GSE Government Science & Engineering

GORS Government Operational Research Service

Scottish Government
Riaghaltas na h-Alba
gov.scot

Coronavirus (COVID-19): Analysis

Coronavirus (COVID-19): modelling the epidemic in Scotland (Issue No. 53)

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 20 May 2021. 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 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 1.0 and 1.3, with the growth rate increasing to between 0% and 4% 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 reflected in the projections over the next four weeks. The increase in Covid-19 cases is also reflected in the wastewater data. Exceedance modelling indicates that there are ten local authority areas at higher risk of increasing transmission.

The measures modelled for this week, as described above, indicate that we are continuing to see a resurgence of the virus 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 1.0 and 1.3. This is an increase in the range since last week.
- The number of new daily infections for Scotland is estimated as being between 6 and 14, per 100,000 people. This has increased since last week.

- The growth rate for Scotland is currently estimated as being between 0% and 4%. This is an increase since last week.
- Average contacts have remained at a similar level in the last two weeks (comparing surveys pertaining to 29th April – 5th May and 13th -19th May) with a current level of 4.2 daily contacts.
- Contacts within the home, work and other setting remain at a similar level in comparison to two weeks prior whereas contacts within the school setting have decreased by 39%.
- The only age groups to increase their contacts in the last two weeks were those aged between 18-29 and 40-49. These increases were largely driven by contacts within the other setting (contacts outside of the work, home or school settings) for 18-29 and a combination of the other and work settings for 40-49.
- The biggest increase in the proportion of participants visiting different locations is seen in those visiting a pub or restaurant. This has increased from 21% to 32% in the last two weeks, followed by visiting a non-essential shop, increasing from 35% to 39%.
- Hospital bed and intensive care unit (ICU) occupancy are projected to plateau or rise over the next few weeks, as a result of relaxations of non-pharmaceutical interventions.
- There were ten local authority (LA) areas that exceeded what would be expected at this stage in the epidemic. Between 20th and 26th May, Dundee City, Midlothian, Argyll & Bute, Renfrewshire, Angus, Edinburgh City, East Lothian, Stirling, East Dunbartonshire and Glasgow City were areas at higher risk of increasing transmission.
- Modelled rates of positive tests per 100K indicate that for the week commencing 6 June 2021, the 6 local authorities with at least a 75% probability of exceeding 50 cases are East Dunbartonshire, East Renfrewshire, Glasgow City, Midlothian, Renfrewshire and South Lanarkshire. Of those, 2 local authorities have at least a 75% probability of exceeding 100 cases (East Renfrewshire and Glasgow City).
- The overall level of wastewater Covid-19 has remained at levels similar to last week. This is due to offsetting between large increases and decreases in the Glasgow area, while other locations show smaller increases.
- Inverclyde and the Falkirk area both show increases in virus levels that are not yet reflected by the case levels. If this follows the patterns seen in Alloa and Lerwick, rises in cases in these areas in the near future is possible.

Overview of Scottish Government Modelling

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.

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 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.

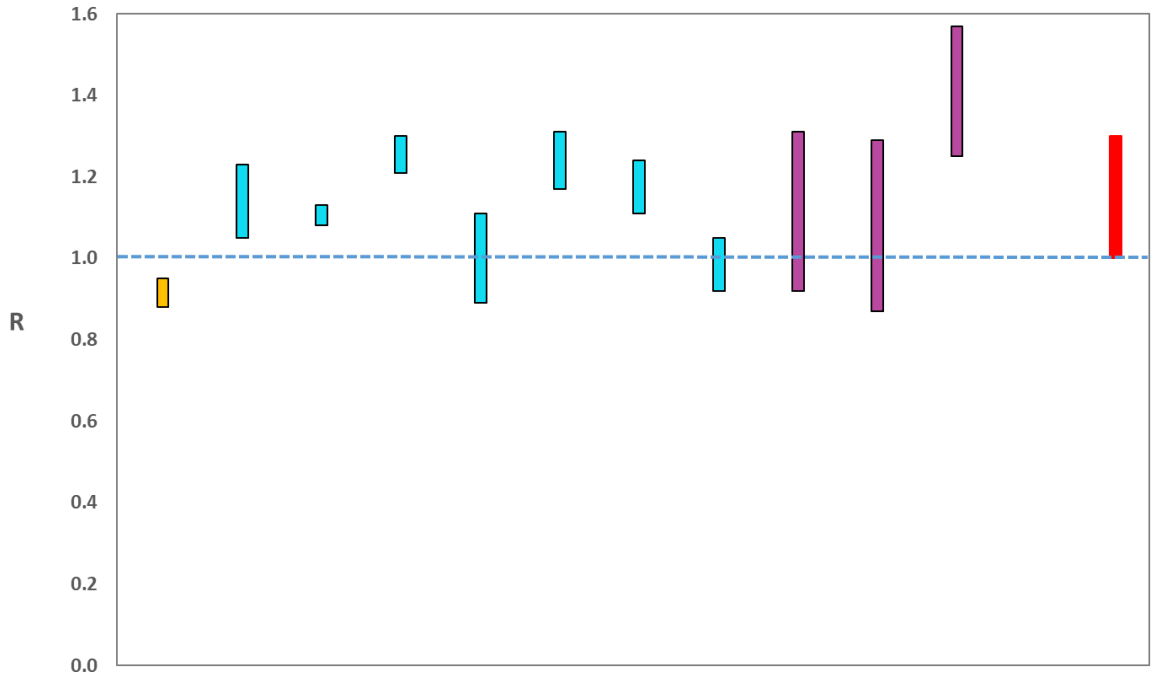
The logistical model utilises results from the epidemiological modelling, principally the number of new infections. The results are split down by age group, and the model is used to give a projection of the number of people that will go to hospital, and potentially to ICU. This will continue to be based on both what we know about how different age groups are effected 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 26th May, was that the value of R in Scotland was between 1.0 and 1.3 (see Figure 1). This has increased from the range of 0.9 to 1.2 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. They should not be treated as robust enough to inform policy decisions alone.

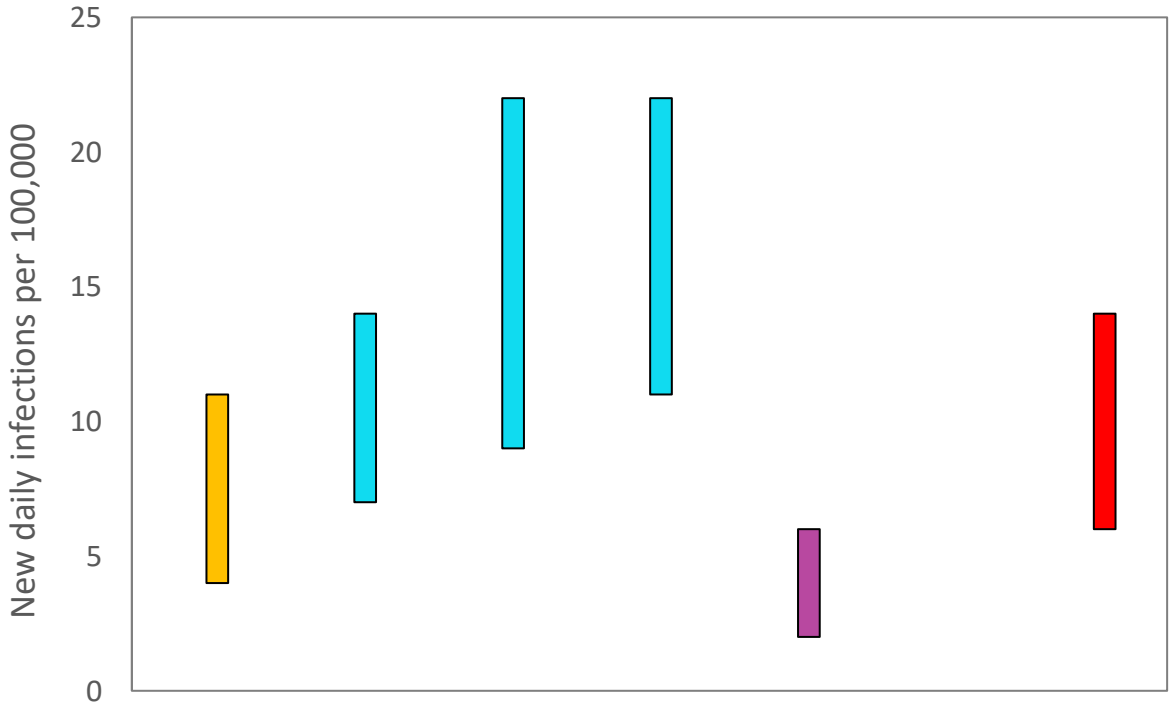
Figure 1. Estimates of R_t for Scotland, as of 26th May, including 90% confidence intervals, produced by SAGE. The cyan bars use Covid-19 test data and purple bars use multiple sources of data. The estimate produced by the Scottish Government (based on cases and deaths) is the left-most (yellow), while 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 26th May, was that the incidence of new daily infections in Scotland was between 6 and 14 new infections per 100,000. This is an increase since last week. This equates to between 300 and 800 people becoming infected each day in Scotland.

