

# MONTHLY REPORT ON WEEKLY NUMBERS OF DEATHS IN SOUTH AFRICA

## DECEMBER 2023

(TO EPIWEEK 52)

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UCT Centre  
for Actuarial  
Research

**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. We use 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 adjustments to account for incompleteness of recording of deaths on the National Population Register were re-estimated taking into account the 2017 cause-of-death data released by Stats SA in 2021.

**Epi-week:** We report by an 'Epi-week' consistent with CDC and many NICD reports which run from Sunday to Saturday, ensuring continuity of weeks from one year to the next. Each week is aligned with the 'Epi-year' that has 4 or more days in that week. Week 53 of 2020 is from 27 December 2020 to 2 January 2021, Week 1 of 2021 is 3 January – 9 January 2021, Week 1 of 2022 is 2 January – 8 January 2022 and Week 1 of 2023 is 1 January – 7 January 2023.

**Predicted number of deaths:** The predicted number of weekly deaths have been revised after an investigation into the underlying trends in mortality prior to 2020. They are now modelled on data from the period **2015-2019** rather than for the period 2014-2019. A single negative binomial model has been used for unnatural deaths allowing for age and sex. Negative binomial models have been fitted for each province in 10-year age groups from 5 years of age, allowing for different historical trends in each age group. In contrast, for <1 year and 1-4 years, the predicted numbers were set to the average rates for 2015–2019 were continued. The predicted numbers for each component have been summed to give the total.

**P-score:** The P-Score is frequently used to describe excess mortality. It is the percentage change in the number of deaths from the expected number for that week. Negative values below 0% reflect a deficit in deaths while positive values reflect an increase.

**General warning:** The Department of Home Affairs faces sporadic temporary office closures for various reasons. Closure may cause a delay in the processing of the death registration which would result in an underestimate of the deaths in the most recent weeks.

## Background

The weekly reports on excess natural deaths in South Africa ended in December 2022. The growing uncertainty about the estimate of the counterfactual (predicted) numbers of deaths the further from the start of the pandemic that one projects and the need to allow for the impact of the epidemic on the size of the population (particularly at the older ages), demanded an investigation into the appropriateness of the models that were being used.

A careful evaluation of the trends in mortality rates since 2014 was undertaken. This indicated that it would be better to exclude the data for 2014 from the models as the numbers of deaths in 2014 were substantially higher than those of 2015–2019. Secondly, it was noted that rates of change in mortality differed by age group. A detailed report on the revised predicted numbers is still in preparation. Briefly, the predicted numbers of weekly deaths for 2020 – 2023 have been estimated using new models together with population estimates for 2020 – 2023 based on data from the pre-COVID period 2015–2019. The overall impact of revised predicted (without changing the benchmark in the early stage of the pandemic) is to reduce the estimate of excess deaths from natural causes for the period 2020 – 2022 by some 32,000 (less than 10%). Much of this was due to the overestimate of excess deaths under age 5.

The predicted values for the weekly deaths are based on negative binomial models for natural deaths for each province for 10-year age groups (to deal with digit preference in the deaths) from 5-years of age allowing for age-specific trends. For child deaths <1 year and 1-4 years, the average deaths rates for 2015 – 2019 were continued. Deaths in the 10-year age groups have been redistributed to the component five-year age groups in proportion to mortality increases between the 2 five-year age groups from model life table (Coale & Demeny West level 20) up to the age group 35-44. The apportionment for age group 35-44 was applied to all the older age groups.

This monthly report provides estimates of the weekly number of deaths of all persons in South Africa up to the end of epidemiological **Week 52 of 2023**, covering the period **January 2020 till 30 December 2023**. It reports national estimates for all causes of death as well as natural and unnatural causes. The report also presents natural deaths by significant age groups and the provincial estimates for all-cause deaths as well as the sex-age group breakdown for natural deaths.

**Since this report covers estimates of the weekly deaths since 2020, we have added a section at the end where we reflect briefly on the annual trends and patterns of reported deaths in South Africa over the four years 2020-2023 when compared with the baseline expected deaths over the same period.** It must be recalled that the baseline expected deaths have been estimated by extrapolating the trends in mortality rates (by age, and sex, and province) observed in the pre-Covid era (2015-2019) applied to our best estimate of the population size in those groupings. With each year of extrapolation, our uncertainty (even though not quantifiable) as to those mortality rates increases; likewise the population numbers are derived from standard demographic projection techniques that were complicated by the impact of Covid-19.

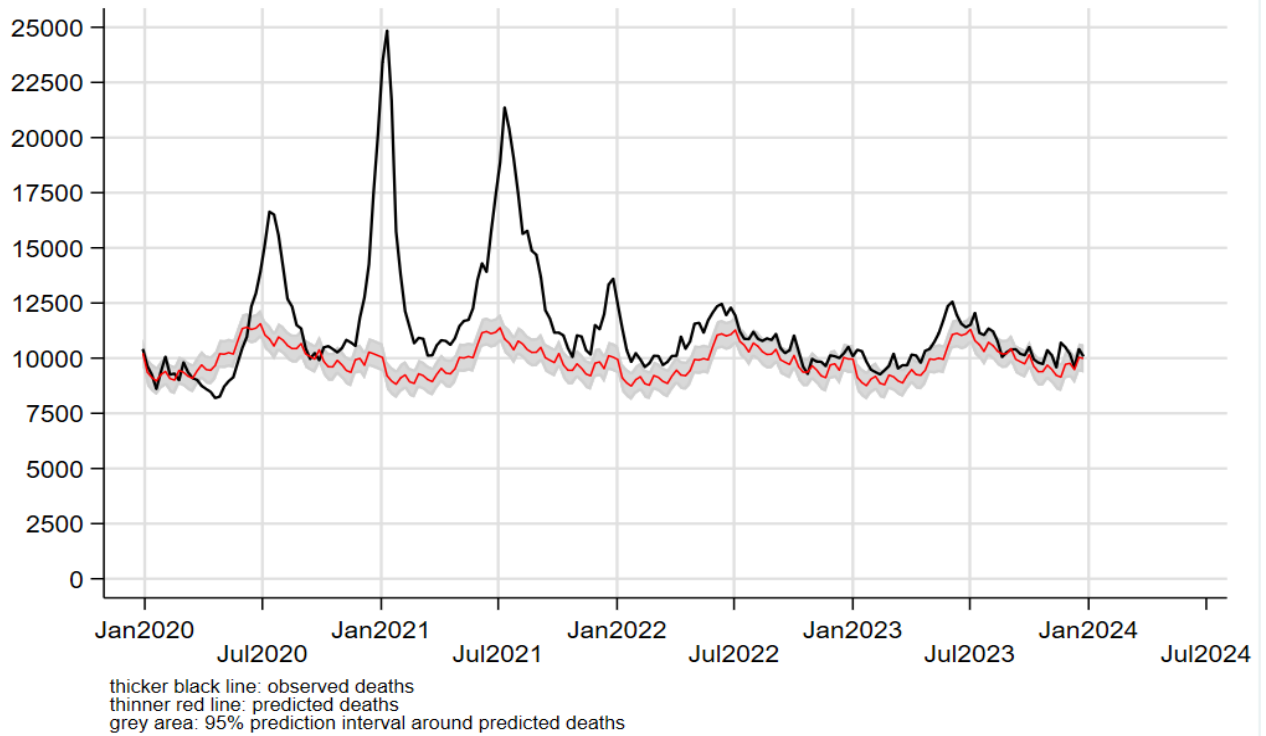
While the current estimates of weekly deaths and comparison of the actual number with the predicted number has served the country well in providing a near to real-time mortality surveillance system, we are currently in the process of investigating improvements to establishing the baseline expected deaths to enhance the estimate of excess deaths.

## All-cause deaths

- The all-cause weekly deaths in 2023 reverted to within the prediction bounds (for both natural and unnatural) since February 2023, following a short period of exceeding the upper prediction bound in January. Thereafter the weekly numbers occasionally exceeded the upper prediction bound, driven by increases in deaths from natural causes, particularly among persons older than 60 years. Weekly all-cause deaths were elevated during May, running higher than the upper prediction bound from Weeks 20 to 23. There was a single spike in the numbers of deaths in July in Week 28. Again, in Weeks 28 to 30, the numbers of deaths from natural causes exceeded the upper prediction bound, particularly for persons 80 years and older. There was a noticeable spike in the numbers of deaths in Week 47 (19 – 25 November 2023). During this week there were 10 348 deaths compared with the predicted 9 142 i.e. 13% higher than expected. This was largely a result of a sharp increase in deaths in Limpopo province (1 532 observed deaths compared with 1 090 predicted, i.e. 41% higher than expected). The increase in deaths was mostly from natural causes among older women and coincided with extremely hot weather in that province, and in Gauteng and KwaZulu Natal provinces to a lesser extent.
- Natural deaths of persons 20-39 years have tracked consistently above the predicted numbers throughout 2023, although they do not exceed the upper prediction bound.
- During December (Weeks 49-52) the overall number of deaths fell within the prediction bounds. However, in Weeks 51 and 52 there was a noticeable increase in deaths in KwaZulu Natal from natural causes and a noticeable increase in deaths in the Eastern Cape from both natural and unnatural causes.
- From the review of annual numbers, in 2022 there were 9% more deaths than predicted and in 2023 there were 6%, affecting both natural and unnatural causes. Without additional information about the causes of death, care must be taken to not over-interpret the results.

