

Comparing 2019 Preliminary Suicide Deaths data with Modelled Forecasts

Addendum to:

Biddle, N., Ellen, L., Korda, R., and Reddy, K., (2020) 'Suicide Mortality in Australia: Estimating and Projecting Monthly Variation and Trends From 2007 to 2018 and Beyond'

<https://www.aihw.gov.au/getmedia/742843a5-ae99-417f-a731-62b437cefabb/Suicide-mortality-Australia-2007-2018.pdf.aspx>

This addendum provides a descriptive comparison of the monthly forecasted deaths for the period of January 2019 till November 2019 from Biddle, Ellen, Korda and Reddy (henceforth, BEKR 2020), with preliminary suicide deaths data for this same period, adjusted for the expected revisions process.

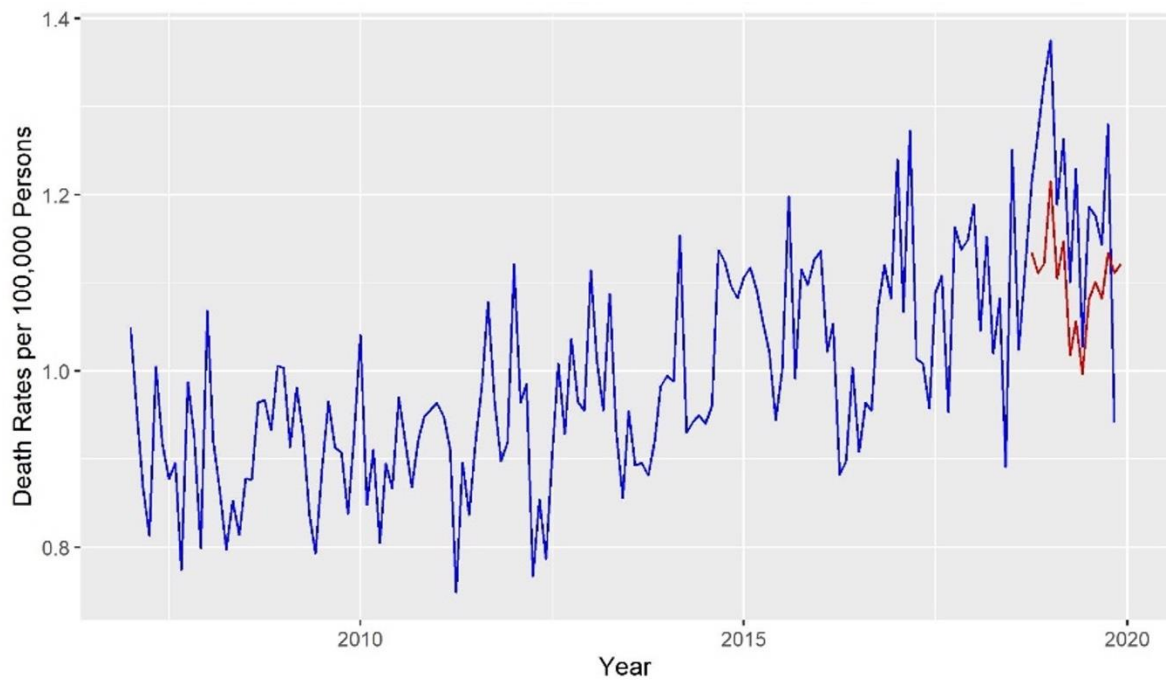
The final forecasting model used within BEKR (2020) was an Exponential State Smoothing Model (ETS) Model. Five different models were initially trained with the ETS model selected because of its higher comparative accuracy (measured using mean absolute percentage error) and after a visual inspection of residual diagnostics. The ETS modelled forecasts have been used for descriptive comparison with the actual preliminary suicide deaths data. However, it is noted that the ETS model performance was only marginally superior to the Exponential Smoothing State Space Model with Box-Cox Transformation (TBATS) model also trained.

The ETS modelled death forecasts provided within BEKR (2020) are designed to estimate Final suicide deaths data. Currently the most updated 2019 suicide deaths data is Preliminary.¹ To allow for accurate comparisons, and based on historic estimates of the difference between the preliminary and final estimates, the deaths figures are multiplied by 1.133. The month of December was excluded from the comparison of forecasted and actual preliminary deaths data because preliminary deaths data for December appears to be differentially impacted by the data revisions process when compared to other calendar months. This may be explained by a larger number of deaths occurring in December not being officially registered until the following calendar year.

Figure 1 shows the monthly point forecasted death rates alongside the actual (adjusted) death rates calculated using the preliminary deaths data provided by the AIHW. Deaths rates per 100 000 population were calculated using the method outlined within our substantive report. Figure 2 provides that same information as Figure 1, with the addition of confidence intervals around monthly point forecasts. Table 1 presents the modeled death rates per 100 000 population and the actual (adjusted) Preliminary death rates and counts.