Figure 2. Estimates of incidence for Scotland, as of 26th May, 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 0% and 4% per day. This is an increase in the range from 19th May.

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

Average contacts have remained at a similar level in the last two weeks (comparing surveys pertaining to 29th April – 5th May and 13th -19th May) with a current level of 4.2 daily contacts as seen in Figure 3. Contacts within the home, work and other setting remain at a similar level in comparison to two weeks prior whereas contacts within the school setting have decreased by 39%.

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

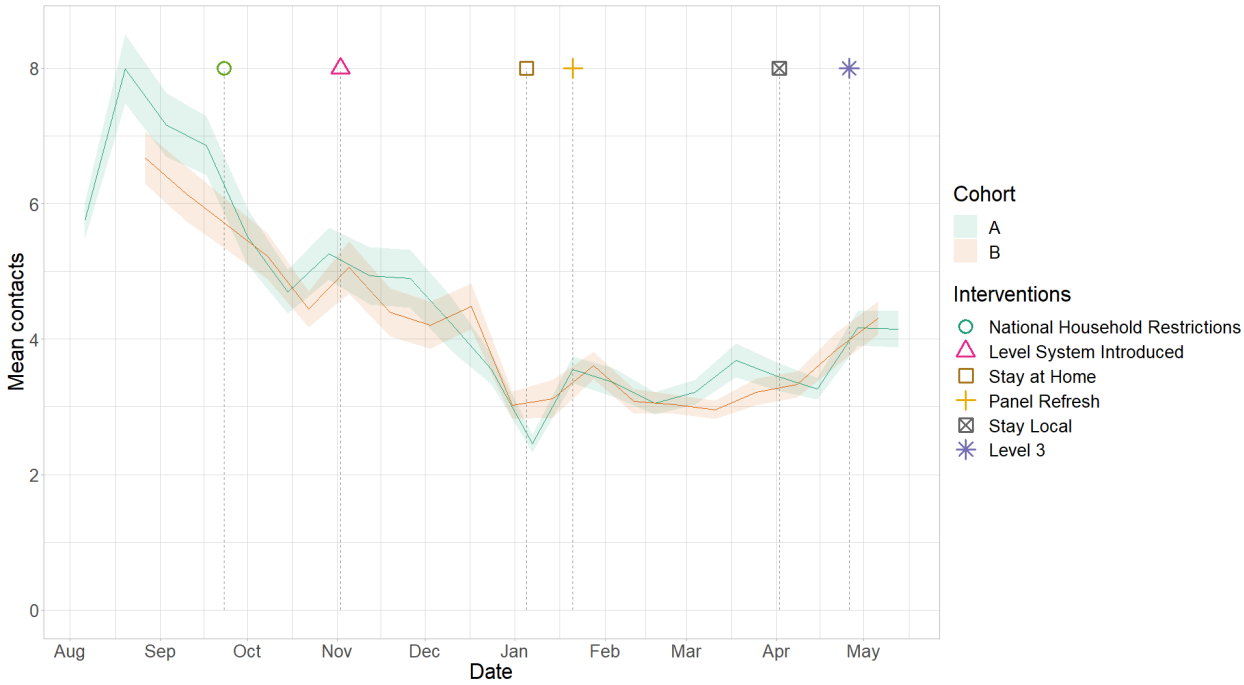
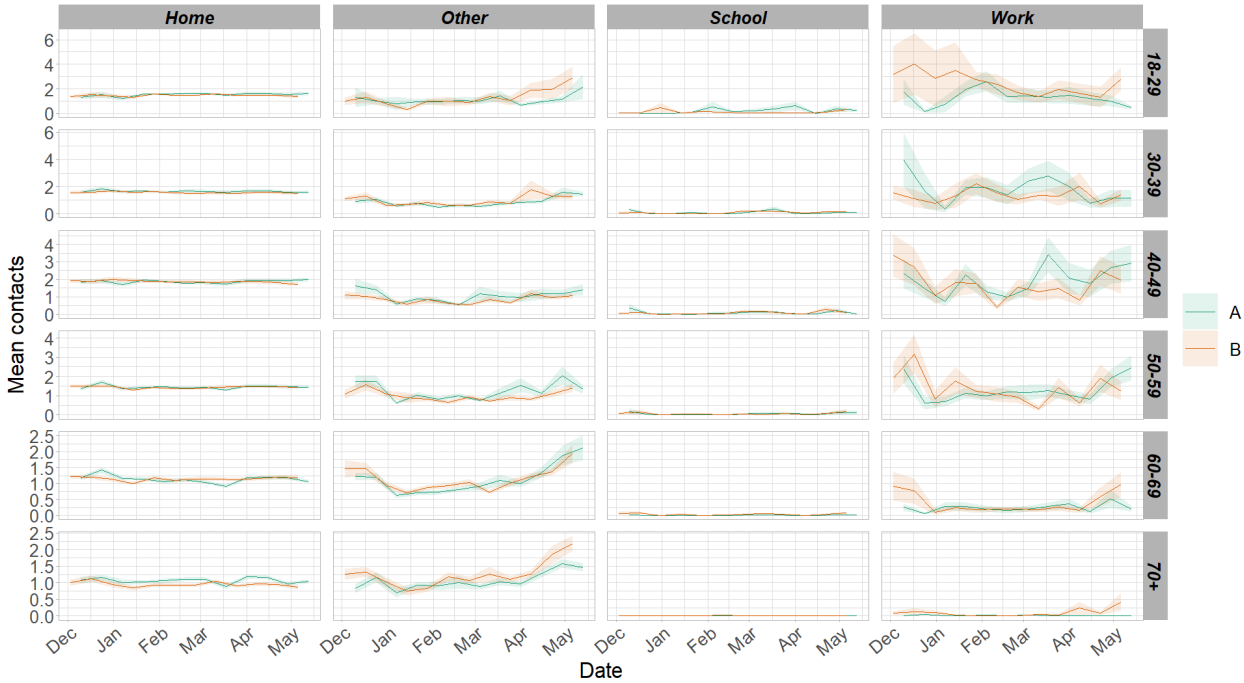


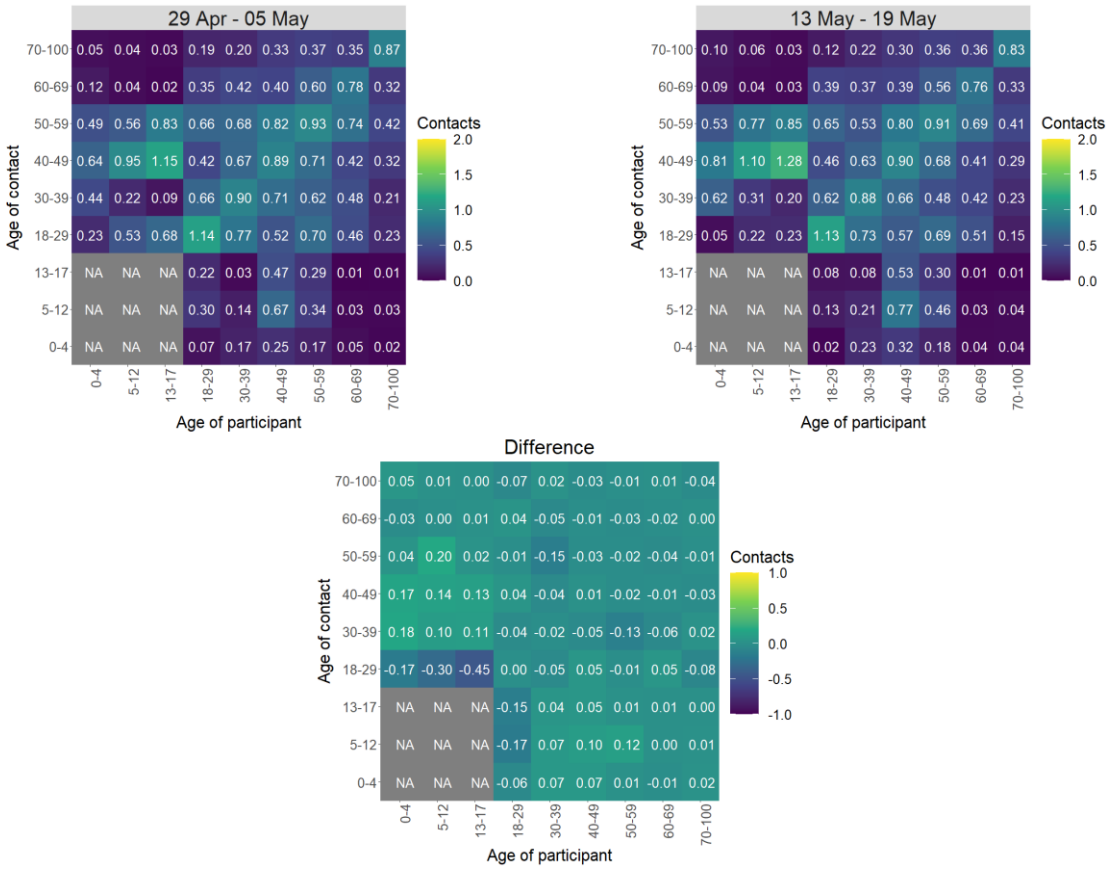
Figure 4 shows how contacts change across age group and setting. The only age groups to increase their contacts in the last two weeks were those aged between 18-29 and 40-49. These increases were largely driven by contacts within the other setting (contacts outside of the work, home or school settings) for 18-29 and a combination of the other and work settings for 40-49.

