

## Coronavirus (COVID-19): Analysis

# Coronavirus (COVID-19): modelling the epidemic in Scotland (Issue No. 6)

### Background

This is an update on the Scottish Government modelling of the spread and level of Covid-19. This updates the previous publication on modelling the spread and level of Covid-19 in Scotland published on the 18 June 2020. The estimates in this document help the Scottish Government, the health service and the wider public sector plan and put in place what is needed to keep us safe and treat people who have virus, e.g. to decide how many Intensive Care Beds (ICU) we need available for Covid patients.

### Key Points

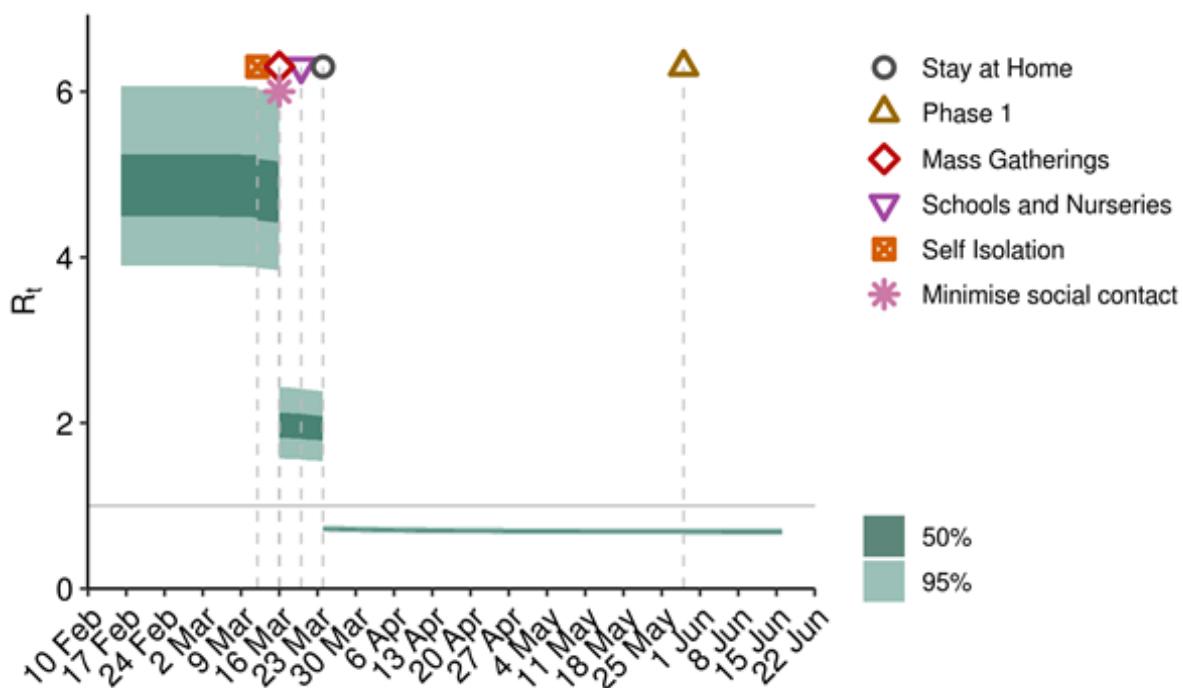
- Modelling of the epidemic in Scotland is undertaken to look at the progression of the epidemic and to inform logistical response required.
- This is done over two time periods. Short term, for the next two weeks, and longer term. Both these help to forecast Covid-19, which helps the public sector in Scotland plan their response and helps determine if the measures in place are working.
- We use the value of R to talk about Covid-19 in Scotland. On the 24 June, R in Scotland was estimated to be between 0.6 & 0.8.
- Modelling by the Scottish Government estimates that on 19 June there were around 160 new infections and 2,000 people in Scotland who could be infectious with Covid-19.
- The modelling forecasts that the number of infectious people, the number of cases, hospital and ICU use and deaths are all likely to continue to fall over the next two weeks.
- These forecasts were based on estimates of moving in to phase 1 guidance implemented from 29 May. Due to the time associated with

disease progression, data used in the Scottish Government model does not yet fully reflect changes associated with phase 1. Changes associated with the move to phase 2 will not be seen for several weeks. The longer term forecasts will be closely monitored against actual cases over the next few weeks as the situation changes.

