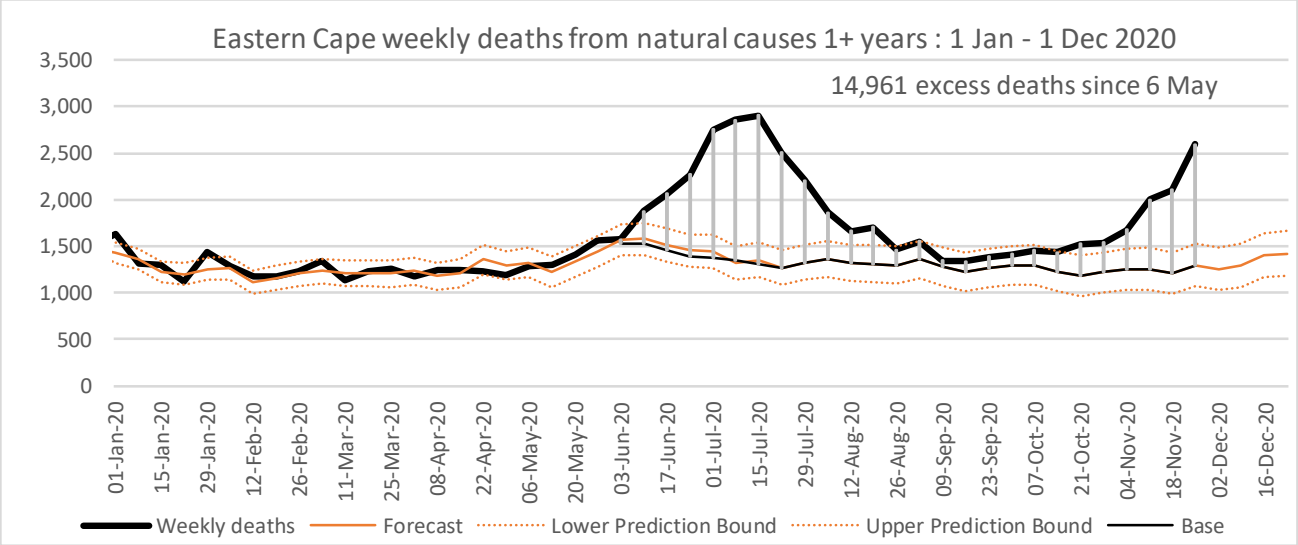
Region	Excess deaths vs forecast
South Africa	48,075
Province	
Eastern Cape	14,799
Free State	4,799
Gauteng	11,990
KwaZulu-Natal	7,118
Limpopo	1,118
Mpumalanga	2,583
Northern Cape	1,717
North West	3,044
Western Cape	5,683
Metropolitan Municipality	
Buffalo City	1,636
City of Cape Town	3,485
Ekurhuleni	3,165
eThekwini	1,570
Johannesburg	4,005
Mangaung	1,159
Nelson Mandela Bay	3,593
City of Tshwane	2,365

