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Supporting Information

Supplementary methods and results

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.

Appendix to: Mian M, Sreedharan S, Giles S. Increased dispensing of prescription medications in Australia early in the COVID-19 pandemic. *Med J Aust* 2021; doi: 10.5694/mja2.51029.

1. Statistical methods

Background

Triple exponential smoothing (TES%) is a forecasting method used to model and predict observations $x_1, x_2, \ldots, x_t$ in a time series. TES uses weighted averages of past observations, with weights decreasing exponentially as observations get older. Additive TES accounts for long term trend and seasonality by decomposing the data series using three equations as follows:

For the level component

$$L_t = \alpha\left(\frac{x_t}{S_{t-s}}\right) + (1-\alpha)(L_{t-1} + T_{t-1})$$

For the trend component:

$$T_t = \beta(L_t - L_{t-1}) + (1-\beta)T_{t-1}$$

For the seasonal component:

$$S_t = \gamma\left(\frac{Y_t}{L_t}\right)S_{t-s} + (1-\gamma)S_{t-s}$$

Where α, β and γ represent model-specific smoothing parameters between zero and one and s represents the number of periods per season.

Thus, the final forecasting equation for h periods into the future is as follows:

$$F(h\%) = (L_t + hT_t)S_{t-s+h}$$

Modelling

Additive TES was used to model monthly PBS prescriptions dispensed between January 2016 and December 2019. Models were prepared for (1%) total PBS prescriptions, (2%) the top 10 individual medications by number of prescriptions dispensed during the 2018-19 financial year and (3%) hydroxychloroquine and dexamethasone. Smoothing parameters were determined by minimising the mean absolute percentage error (MAPE%) for each model. The MAPE for the total medication model was 1.38%. The mean ± standard deviation of the MAPEs for the individual medication models was 1.64% ± 0.80%. Additive TES models were used to predict total monthly prescriptions dispensed between January 2020 and June 2020 within a 95% confidence interval. Observed and predicted monthly prescriptions dispensed between January 2020 and June 2020 were compared. Values falling outside the 95% confidence interval were statistically significant.

Cross-Validation

To determine the predictive accuracy of the models, cross-validation was performed by using observed total monthly prescriptions dispensed between January 2016 and December 2018 to predict total monthly prescriptions dispensed between January 2019 and June 2019. The predicted and observed total monthly prescriptions dispensed were then compared. This cross-validation model has a MAPE of 2.23%.

Table. Number of prescriptions dispensed, and percentage difference compared to predicted, for selected individual medications in Australia during the COVID-19 pandemic

	Jan 2020		Feb 2020		Mar 2020		Apr 2020		May 2020		June 2020	
Medication	**Dispensed**	**Difference (95% CI%)**	**Dispensed**	**Difference (95% CI%)**	**Dispensed**	**Difference (95% CI%)**	**Dispensed**	**Difference (95% CI%)**	**Dispensed**	**Difference (95% CI%)**	**Dispensed**	**Difference (95% CI%)**
Rosuvastatin	1,006,233	0.3% (–2.7 to 3.5%)	1,027,742	**3.2%** (0.1 to 6.4%)	1,334,584	**21.2%** (17.9 to 24.7%)	957,829	**–11.6%** (–14.0 to –9.0%)	1,047,892	**–9.2%** (–11.6 to –6.7%)	1,103,305	1.4% (–1.4 to 4.4%)
Atorvastatin	864,112	–0.2% (–4.2 to 4.2%)	881,525	2.3% (–2.0 to 7.0%)	1,119,121	**17.0%** (12.3 to 22.0%)	838,631	**–10.1%** (–13.8 to –6.0%)	899,385	**–9.6%** (–13.3 to –5.6%)	938,492	1.2% (–3.3 to 6.2%)
Esomeprazole	615,531	4.5% (–4.4 to 15.2%)	627,666	8.3% (–2.5 to 21.8%)	791,695	**21.0%** (8.6 to 36.5%)	618,431	–1.6% (–13.4 to 13.9%)	655,901	0.3% (–12.6 to 17.8%)	682,479	16.3% (–1.9 to 42.8%)
Pantoprazole	638,596	1.0% (–4.1 to 6.6%)	655,532	1.3% (–4.0 to 7.3%)	806,266	**12.7%** (6.6 to 19.5%)	658,014	**–7.3%** (–13.1 to –0.6%)	701,624	**–8.0%** (–14.3 to –0.7%)	730,664	–0.3% (–8.5 to 9.5%)
Perindopril	525,490	1.7% (–1.9 to 5.6%)	526,318	**4.2%** (0.3 to 8.3%)	664,155	**19.1%** (15.1 to 23.5%)	490,865	**–9.4%** (–12.7 to –5.9%)	532,216	**–8.2%** (–11.4 to –4.8%)	554,902	2.1% (–1.8 to 6.3%)
Cefalexin	454,248	0.9% (–4.7 to 7.1%)	464,126	4.1% (–2.0 to 11.1%)	519,079	5.8% (–0.1 to 12.5%)	341,850	**–25.8%** (–30.4 to –20.5%)	343,967	**–30.9%** (–35.1 to –26.2%)	363,126	**–21.3%** (–26.5 to –15.2%)
Amoxicillin	334,502	9.4% (–7.0 to 33.0%)	348,335	7.1% (–9.2 to 30.5%)	469,844	**21.5%** (4.6 to 44.8%)	209,864	**–46.3%** (–54.1 to –35.4%)	189,965	**–60.2%** (–65.3 to –53.5%)	255,059	**–51.7%** (–57.5 to –43.9%)
Metformin	374,971	2.7% (–1.0 to 6.8%)	390,616	**4.5%** (0.8 to 8.5%)	543,424	**30.2%** (26.0 to 34.6%)	373,713	**–7.9%** (–10.9 to –4.7%)	398,546	**–9.4%** (–12.1 to –6.4%)	419,462	1.9% (–1.4 to 5.5%)
Amoxicillin + clavulanic acid	310,647	6.1% (–5.5 to 21.0%)	304,215	6.3% (–6.3 to 22.9%)	411,328	**22.4%** (9.1 to 39.4%)	205,587	**–39.1%** (–46.0 to –30.2%)	190,680	**–51.6%** (–56.6 to –45.3%)	212,592	**–48.6%** (–53.9 to –42.0%)
Escitalopram	401,899	0.7% (–2.1 to 3.6%)	399,432	2.7% (–0.2 to 5.8%)	493,163	**15.3%** (12.3 to 18.5%)	375,946	**–9.7%** (–12.2 to –7.0%)	413,499	**–6.9%** (–9.4 to –4.3%)	427,987	0.7% (–2.3 to 3.8%)
Dexamethasone	37,172	–1.6% (–8.1 to 5.9%)	40,792	–1.3% (–7.5 to 5.8%)	44,833	–2.6% (–8.3 to 3.8%)	28,741	**–32.7%** (–37.0 to –27.7%)	33,247	**–30.3%** (–34.5 to –25.6%)	38,698	**–11.7%** (–17.6 to –4.9%)
Hydroxy-chloroquine	22,903	2.1% (–1.7 to 6.1%)	24,064	**5.6%** (1.7 to 9.7%)	49,711	**95.5%** (89.1 to 102.4%)	29,653	**20.0%** (15.9 to 24.3%)	20,209	**–24.8%** (–27.2 to –22.3%)	20,440	**–19.2%** (–22.0 to –16.3%)

CI = confidence interval.