## What the modelling tells us

Figure 1 shows how  $R_t$  has changed since February. Before the “stay at home” restrictions were put in place  $R_t$  was above 1, and most likely to have been between 4 and 6 before any interventions were put in place.

Figure 1: Trends in  $R_t$  for Scotland, 2020

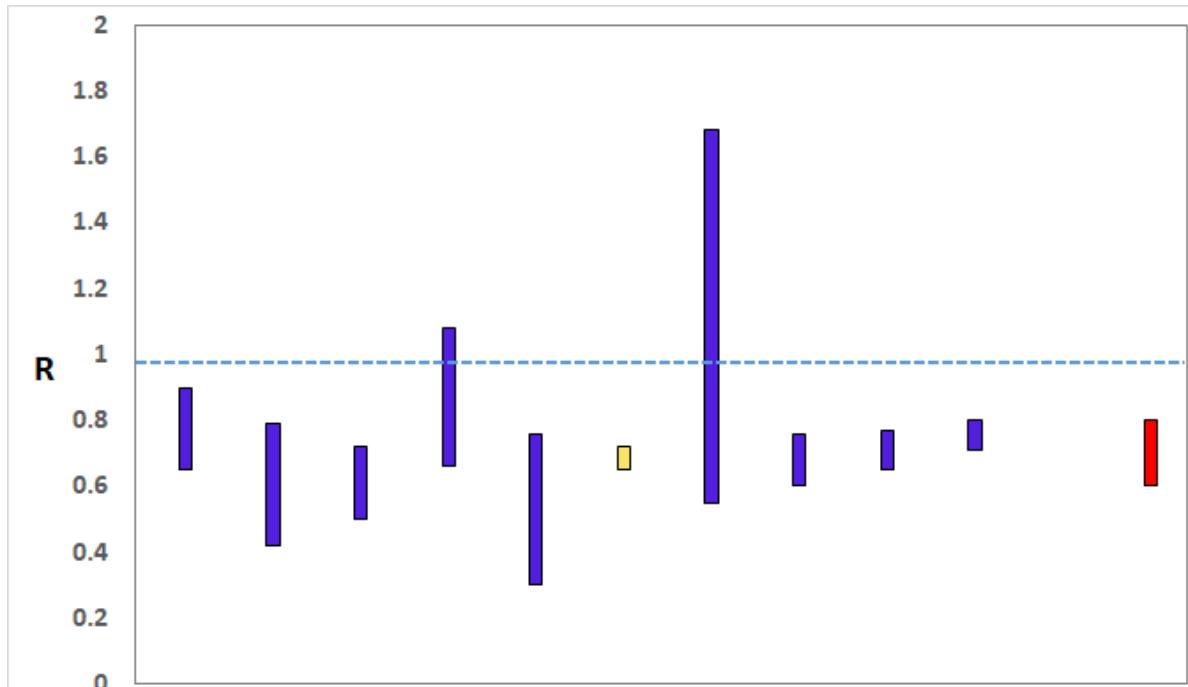


Source: Scottish Government modelled estimates using Imperial College model code,

Source: Actual data from <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/weekly-and-monthly-data-on-births-and-deaths/deaths-involving-coronavirus-covid-19-in-scotland>

The  $R_t$  value estimated by the Scottish Government falls within the range of values estimated by other modelling groups and considered by SPI-M and SAGE (Figure 2). SAGE’s consensus view, as of 24 June, was that the value of  $R_t$  in Scotland was between 0.6 and 0.8.

Figure 2. Estimates of  $R_t$  for Scotland, as of the 24 June, including 90% confidence intervals, produced by SAGE. The estimate produced by the Scottish Government is the 6th from left (yellow), while the SAGE consensus range is the right-most (red).