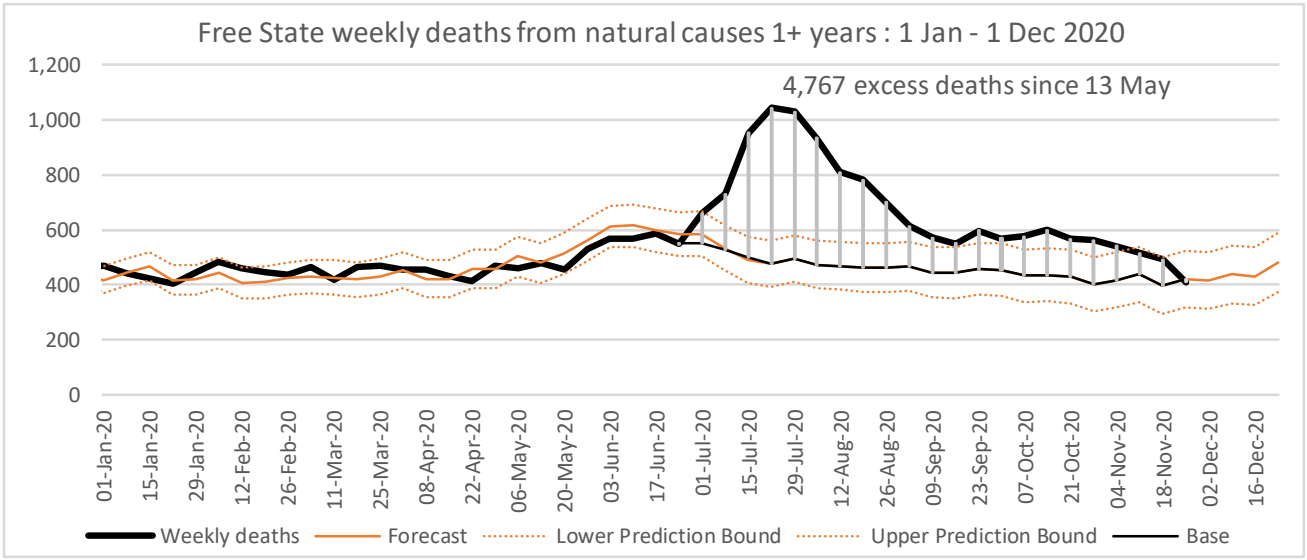


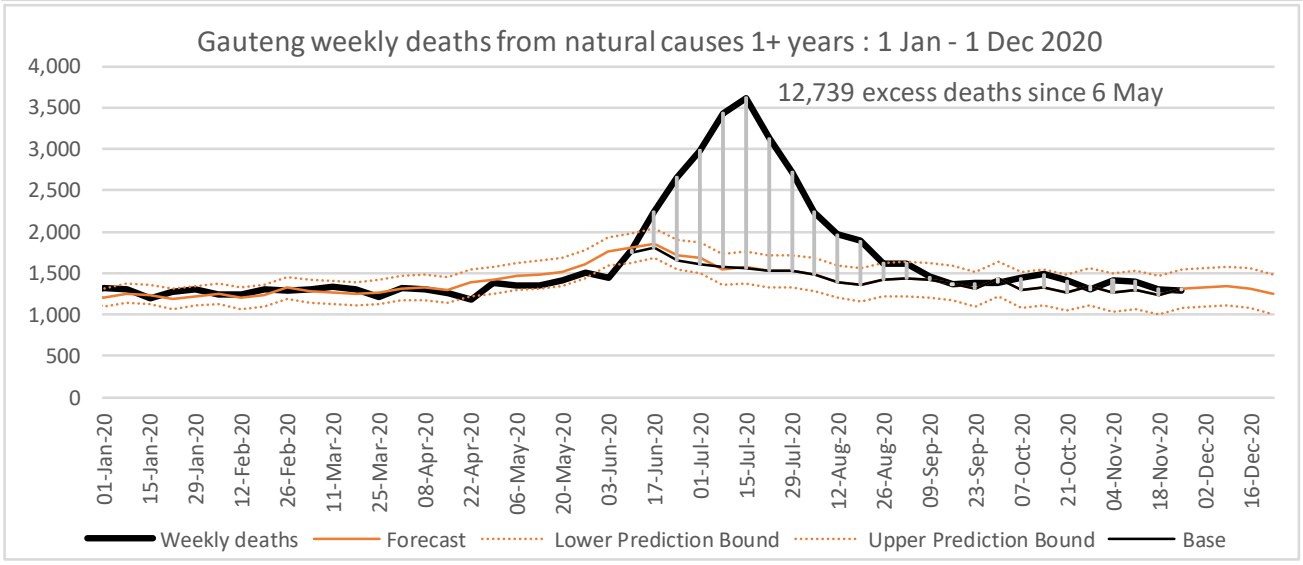




Numbers have been scaled to the estimated actual number of death and for the last week has been adjusted for delayed registrations







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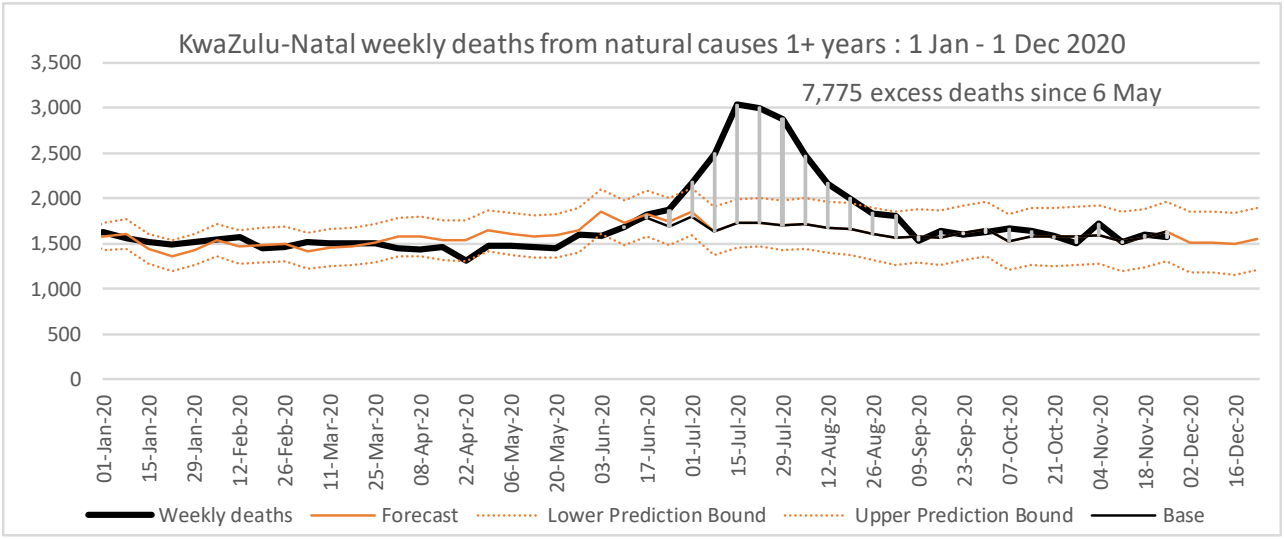