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



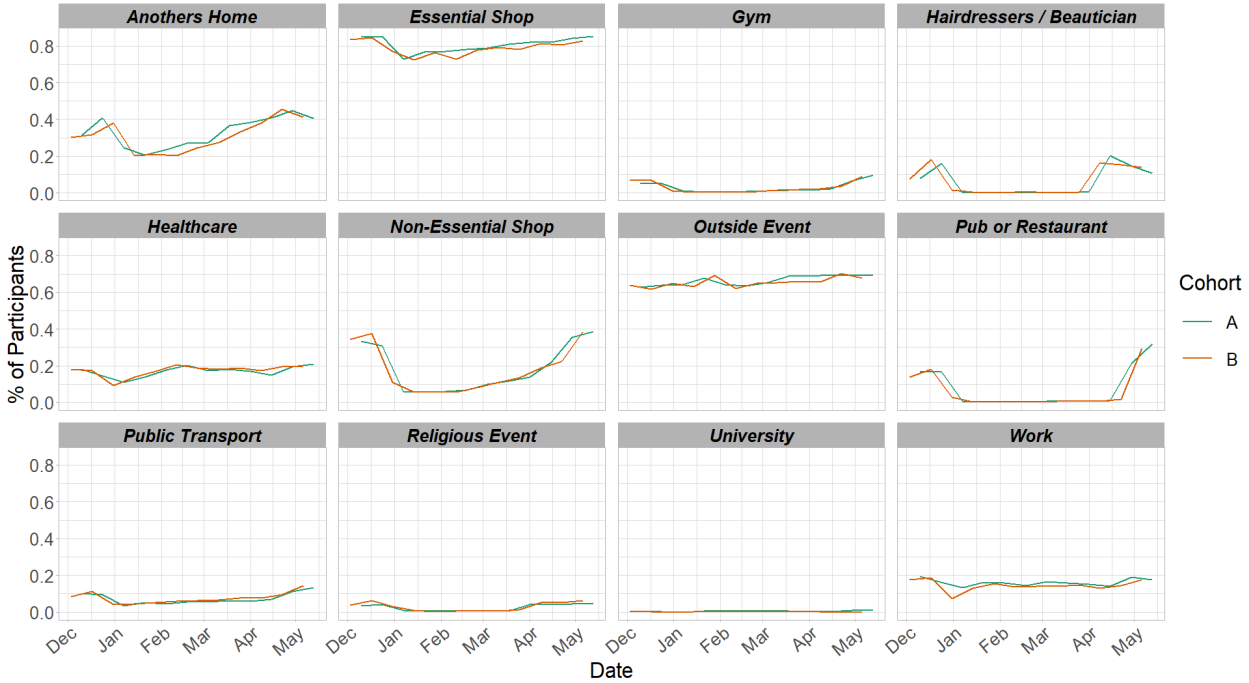
The heatmaps in Figure 5 show the mean overall contacts between age groups for the weeks relating to 29th April – 5th May and 13th - 19th May, and the difference between these periods. Interactions between all age groups remain at similar levels, with the exception of those aged between 18-29 showing the biggest reduction in contacts with those under 18.

Figure 5: Overall mean contacts by age group before for the weeks relating to 29th April – 5th May and 13th – 19th May



The biggest increase in the proportion of participants visiting different locations is seen in those visiting a pub or restaurant in Figure 6. This has increased from 21% to 32% in the last two weeks, followed by visiting a non-essential shop, increasing from 35% to 39%.

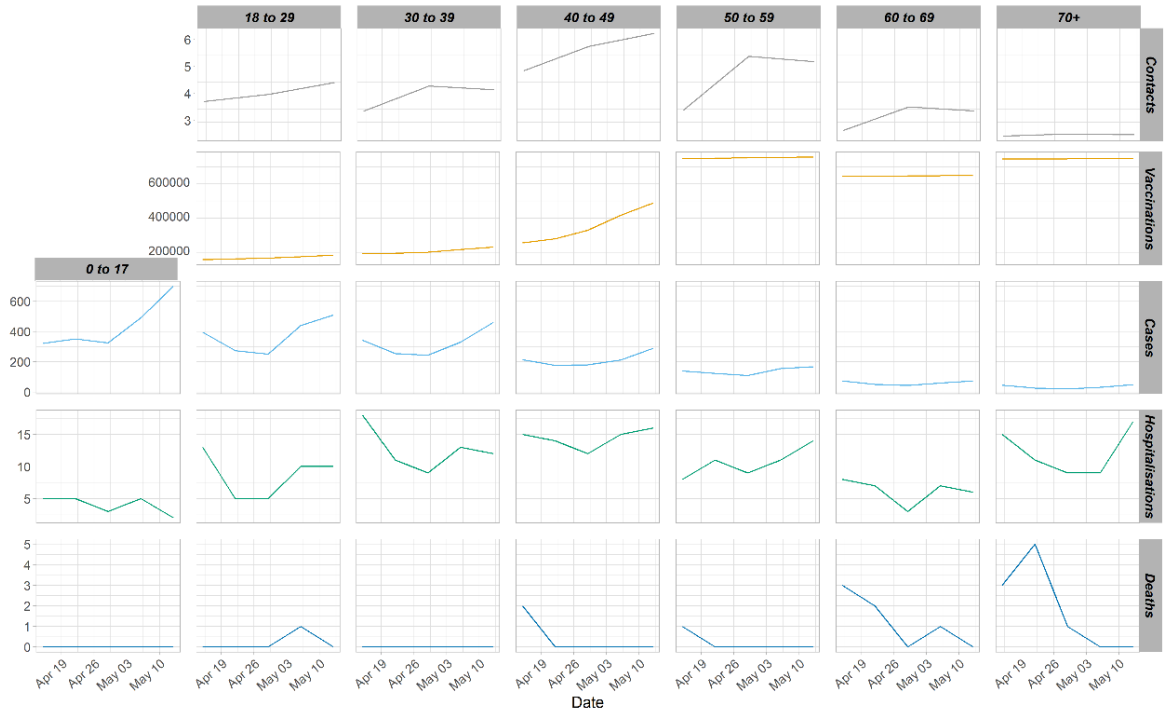
Figure 6: Locations visited by participants at least once for panel A and B (from SCS).



Vaccinations and contacts patterns

From Figure 7, it can be seen that even when contacts have increased or remained level, deaths have decreased. Generally the same is true for hospitalisations and cases, however there has been a recent uptick in cases across all the age groups and in hospitalisations across some age groups.

Figure 7: Average contacts for Panel A, daily 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.[4] Figure 8 shows two projections[5], which take account of new variants (little impact for 'Better' and high impact for 'Worse')[6], as well as the recent increase in infections observed in the last two weeks.

[2] Deaths, Cases and Hospitalisations from PHS COVID-19 daily cases in Scotland dashboard.
[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.
[5] Four week projections are included here.
[6] 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[7] to account for asymptomatic and undetected infections, from Scottish Government modelling, positive test data up to 22 May.

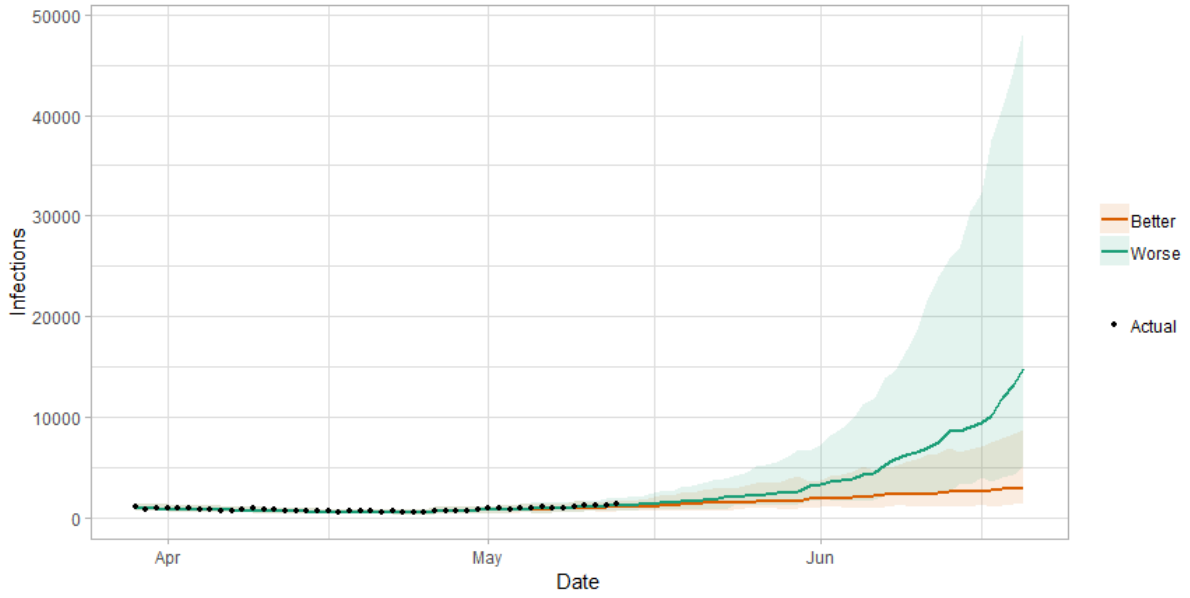


Figure 9 shows the impact of the projections on the number of people in hospital. The modelling includes all hospital stays, whereas the actuals only include stays up to 28 days duration that are linked to Covid-19. Work is ongoing to show the modelled occupancy for stays up to a 28 day limit.

