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Coronavirus (COVID-19): Analysis

Coronavirus (COVID-19): modelling the epidemic in Scotland (Issue No. 55)

Background

This is a report on the Scottish Government modelling of the spread and level of Covid-19. This updates the previous publication on modelling of Covid-19 in Scotland published on 3 June 2021. The estimates in this document help the Scottish Government, the health service and the wider public sector plan and put into place what is needed to keep us safe and treat people who have the virus.

This edition of the research findings focuses on the epidemic as a whole, looking at estimates of R, growth rate and incidence as well as local measures of change in the epidemic.

In Scotland, the modelled estimate for R is between 1.2 and 1.4, with the growth rate increasing to between 3% and 6% and modelled estimates of infections now increasing over the next four weeks. There has been a rise in hospital beds in use by Covid-19 patients, which is projected to continue over the next four weeks. The increase in Covid-19 cases is also reflected in the wastewater data.

The measures modelled for this week, as described above, indicate that we are seeing a further deterioration in Scotland, with considerable uncertainty as to what this means for future weeks.

Key Points

- The reproduction rate R in Scotland is currently estimated as being between 1.2 and 1.4. This is an increase in the bottom and the top of the range since last week.
- The number of new daily infections for Scotland is estimated as being between 16 and 41, per 100,000 people. This has increased since last week.
- The growth rate for Scotland is currently estimated as being between 3% and 6%. This is an increase since last week.

- Average contacts have increased by 10% in the last two weeks (comparing surveys pertaining to 13th – 19th May and 27th May - 2nd June) with a current level of 4.6 daily contacts.
- Contacts within the work and school setting have increased, 22% and 20% respectively in comparison to two weeks prior and contacts within the other setting (contacts outside of those in the home, school and work) have increased slightly by 8%.
- All age groups have increased their contacts or remained at a similar level compared to two weeks prior. The increases were largely driven by contacts within the work setting for those aged under 50 and by contacts within the home or other setting for those over 50.
- There has been a rise in interactions with those aged between 18-29 with all other age groups, with the biggest increase in interactions seen between those aged 18-29 with each other.
- The biggest increase in the proportion of participants visiting different locations is seen in those visiting another's home, increasing from 40% to 48% in the last two weeks, followed by visiting a Pub or Restaurant, increasing from 32% to 38%.
- Hospital bed and intensive care unit (ICU) occupancy are projected to rise over the next few weeks.
- Modelled rates of positive tests per 100K indicate that for the week commencing 20 June 2021, there are 22 local authorities with at least a 75% probability of exceeding 50 cases. Of those, 13 local authorities have at least a 75% probability of exceeding 100 cases and one (Edinburgh) had a 75% probability of exceeding 500 cases.
- The overall level of wastewater Covid-19 continues to rise, matching the increase seen in case rates. As well as continued high levels in and around Glasgow, Edinburgh and Dundee, levels of WW Covid-19 are increasing across a broadening range of sites.

Overview of Scottish Government Modelling

Modelling outputs are provided here on the current epidemic in Scotland as a whole, based on a range of methods. Because it takes a little over three weeks on average for a person who catches Covid-19 to show symptoms, become sick, and either die or recover, there is a time lag in what our model can tell us about any re-emergence of the epidemic and where in Scotland this might occur. However modelling of Covid-19 deaths is an important measure of where Scotland lies in its epidemic as a whole. In addition, the modelling groups that feed into the SAGE consensus use a range of other data along with deaths in their estimates of R and the growth rate. These outputs are provided in this research

findings. The type of data used in each model to estimate R is highlighted in Figure 1.

We use the Scottish Contact Survey (SCS) to inform a modelling technique based on the number of contacts between people. Over time, a greater proportion of the population will be vaccinated. This is likely to impact contact patterns and will become a greater part of the analysis going forwards.

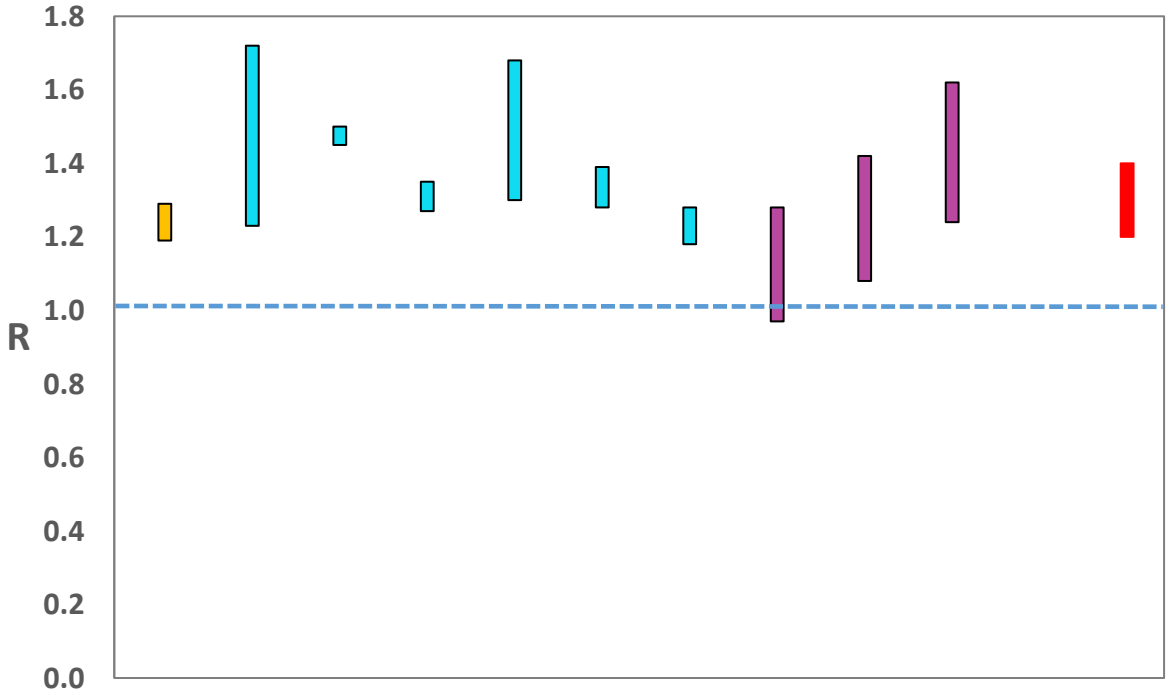
The logistical model utilises results from the epidemiological modelling, principally the number of new infections. The results are split down by age group, and the model is used to give a projection of the number of people that will go to hospital, and potentially to ICU. This will continue to be based on both what we know about how different age groups are affected by the disease and the vaccination rate for those groups.

What the modelling tells us about the epidemic as a whole

The various groups which report to the Scientific Pandemic Influenza Group on Modelling (SPI-M) use different sources of data in their models (i.e. deaths, hospital admissions, cases) so their estimates of R are also based on these different methods. SAGE's consensus view across these methods, as of 2nd June, was that the value of R in Scotland was between 1.2 and 1.4 (see Figure 1). This has increased from the range of 1.1 to 1.3 last week[1].

[1] Particular care should be taken when interpreting this estimate as it is based on low numbers of cases, hospitalisations, or deaths and / or dominated by clustered outbreaks. It should not be treated as robust enough to inform policy decisions alone.

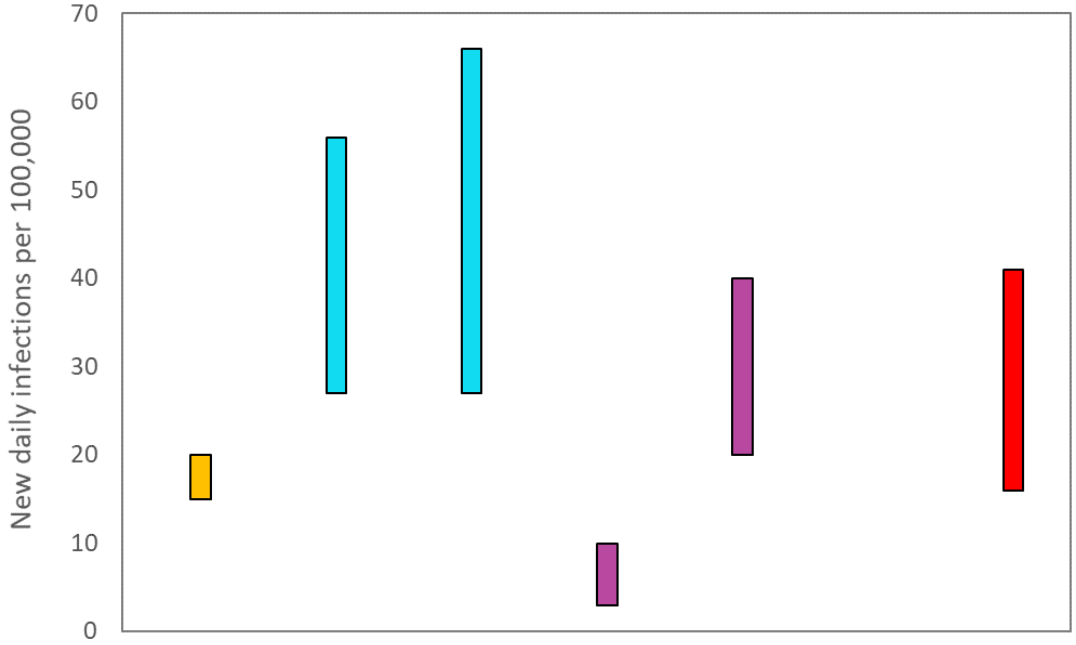
Figure 1. Estimates of R_t for Scotland, as of 9th June, including 90% confidence intervals, produced by SAGE. The cyan bars use Covid-19 test data and purple bars use multiple sources of data. The estimate produced by the Scottish Government (based on cases and deaths) is the left-most (yellow), while the SAGE consensus range is the right-most (red).



Source: Scientific Advisory Group for Emergencies (SAGE).

The various groups which report to the Scientific Pandemic Influenza Group on Modelling (SPI-M) use different sources of data in their models to produce estimates of incidence (Figure 2). SPI-M's consensus view across these methods, as of 9th June, was that the incidence of new daily infections in Scotland was between 16 and 41 new infections per 100,000. This is an increase since last week. This equates to between 900 and 2,200 people becoming infected each day in Scotland.

Figure 2. Estimates of incidence for Scotland, as of 9th June, including 90% confidence intervals, produced by SPI-M. The cyan bars use Covid-19 test data and purple bars use multiple sources of data. The estimate produced by the Scottish Government is the first on the left (yellow), while the SAGE consensus range is the right-most (red).



Source: Scientific Pandemic Influenza Group on Modelling (SPI-M).

The consensus from SAGE for this week is that the growth rate in Scotland is between 3% and 6% per day. This is an increase in the range from 2nd June.