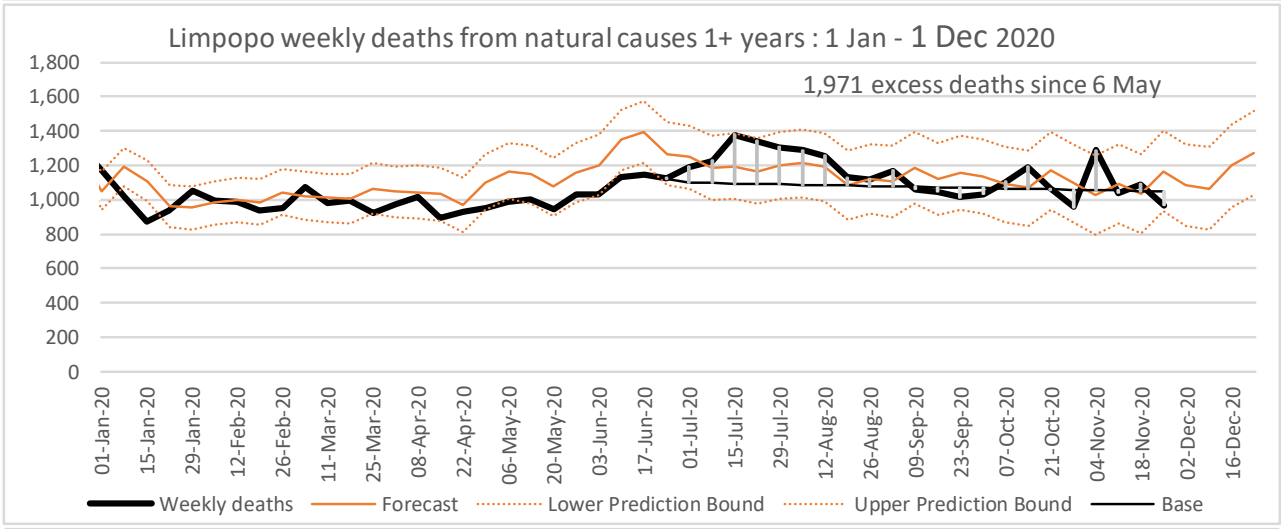

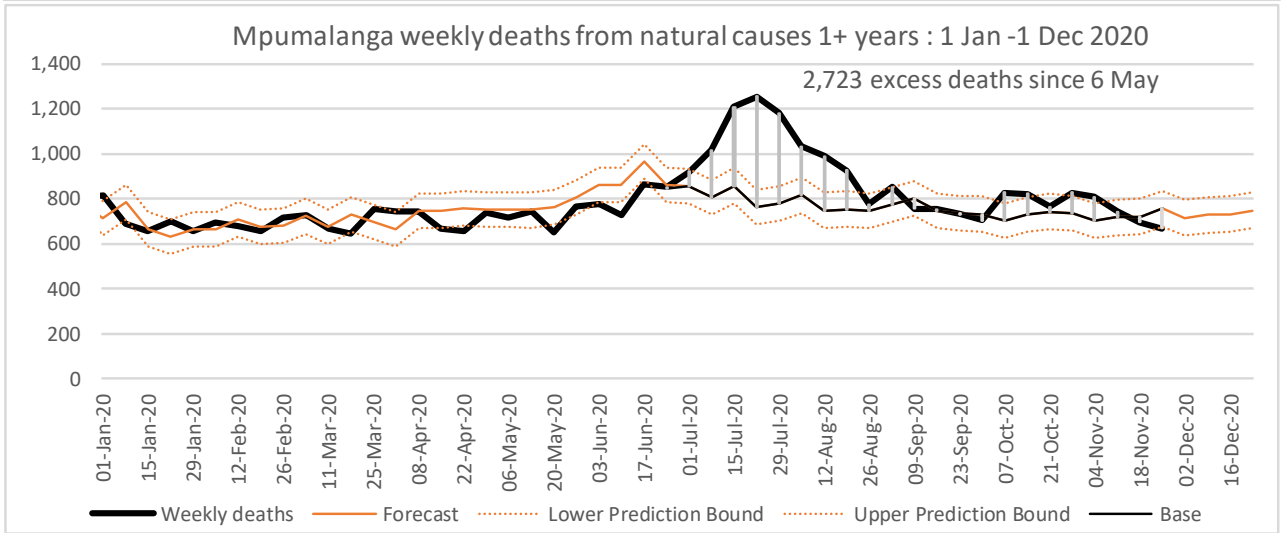

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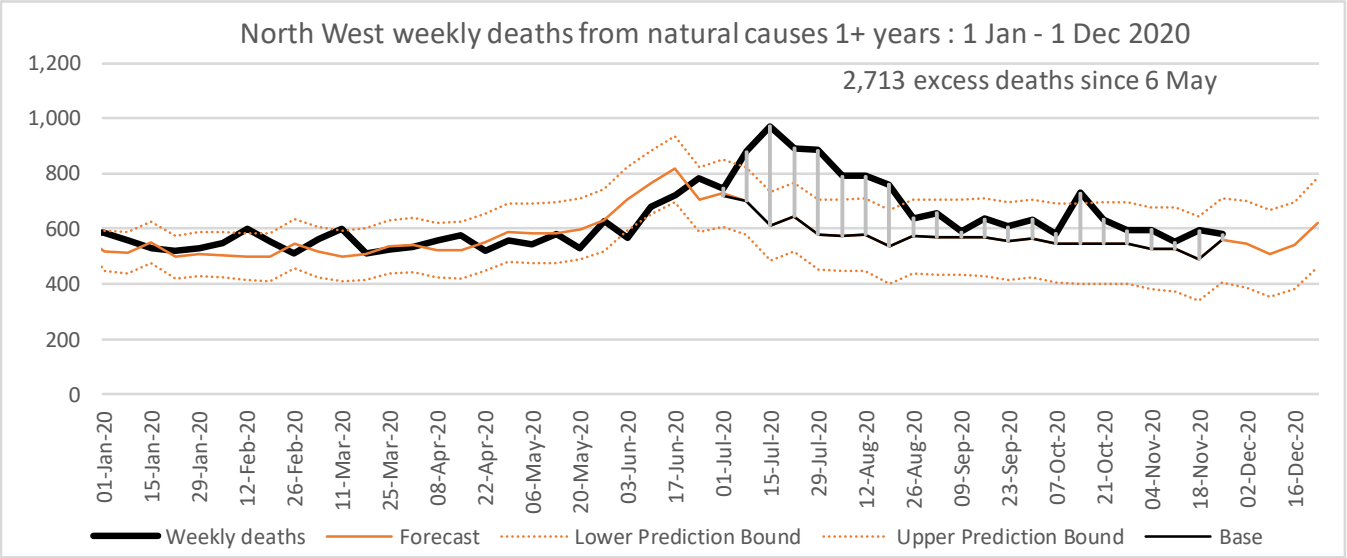