[7] 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.

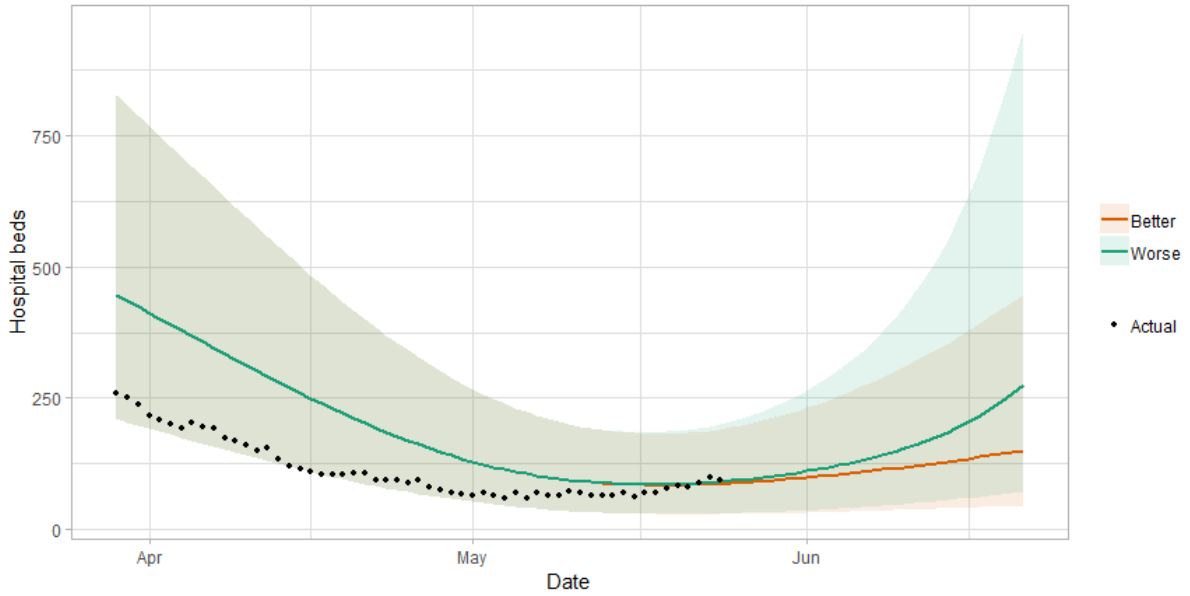
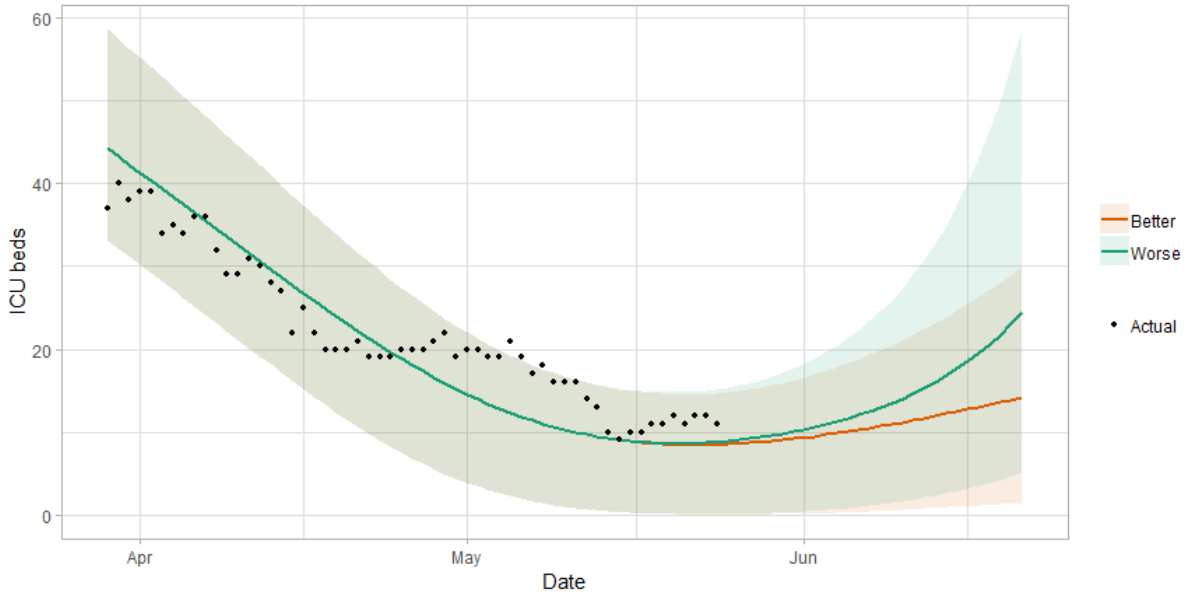


Figure 10 shows the impact of the projection on ICU bed demand.

Figure 10. Medium term projections of modelled ICU bed demand, from Scottish Government modelling[8].



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

[8] 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[9] (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 24 May.

Modelling groups have used data from contact surveys, previous findings[10] and their own expert judgement to incorporate the impact of recent relaxations on transmission. **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 24 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. Modelling groups have used their expert judgement and evidence from Public Health England, Scottish universities, Public Health Scotland and other published studies when making assumptions about vaccine effectiveness.

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.

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

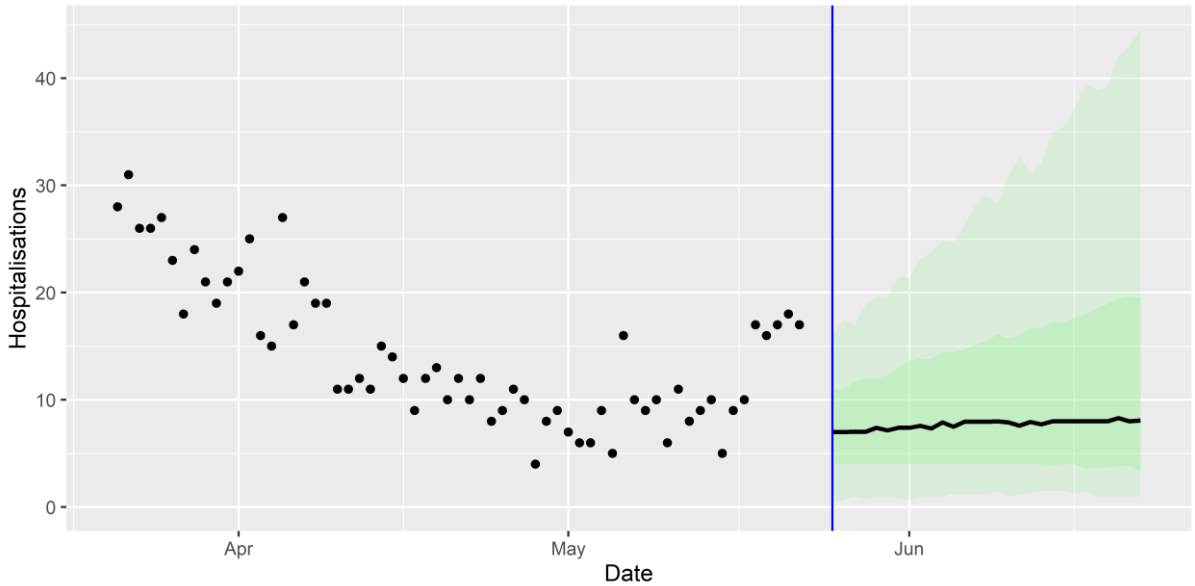
---

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

[10] 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

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.

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



What the modelling tells us about whether Covid-19 infections exceeded what would be expected at this stage in the epidemic

Exceedance indicates whether the number of confirmed infections (based on testing) in each local authority area exceeds the number that was expected. Numbers of positive tests recorded each day, adjusted for population of each local authority and number of cases seen in preceding weeks, should fall within a certain distribution of values, which will rise and fall depending on the number of cases being seen nationally. Areas where the number of positive test results fall beyond the upper 95th percentile of this distribution may be at risk of seeing increased local transmission of Covid-19 and heightened vigilance may be required. This happens when the cumulative exceedance is higher than 6.0. See the Technical Annex in issue 47 for more information.