What we know about how people's contact patterns have changed

Average contacts have increased by 10% in the last two weeks (comparing surveys pertaining to 13th – 19th May and 27th May - 2nd June) with a current level of 4.6 daily contacts as seen in Figure 3. Contacts within the work and school setting have increased, 22% and 20% respectively in comparison to two weeks prior and contacts within the other setting (contacts outside of those in the home, school and work) have increased slightly by 8%. Contacts within the home setting remain at similar levels over the same period.

Figure 3: Mean Adult Contacts (truncated at 100) from SCS.

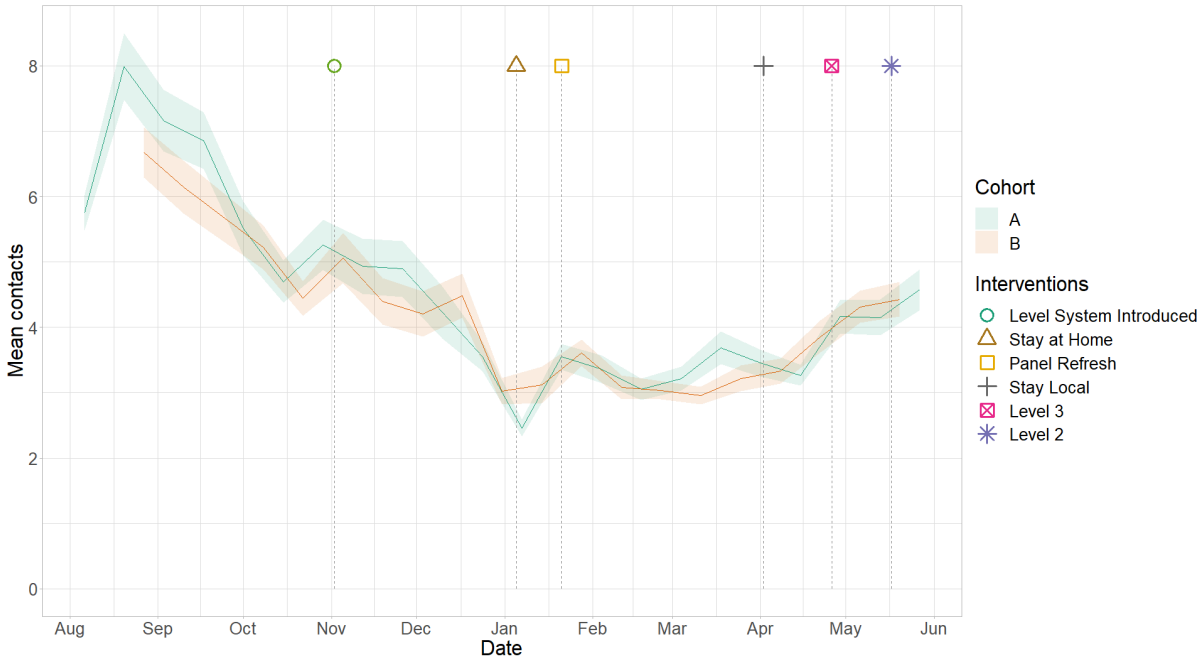
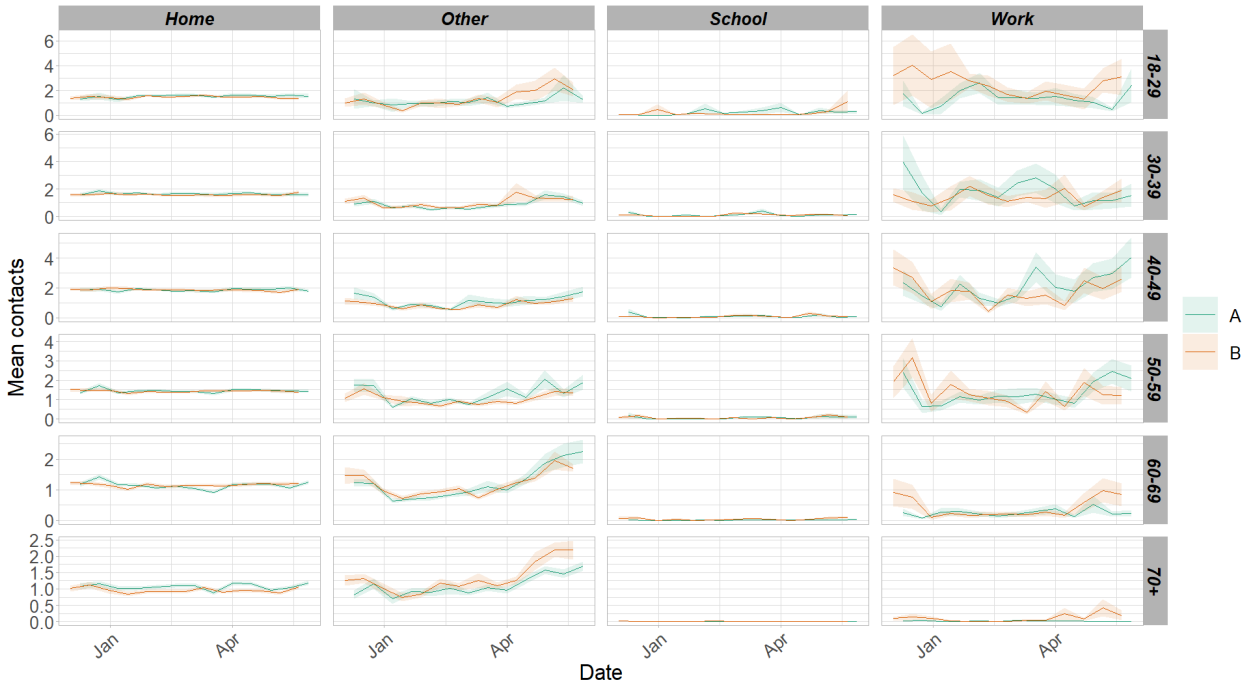


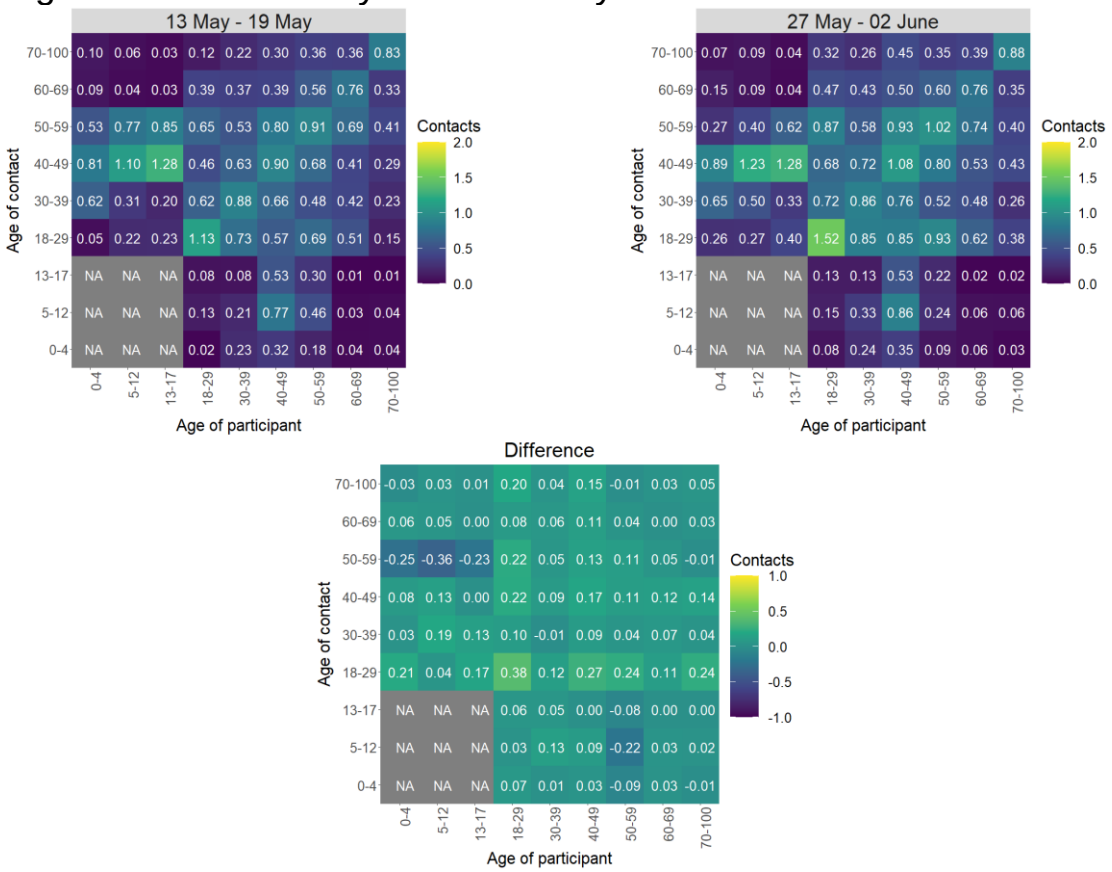
Figure 4 shows how contacts change across age group and setting. All age groups have increased their contacts or remained at a similar level compared to two weeks prior. The increases were largely driven by contacts within the work setting for those aged under 50 and by contacts within the home or other setting for those over 50.

Figure 4: Average (mean) contacts for each panel per day by setting for adults in Scotland, truncated to 100 contacts per participant (from SCS).



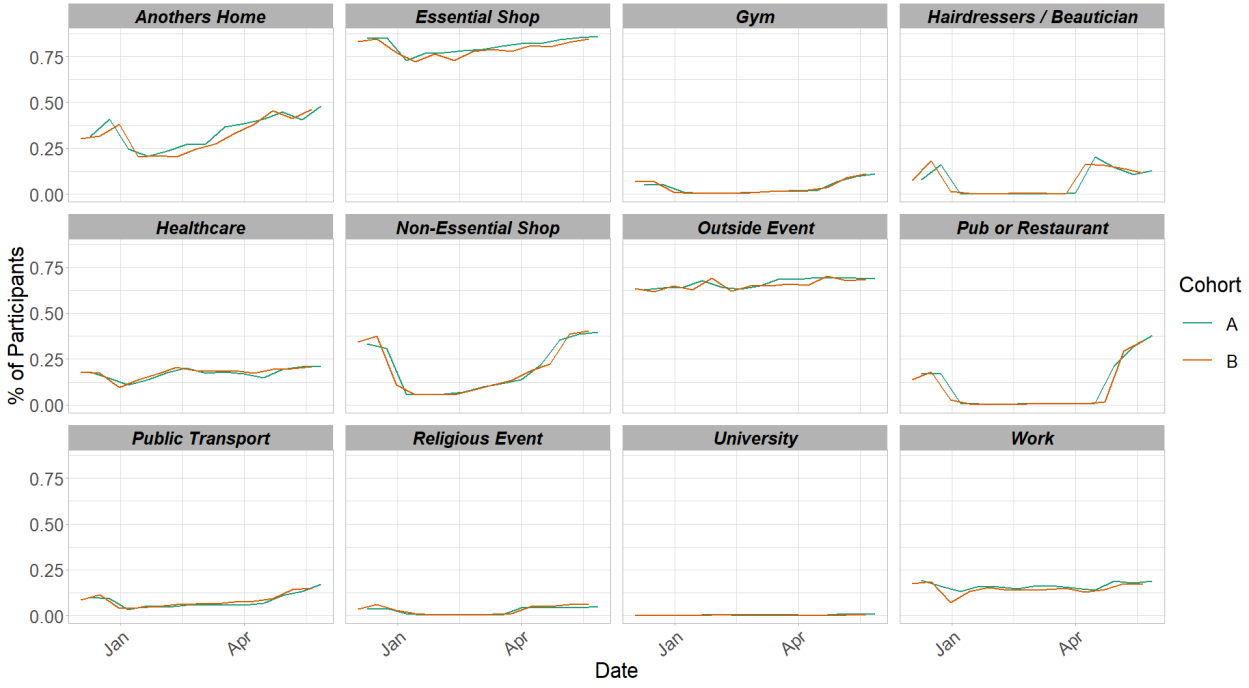
The heatmaps in Figure 5 show the mean overall contacts between age groups for the weeks relating to 13th –19th May and 27th May - 2nd June and the difference between these periods. There has been a rise in interactions with those aged between 18-29 with all other age groups, with the biggest increase in interactions seen between those aged 18-29 with each other.

