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Scottish Government
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Coronavirus (COVID-19): Analysis

Coronavirus (COVID-19): modelling the epidemic in Scotland (Issue No. 80)

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 25th November 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 0.8 and 1.1, with the growth rate between -3% and 1%.

It is too soon to take account of the potential impact of Omicron within the modelling presented in this report. Therefore projections included are based on Delta only. In the coming weeks we hope to have further data to enable us to model the impact of Omicron with some degree of confidence.

Key Points

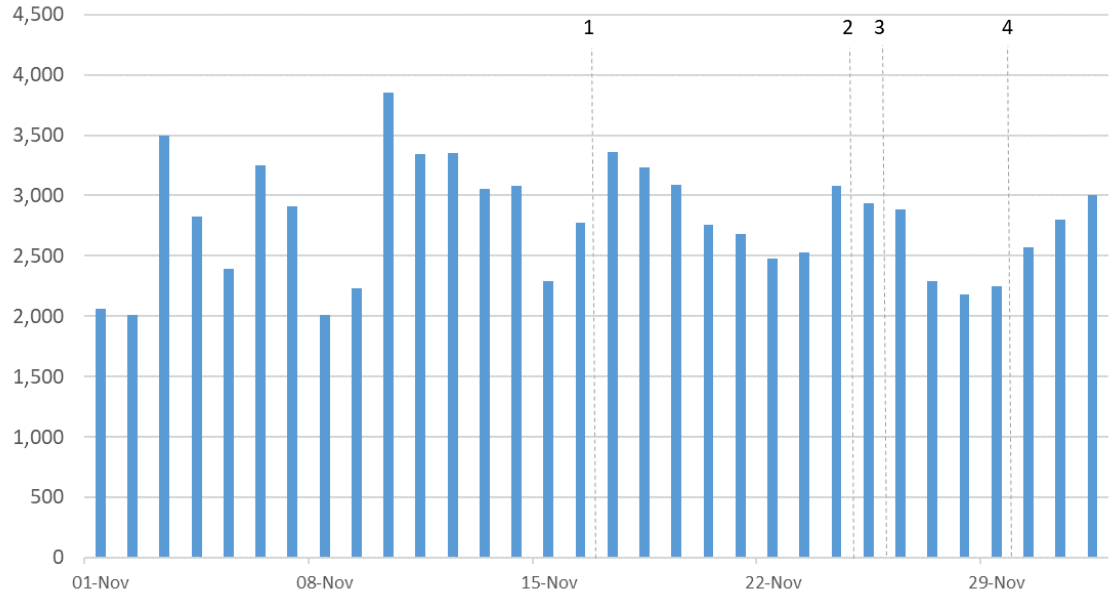
- The reproduction rate R in Scotland is currently estimated as being between 0.8 and 1.1, as of 16th November. The lower estimate has decreased since last week.
- The number of new daily infections for Scotland is estimated as being between 79 and 121 as at 16th November, per 100,000 people.
- The growth rate for Scotland is currently estimated as between -3% and 1%. The lower limit has decreased since last week.
- Average contacts from the most recent Panel B cohort of the Scottish Contact Survey (week ending 24th November) indicate an average of 5.2 contacts.

- Mean contacts within the other setting (contacts outside home, school and work) have decreased by 11% in the last two weeks. Contacts within the home and work setting remained at a similar level over the same period.
- Differences across age groups are largely driven by changes in contacts within the workplace. Those aged between 18-49 have all reported an increase in contacts within the last two weeks, rising by at least 12%. Individuals aged between 50-69 decreased their overall contacts by at least 14%.
- Those aged between 30-39 have reported the biggest increase in interactions with those aged under 18 in the last two weeks.
- The biggest change in the proportion of participants visiting different locations, though slight, is seen in those visiting an non-essential shop, increasing from 42% to 44% in the last two weeks.
- The number of people wearing a face covering where they have at least one contact outside of the home has decreased in the last two weeks from 83% to 81%.
- The recent fall in hospital occupancy may have levelled off. ICU occupancy has fallen slightly. There continues to be uncertainty over hospital occupancy and intensive care in the next three weeks.
- Modelled rates of positive tests per 100K using data to 29th November indicate that, for the week commencing 12th December 2021, 29 of the 32 local authorities are expected to exceed 50 cases per 100K with at least 75% probability. These 29 local authorities are also expected to exceed 100 cases per 100K with at least 75% probability.
- There are no local authorities which are expected to exceed 300 cases per 100K with at least 75% probability.
- Nationwide, Covid-19 wastewater levels have continued to increase, with the week ending on 25th November seeing levels of around 80 million gene copies per person per day (Mgc/p/d), up from around 70 Mgc/p/d in the previous week.
- Modelling of long Covid estimates that on 19th December 2021 between 1.5% and 3.1% of the population are projected to self-classify with long Covid for 12 weeks or more after their first suspected Covid infection in Scotland. The lower and upper limits of the estimate are higher than last week.