Figures 12 and 13 show exceedance for local authority areas. Recent cumulative exceedance highlights Dundee City (exceedance = 9.55), Midlothian (6.43), Argyll & Bute (5.89), Renfrewshire (5.58), Angus (4.90), Edinburgh City (4.07), East Lothian (3.87), Stirling (3.77), East Dunbartonshire (3.24) and Glasgow City (3.22) as areas at higher risk of increasing transmission.

Figure 12. Map of cumulative weekly exceedance to 26th May, for Scottish Local Authorities.

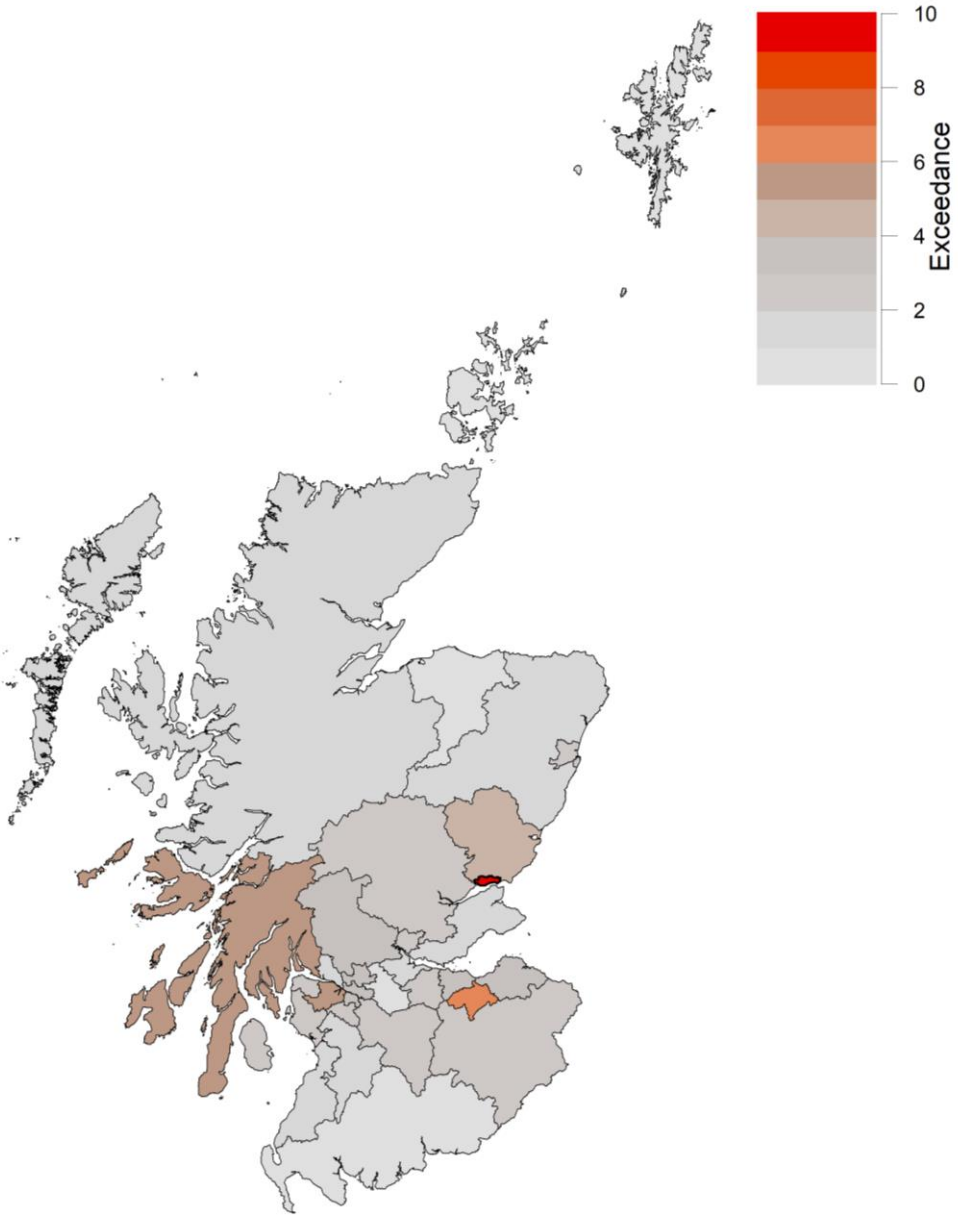
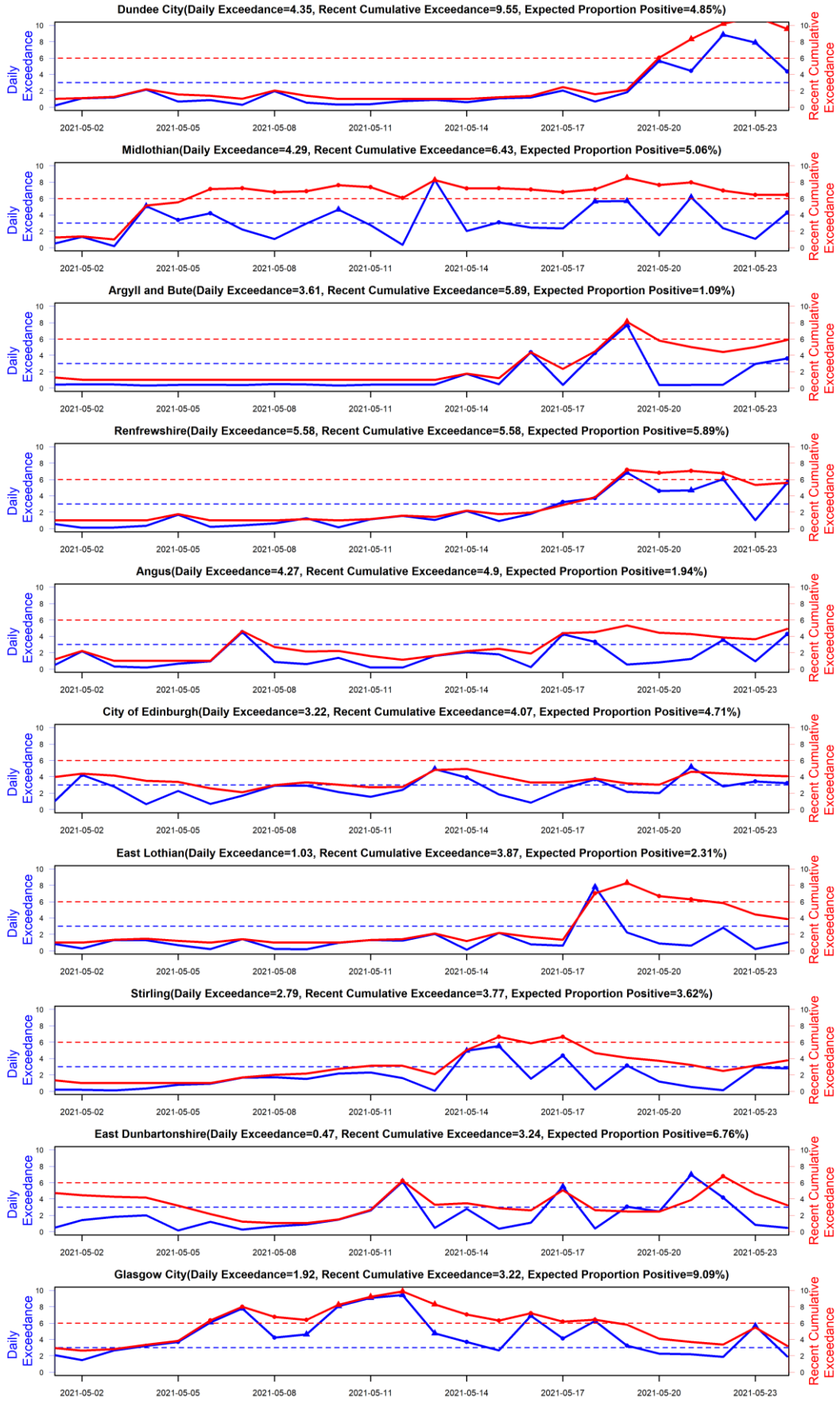


Figure 13. Graphs of daily and cumulative exceedance for the local authorities deemed as higher risk over the period 20th to 26th May.