Figure 5: Overall mean contacts by age group before for the weeks relating to 13th –19th May and 27th May - 2nd June



The biggest increase in the proportion of participants visiting different locations is seen in those visiting another's home in Figure 6. This has increased from 40% to 48% in the last two weeks, followed by visiting a pub or restaurant, increasing from 32% to 38%

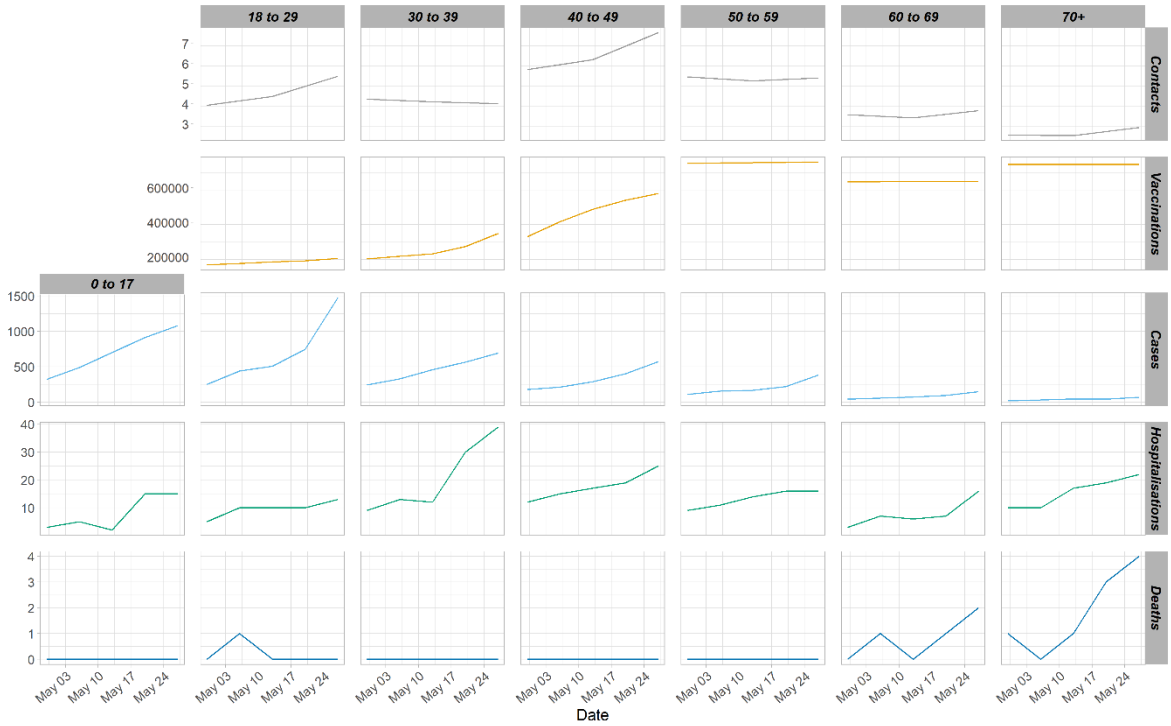
Figure 6: Locations visited by participants at least once for panel A and B (from SCS).



Vaccinations and contacts patterns

From Figure 7, it can be seen that where contacts have increased or remained level, there has been a steady increase in cases, particularly for the younger age groups and a recent uptick in deaths in the oldest age groups. Covid-19 hospitalisations numbers have also increased all age groups.

Figure 7: Average contacts for Panel A, weekly cases, covid-19 hospital admissions and deaths[2] and cumulative vaccinations by age band[3]



What the modelling tells us about estimated infections as well as Hospital and ICU bed demand

The Scottish Government assesses the impact of Covid-19 on the NHS in the next few weeks in terms of estimated number of infections. Figure 8 shows two projections, which take account of new variants (little impact for 'Better' and high impact for 'Worse')[4], as well as the recent increase in infections observed in the last two weeks.

These projections have not been cross-checked against other medium-term projections produced by modelling groups for SPI-M, which should be taken into account when considering the projections.

[2] Deaths, Cases and Hospitalisations from PHS COVID-19 daily cases in Scotland dashboard. Covid-19 hospital admissions data is shown up to 30th May 2021.
[3] Vaccination and contact data for the 0-17 age cohort is not presented due to the vast majority of this age group not being offered vaccinations and the SCS excluding contacts between children.
[4] Both scenarios are based on current vaccine roll-out plans and efficacy assumptions.

Figure 8. Medium term projections of modelled total new infections, adjusting positive tests[5] to account for asymptomatic and undetected infections, from Scottish Government modelling, positive test data up to 5 June.

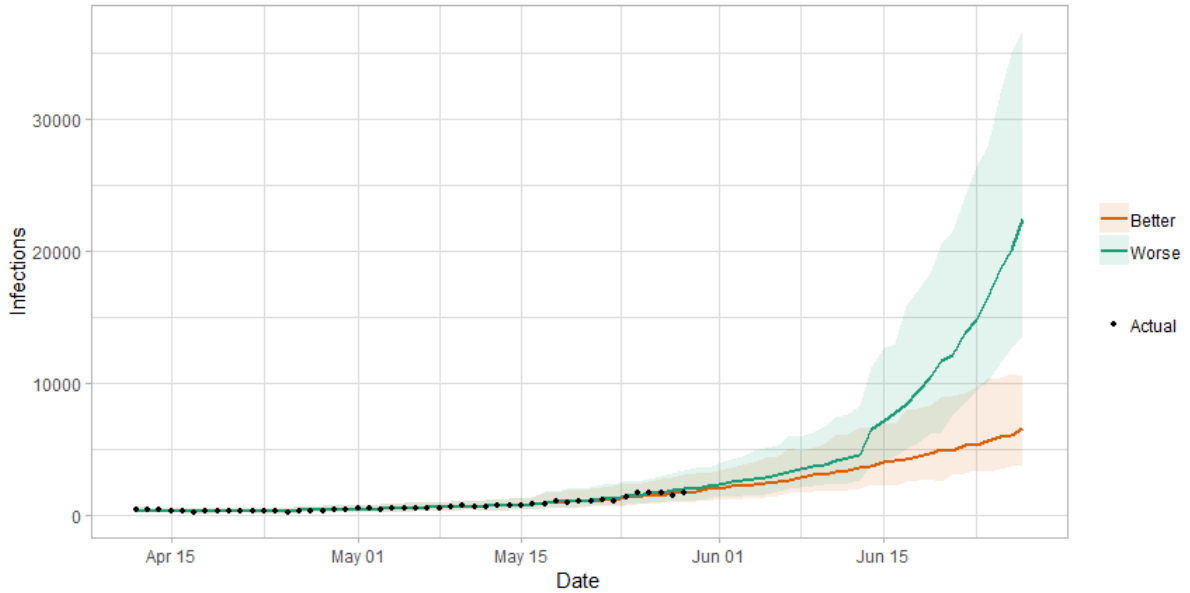


Figure 9 shows the impact of the projections on the number of people in hospital. The modelling includes all hospital stays, whereas the actuals only include stays up to 28 days duration that are linked to Covid-19. Work is ongoing to show the modelled occupancy for stays up to a 28 day limit.

[5] The actual positive tests are adjusted to coincide with the estimated day of infection.

Figure 9. Medium term projections of modelled hospital bed demand, from Scottish Government modelling.

