Probabilistic ensemble forecasting of Australian COVID-19 cases

Rob J Hyndman

robjhyndman.com/covidtalk

MONASH University

Australian Health Protection Principal Committee

The **Australian Health Protection Principal Committee** is the key decision-making committee for national health emergencies. It comprises all state and territory Chief Health Officers and is chaired by the Australian Chief Medical Officer.

COVID-19 forecasting group

- Peter Dawson
- Nick Golding
- Rob J Hyndman
- Dennis Liu
- James M McCaw
- Jodie McVernon
- Pablo Montero-Manso
- Robert Moss
- Mitchell O'Hara-Wild
- David J Price
- Joshua V Ross
- Gerry Ryan
- Freya M Shearer
- Tobin South
- Ruarai Tobin

Data sources

- Case-level data of all positive COVID-19 tests: onset and detection times.
- Daily population mobility data from Google, Apple & Facebook
- Weekly non-household contact surveys
- Weekly behavioural surveys
- Daily case data from ?? countries via the Johns Hopkins COVID-19 repository

Case numbers

```
localcases %>% filter(state=="VIC", date >= "2020-07-01")
```

```
## # A tsibble: 353 x 3 [1D]
## # Key:        state [1]
##    date       state     n
##    <date>     <chr> <dbl>
##  1 2020-07-01 VIC     116
##  2 2020-07-02 VIC     113
##  3 2020-07-03 VIC     161
##  4 2020-07-04 VIC     161
##  5 2020-07-05 VIC     156
##  6 2020-07-06 VIC     237
##  7 2020-07-07 VIC     235
##  8 2020-07-08 VIC     221
##  9 2020-07-09 VIC     272
```
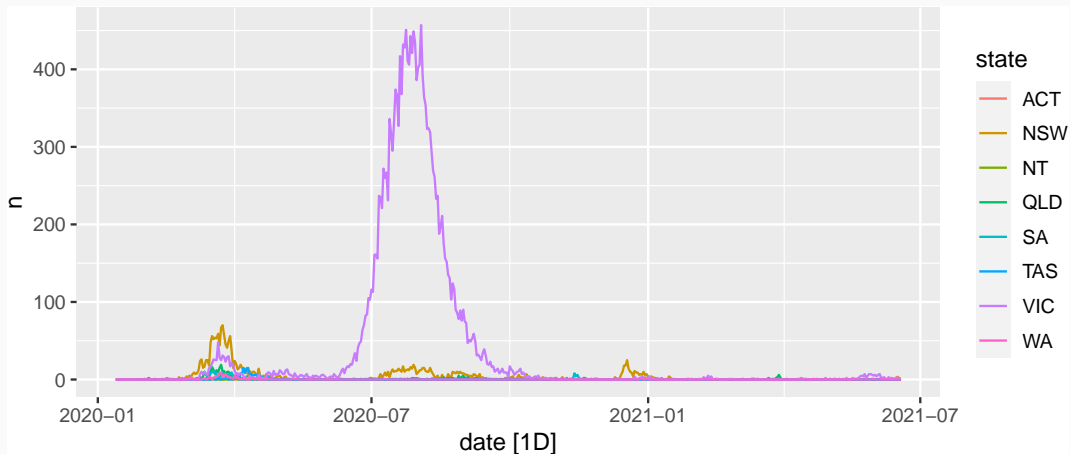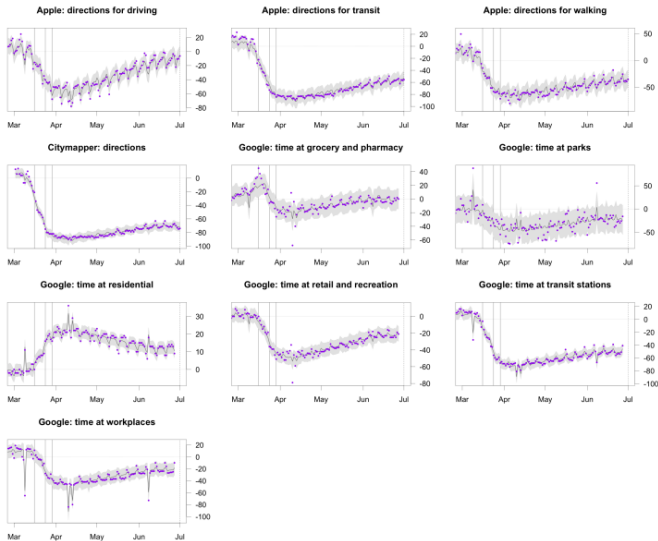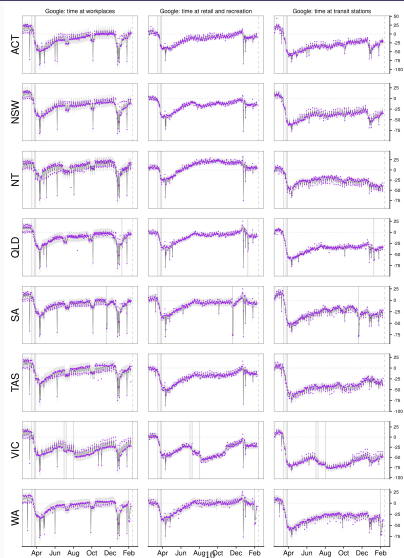
Case numbers
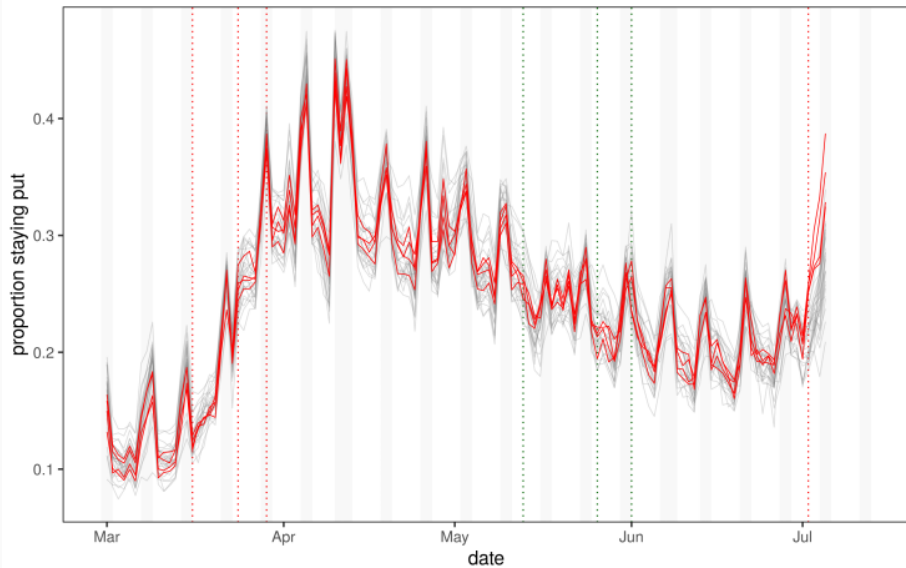
```
localcases %>% autoplot(n)
```