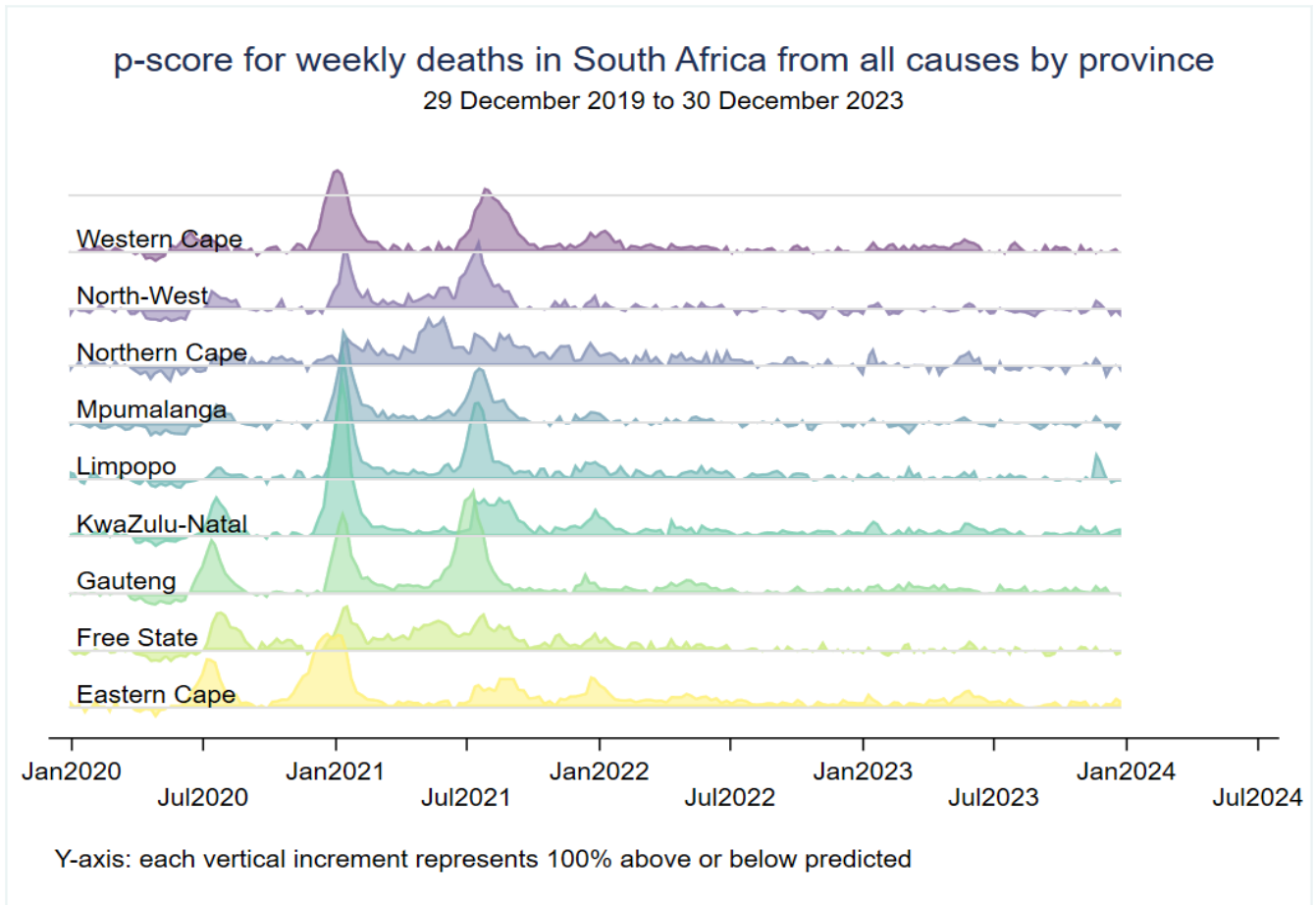
### RSA weekly deaths from all causes

29 December 2019 to 30 December 2023



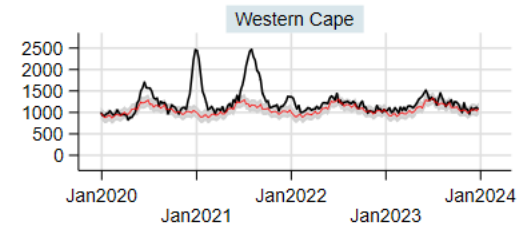
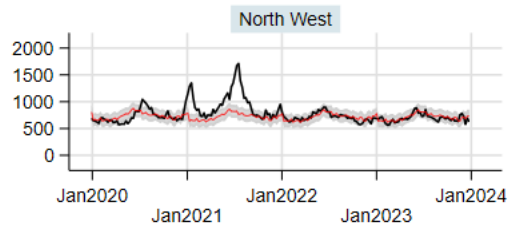
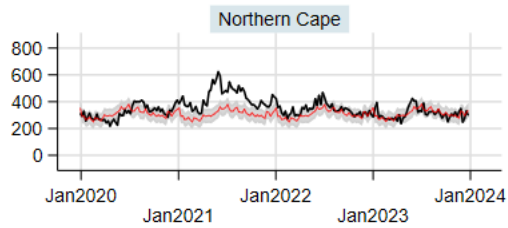
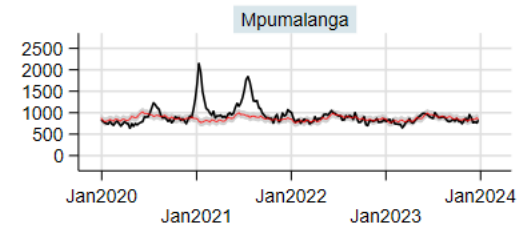
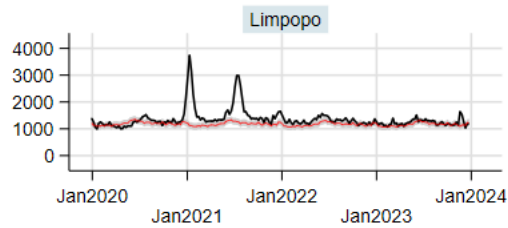
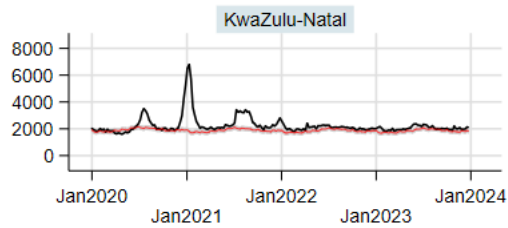
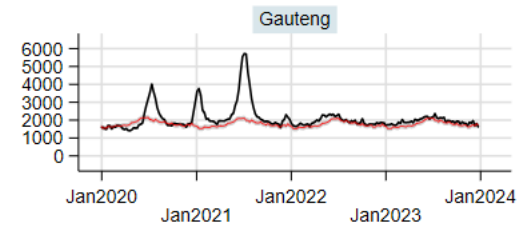
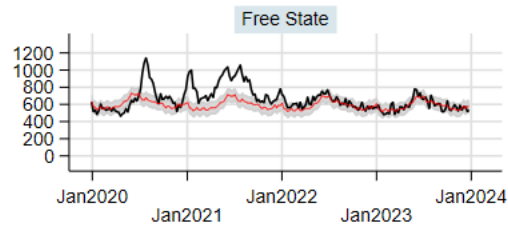
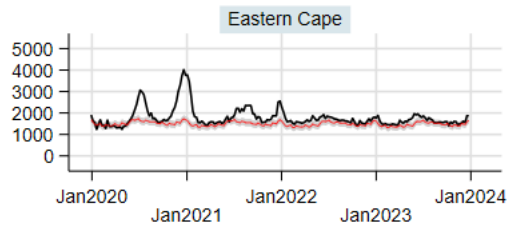
*Numbers have been scaled to the estimated actual number of deaths*