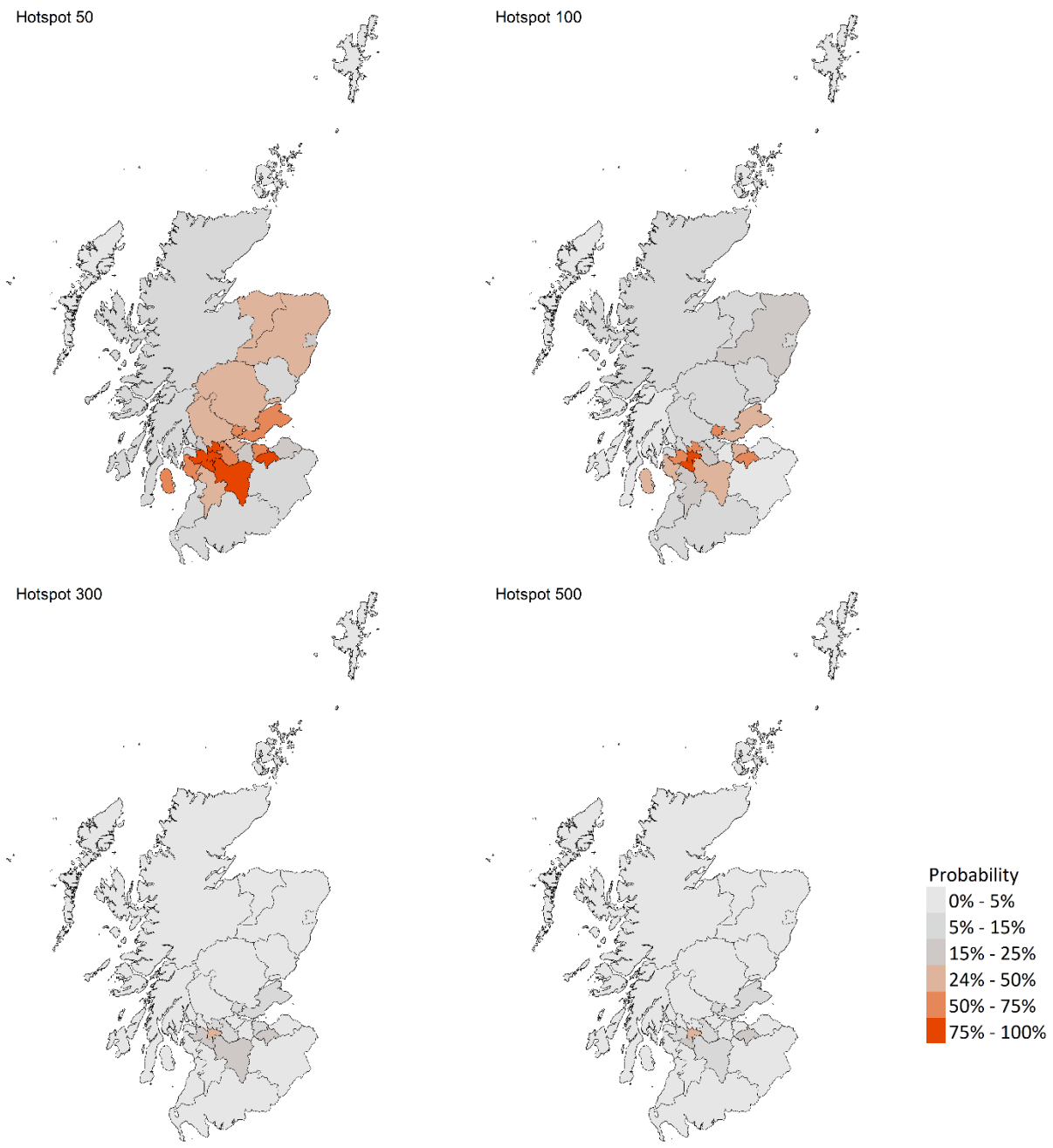
What we know about which local authorities are likely to experience high levels of Covid-19 in two weeks' time

We are using 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 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 14) indicate that for the week commencing 6 June 2021, the 6 local authorities with at least a 75% probability of exceeding 50 cases are East Dunbartonshire, East Renfrewshire, Glasgow City, Midlothian, Renfrewshire and South Lanarkshire. Of those, 2 local authorities have at least a 75% probability of exceeding 100 cases (East Renfrewshire and Glasgow City).

Last week only Glasgow City local authority had at least a 75% probability of exceeding 50 cases. None had at least a 75% probability of exceeding 100 cases.

Figure 14. Probability of local authority areas having more than 50, 100, 300 or 500 cases per 100K (6 – 12 June 2021).



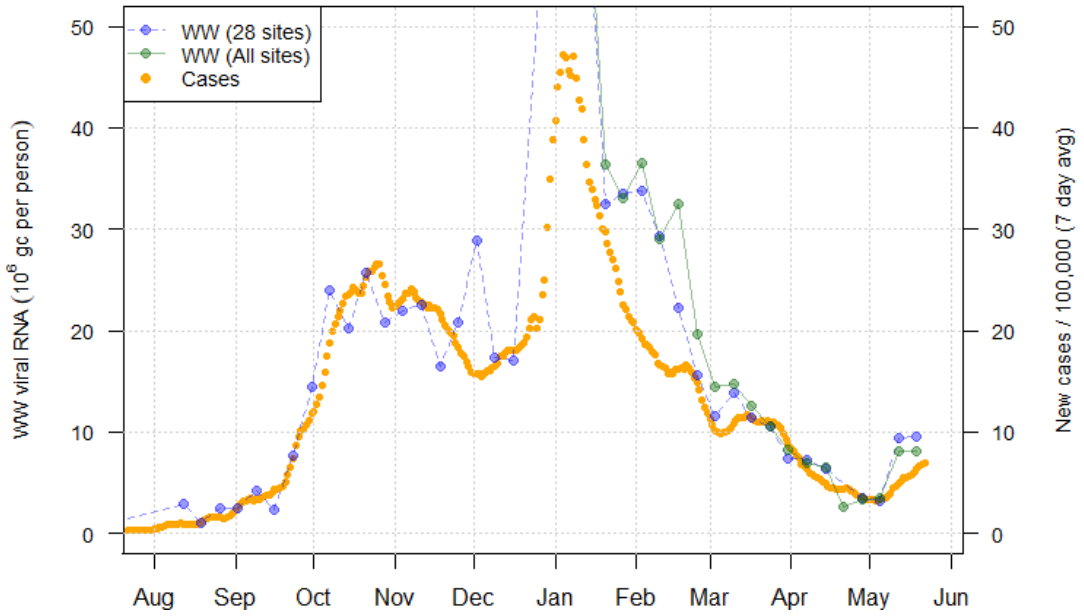
What can analysis of wastewater samples tell us about local outbreaks of Covid-19 infection?

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 remained at levels similar to last week. This is due to offsetting between large increases and decreases in the Glasgow area, while other locations show smaller increases.

Figure 15 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 107 currently sampled sites (in green). This national average shows a plateau in the levels of WW Covid-19 from last week.

Figure 15. National average trends in wastewater Covid-19 and daily case rates (7 day moving average)[11].

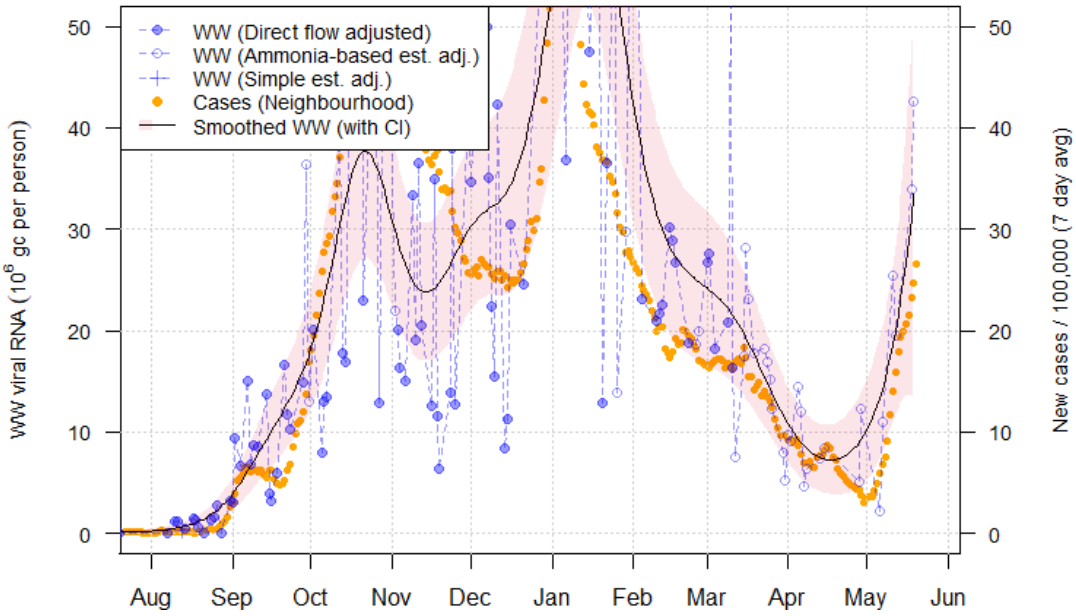


In terms of individual sites, however, the situation is more dynamic. Of particular concern is Shieldhall in Glasgow (Figure 16), where levels

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

continue to increase rapidly in both cases and WW Covid-19 concentrations. This is offset by a lower WW measurement recently recorded at Dalmuir (covering the Dunbarton area).

Figure 16. Wastewater Covid-19 and daily case rate (7 day moving average) for Shieldhall in Glasgow City (pop: 377k).