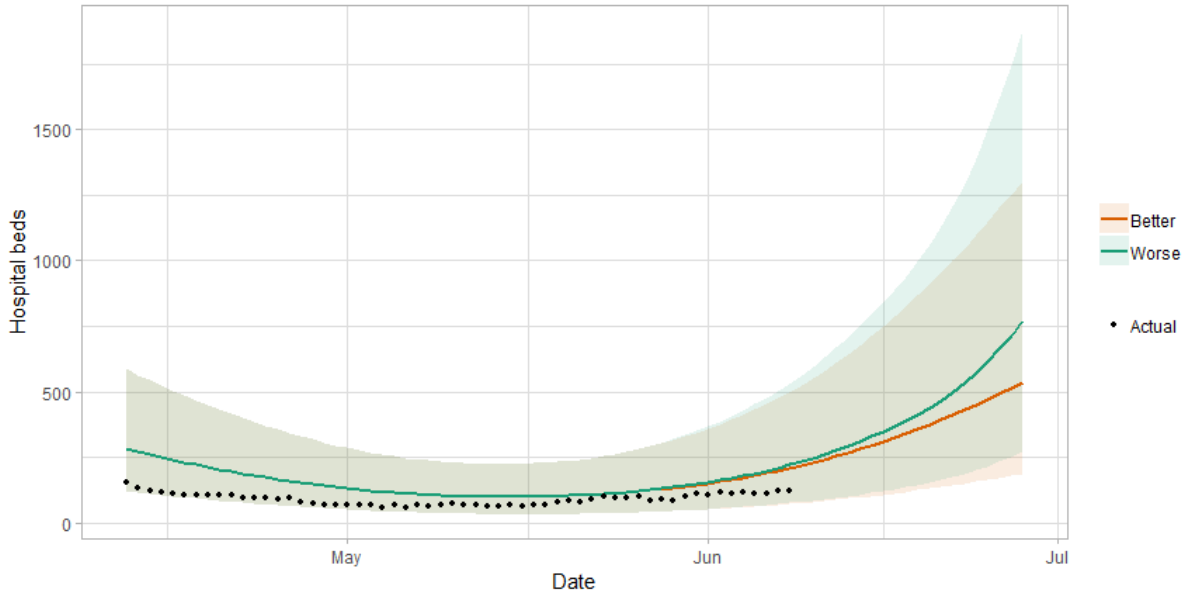
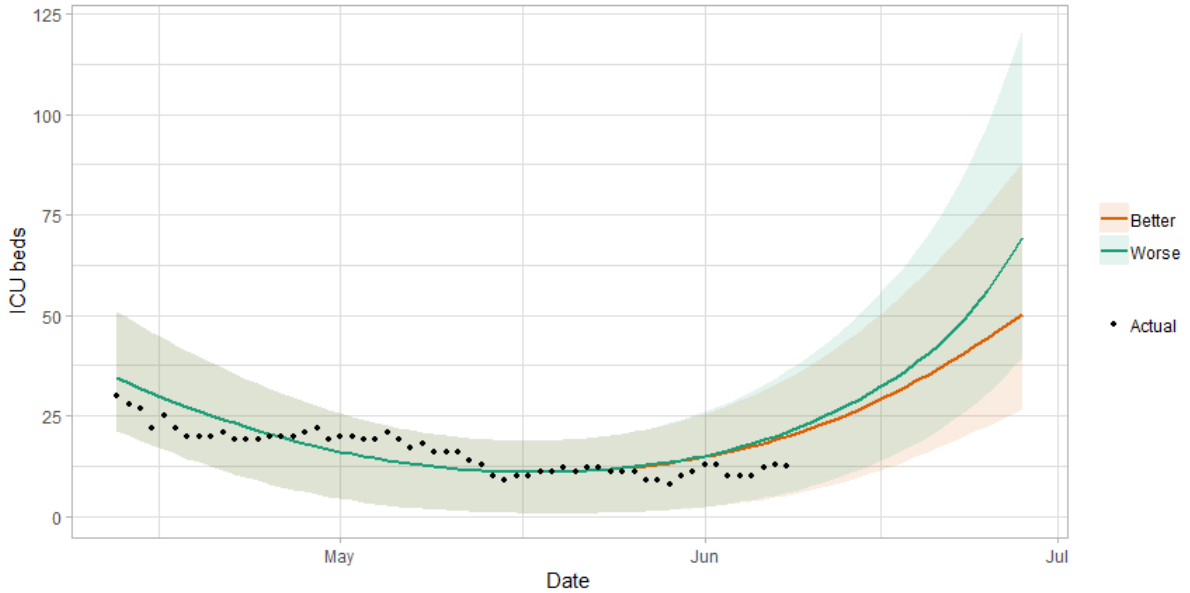


Figure 10 shows the impact of the projection on ICU bed demand.

Figure 10. Medium term projections of modelled ICU bed demand, from Scottish Government modelling[6].



A comparison of the actual data against historical projections is included in the Technical Annex.

[6] Actual data does not include full numbers of CPAP. ICU bed actuals include all ICU patients being treated for Covid-19 including those over 28 days.

What the modelling tells us about projections of hospitalisations and deaths in the medium term

SAGE produces projections of the epidemic[7] (Figure 11), combining estimates from several independent models (including the Scottish Government's logistics modelling, as shown in Figures 8-10). These projections are not forecasts or predictions. They represent a scenario in which the trajectory of the epidemic continues to follow the trends that were seen in the data up to 31 May.

Modelling groups have used data from contact surveys, previous findings[8] and their own expert judgement and evidence from Public Health England, Scottish universities, Public Health Scotland and other published studies to incorporate recent relaxations on transmission and when making assumptions about vaccine effectiveness.

The projections do not include the effects of any other future policy or behavioural changes.

The delay between infection, developing symptoms, the need for hospital care, and death means they will not fully reflect the impact of behaviour changes in the two to three weeks prior to 31 May. Projecting forwards is difficult when the numbers of cases, admissions and deaths fall to very low levels, which can result in wider credible intervals reflecting greater uncertainty. The interquartile range can be used, with judgement, as the projection from which estimates may be derived for the next four weeks, albeit at lower confidence than the 90% credible interval.

These projections include the potential impact of vaccinations over the next four weeks.

Beyond two weeks, the projections become more uncertain with greater variability between individual models. This reflects the large differences that can result from fitting models to different data streams, and the influence of small deviations in estimated growth rates and current incidence.

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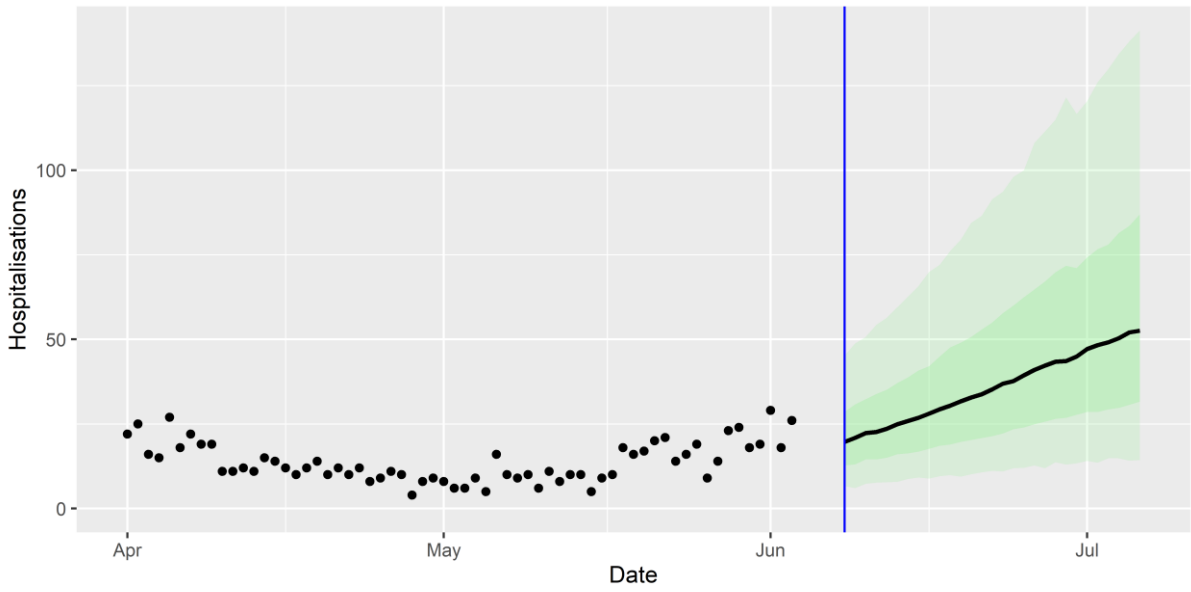
[7] Four week projections are provided here: Scientific evidence supporting the government response to coronavirus (COVID-19) - GOV.UK (www.gov.uk)

[8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/963359/S1072_SPI-M-O_Statement_on_relaxation_of_NPI_scenarios__schools_.pdf

Figure 11. SAGE medium-term projection of daily hospitalisations in Scotland, including 50% and 90% credible intervals.



We are not projecting the numbers of people expected to die with Covid-19 this week. The number of daily deaths has fallen to very low levels over recent weeks. Projecting forwards is difficult when numbers fall to very low levels, therefore SPI-M-O have decided to pause producing medium term projections for daily deaths in Scotland. SPI-M-O's consensus view is that the number of deaths will remain very low over the next four weeks.

What we know about who is testing positive with Covid

The Early Pandemic Evaluation and Enhanced Surveillance of Covid-19 (EAVE) II Study Group[9] has updated the pattern of demographics, clinical risk groups and vaccination status for those who tested positive in Scotland (see Technical Annex in issue 34 of the Research Findings). This data is based on the evidence presented to SPI-M on 2nd June.

The testing data are linked to the EAVE study data of GP clinical conditions for a clinical and demographic description of the individuals testing positive with the S Gene deletion (a proxy for the alpha variant) in comparison to those who do not have this deletion (a proxy for the delta variant). The laboratory data and GP data are then linked to hospital admissions and deaths.

[9] Based at Edinburgh University, Strathclyde University Aberdeen University and Public Health Scotland.

Genomic sequencing shows that most S gene positive cases are the delta variant. Findings indicate that hospital admissions in Scotland are now dominated by delta cases. Figure 12 shows how these cases came to be the majority in the last two weeks of May.

Figure 12. Admissions from community testing where S-gene is known and linking to Early assessment of Anti-virals and Vaccine Effectiveness (EAVE II – a subset of all admissions)

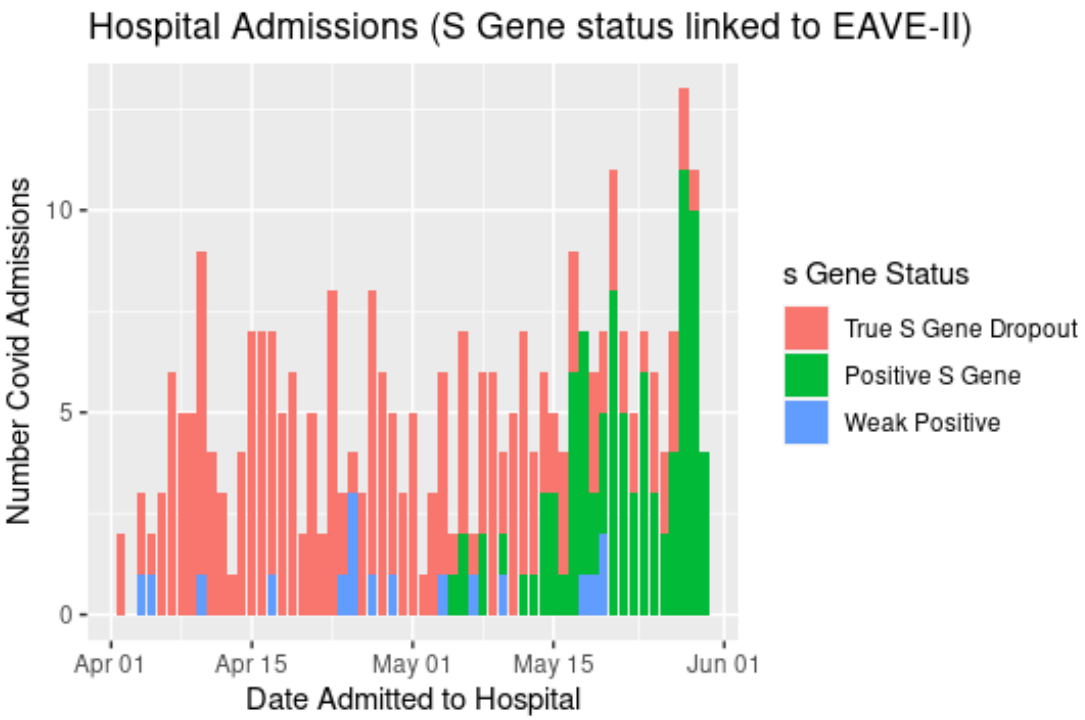


Figure 13. Age distribution of cases (from 1st April to 30th May).