## All-cause deaths by province



# Deaths from all causes, by province

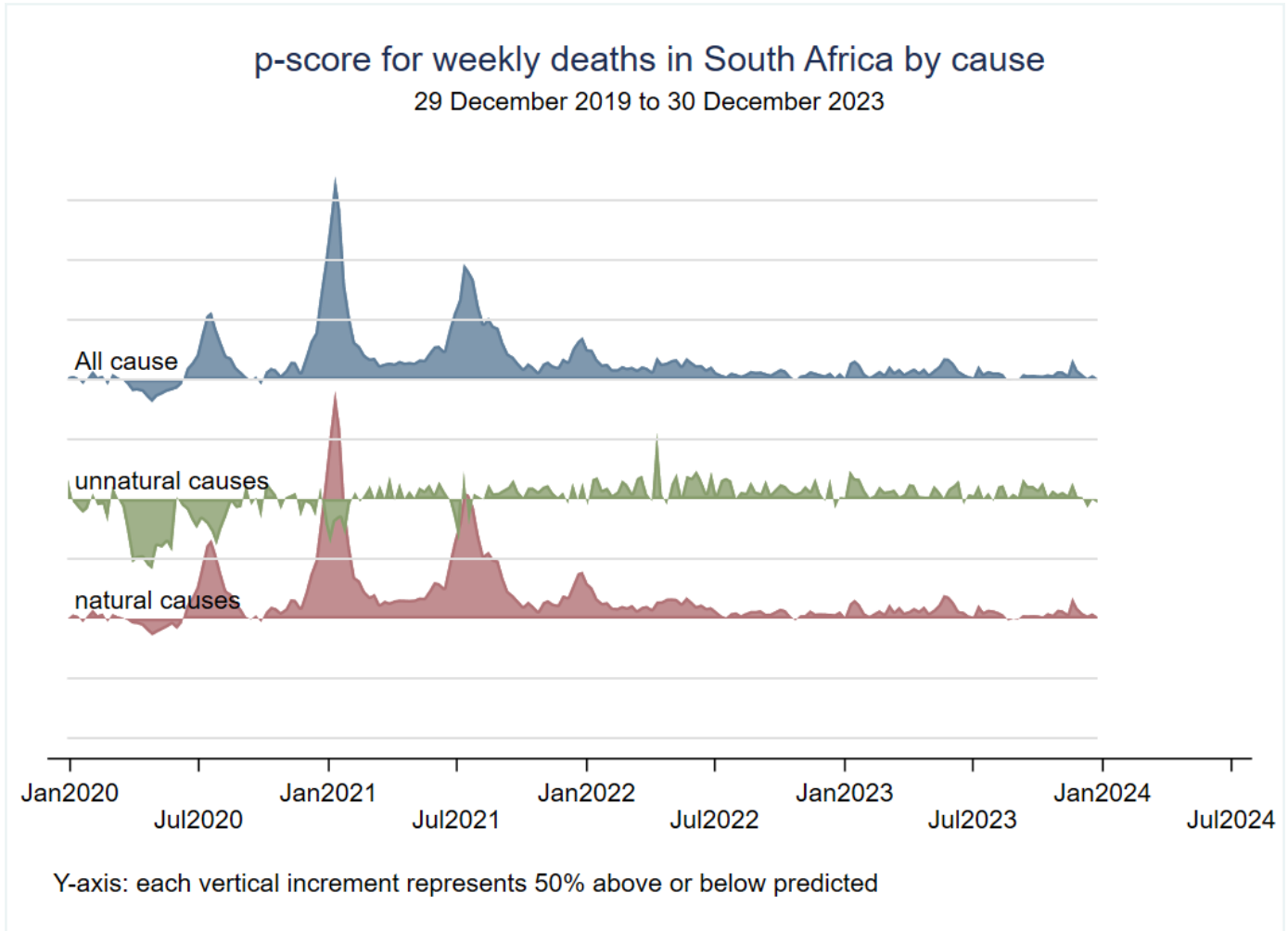
29 December 2019 to 30 December 2023



thicker black line: observed deaths  
 thinner red line: predicted deaths  
 grey area: 95% prediction interval around predicted deaths

*Numbers have been scaled to the estimated actual number of deaths*

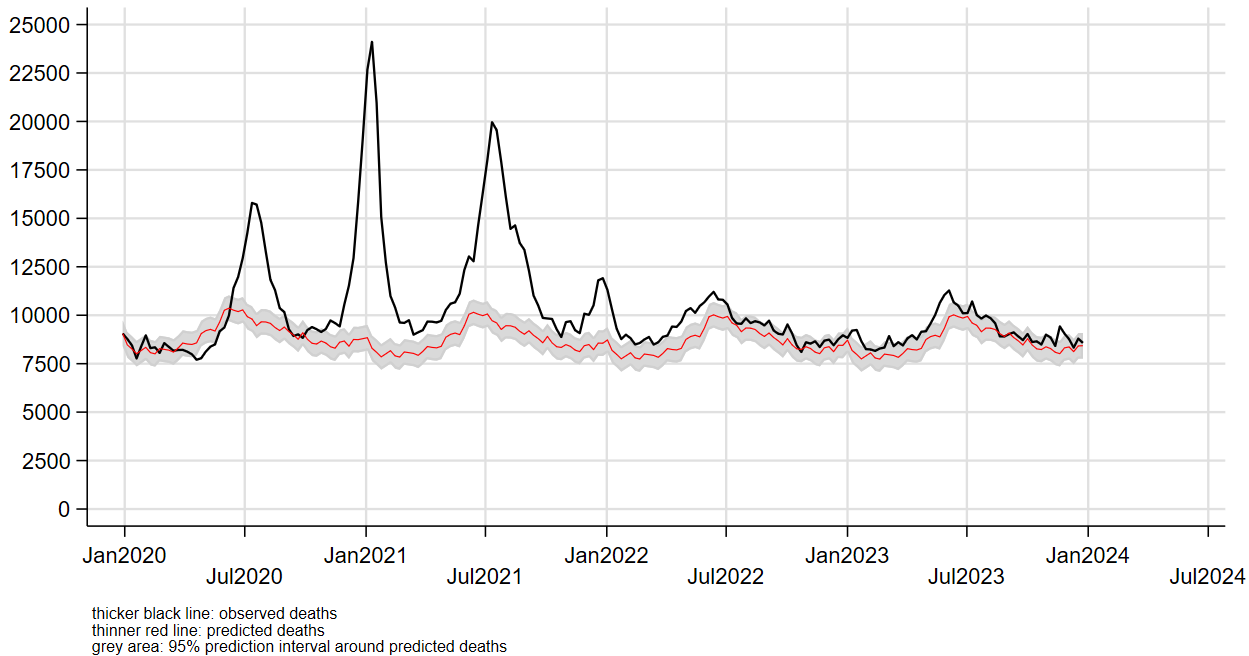
## Natural and unnatural deaths





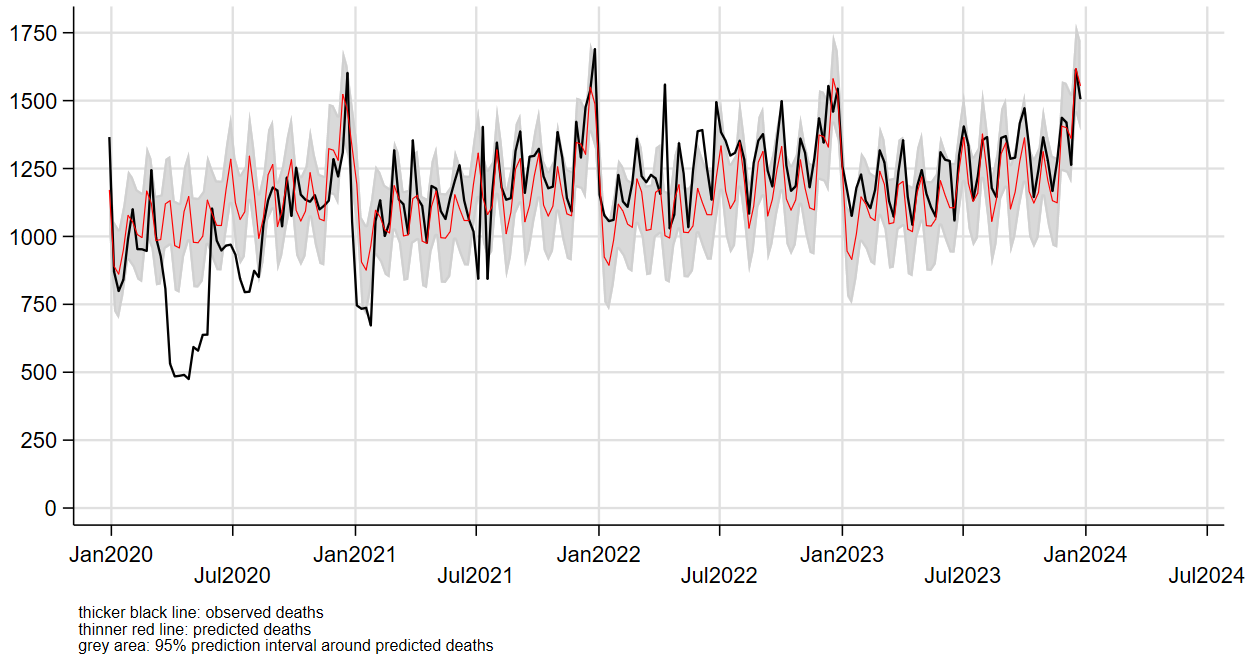
### RSA weekly deaths from natural causes