Source: Scientific Advisory Group for Emergencies (SAGE).

The Scottish Government's epidemiological model estimates that on 19 June there were around 160 new cases of Covid-19 in Scotland (see Table 1), while the number of people in Scotland who could be infectious on this date was around 2,000 (see Table 2). Our estimates indicate this number has been declining by around 30% each week, and will continue to decline at this rate over the following two weeks.

Table 1: Estimated daily number of new Covid-19 cases in Scotland.

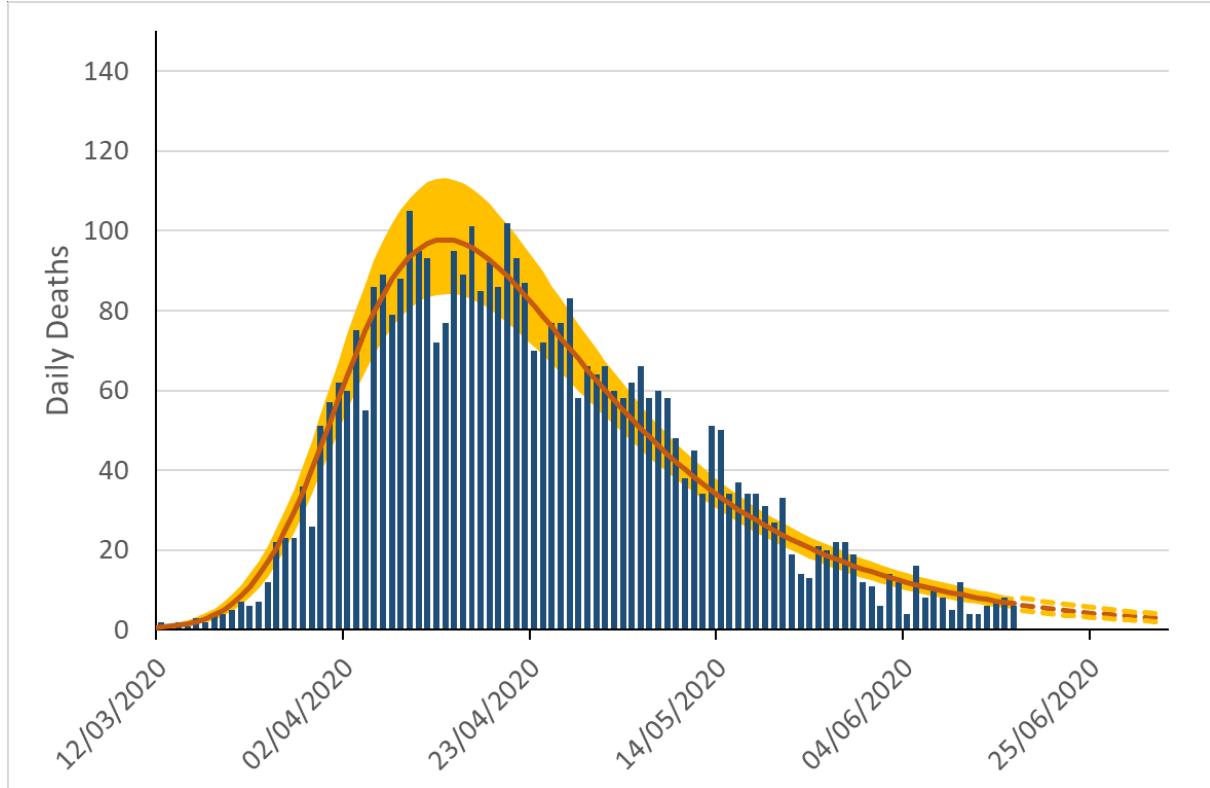
Estimated new daily infections			
Date	Mid	Lower	Upper
15 May	910	680	1180
22 May	640	470	850
29 May	450	320	620
05 June	320	220	450
12 June	230	140	335
19 June	160	100	240
26 June	110	65	180
03 July	80	45	130

Table 2: Estimated number of people in Scotland who could be infectious.