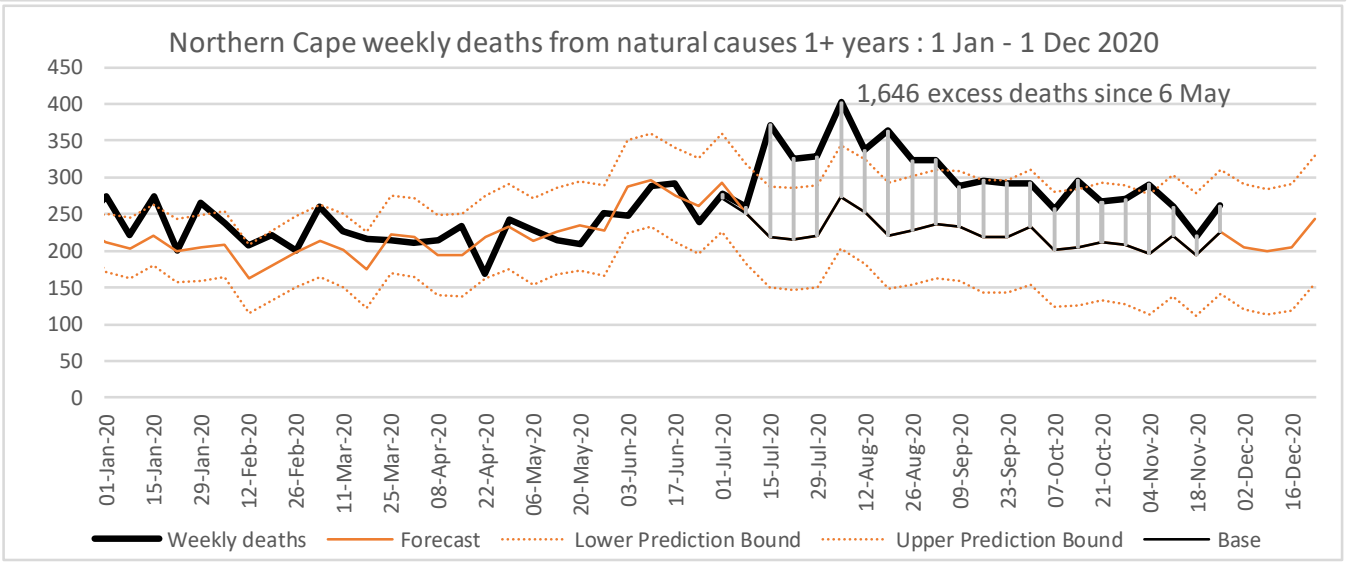

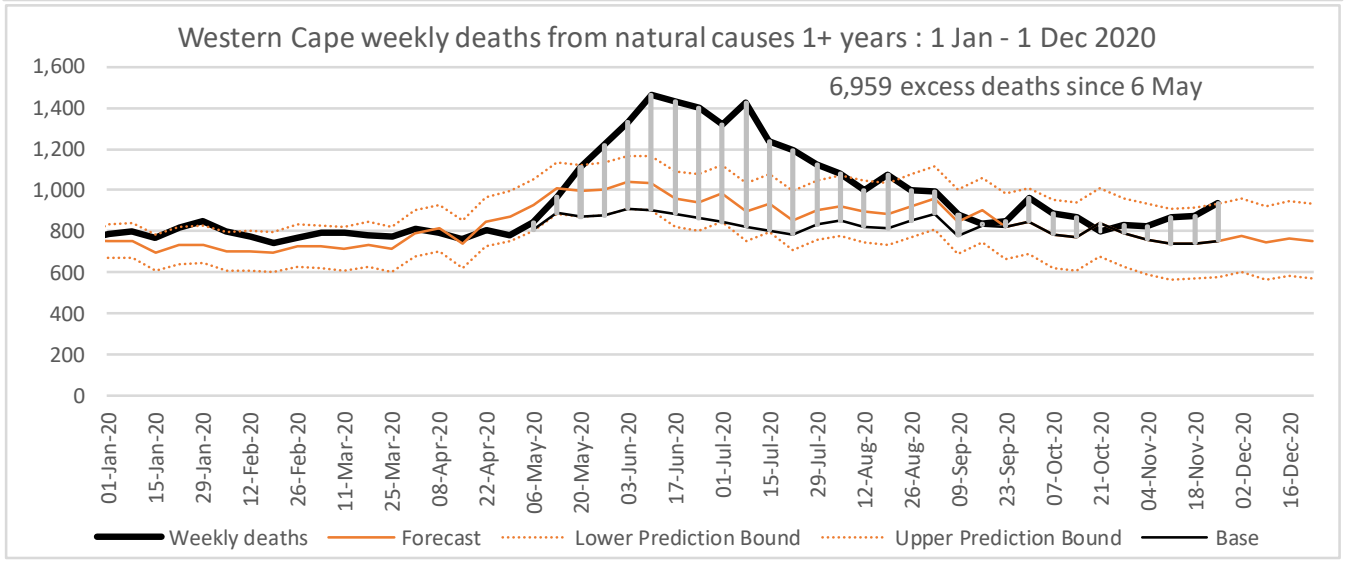