29 December 2019 to 30 December 2023



### RSA weekly deaths from unnatural causes

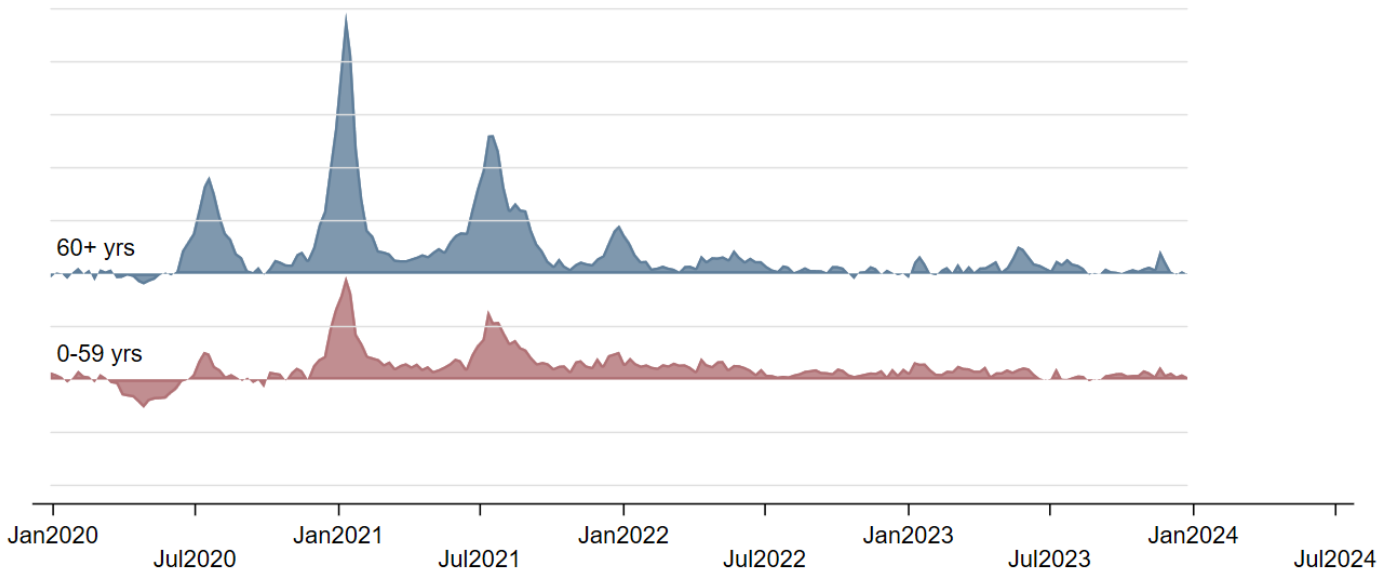
29 December 2019 to 30 December 2023



*Numbers have been scaled to the estimated actual number of deaths*

## Natural deaths by broad age groups

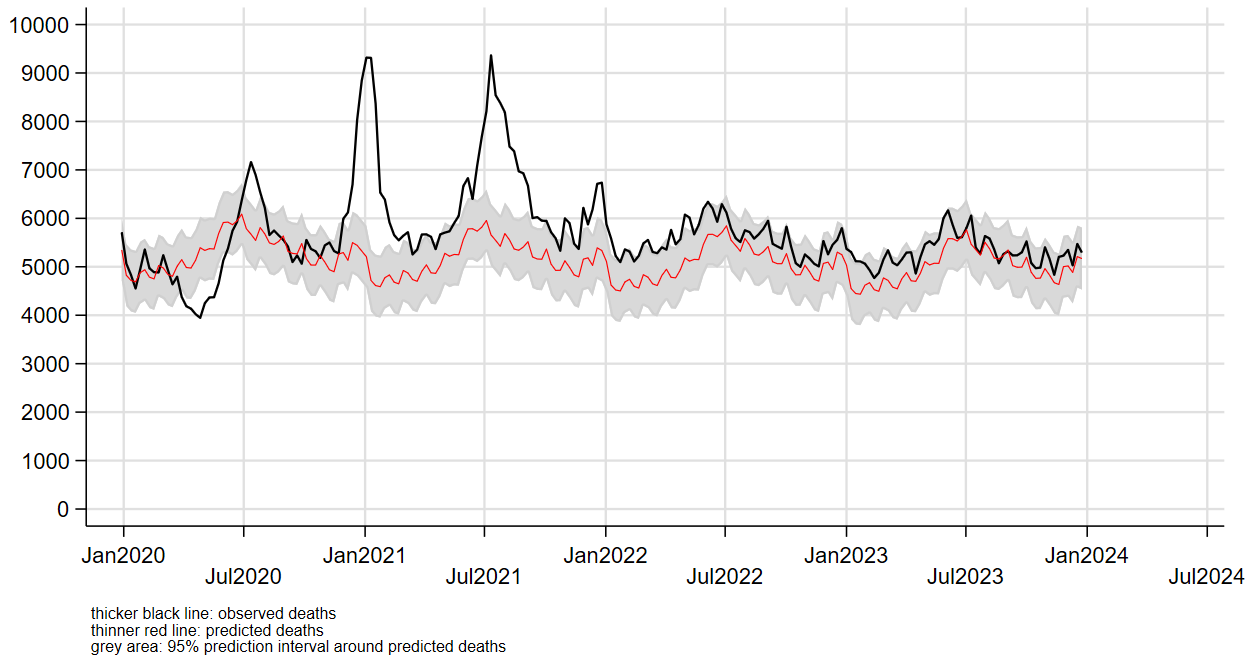
p-score for weekly deaths in South Africa from natural causes by broad age group  
29 December 2019 to 30 December 2023



Y-axis: each vertical increment represents 50% above or below predicted

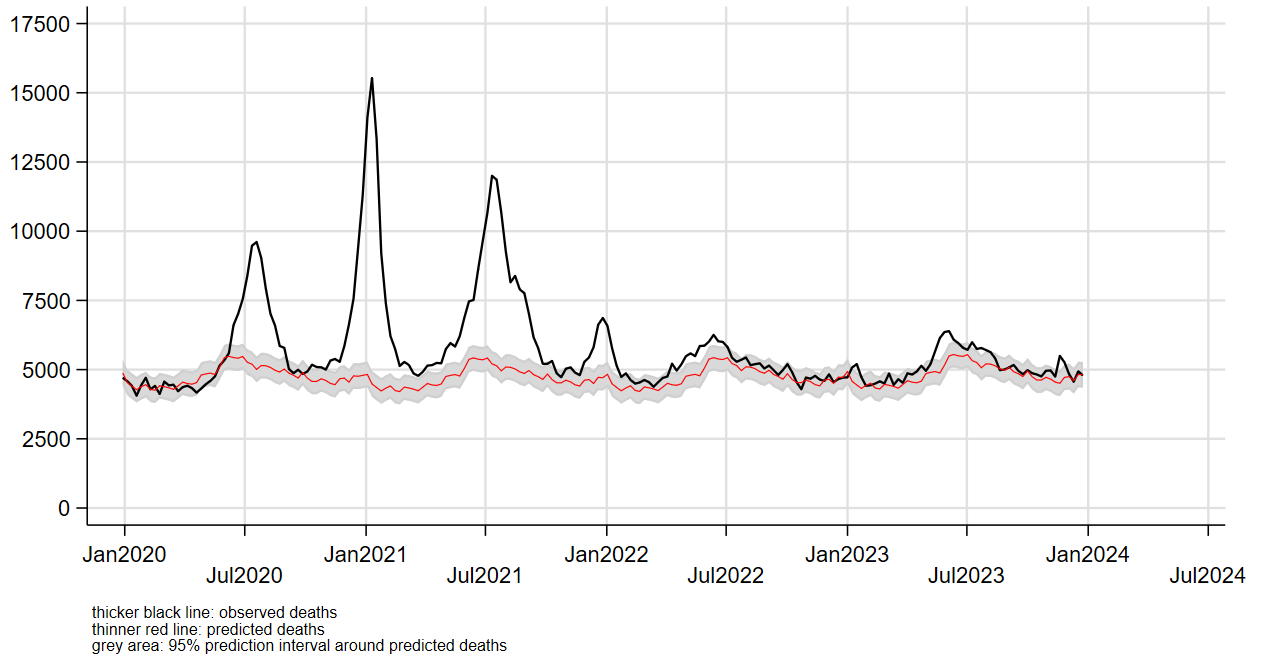
### RSA weekly deaths from all causes : 0-59 years