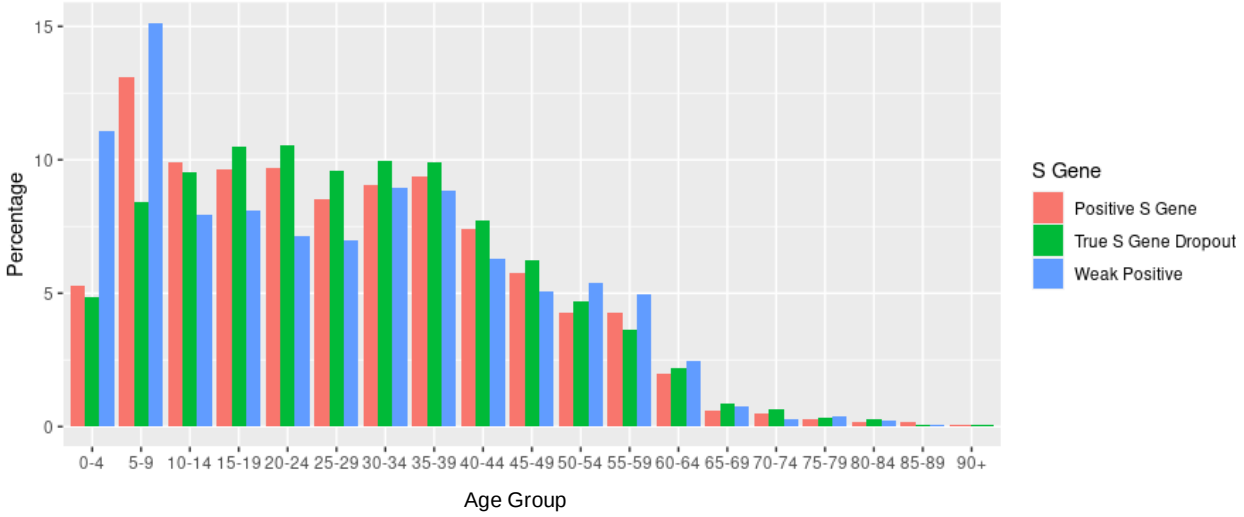
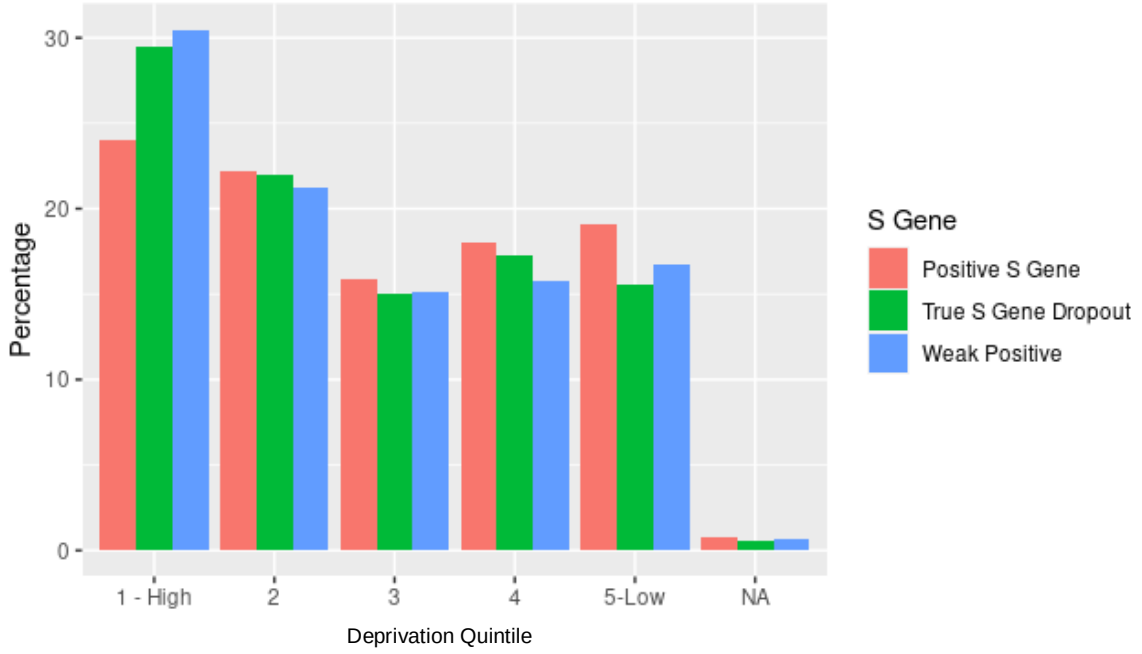


Figure 14. Deprivation group distribution of cases (from 1st April to 30th May).



Delta variant cases[10] have slight demographic differences to alpha[11] cases. As shown in Figure 13, there is a greater proportion with the delta variant in the 5-9 year age group.

There are also indications that a greater proportion of delta variant cases are from the least deprived group (see Figure 14).

In summary, delta cases have slight demographic differences to alpha (less deprived, slightly more in the 5 to 9 age group). Hospital admissions are few but increasing, and are now dominated by cases associated with the delta variant. There is evidence of a higher risk of hospitalisation associated with delta variant cases, but in this cohort vaccination reduces the risk of hospitalisation.

What we know about which local authorities are likely to experience high levels of Covid-19 in two weeks' time

We continue to use modelling based on Covid-19 cases and deaths from several academic groups to give us an indication of whether a local authority is likely to experience high levels of Covid-19 in the future. This has been compiled via SPI-M into a consensus. In this an area is

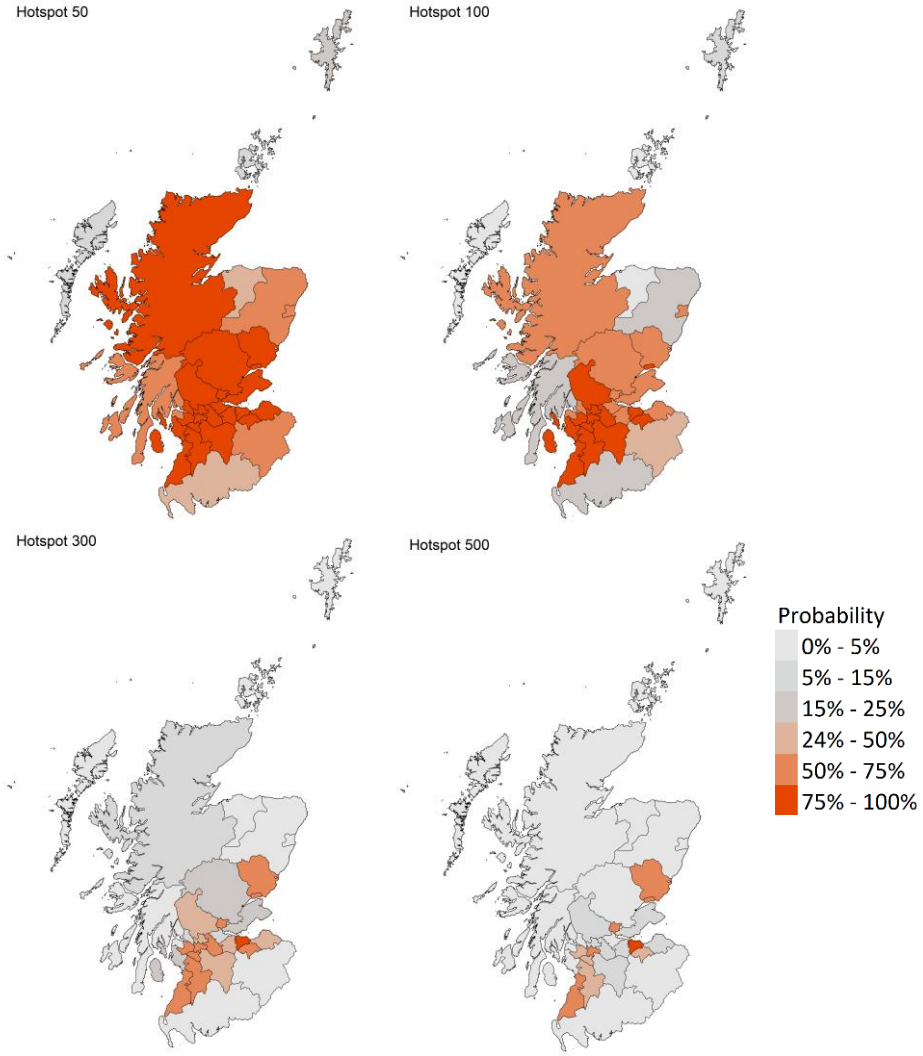
[10] Based on S Gene positive, which is a proxy for the delta variant.
[11] Based on S Gene dropout, which is a proxy for the alpha variant.

defined as a hotspot if the two week prediction of cases (positive tests) per 100K population is predicted to exceed a threshold, e.g. 500 cases.

Modelled rates of positive tests per 100K (Figure 15) indicate that for the week commencing 20 June 2021, there are 22 local authorities with at least a 75% probability of exceeding 50 cases. Of these, 13 local authorities have at least a 75% probability of exceeding 100 cases (Edinburgh, Dundee, East Ayrshire, East Dunbartonshire, East Renfrewshire, Glasgow, Midlothian, North Ayrshire, North Lanarkshire, Renfrewshire, South Ayrshire, South Lanarkshire and Stirling).

Edinburgh has at least a 75% probability of exceeding 500 cases[12].

Figure 15. Probability of local authority areas having more than 50, 100, 300 or 500 cases per 100K (20 – 26 June 2021)



[12] Numbers are included in Table 1 in the Technical Annex.

What can analysis of wastewater samples tell us about local outbreaks of Covid-19 infection?

Levels of Covid-19 RNA in wastewater collected at a number of sites around Scotland are adjusted for population and local changes in intake flow rate and compared to daily 7-day average positive case rates derived from Local Authority and Neighbourhood (Intermediate Zone) level aggregate data. See Technical Annex in Issue 34 of these Research Findings for the methodology.

Nationwide, wastewater (WW) Covid-19 levels continue to rise, matching the rise in case rates. As well as continued high levels in and around Glasgow, Edinburgh and Dundee, levels of WW Covid-19 and cases are increasing across a broadening range of sites.