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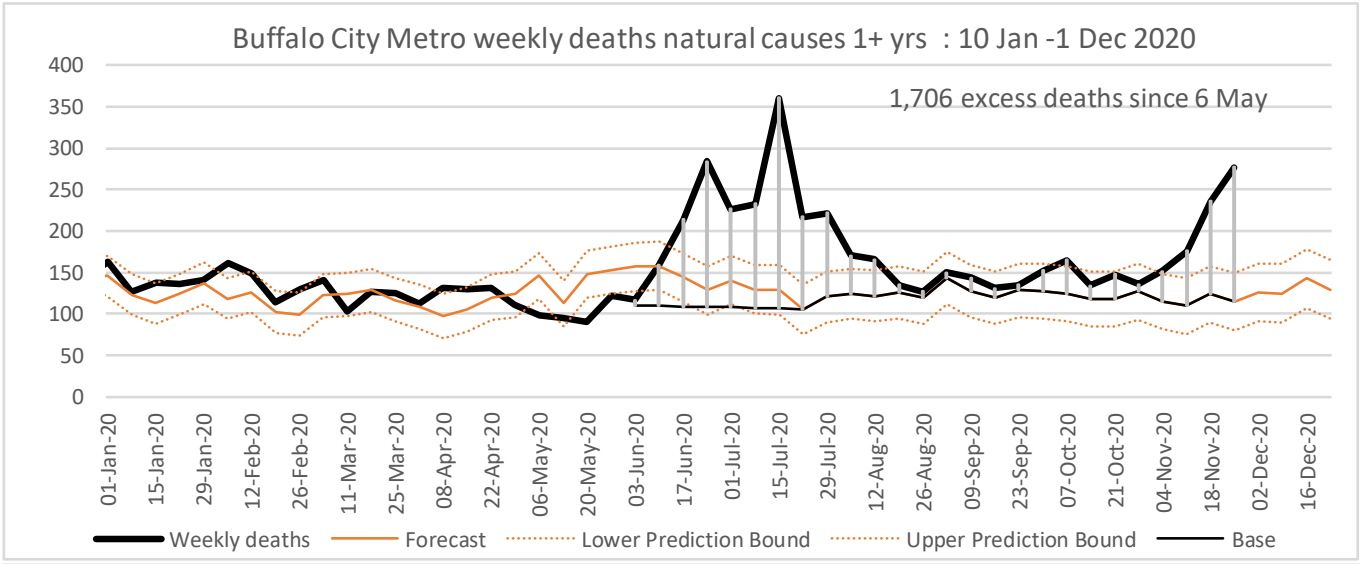