29 December 2019 to 30 December 2023



### RSA weekly deaths from all causes : 60+ years

29 December 2019 to 30 December 2023

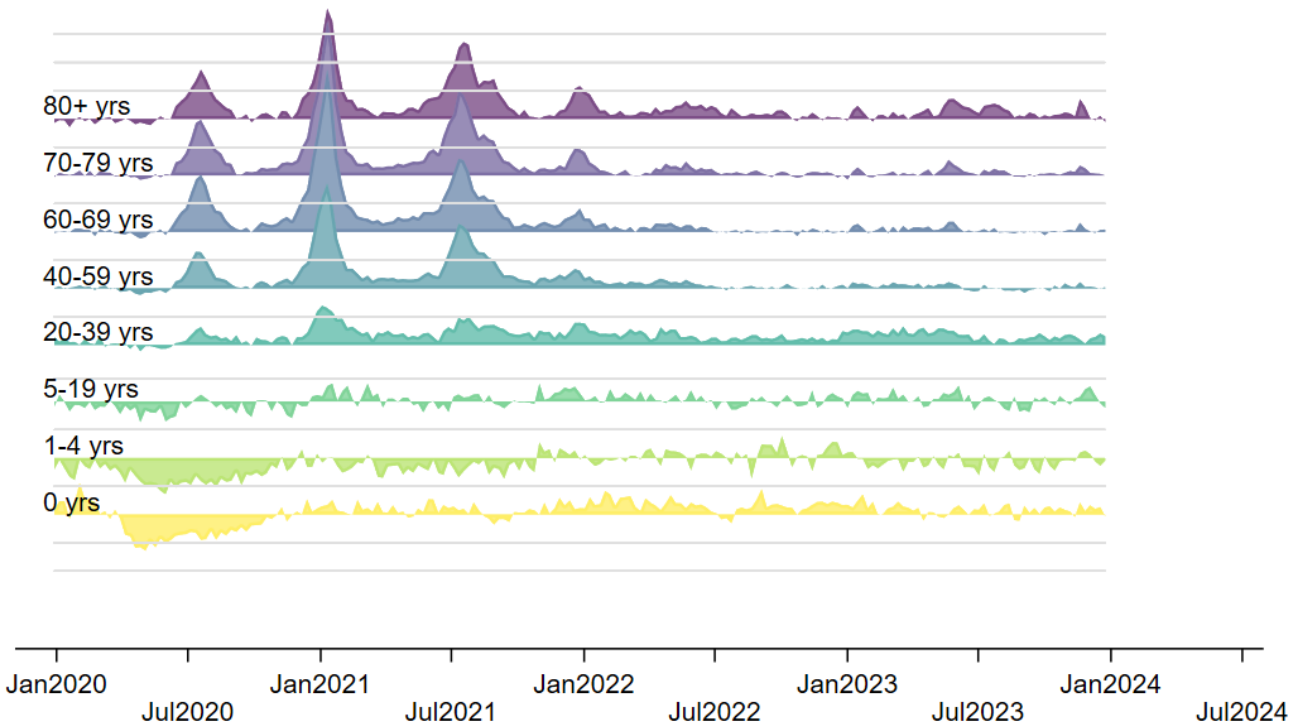


*Numbers have been scaled to the estimated actual number of deaths*

# Natural deaths by age group

p-score for weekly deaths in South Africa from natural causes by age group

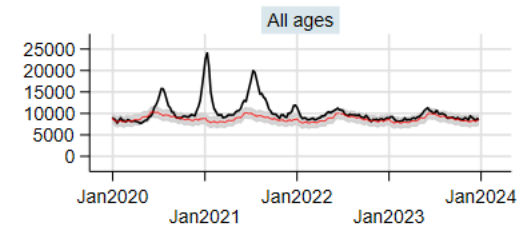
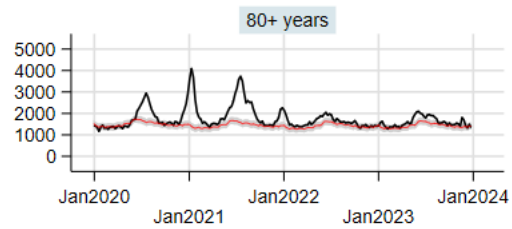
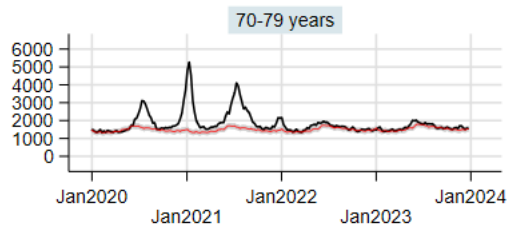
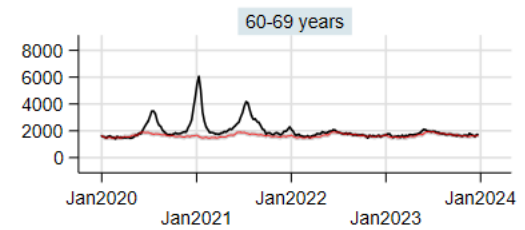
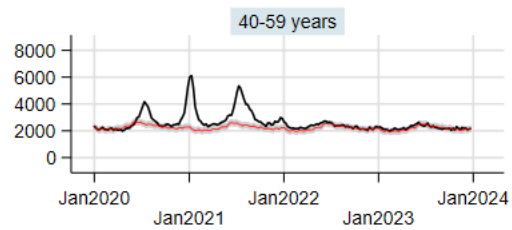
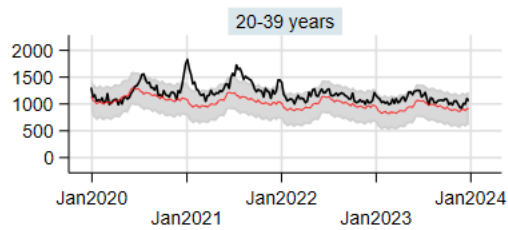
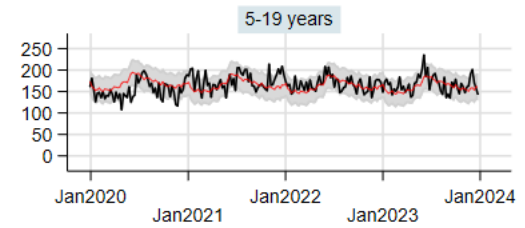
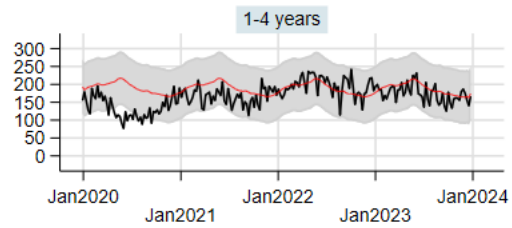
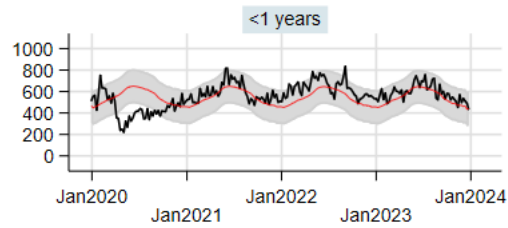
29 December 2019 to 30 December 2023