Mobility data

Victoria - data and model fit up to July 01

Mobility data

Figure with columns: Google: time at workplaces, Google: time at retail and recreation, Google: time at transit stations. Rows: ACT, NSW, NT, QLD, SA, TAS, VIC, WA.
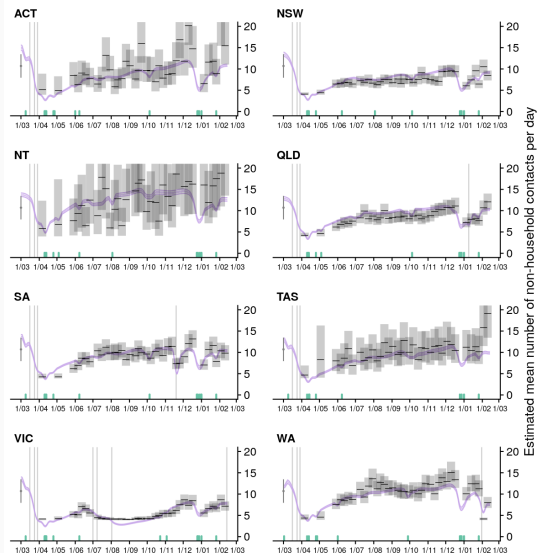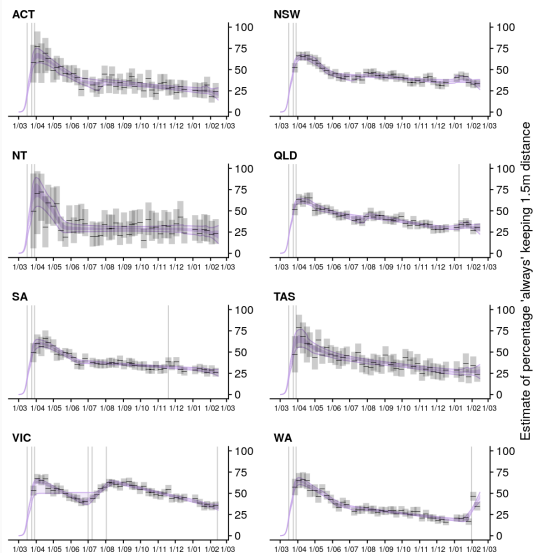
Mobility data

Survey data

Survey data

Blah

We use case-level data of all Australian positive COVID cases, along with nationwide surveys and mobility data from Google, Facebook and Apple. Three separate models have been built: (1) a stochastic susceptible-exposed-infectious-recovered (SEEIIR) compartmental model; (2) a stochastic epidemic model; and (3) a global autoregressive model based on public case data from 31 countries. These are then combined into a mixture ensemble to generate probabilistic forecasts of daily cases which are provided to the Australian governments each week. I will discuss the ensemble forecasting aspects of this work and how we evaluate the results.

Thanks!

More information

- Slides and papers: **robjhyndman.com**
- Packages: **tidyverts.org**
- Forecasting textbook using fable package:
  OTexts.com/fpp3

Find me at ...

- @robjhyndman
- @robjhyndman
- robjhyndman.com
- rob.hyndman@monash.edu