Estimated Infectious Pool				
Date	Mid	Lower	Upper	Percentage Weekly Change
15 May	11,500	8,800	14,600	-
22 May	8,100	6,000	10,600	-30%
29 May	5,700	4,100	7,700	-30%
05 June	4,000	2,800	5,600	-30%
12 June	2,850	1,900	4,100	-29%
19 June	2,000	1,300	3,000	-30%
26 June	1,400	900	2,200	-30%
03 July	1,000	600	1,600	-29%

Figure 3 shows the epidemiological model forecasts produced by the Scottish Government, given the present set of interventions. This epidemic curve continues to show signs of reducing.

Figure 3: Scottish Government short-term forecast of the number of deaths from Covid-19 in Scotland, based on actual data (19 June 2020).

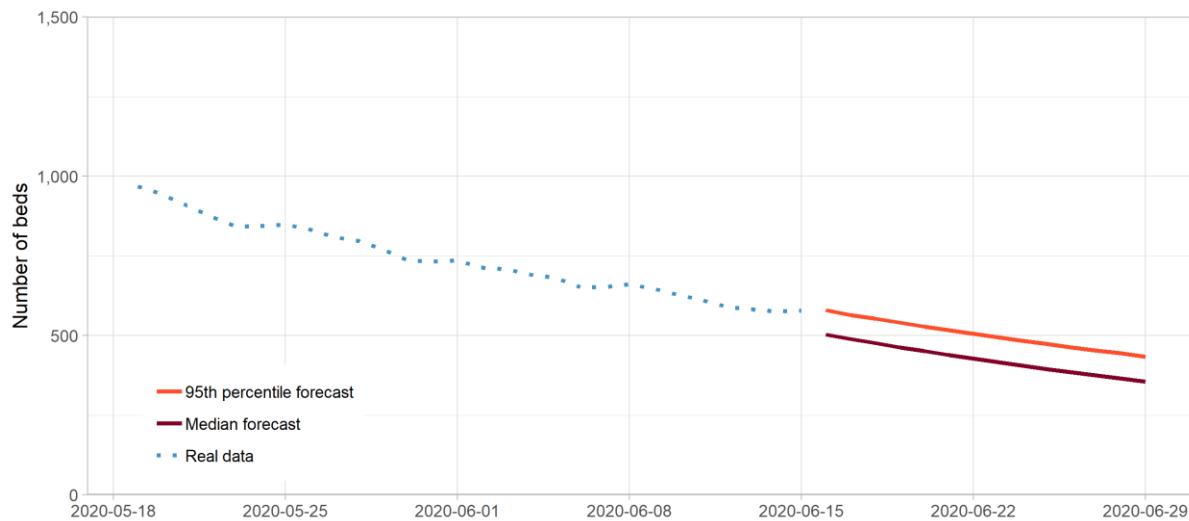


Source: Scottish Government modelled estimates using Imperial College model code,  
Source: Actual data from <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/weekly-and-monthly-data-on-births-and-deaths/deaths-involving-coronavirus-covid-19-in-scotland>

The short-term forecasts produced by SAGE suggest that the number of hospital beds occupied by Covid-19 patients in Scotland will continue to fall over the next two weeks (Figure 4). This is well within our Covid-19 hospital capacity of 4,250.

These short-term forecasts are fitted to trends in the historical data. Because it takes time for infected people to develop symptoms, require hospitalisation, and either die or recover, we will not fully see the effect of moving through phase 1 and into phase 2 in our modelling until late June or early July.

Figure 4. Short-term forecast of hospital bed occupancy in Scotland as produced by SAGE (18 June).



Source: This figure has been produced by the Scottish Government using the forecast data provided by SAGE.

The medium-term forecasts produced by the Scottish Government (Figure 5) using the logistics model show a similar story over the next few months, with a steady decline in the number of people requiring a hospital bed from Covid-19. The logistical model also provides us with a medium term forecast of the number of ICU beds which may be required (Figure 6).