Figure 16 shows the national aggregate for the original 28 sites with long-term records (in blue) and, from January 2021, the aggregate for the full set of up to 108 currently sampled sites (in green). This aggregate shows a continued rise in WW COVID-19 to around 15 million gene copies per person per day (Mgc/p/d), matching the rising rate of new cases and being similar to the levels last seen at the end of February, and to the rising levels at the start October 2020

Figure 16. National average trends in wastewater RNA and daily case rates (7 day moving average)[13]

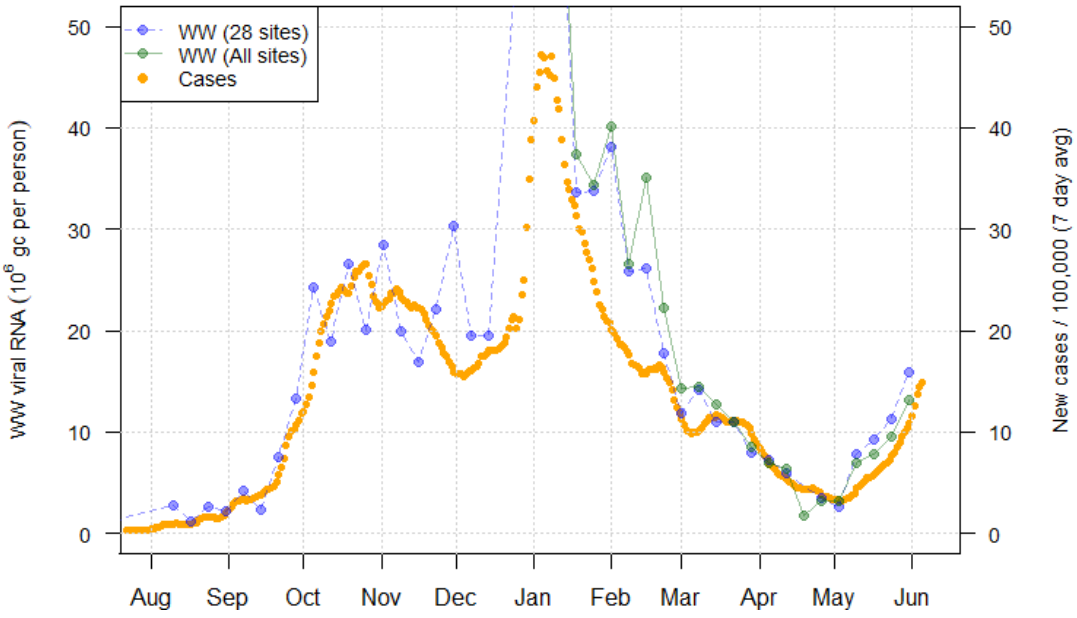
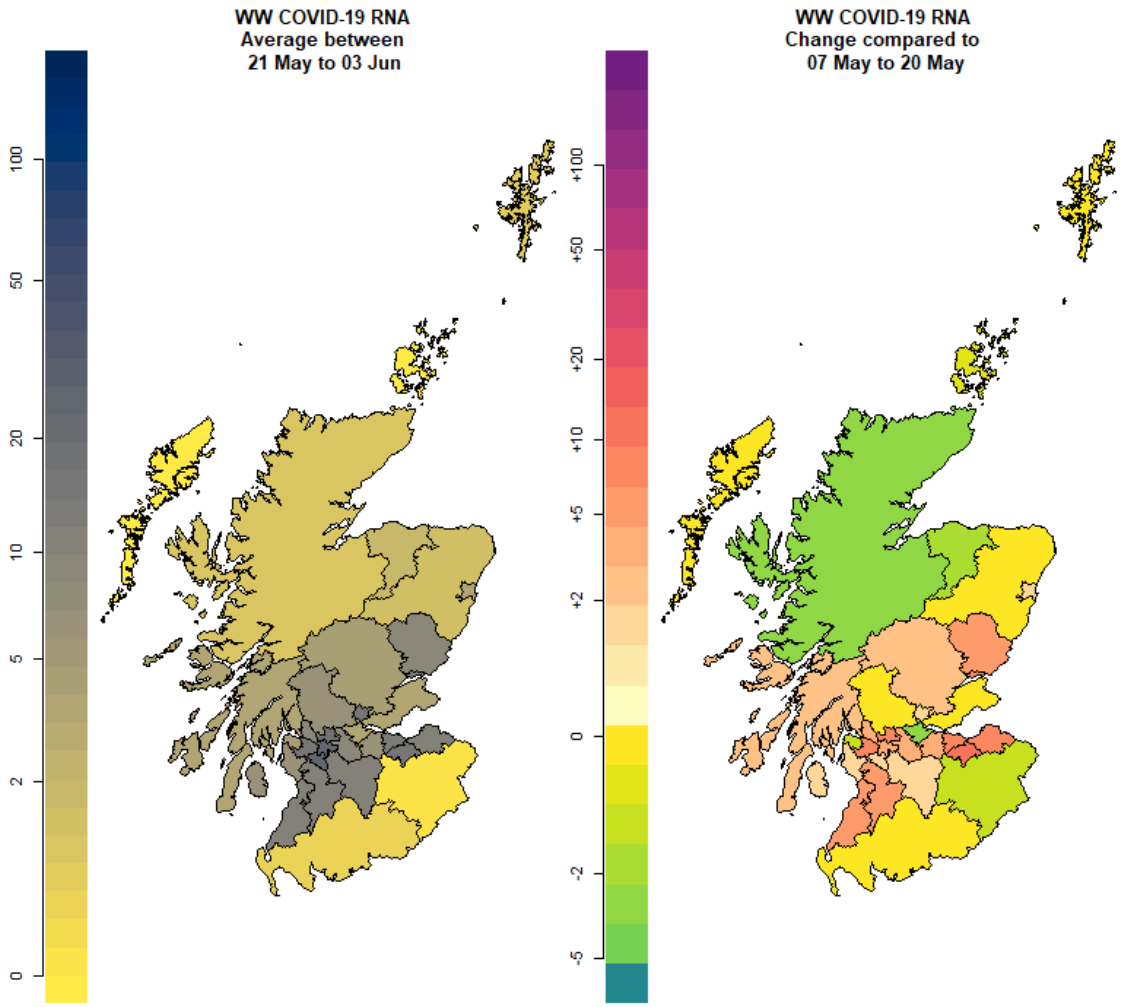


Figure 17 shows the main increases in wastewater Covid-19 levels are concentrated in the central belt, with particularly high increases near Glasgow, Edinburgh, and Dundee. These maps use colours to show (i) the Local Authority average viral Covid-19 levels (in Mgc/p/d) over the 2 week period from 21st May to 3rd June, and (ii) in absolute terms the change in viral Covid-19 levels compared to the previous two week period 7th to 20th May. Darker, or warmer, colours show high levels of virus or large increases in virus respectively.

[13] An anomalously high value in Seafield (Edinburgh) in mid-February is removed. See Issue 40 for details.

Figure 17. Map showing wastewater Covid-19 levels (million gene copies/person/day) for each local authority for the period 21st May to 3rd June and changes compared to the period 7th May to 20th May.



Virus levels at sites in and around Glasgow, such as Shieldhall (Figure 18), continue to increase. Although cases there now appear to be levelling out, this effect is not yet clear in the wastewater measurements, in part due to the variability from this site. In other locations with large populations, like Seafield in Edinburgh and Hatton in Dundee City (Figure 19), levels are also climbing rapidly. A much smaller increase can be seen at Nigg in Aberdeen city, reaching around 5 Mgc/p/day. This may precede a greater rise to come.

Figure 18. Wastewater Covid-19 and daily case rate (7 day moving average) for Shieldhall in Glasgow City (pop: 377k)[14].

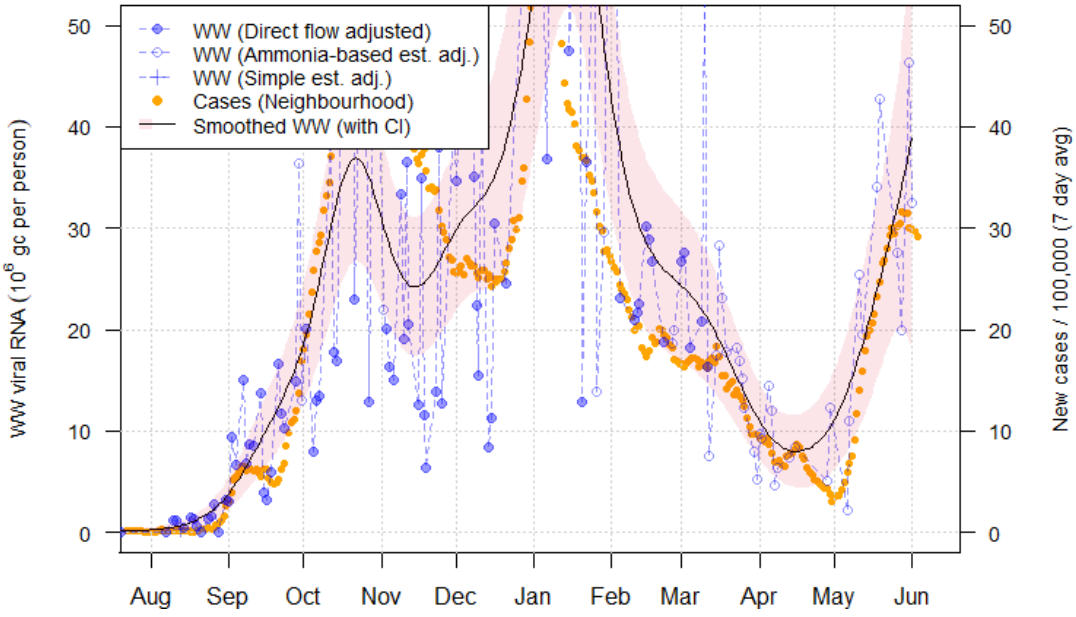
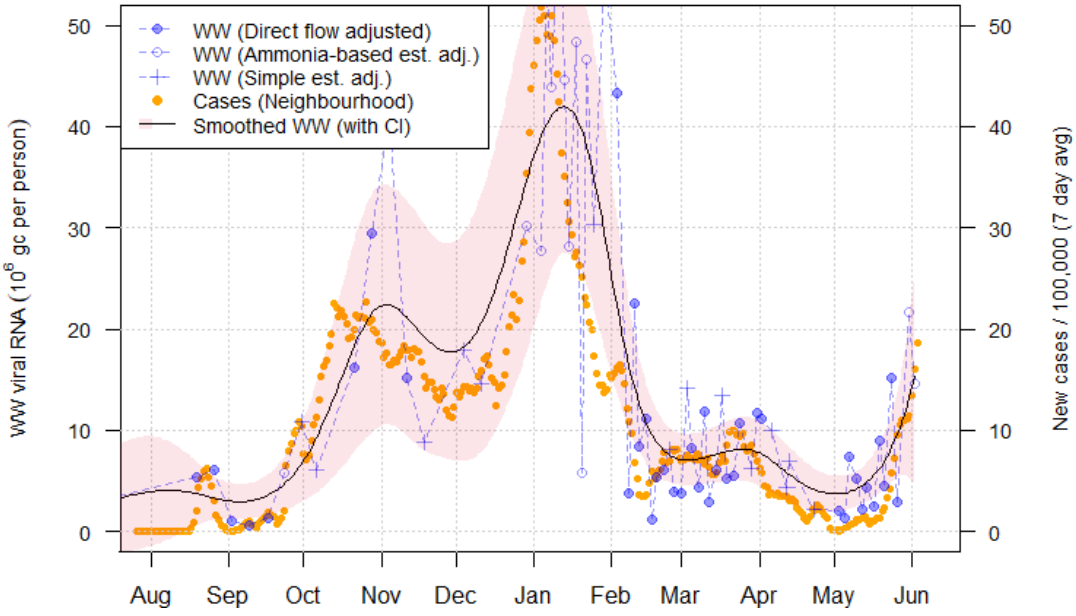


Figure 19. Wastewater Covid-19 and daily case rate (7 day moving average) for Hatton in Dundee City (pop: 194k).