Recent cases

Figure 1 shows the number of Covid-19 cases reported in Scotland between November and December 2021. The vertical dashed lines indicate the cut off points for each of the modelling inputs; after these dates, the number of cases is not incorporated into the outputs.

Figure 1: Cases reported in Scotland to 2nd December 2021



R, growth rate and incidence are as of 16th November (dashed line 1). The Scottish Contact Survey uses data to 24th November (dashed line 2). Wastewater analysis used data to 25th November (dashed line 3). The Scottish Government modelling of infections, hospitalisations and ICU beds, the long Covid analysis, the medium term projections and the modelled rates of positive tests per 100K use data to 29th November (dashed line 4).

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 UK Health Security Agency (UKHSA) 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 2.

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 to estimate the proportion of cases that will require hospital, and the length of time people that people will stay there.

What the modelling tells us about the epidemic as a whole

The R value and growth rates are estimated by several independent modelling groups based in universities and the UKHSA. Estimates are considered, discussed and combined at the Epidemiology Modelling Review Group (EMRG), which sits within the UKHSA.

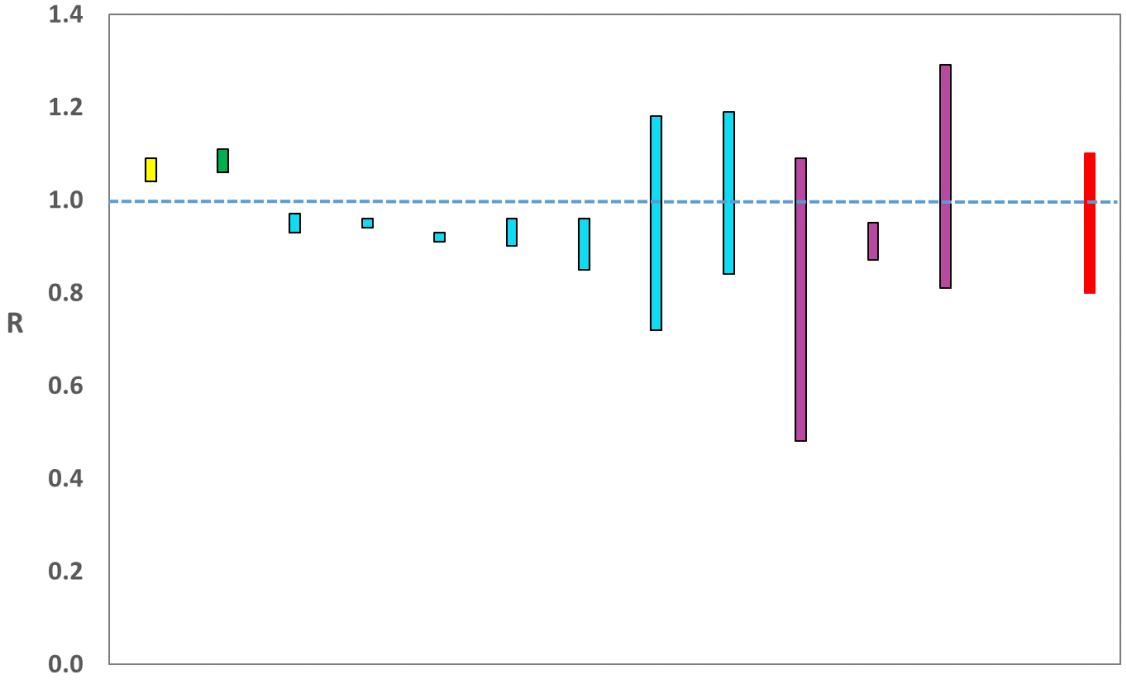
UKHSA's consensus view across these methods, was that the value of R as at 16th November[1] in Scotland was between 0.8 and 1.1 (see Figure 2)[2].