Y-axis: each vertical increment represents 50% above or below predicted

# RSA weekly deaths from natural causes, by age group

29 December 2019 to 30 December 2023



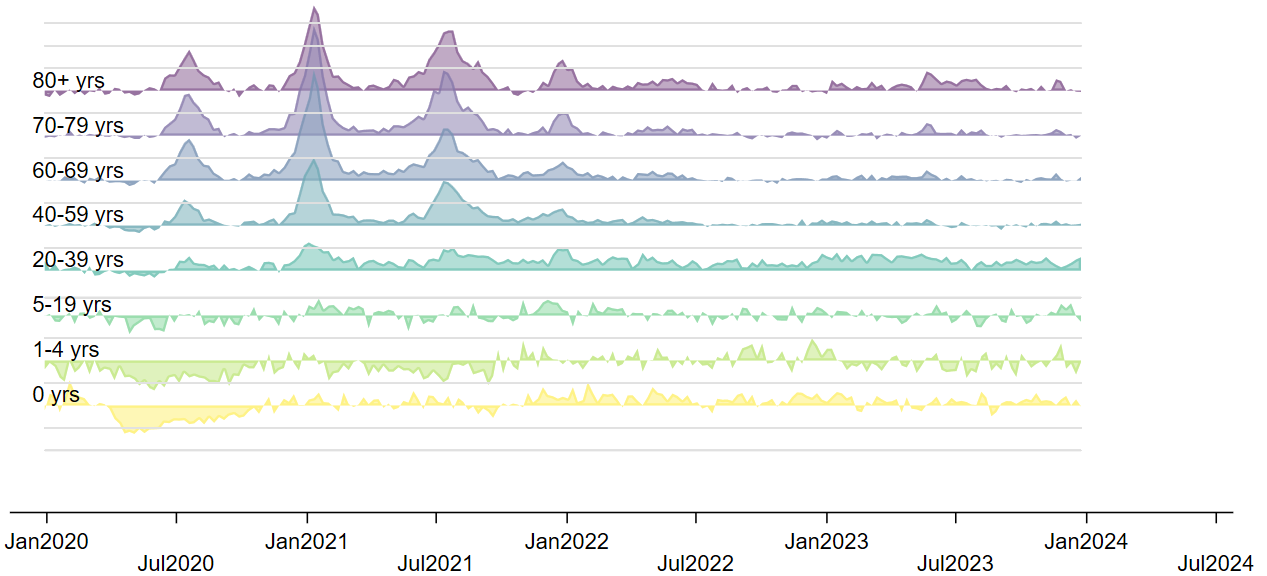
thicker black line: observed deaths  
 thinner red line: predicted deaths  
 grey area: 95% prediction interval around predicted deaths

*Numbers have been scaled to the estimated actual number of deaths*

## Natural deaths by sex and age group

p-score for male weekly deaths in South Africa from natural causes by age group

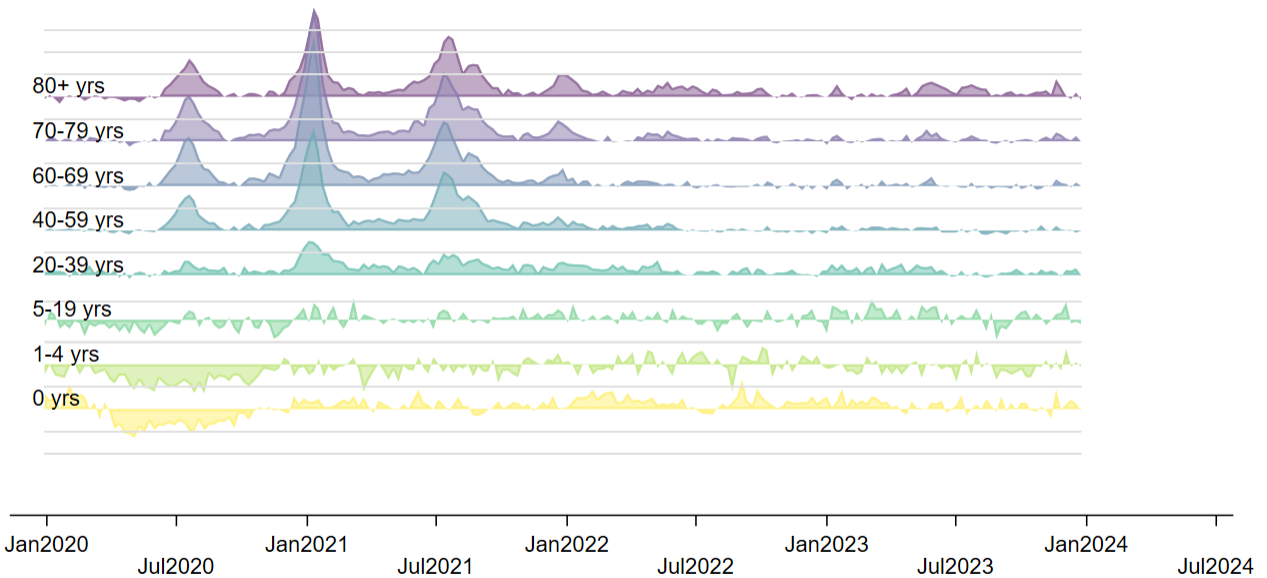
29 December 2019 to 30 December 2023



Y-axis: each vertical increment represents 50% above or below predicted

p-score for female weekly deaths in South Africa from natural causes by age group

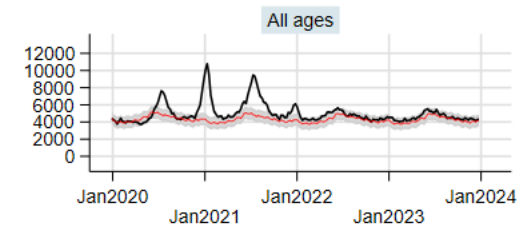
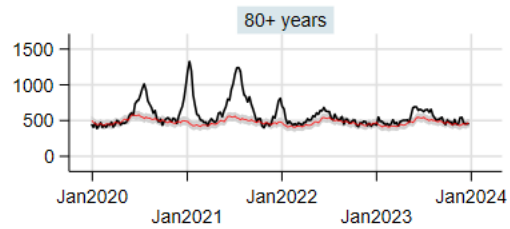
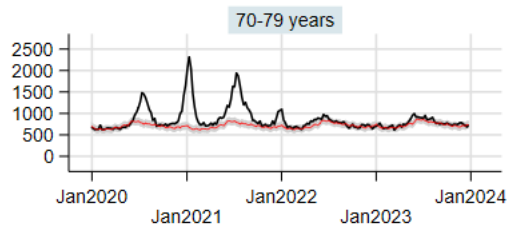
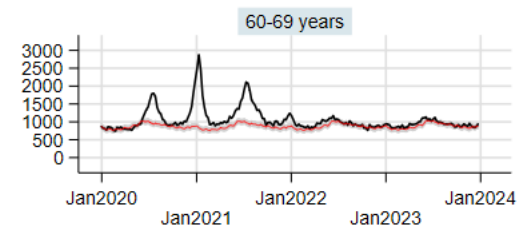
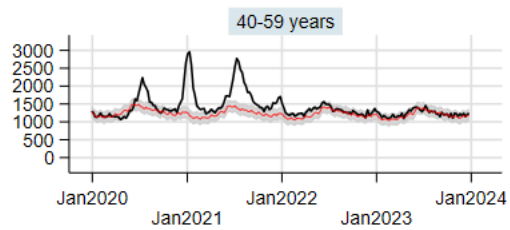
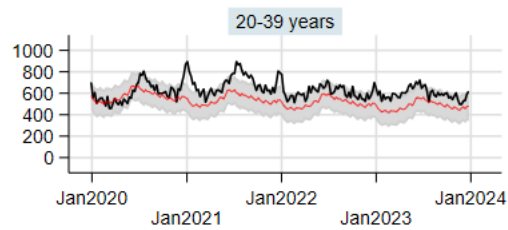
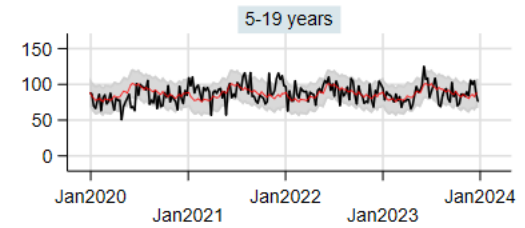
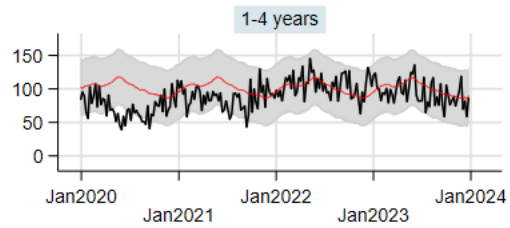
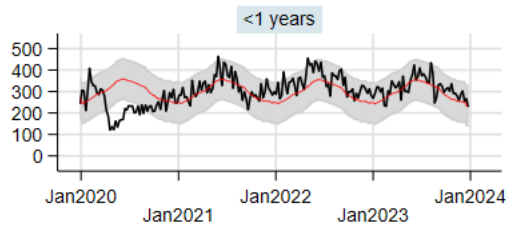
29 December 2019 to 30 December 2023