In smaller sites further away from large cities, increases in WW Covid-19 and cases are now underway, albeit starting in late May than the start of May as occurred in Glasgow (Figure 18). Examples include Philipshill in Lanarkshire and St Andrews in Fife (Figures 20 and 21). In the case of

[14] The black line and red shaded area provide a smoothed curve and confidence interval estimated from a generalised additive model based on a Tweedie distribution.

St Andrews, the increase seems to have been detected first in the wastewater. A similar increase can be seen in Cumnock in Ayrshire.

Figure 20. Wastewater Covid-19 and daily case rate (7 day moving average) for Philipshill in South Lanarkshire (pop: 44k)

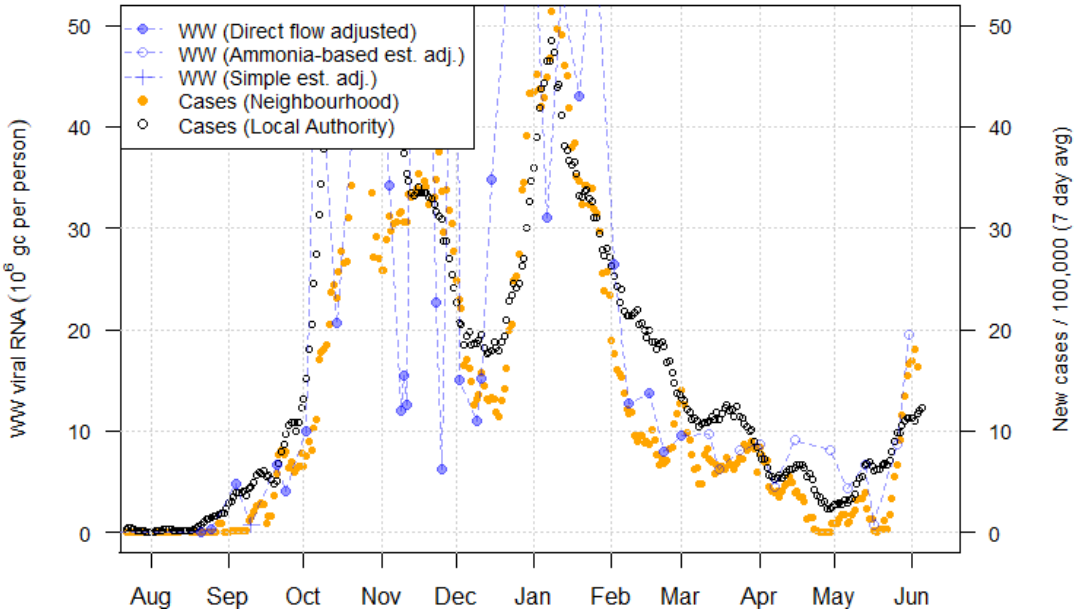
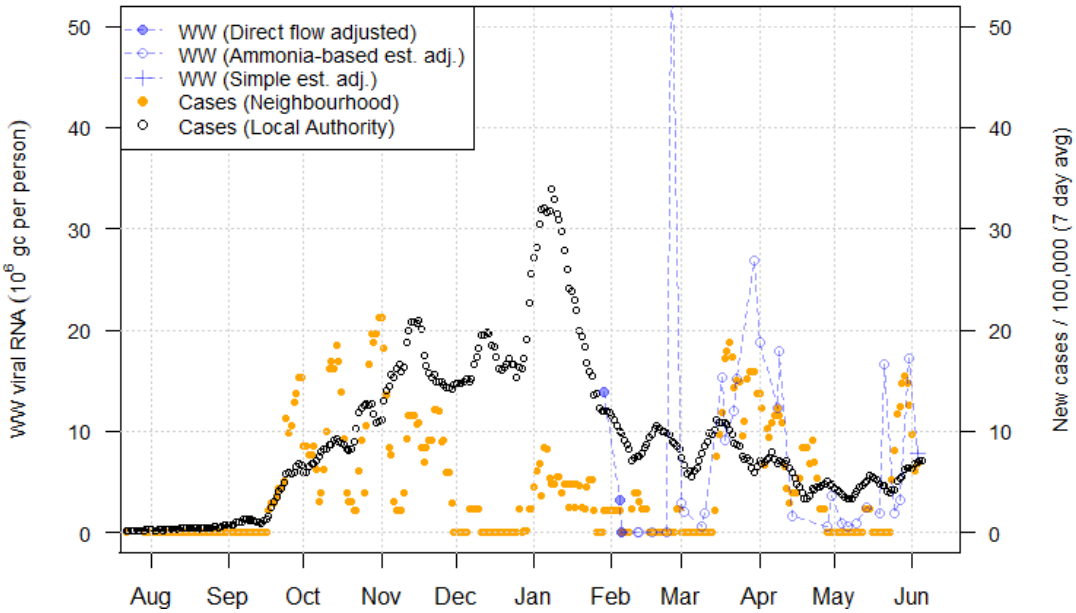


Figure 21. Wastewater Covid-19 and daily case rate (7 day moving average) for St Andrews in Fife (pop: 16k)



In some locations, cases are up while WW Covid-19 have not risen. One example is Maybole in Ayrshire. It is unclear whether this is due to a delayed response in the WW signal, or due to other factors relating to the small size of the site (population 4k).

Advancements in detection and interpretation practices allow us to identify when outlying results are anomalous rather than indicators of

spikes in Covid-19 levels. Table 2 in the Technical Annex provides population weighted daily averages for normalised WW Covid-19 levels both with and without the outliers removed. It is worth noting that the Dunblane site near Stirling, which registered a very high reading last week, has subsequently provided several much lower readings. This confirms the identification of that reading as anomalous by the new algorithm; although the measurement was probably an over-estimate of Covid-19 levels at the time, it is highly likely that there was Covid-19 in the wastewater.

What next?

The Scottish Government continues to work with a number of academic modelling groups to develop other estimates of the epidemic in Scotland.

The modelled estimates of the numbers of new cases and infectious people will continue to be provided as measures of the epidemic as a whole, along with measures of the current point in the epidemic such as R_t and the growth rate. Further information can be found at https://www.gov.scot/coronavirus-covid-19**.**

We may report on exceedance in future weeks when the background levels of Covid-19 reduces so that it can be useful in identifying outbreaks.

Technical Annex

Epidemiology is the study of how diseases spread within populations. One way we do this is using our best understanding of the way the infection is passed on and how it affects people who catch it to create mathematical simulations. Because people who catch Covid-19 have a relatively long period in which they can pass it on to others before they begin to have symptoms, and the majority of people infected with the virus will experience mild symptoms, this “epidemiological modelling” provides insights into the epidemic that cannot easily be measured through testing e.g. of those with symptoms, as it estimates the total number of new daily infections and infectious people, including those who are asymptomatic or have mild symptoms.

Modelling also allows us to make short-term forecasts of what may happen with a degree of uncertainty. These can be used in health care and other planning. The modelling in this research findings is undertaken using different types of data which going forward aims to both model the progress of the epidemic in Scotland and provide early indications of where any changes are taking place.

The delivery of the vaccination programme will offer protection against severe disease and death. The modelling includes assumptions about compliance with restrictions and vaccine take-up. Work is still ongoing to understand how many vaccinated people might still spread the virus if infected. As Covid-19 is a new disease there remain uncertainties associated with vaccine effectiveness. Furthermore, there is a risk that new variants emerge for which immunisation is less effective.

Better and Worse Scenarios

Due to the large areas of uncertainty around the path of the epidemic, both in how many people could be affected and in how quickly it could happen, we provide two projections for estimated infections and hospital demand, illustrating what might happen in two broad scenarios.

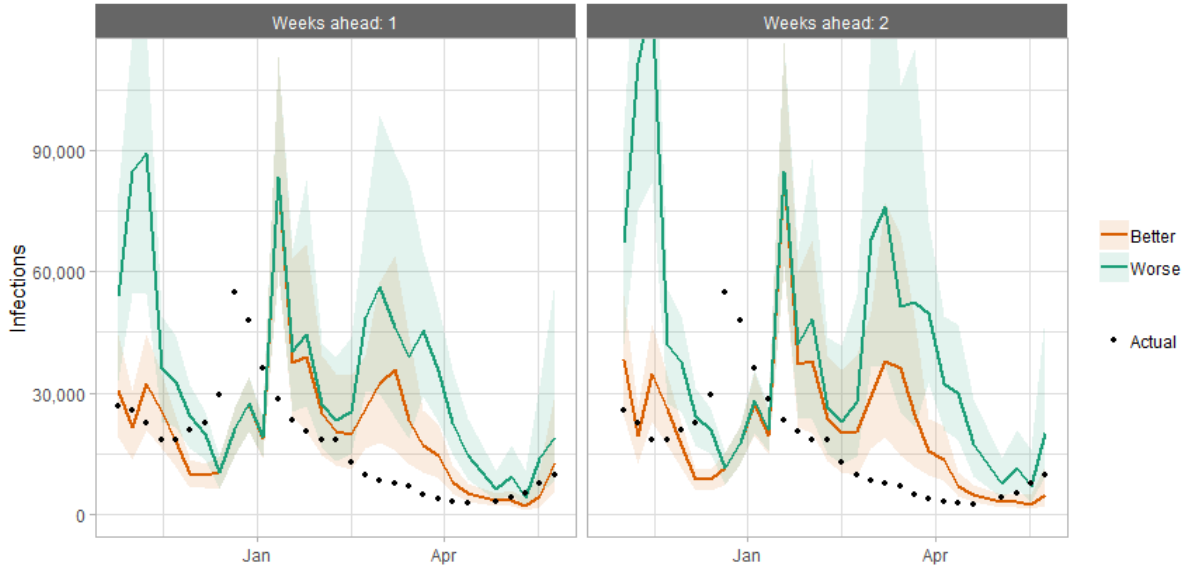
In this issue, the difference between the Better and Worse scenarios illustrates the difference between a significant (Worse) and not significant (Better) impact from the delta variant. For the Worse scenario, we assume the delta variant is between 20% and 60% more transmissible than the alpha variant, while in the Better scenario we assume they are the same.

Both scenarios cover the same wide range of behavioural patterns, from decreased mixing in comparison to now to increased mixing.