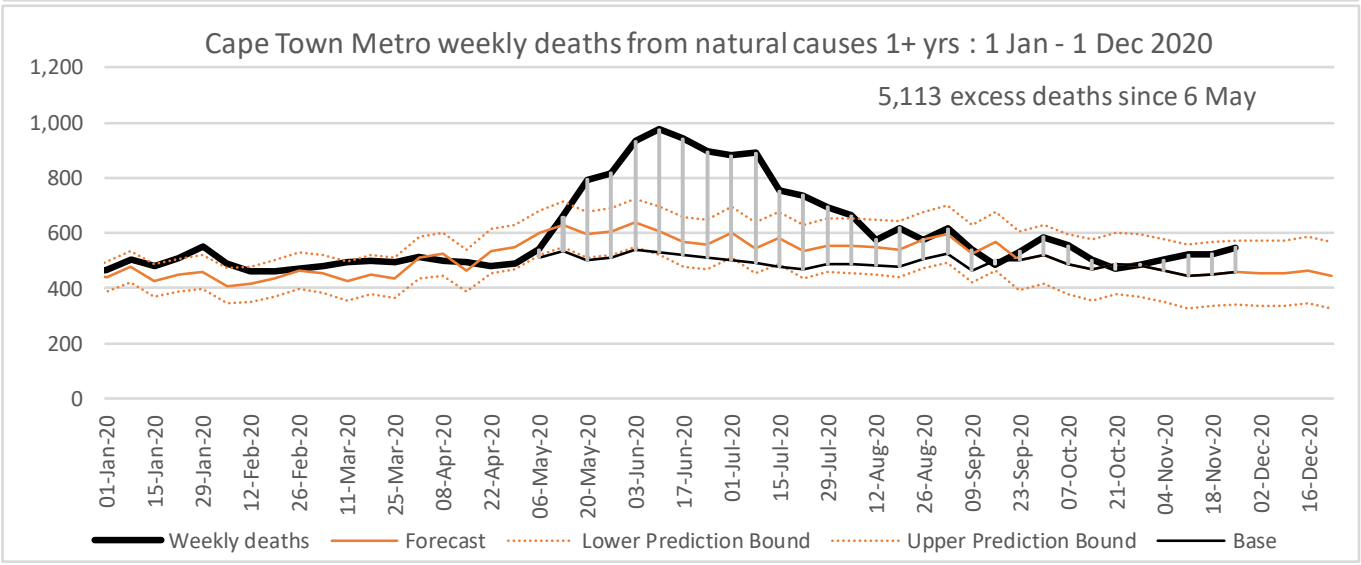

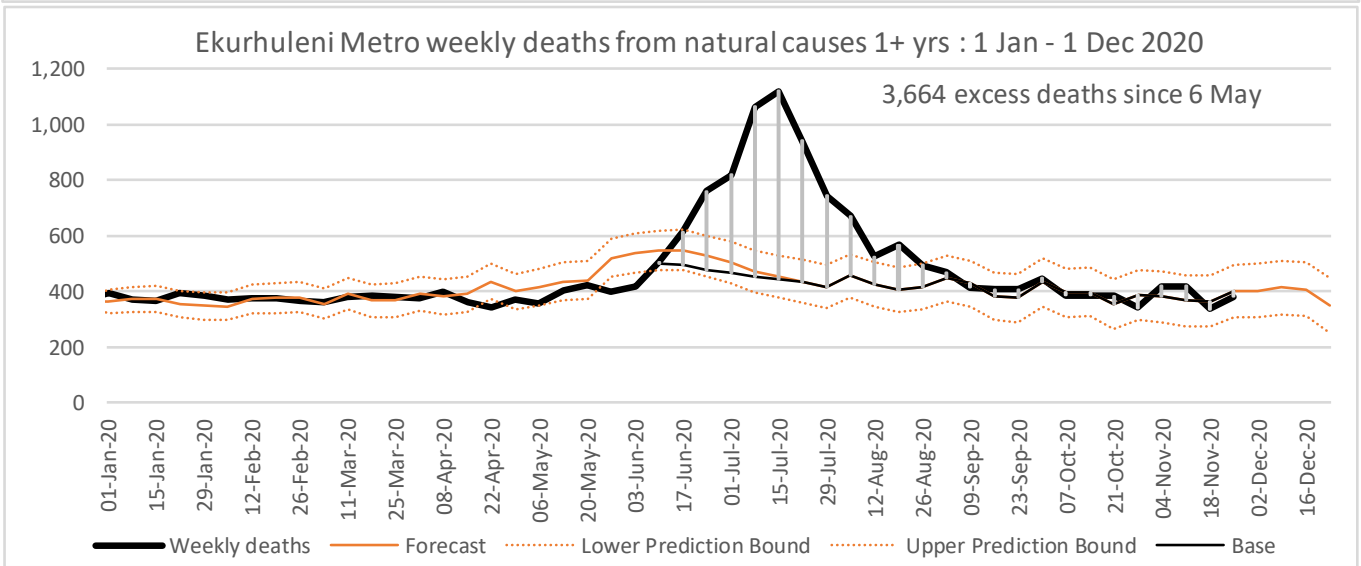

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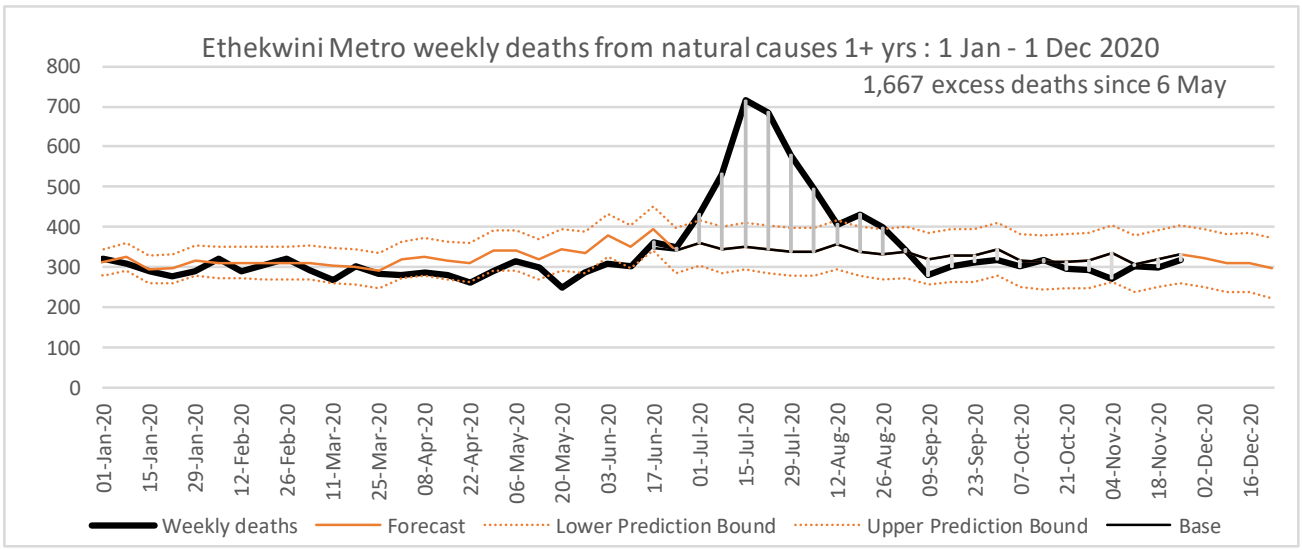