Other sites show smaller increases in WW Covid-19 and cases. This includes Seafield in Edinburgh (Figure 17), sites in the North Ayrshire LA area (Figure 18), and Hatton in the vicinity of Dundee. Seafield's increase is comparatively slight, consistent with the small increase in cases in the City of Edinburgh where most of the site's catchment is located. However, the adjoining LA region of Midlothian which only overlaps somewhat with the Seafield catchment shows a much greater increase in cases, and the much smaller Penicuik WW sampling site which is entirely in Midlothian showed a measurement of in excess of 90 Mgc/p/d on 19 May, displaying clearly much higher than in the Seafield area.

Figure 17. Wastewater Covid-19 and daily case rate (7 day moving average) for Seafield in City of Edinburgh (pop: 606k).

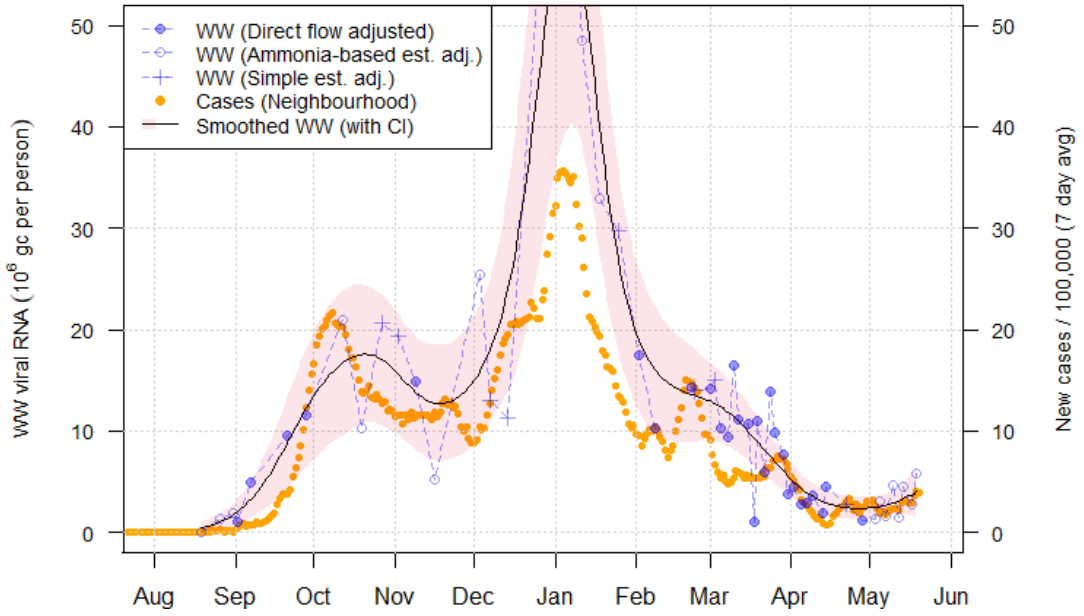
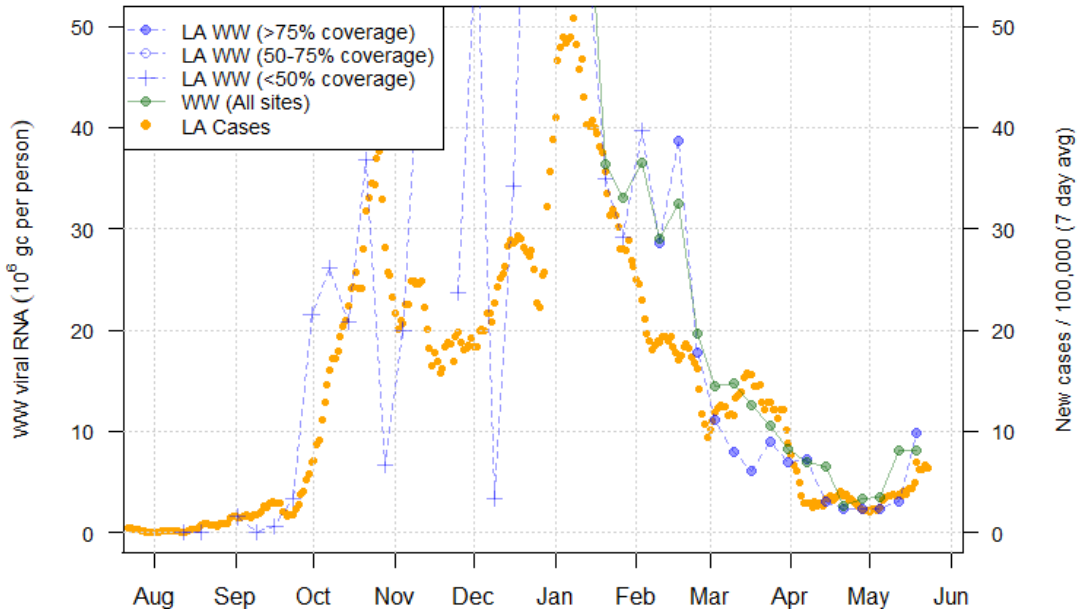


Figure 18. Local authority average trends in wastewater Covid-19 and daily case rates (7 day moving average) in North Ayrshire (pop: 140k)[12].



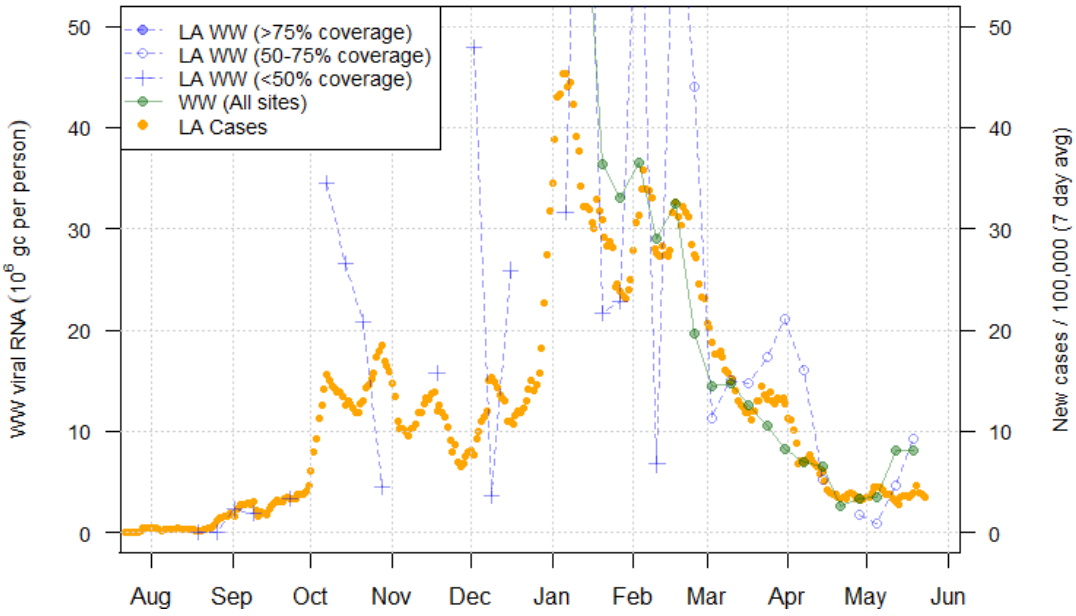
The sites of Alloa (in Clackmannanshire) and Lerwick (in the Shetlands), where last week's report identified an increase in WW Covid-19 without

[12] The blue line and points give a population weighted weekly average in the Local Authority area, with the shape of each point denoting the percentage of the LA population covered by WW sampling that week.

a rise in cases, both showed a rise in case rates this week. However, the WW Covid-19 levels in both locations have reduced this week from values observed last week. This may be indicative of a decrease in Covid-19 levels with cases as a lagging indicator, or simply a temporary change due to variability. Further readings are required for confirmation.

Consistent elevated levels of WW Covid-19, with no current rise in cases, can be found in Inverclyde and the Falkirk area (Figure 19). If this follows the patterns seen in Alloa and Lerwick, rises in cases in these areas in the near future is possible.

Figure 19. Local authority average trends in wastewater Covid-19 and daily case rates (7 day moving average) in Falkirk (pop: 159 k).



What next?