How the modelling compares to the real data as it emerges

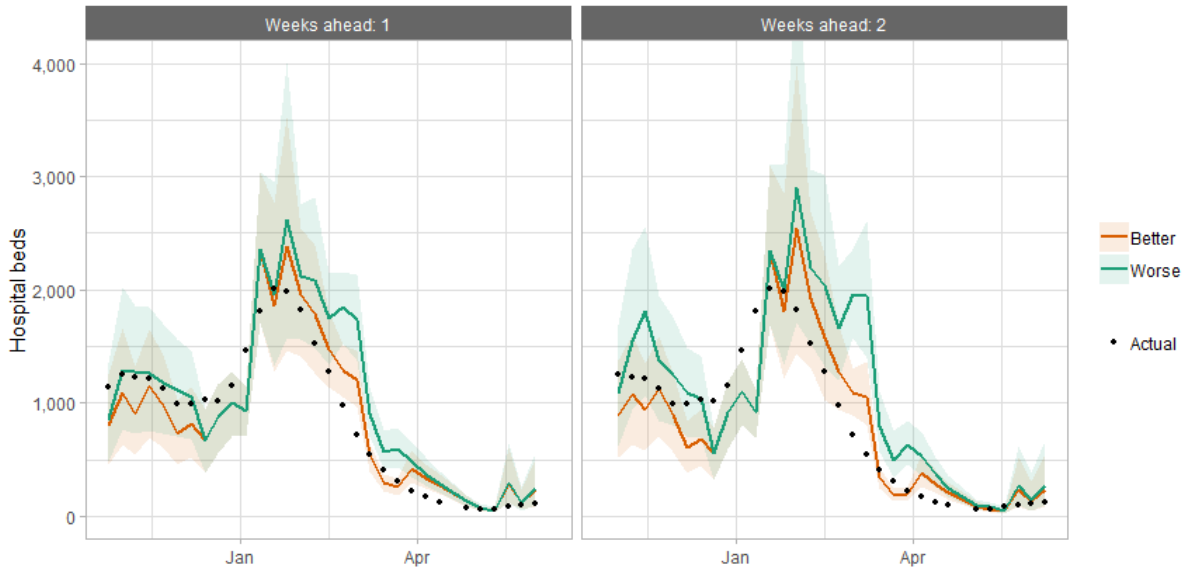
The following charts show the history of our modelling projections in comparison to estimates of the actual data. The infections projections were largely accurate during October to mid-December and from mid-January onward. During mid-December to mid-January, the projections underestimated the number of infections, due to the unforeseen effects of the new variant.

Figure 22. Infections projections versus actuals, for historical projections published between one and three weeks before the actual data came in.



Hospital bed projections have generally been more precise than infections estimates due to being partially based on already known information about numbers of current infections, and number of people already in hospital. The projections are for number of people in hospital due to Covid-19, which is slightly different to the actuals, which are number of people in hospital within 28 days of a positive Covid-19 test.

Figure 23. Hospital bed projections versus actuals, for historical projections published between one and three weeks before the actual data came in.



As with hospital beds, ICU bed projections have generally been more precise than infections. The projections are for number of people in ICU due to Covid-19. The actuals are number of people in ICU within 28 days of a positive Covid-19 test up to 20 January, after which they include people in ICU over the 28 day limit.

Figure 24. ICU bed projections versus actuals, for historical projections published between one and three weeks before the actual data came in.

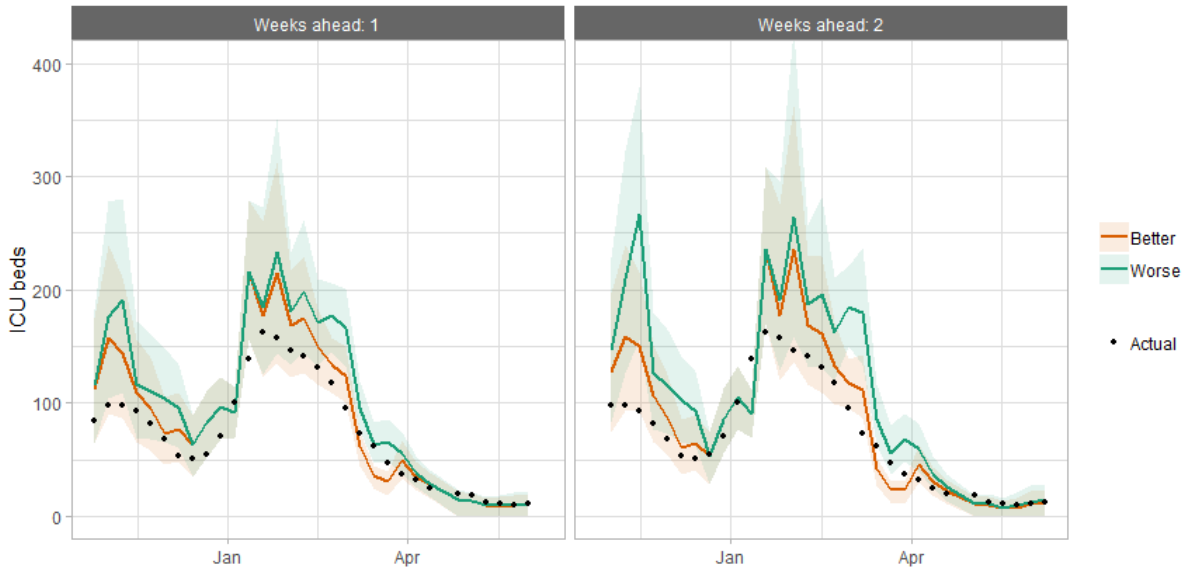


Table 1. Probability of local authority areas having more than 50, 100, 300 or 500 cases per 100K (20 to 26 June 2021)[15].

LA	P (Cases > 500)	P (Cases > 300)	P (Cases > 100)	P (Cases > 50)
Aberdeen City	0-5%	0-5%	50-75%	50-75%
Aberdeenshire	0-5%	0-5%	15-25%	50-75%
Angus	50-75%	50-75%	50-75%	75-100%
Argyll and Bute	0-5%	0-5%	15-25%	50-75%
City of Edinburgh	75-100%	75-100%	75-100%	75-100%
Clackmannanshire	50-75%	50-75%	50-75%	75-100%
Dumfries & Galloway	0-5%	0-5%	15-25%	25-50%
Dundee City	50-75%	50-75%	75-100%	75-100%
East Ayrshire	25-50%	50-75%	75-100%	75-100%
East Dunbartonshire	5-15%	25-50%	75-100%	75-100%
East Lothian	5-15%	25-50%	50-75%	75-100%
East Renfrewshire	25-50%	50-75%	75-100%	75-100%
Falkirk	0-5%	5-15%	50-75%	75-100%
Fife	5-15%	15-25%	50-75%	75-100%
Glasgow City	50-75%	50-75%	75-100%	75-100%
Highland	0-5%	5-15%	50-75%	75-100%
Inverclyde	0-5%	0-5%	50-75%	50-75%
Midlothian	25-50%	50-75%	75-100%	75-100%
Moray	0-5%	0-5%	0-5%	25-50%
Na h-Eileanan Siar	0-5%	0-5%	0-5%	5-15%
North Ayrshire	0-5%	15-25%	75-100%	75-100%
North Lanarkshire	5-15%	50-75%	75-100%	75-100%
Orkney Islands	0-5%	0-5%	0-5%	5-15%
Perth and Kinross	0-5%	15-25%	50-75%	75-100%
Renfrewshire	25-50%	50-75%	75-100%	75-100%
Scottish Borders	0-5%	0-5%	25-50%	50-75%
Shetland Islands	0-5%	0-5%	5-15%	15-25%
South Ayrshire	50-75%	50-75%	75-100%	75-100%
South Lanarkshire	5-15%	25-50%	75-100%	75-100%
Stirling	5-15%	25-50%	75-100%	75-100%
West Dunbartonshire	0-5%	5-15%	50-75%	75-100%
West Lothian	5-15%	25-50%	50-75%	75-100%

[15] This week we report on a subset of local authorities for their rates of positive tests per 100K due to the uncertainty around the spread of the Delta variant.

What levels of Covid-19 are indicated by wastewater (WW) data?

Table 2 provides population weighted daily averages for normalised WW Covid-19 levels in the weeks of the 21st May and 28th May, with no estimate for error. This is given in Million gene copies per person, which approximately corresponds to new cases per 100,000 per day. Coverage is given as percentage of LA inhabitants covered by a wastewater Covid-19 sampling site delivering data during this period.

Table 2. Average daily cases per 100k as given by WW data

Local authority	Average daily WW case estimate, with outliers included		Average daily WW case estimate, with outliers removed		Coverage[16]
	w/b 21st May	w/b 28th May	w/b 21st May	w/b 28th May	
Aberdeen City	2.8	4.6	2.8	4.6	80%
Aberdeenshire	1.1	2.2	1.1	2.2	52%
Angus	5.9	14.5	5.9	14.5	56%
Argyll and Bute	2.1	5.3	2.1	5.3	18%
City of Edinburgh	12.6	14.0	12.6	14.0	96%
Clackmannanshire	9.8	22.1	9.8	17.8	92%
Dumfries & Galloway	0.2	1.4	0.2	1.4	32%
Dundee City	7.5	18.1	7.5	18.1	100%
East Ayrshire	11.1	13.1	11.1	13.1	72%
East Dunbartonshire	12.7	26.5	12.7	26.5	99%
East Lothian	12.6	12.4	12.6	12.4	65%
East Renfrewshire	25.8	30.9	25.8	30.9	95%
Falkirk	3.6	4.3	3.6	4.3	69%
Fife	4.1	4.5	4.1	4.5	85%
Glasgow City	19.7	29.7	19.7	29.7	71%
Highland	0.1	2.5	0.1	2.5	36%
Inverclyde	3.6	6.6	3.6	6.6	92%
Midlothian	17.7	14.0	17.7	14.0	88%
Moray	3.0	1.2	3.0	1.2	55%
Na h-Eileanan Siar	0.0	0.0	0.0	0.0	21%
North Ayrshire	7.0	7.2	7.0	7.2	93%
North Lanarkshire	8.6	12.5	8.6	12.5	44%
Orkney Islands	0.1	0.0	0.1	0.0	34%
Perth and Kinross	2.1	7.5	2.1	7.5	45%
Renfrewshire	13.4	21.2	13.4	21.2	57%
Scottish Borders	0.3	0.1	0.3	0.1	43%
Shetland Islands	0.0	1.0	0.0	1.0	29%
South Ayrshire	11.8	11.3	11.8	11.3	88%
South Lanarkshire	9.4	14.2	9.4	14.2	79%
Stirling	10.5	3.6	0.7	3.6	63%
West Dunbartonshire	6.8	13.5	6.8	13.5	98%
West Lothian	7.7	7.0	6.2	6.7	85%

[16] Coverage as at the week beginning 28th May 2021.

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

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