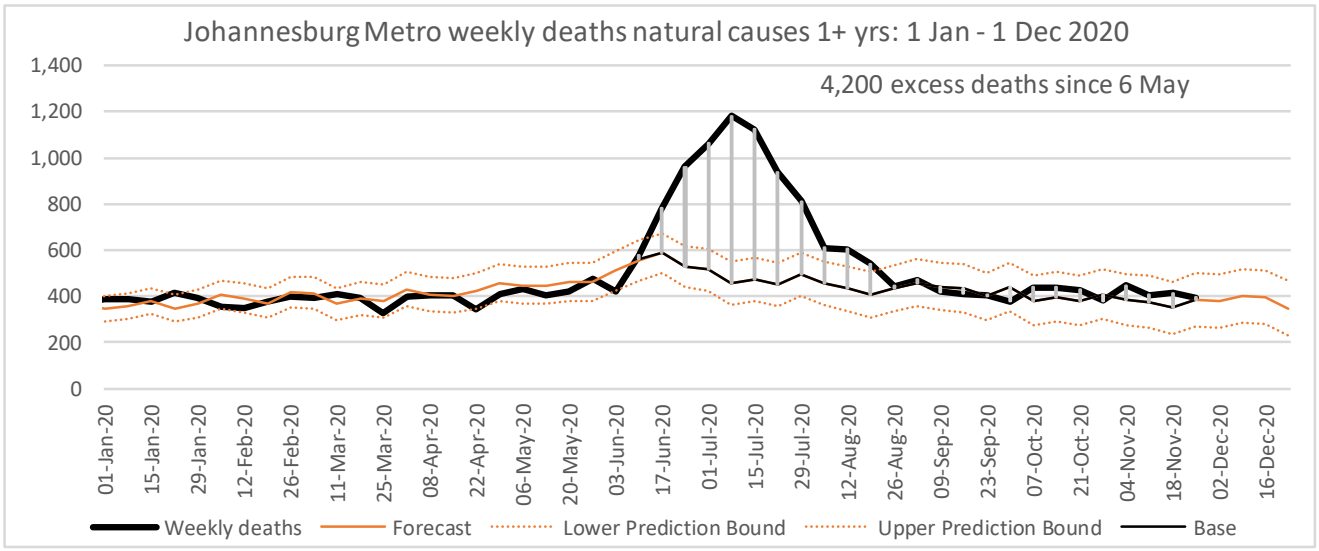

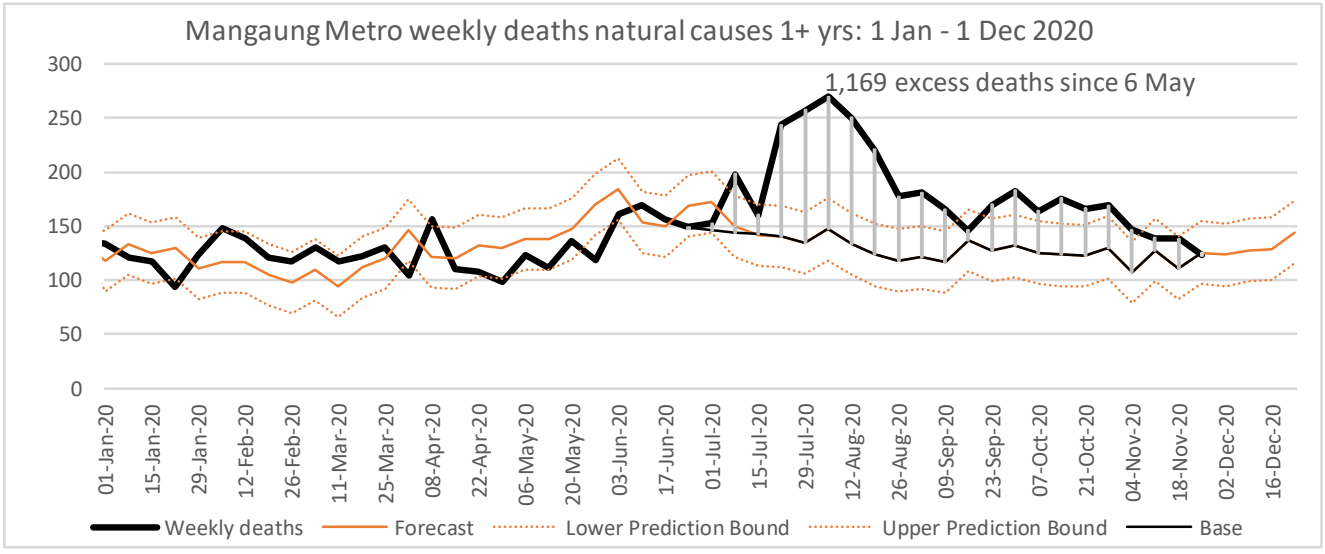

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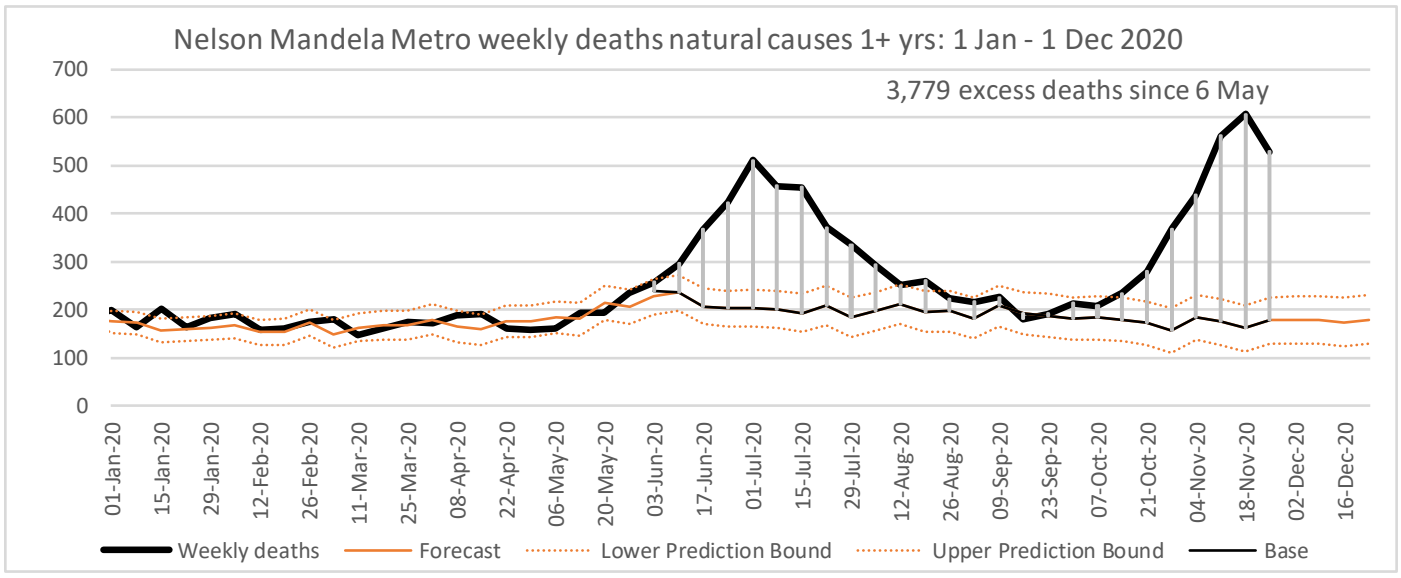