R is an indicator that lags by two to three weeks and therefore should not be expected to reflect recent fluctuations.

This week the Scottish Government presented two outputs to EMRG. The first uses confirmed cases, as published by Public Health Scotland (PHS), and deaths from National Records Scotland (NRS). The second uses instead wastewater data to estimate the number of cases, and deaths from NRS. Both outputs are shown in Figures 2 and 3.

[1] Using data to 29th November 2021.
[2] 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 2. Estimates of R_t for Scotland, as of 16th November, including 90% confidence intervals, produced by EMRG[3].

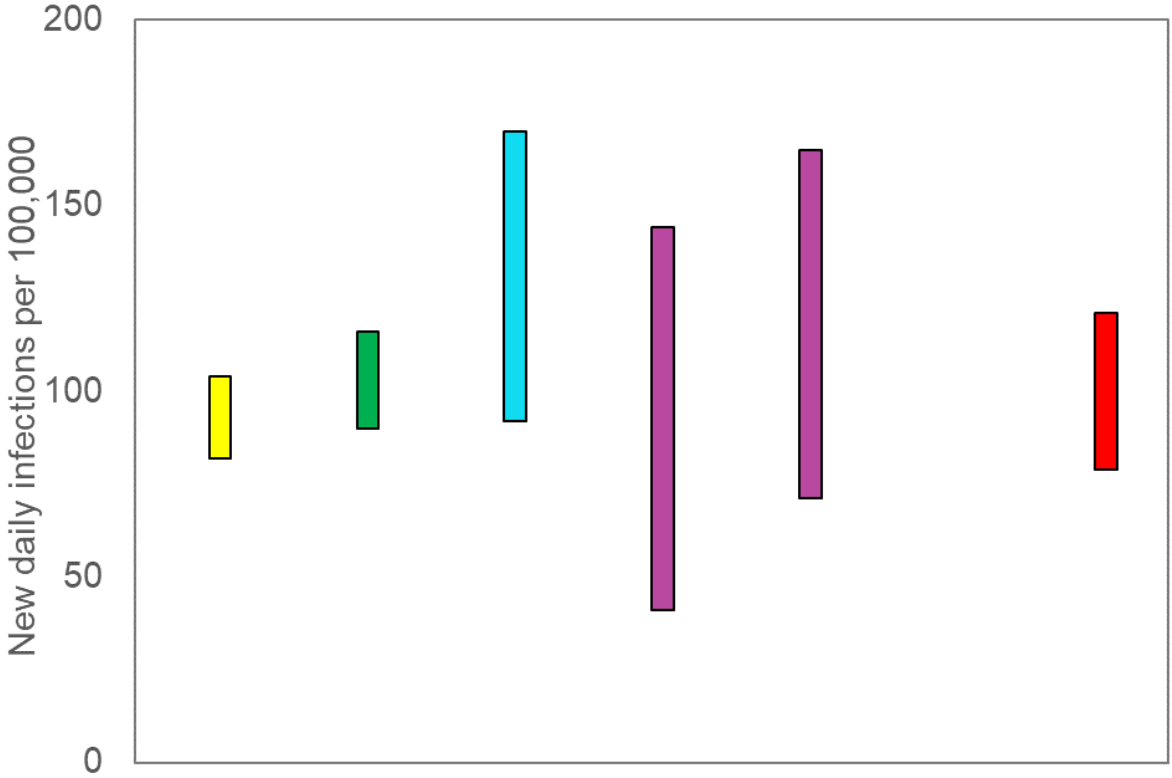


Source: EMRG

The various groups which report to the EMRG use different sources of data in their models to produce estimates of incidence (Figure 3). UKHSA's consensus view across these methods, as at 16th November, was that the incidence of new daily infections in Scotland was between 79 and 121 new infections per 100,000. This equates to between 4,300 and 6,600 people becoming infected each day in Scotland.