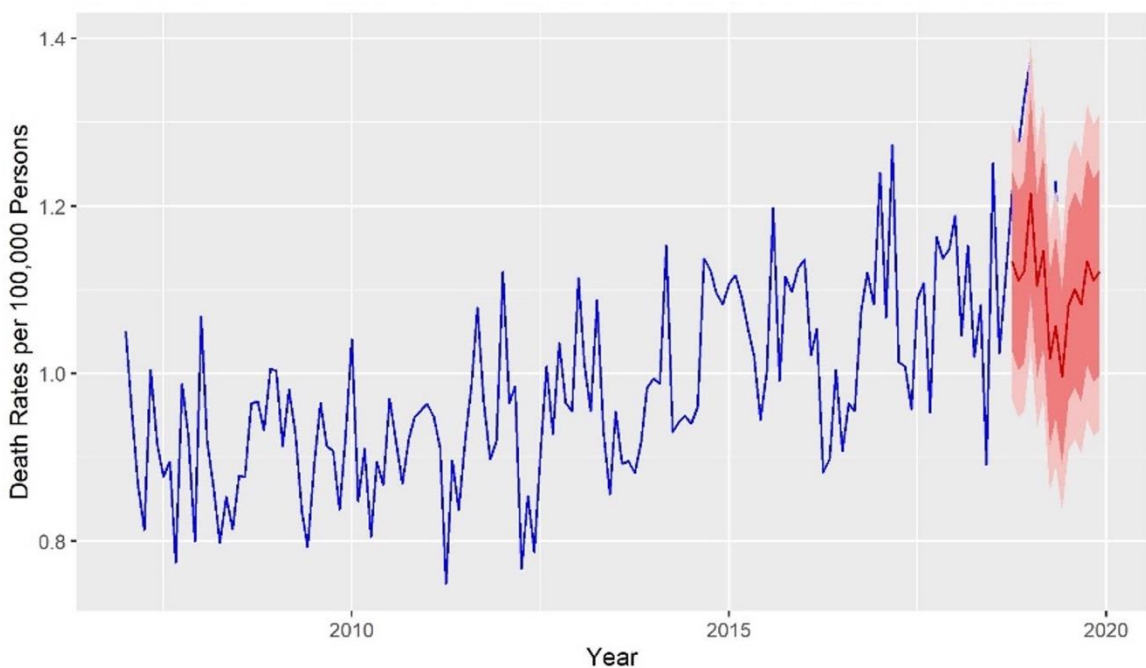
¹ Pages 6-7 of BEKR (2020) provides an overview of the Australian Bureau of Statistics review processes for suicide deaths data.

Figure 1 Monthly Point Forecasts Compared with Adjusted Preliminary Suicide Deaths Data



Note. The blue line indicates the observed (adjusted) dataset for monthly suicide death rates. The red line indicates the predicted point forecasts of the model.

Figure 2 Monthly Point Forecasts Compared with Adjusted Preliminary Suicide Deaths Data with Confidence Intervals



Note. The blue line indicates the observed (adjusted) dataset for monthly suicide death rates. The red line indicates the predicted point forecasts of the model. The dark red shaded area indicates the 80% confidence interval around the point forecasts. The pink shaded area indicates the 95% confidence interval around the point forecasts.

A visual inspection indicates that the forecast performed reasonably well, particularly when considering the 95% confidence interval. The mean absolute percentage error (MAPE) for the forecast model when tested against the actual (adjusted) Preliminary 2019 data was 9.31%. The MAPE measure

captures the difference between values predicted by the forecast model and observed values, expressed in percentage terms.

Overall, it appears our monthly forecasted deaths values for January 2019 till November 2019 are accurate, within the 95% CI of the estimates, when tested against actual Preliminary suicide deaths data generated by the ABS. Though we acknowledge that the confidence interval for some months are reasonably wide. Given that our forecasts are designed to estimate Finalised suicide deaths data, adjustment has been made to the Preliminary data to account for the impact of the ABS data revisions processes. Although accurate within the 95% CI, our monthly forecasted point estimates consistently underestimate the actual adjusted Preliminary deaths data. The exception is our estimate for November 2019 which overestimates the actual adjusted Preliminary deaths data.

In general though, the conclusions from the original paper hold. Nationally, suicide rates were fairly steady from 2007 to 2010 but rose from 2010 to 2015 and have shown no clear trend since 2015. Overall, this pattern is quite similar for males and females however, death rates for males appear to have been approximately 3 times greater than for females at any given point in time. There are also clear seasonal patterns with January and February having the highest suicide rates and April to July having the lowest rates.

Table 1 Monthly Point Forecasts Compared with Adjusted Preliminary Suicide Deaths Data

Month-Year	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95	Population	Count	LoCount80	HiCount80	LoCount95	HiCount95	ActualDeaths	ActualDR
Jan-19	1.215	1.096	1.335	1.032	1.398	25213202	306	276	337	260	353	347	1.375
Feb-19	1.105	0.995	1.215	0.937	1.273	25255112	279	251	307	237	322	300	1.189
Mar-19	1.147	1.031	1.262	0.970	1.324	25292967	290	261	319	245	335	320	1.263
Apr-19	1.018	0.914	1.122	0.860	1.177	25317490	258	232	284	218	298	279	1.101
May-19	1.057	0.948	1.166	0.890	1.223	25341222	268	240	295	226	310	312	1.230
Jun-19	0.996	0.892	1.100	0.838	1.154	25365745	253	226	279	212	293	261	1.027
Jul-19	1.082	0.968	1.195	0.908	1.255	25400536	275	246	304	231	319	301	1.187
Aug-19	1.101	0.984	1.217	0.922	1.279	25436486	280	250	310	235	325	299	1.176
Sep-19	1.083	0.967	1.199	0.905	1.260	25472437	276	246	305	231	321	291	1.143
Oct-19	1.134	1.011	1.257	0.947	1.322	25497882	289	258	320	241	337	326	1.280
Nov-19	1.111	0.990	1.233	0.926	1.297	25524175	284	253	315	236	331	240	0.941