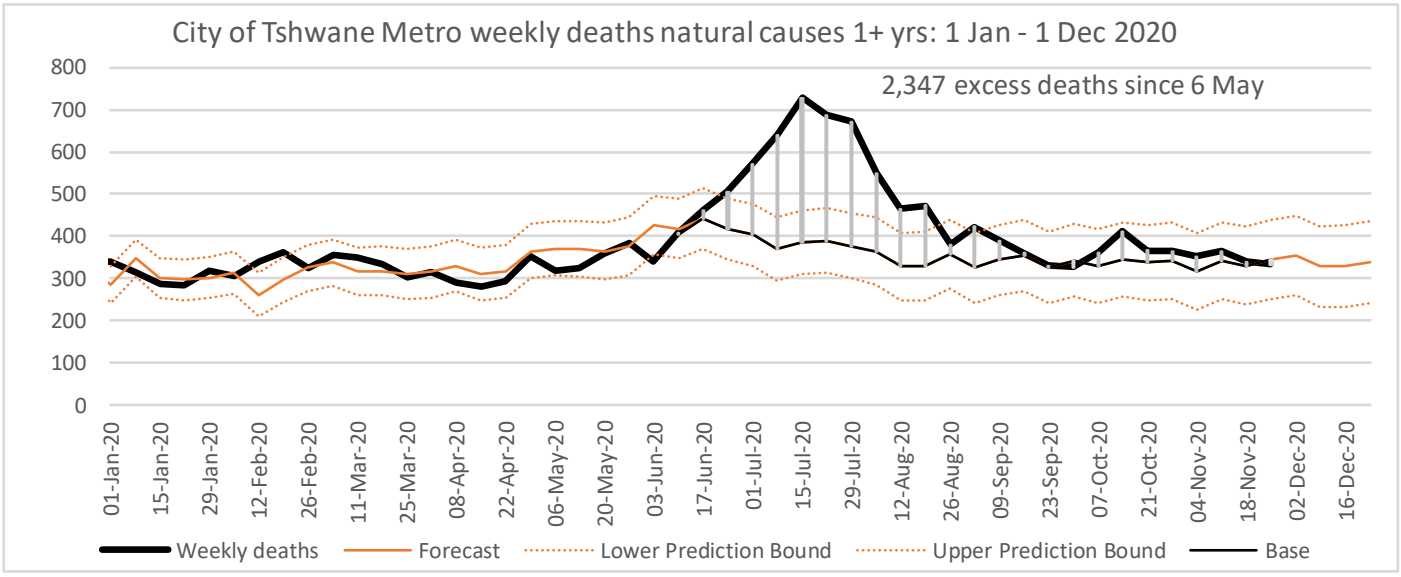

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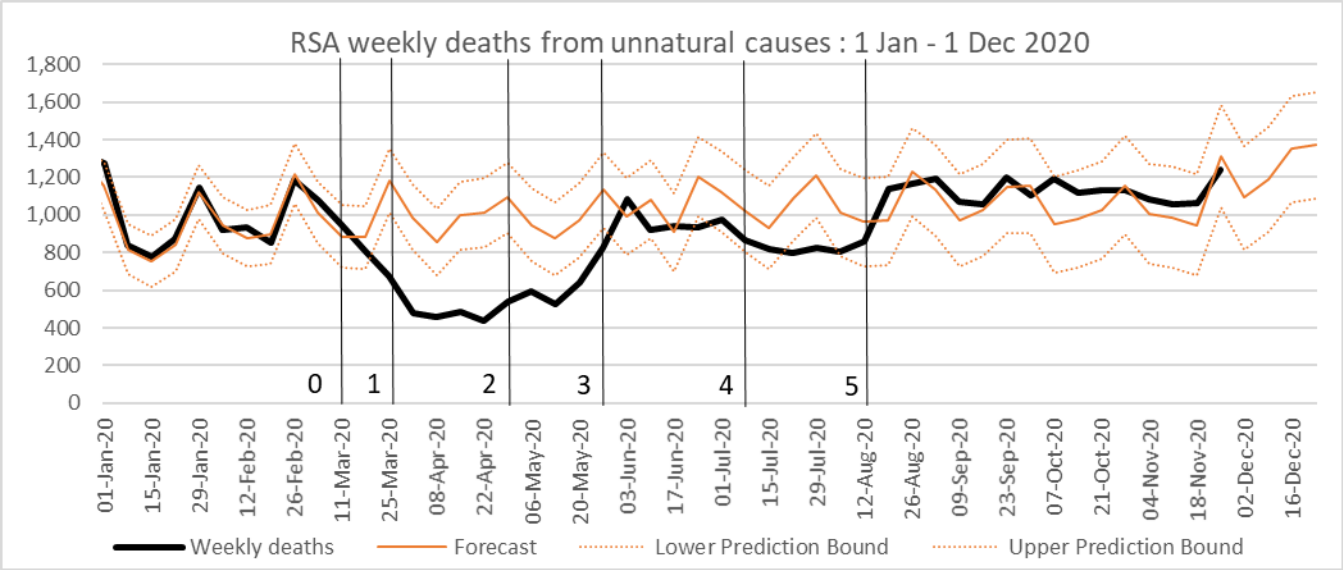

Vertical lines in order

0 Week Disaster Management Act implemented
1 Week lockdown level 5 introduced
2 Week lockdown changed to level 4, with curfew
3 Week lockdown changed to level 3 including unbanning of alcohol
4 Week alcohol re-banned and a curfew re-introduced
5 Week lockdown changed to level 2, including unbanning of alcohol
6 Week lockdown changed to level 1

Numbers have been scaled to the estimated actual number of death and for the last week has been adjusted for delayed registrations