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

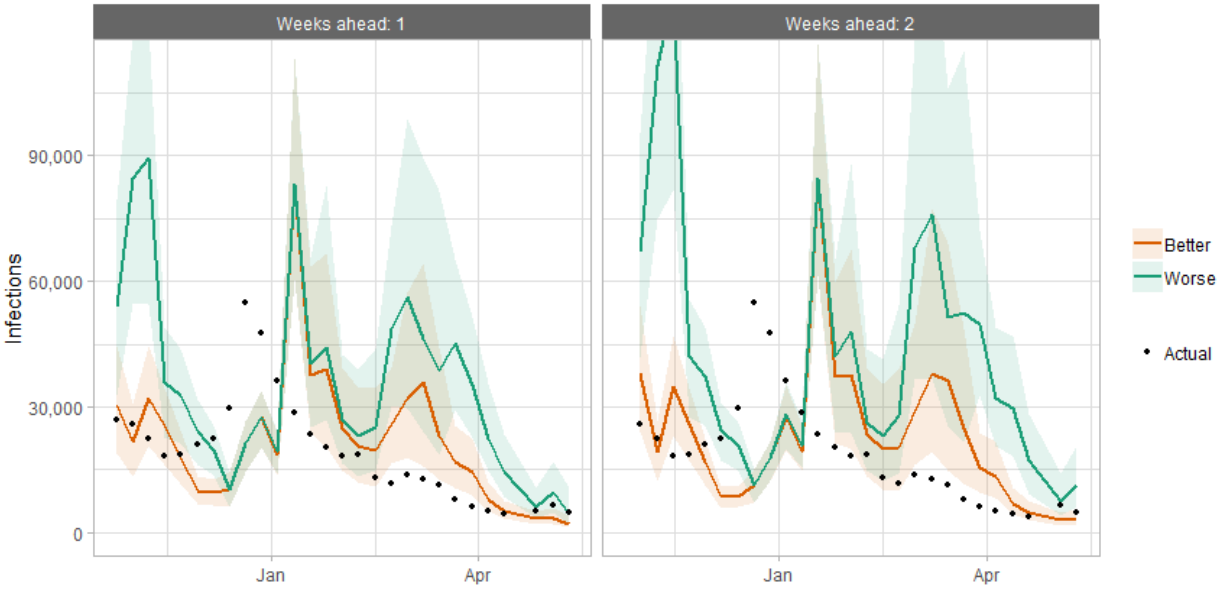
The modelled estimates of the numbers of new cases and infectious people will continue to be provided as measures of the epidemic as a whole, along with measures of the current point in the epidemic such as R_t and the growth rate. Further information can be found at https://www.gov.scot/coronavirus-covid-19.

Technical Annex

How the modelling compares to the real data as it emerges

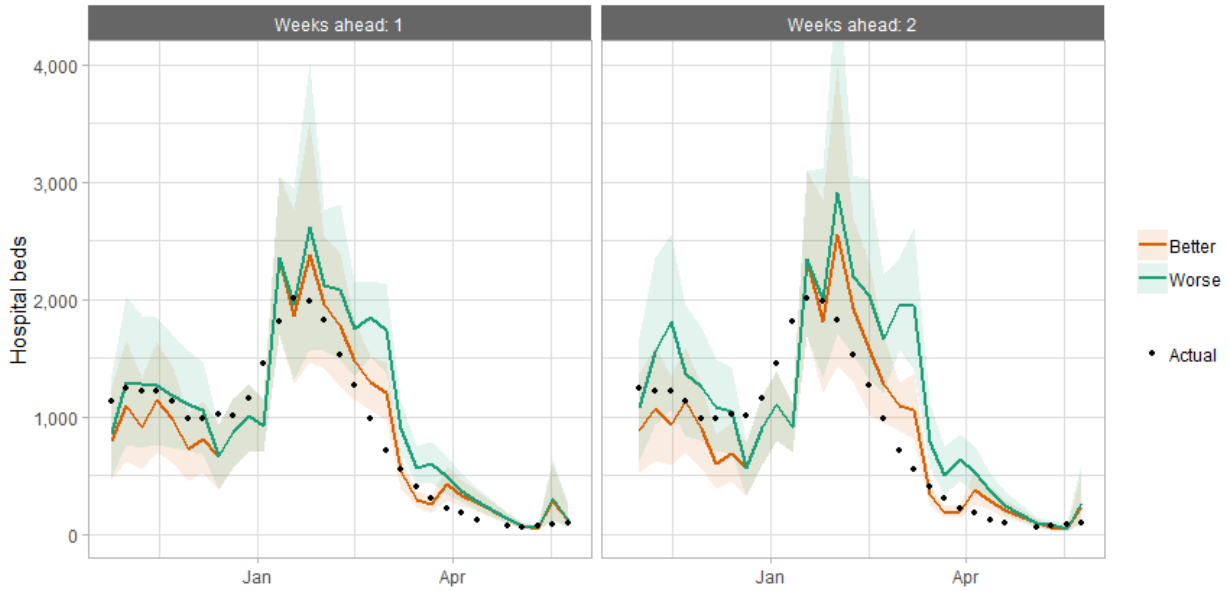
The following charts show the history of our modelling projections in comparison to estimates of the actual data. The infections projections were largely accurate during October to mid-December and from mid-January onward. During mid-December to mid-January, the projections underestimated the number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

Figure 20. 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 21. 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 22. ICU bed projections versus actuals, for historical projections published between one and three weeks before the actual data came in.

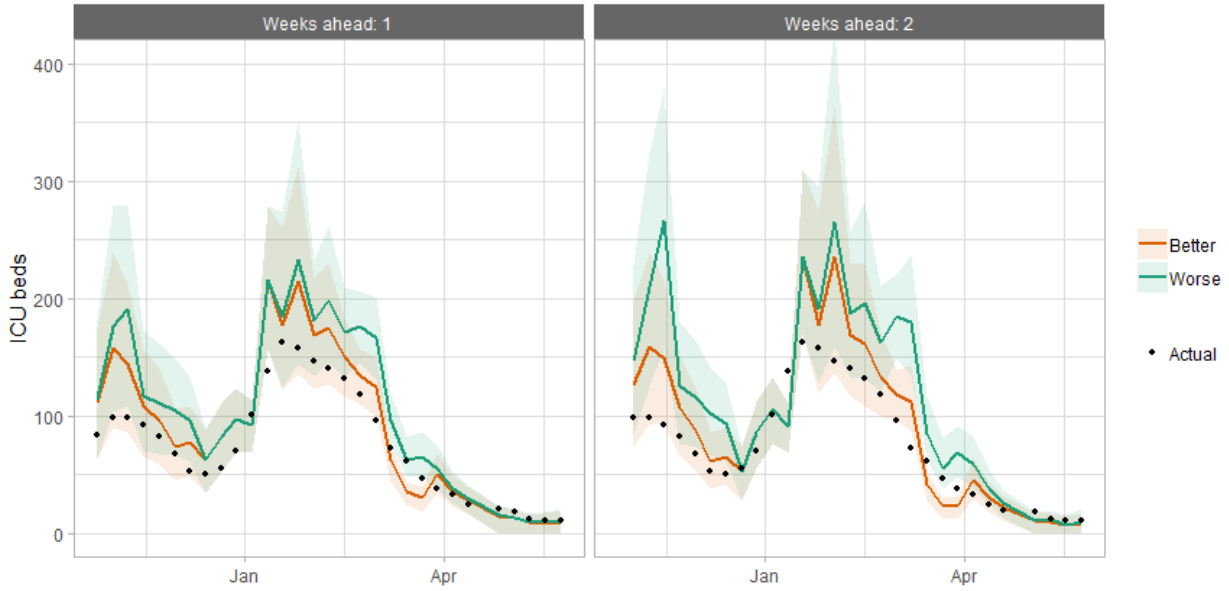


Table 1. Probability of local authority areas having more than 50, 100, 300 or 500 cases per 100K (6 to 12 June 2021).

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

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 covering 9th – 15th May and 16th –22nd 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	9th – 15th May		16th – 22nd May	
	Average daily WW Case Estimate per 100k	Local Authority WW Coverage	Average daily WW Case Estimate per 100k	Local Authority WW Coverage
Aberdeen City	2.3	80%	0.6	80%
Aberdeenshire	2.9	47%	0.6	51%
Angus	3.8	43%	4.3	56%
Argyll and Bute	1.3	18%	0.5	18%
City of Edinburgh	3.1	97%	4.3	96%
Clackmannanshire	14.0	92%	4.8	81%
Dumfries & Galloway	0.5	30%	0.6	32%
Dundee City	3.8	100%	5.1	100%
East Ayrshire	3.8	72%	7.0	72%
East Dunbartonshire	19.8	99%	7.4	99%
East Lothian	2.6	65%	3.7	65%
East Renfrewshire	21.0	95%	36.0	95%
Falkirk	5.3	69%	9.3	69%
Fife	6.2	84%	4.4	85%
Glasgow City	19.7	98%	22.1	75%
Highland	3.0	36%	0.3	37%
Inverclyde	9.1	92%	4.6	92%
Midlothian	3.4	88%	18.5	88%
Moray	3.6	55%	2.0	55%
Na h-Eileanan Siar	0.0	21%	0.0	21%
North Ayrshire	2.6	93%	9.9	93%
North Lanarkshire	6.5	86%	6.1	83%
Orkney Islands	0.3	34%	0.0	34%
Perth and Kinross	2.9	45%	0.8	45%
Renfrewshire	6.8	57%	9.2	57%
Scottish Borders	1.3	56%	0.6	56%
Shetland Islands	1.4	29%	0.0	29%
South Ayrshire	3.7	82%	5.7	88%
South Lanarkshire	8.9	79%	11.7	74%
Stirling	0.8	10%	0.8	10%
West Dunbartonshire	9.8	98%	3.7	98%
West Lothian	2.7	85%	3.7	79%

This publication will be available in accessible HTML on the gov.scot website

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.
ISBN: 978-1-80201-005-3

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

Produced for
the Scottish Government
by APS Group Scotland
PPDAS883926 (05/21)
Published by
the Scottish Government,
May 2021

ISBN 978-1-80201-005-3

Web Publication

PPDAS883926 (05/21)