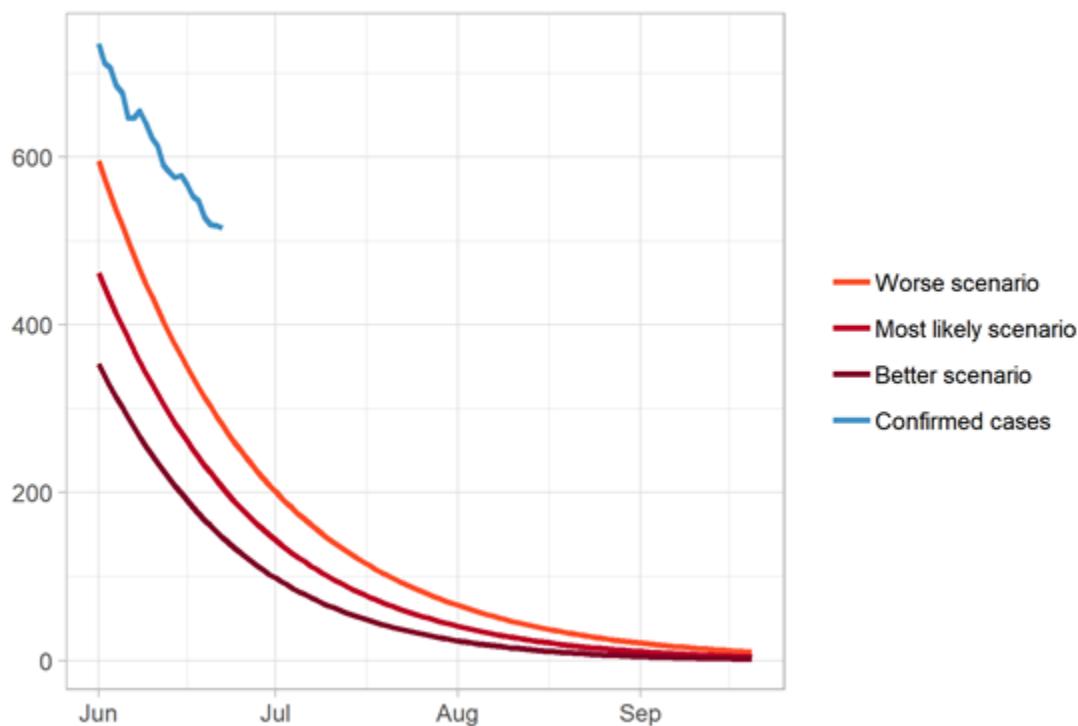
These forecasts are based on the measures implemented under Phase 1 of Scotland's route map, which were implemented on 29 May. We will not be able to fully measure the effects of this change until late June. Instead, the medium term forecasts are based on observations from other European countries which have enacted measures similar to those within our Phase 1 measures. We will monitor the impact of these changes in the coming weeks, and how this will affect hospital demand.

The three scenarios presented in Figure 5 for hospital demand and Figure 6 for ICU demand are for different levels of daily infections. In each case, we translate these into logistical forecasts which are used for planning purposes.

The Worse scenario and Better scenario should not be considered an upper and lower bound. It is important to note, in particular, that for planning reasons many of the assumptions used are deliberately precautionary, and so it is reassuring that actual case data are lower than the modelled estimate in the past, as is the case with the ICU demand forecast in Figure 6.

The number of hospital beds in use (Figure 5) is tracking above the worse scenario. This could be because patients are being kept in hospital for longer, particularly later in the epidemic, or actual cases are declining more slowly at this point in time.