Y-axis: each vertical increment represents 50% above or below predicted

# Males: Natural deaths, by age group

29 December 2019 to 30 December 2023

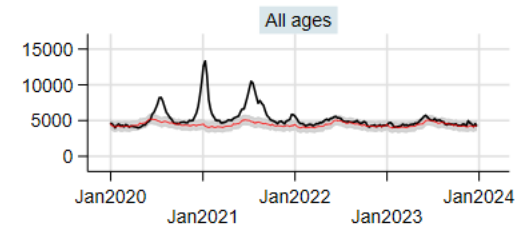
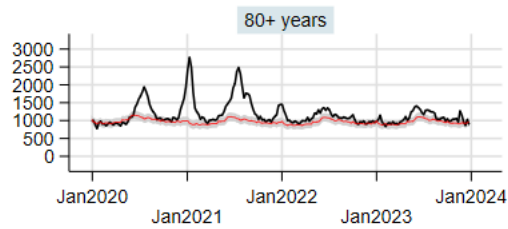
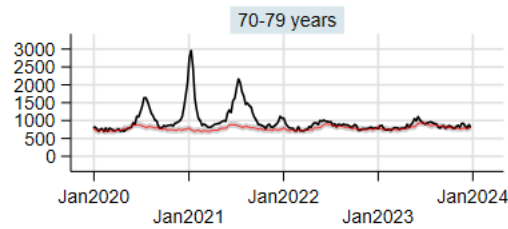
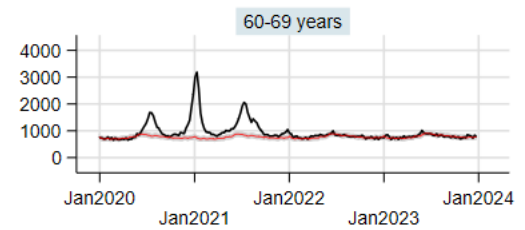
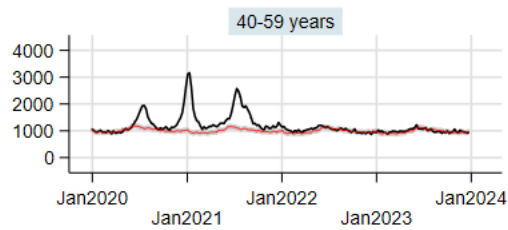
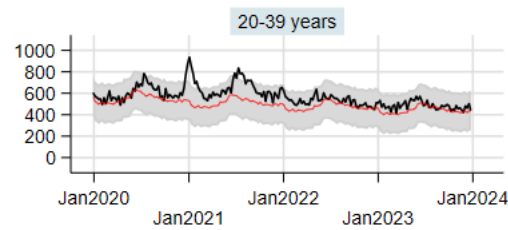
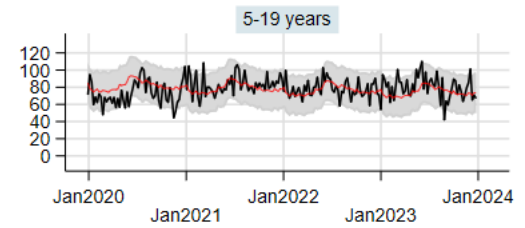
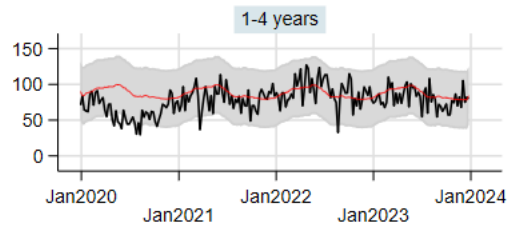
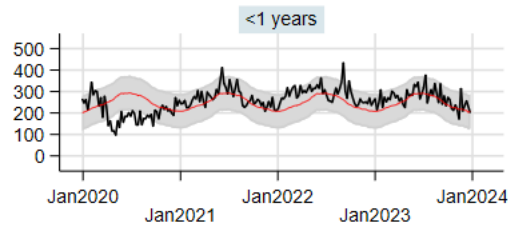


thicker black line: observed deaths  
 thinner red line: predicted deaths  
 grey area: 95% prediction interval around predicted deaths

*Numbers have been scaled to the estimated actual number of deaths*

# Females: Natural deaths, by age group

29 December 2019 to 30 December 2023



thicker black line: observed deaths  
 thinner red line: predicted deaths  
 grey area: 95% prediction interval around predicted deaths

*Numbers have been scaled to the estimated actual number of deaths*



## Review of annual numbers of deaths for 2020-2023

Table 1 shows the annual numbers of deaths (all cause) and natural deaths by sex for each of the four epi-years from 2020-2023.<sup>1</sup> While the numbers of predicted deaths were largely stable in 2021-2023, the number of observed deaths from both all causes and natural causes have fallen substantially.

Table 1: Actual and predicted deaths from all causes, and from natural causes by sex, South Africa 2020-2023.

Epi-year	All cause deaths		Natural deaths					
	Persons		Persons		Males		Females	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2020	588 920	532 428	537 650	473 150	259 099	233 551	278 551	239 599
2021	705 279	513 670	644 901	454 715	309 807	224 557	335 094	230 158
2022	554 907	509 059	488 913	448 907	242 733	221 255	246 180	227 652
2023	543 221	510 302	477 948	448 714	237 123	220 667	240 824	228 047

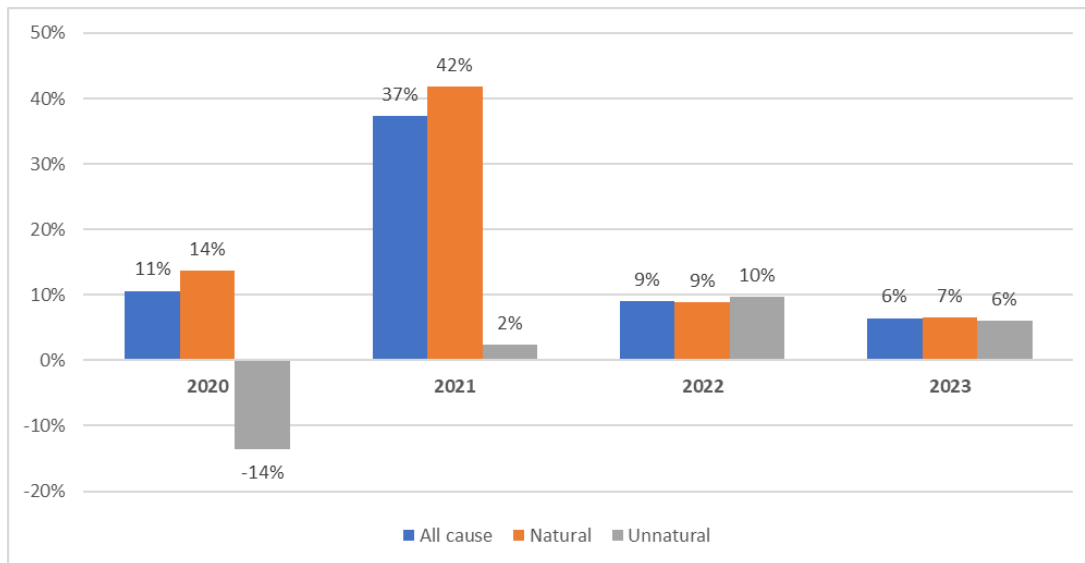
Table 2 shows the proportional excess mortality in each year by cause, and by sex for natural deaths and the estimate of excess mortality by cause are shown in Figure 1. The impact of Covid-19, particularly in 2021, is evident: in that year, natural deaths were 42% higher than expected; 38% higher for males and 46% for females. In 2023, deaths from all causes were 6% higher than expected, and natural deaths were 7% higher than expected. We would have anticipated deaths in 2023 to have been closer to the expected baselines and remain alert to the possibility that the extrapolation of the expected baselines over many years may have resulted in an exaggerated decrease in those baselines.

Table 2: Proportional excess mortality from all causes, and from natural causes by sex, South Africa 2020-2023.

Epi-year	All cause deaths	Natural deaths		
	Persons	Persons	Males	Females
2020	11%	14%	11%	16%
2021	37%	42%	38%	46%
2022	9%	9%	10%	8%
2023	6%	7%	7%	6%

<sup>1</sup> An epi-year runs for the 52 (or 53 in some calendar years) weeks beginning on the Sunday in December or January with four or more days in that week falling in January, up to and including the last week beginning on the last Sunday in December with three or fewer days in that week falling in January..

Figure 1: Percent excess mortality by cause and year, South Africa 2020-2023.



The annual excess deaths from natural causes are reviewed further by age and sex. The percent excess is shown in Figure 2 by age group for males and females separately while Table 3 shows the numbers and Table 4 the proportional excess mortality respectively.