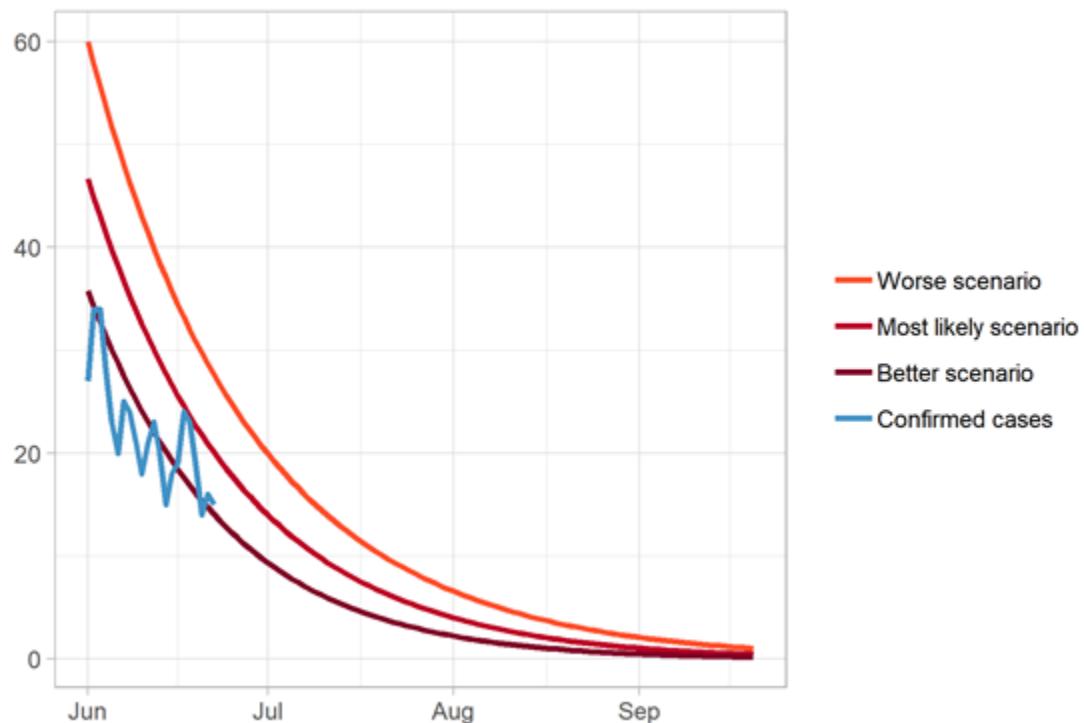
Figure 5: Logistical model medium term forecast of number of people requiring a hospital bed from Covid-19 in Scotland, 2020. Capacity is around 4,000.



Source: Scottish Government modelled estimates using outputs from the Imperial College model code,

Source: Actual data from <https://www.gov.scot/publications/coronavirus-covid-19-trends-in-daily-data/>

Figure 6: Logistical model medium term forecast of number of people requiring an intensive care from Covid-19 in Scotland, 2020. Capacity is around 700.



Source: Scottish Government modelled estimates using outputs from the Imperial College model code,

Source: Actual data from <https://www.gov.scot/publications/coronavirus-covid-19-trends-in-daily-data/>

## What next?

The modelled estimates of hospital and ICU use, and of the reproduction number  $R_t$  will be published each week. Further information can be found at <https://www.gov.scot/coronavirus-covid-19>

**© Crown copyright 2020**

**You may re-use this information (excluding logos and images) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit <http://www.nationalarchives.gov.uk/doc/open-government-licence/> or e-mail: [psi@nationalarchives.gsi.gov.uk](mailto:psi@nationalarchives.gsi.gov.uk).**

**Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.**

**The views expressed in this report are those of the researcher and do not necessarily represent those of the Scottish Government or Scottish Ministers.**

**This document is also available from our website at [www.gov.scot](http://www.gov.scot).  
ISBN: 978-1-83960-852-0**

**The Scottish Government  
St Andrew's House  
Edinburgh  
EH1 3DG**

**Produced for  
the Scottish Government  
by APS Group Scotland  
PPDAS743846 (06/20)**

**Published by  
the Scottish Government,  
June 2020**



**ISBN 978-1-83960-852-0**

**Web Publication**

**PPDAS743846 (06/20)**