As can be seen from Figure 2, the excess fell particularly heavily on those over the age of 40 in 2020 and 2021. Given this age pattern together with the temporal correspondence with SARS-CoV2 testing data that occurred, we interpret this excess in natural deaths as COVID burden. Younger children experienced somewhat lighter mortality in 2020 and 2021, a feature largely attributable to the attenuating effects of lockdowns on the transmission of communicable diseases among those under the age of 5. In 2022 and 2023, the pattern of excess mortality by age and sex was a little erratic, with somewhat higher excess mortality among males (especially those aged 20-39) than females, and persistent higher mortality than expected among those (of both sexes) aged over 80. While the numbers are relatively small, there was an improvement in child mortality 1-4 years in 2023 compared with the average mortality rates in 2015-2019.

Again, as noted, the observed excess may well be an artifact of the extrapolation of mortality rates into 2022 and 2023 rather than a real phenomenon. Unfortunately, cause of death data are not available to provide definitive information about the causes of the excess. Investigations into the spatio-temporal patterns and comparison with other surveillance data such as influenza and RSV trends and climate related information e.g. heat waves, will be helpful to interpret the excess deaths, but it remains critical that South Africa revamps the death registration system to enable more rapid access to the medical cause of death information.

Figure 2: Percent excess mortality from natural causes by age group and sex, South Africa 2020-2023

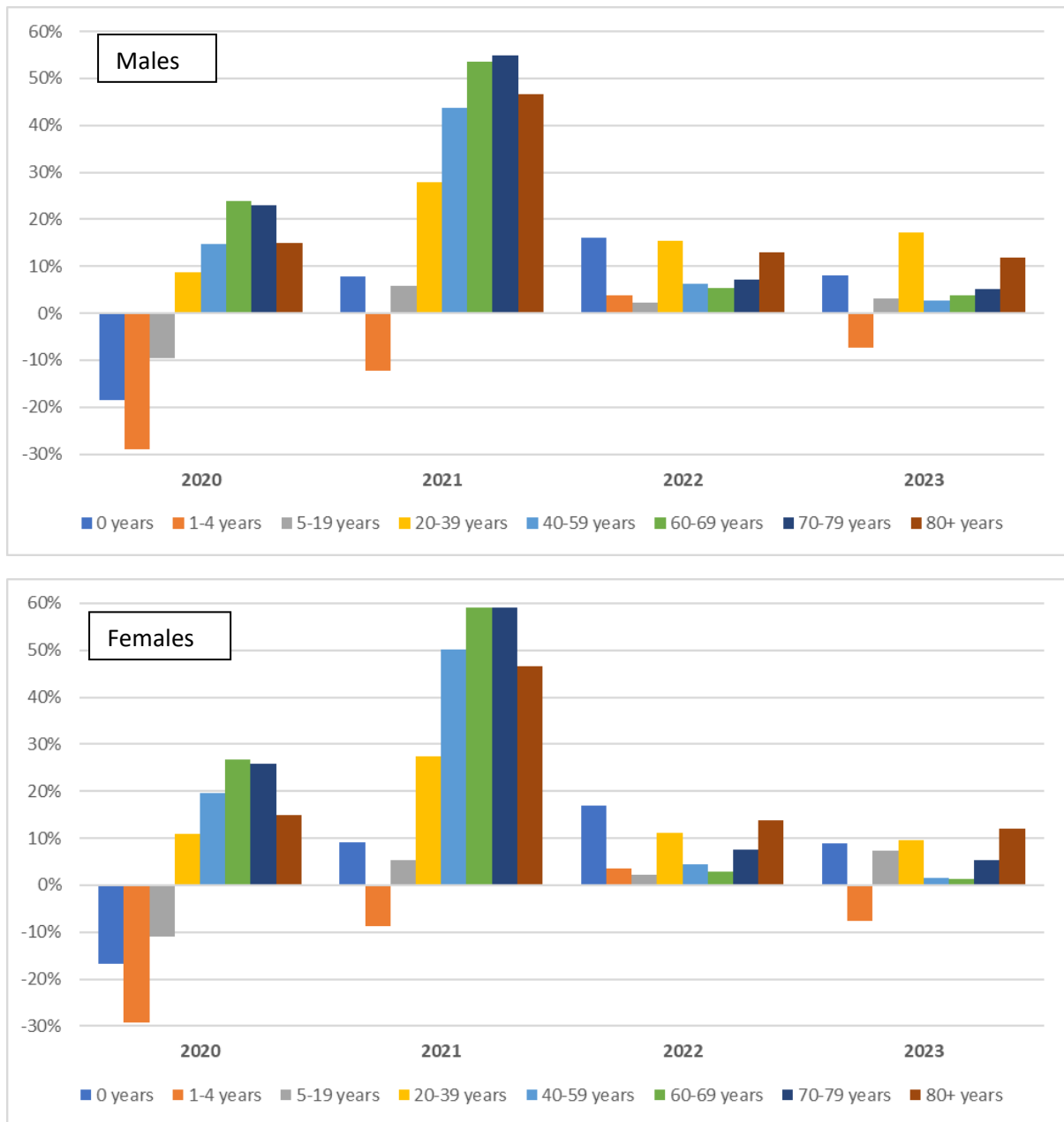


Table 3: Actual and predicted deaths from natural causes by age group and sex, South Africa 2020-2023.

<b>MALES (Natural deaths)</b>																
<b>Epi-year</b>	<b>0 years</b>		<b>1-4 years</b>		<b>5-19 years</b>		<b>20-39 years</b>		<b>40-59 years</b>		<b>60-69 years</b>		<b>70-79 years</b>		<b>80+ years</b>	
	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>
<b>2020</b>	12 661	15 794	3 825	5 376	4 232	4 614	32 238	30 304	74 812	67 481	56 235	46 373	44 704	37 267	30 392	26 341
<b>2021</b>	16 527	15 506	4 454	5 260	4 780	4 505	36 052	28 076	89 085	64 328	67 290	45 236	55 113	36 697	36 506	24 948
<b>2022</b>	17 817	15 424	5 475	5 252	4 620	4 507	31 686	26 476	67 755	62 844	48 855	45 440	39 747	37 226	26 776	24 087
<b>2023</b>	16 522	15 382	4 850	5 220	4 512	4 526	30 998	24 946	64 044	61 855	48 740	46 078	40 284	38 400	27 174	24 260

<b>FEMALES (Natural deaths)</b>																
<b>Epi-year</b>	<b>0 years</b>		<b>1-4 years</b>		<b>5-19 years</b>		<b>20-39 years</b>		<b>40-59 years</b>		<b>60-69 years</b>		<b>70-79 years</b>		<b>80+ years</b>	
	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>	<b>Obs.</b>	<b>Pred.</b>
<b>2020</b>	10 902	13 098	3 300	4 662	3 851	4 320	32 156	28 979	64 959	54 345	51 010	40 239	51 363	40 821	61 010	53 135
<b>2021</b>	14 082	12 897	4 158	4 560	4 319	4 102	33 779	26 519	78 366	52 193	63 043	39 636	63 791	40 099	73 556	50 152
<b>2022</b>	15 031	12 865	4 705	4 545	4 064	3 978	27 432	24 700	53 608	51 368	41 332	40 140	43 886	40 765	56 122	49 291
<b>2023</b>	13 989	12 853	4 173	4 522	4 150	3 866	25 190	22 976	51 579	50 818	41 458	40 897	44 400	42 183	55 885	49 932

Table 4: Proportional excess deaths from natural causes by age group and sex, South Africa 2020-2023.

<b>MALES (Natural deaths)</b>										
<b>Epi-year</b>	<b>0 years</b>	<b>1-4 years</b>	<b>5-19 years</b>	<b>20-39 years</b>	<b>40-59 years</b>	<b>60-69 years</b>	<b>70-79 years</b>	<b>80+ years</b>		
<b>2020</b>	-20%	-29%	-8%	6%	11%	21%	20%	15%		
<b>2021</b>	7%	-15%	6%	28%	38%	49%	50%	46%		
<b>2022</b>	16%	4%	3%	20%	8%	8%	7%	11%		
<b>2023</b>	7%	-7%	0%	24%	4%	6%	5%	12%		

<b>FEMALES (Natural deaths)</b>										
<b>Epi-year</b>	<b>0 years</b>	<b>1-4 years</b>	<b>5-19 years</b>	<b>20-39 years</b>	<b>40-59 years</b>	<b>60-69 years</b>	<b>70-79 years</b>	<b>80+ years</b>		
<b>2020</b>	-17%	-29%	-11%	11%	20%	27%	26%	15%		
<b>2021</b>	9%	-9%	5%	27%	50%	59%	59%	47%		
<b>2022</b>	17%	4%	2%	11%	4%	3%	8%	14%		
<b>2023</b>	9%	-8%	7%	10%	1%	1%	5%	12%		