[3] The cyan bars use Covid-19 test data and purple bars use multiple sources of data. The estimates produced by the Scottish Government are the two on the left. (Yellow uses confirmed cases from PHS and deaths from NRS; green uses wastewater data).The UKHSA consensus range is the right-most (red). Data to 29th November. R, incidence and growth rate as of 16th November.

Figure 3. Estimates of incidence for Scotland, as at 16th November, including 90% confidence intervals, produced by EMRG[4].



Source: EMRG

The consensus from UKHSA for this week is that the growth rate in Scotland is between -3% and 1% per day as at 16th November. The lower limit has decreased since last week.

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

Average contacts from the most recent Panel B cohort of the Scottish Contact Survey (week ending 24th November) indicate an average of 5.2 contacts. This has remained at similar levels compared to the previous Panel B of the survey (week ending 10th November), as seen in Figure 4. Mean contacts within the other setting (contacts outside home, school and work) have decreased by 11% in the last two weeks. Contacts within the home and work setting remained at a similar level over the same period.

Figure 4: Mean Adult Contacts (truncated at 100) from SCS.

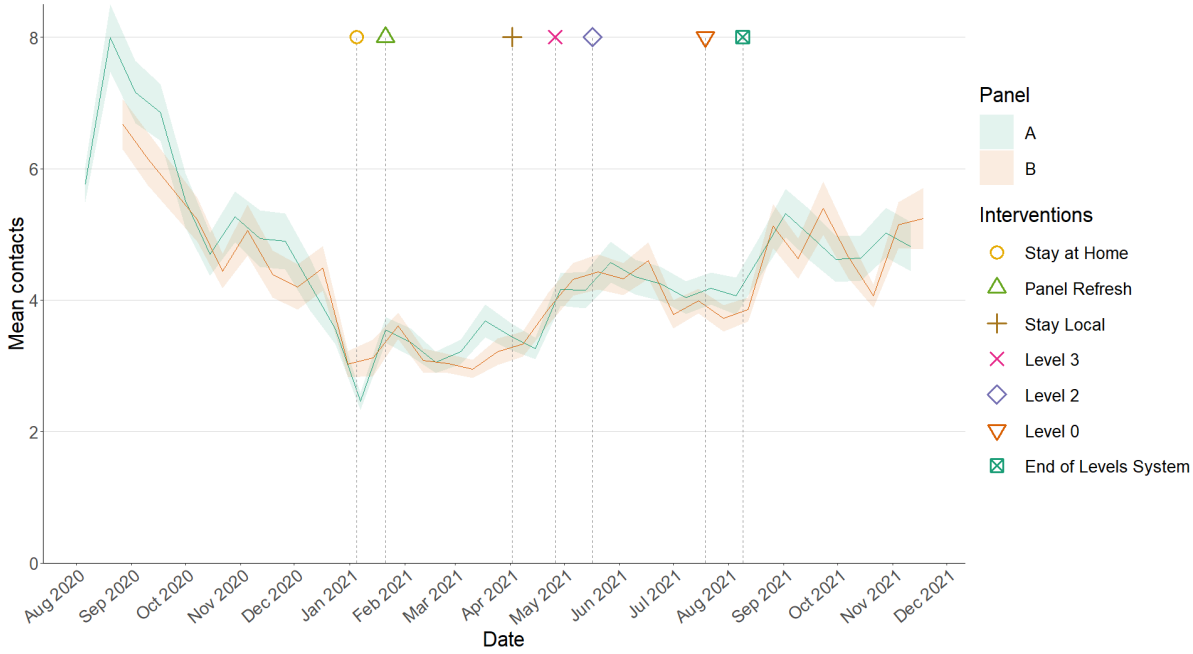
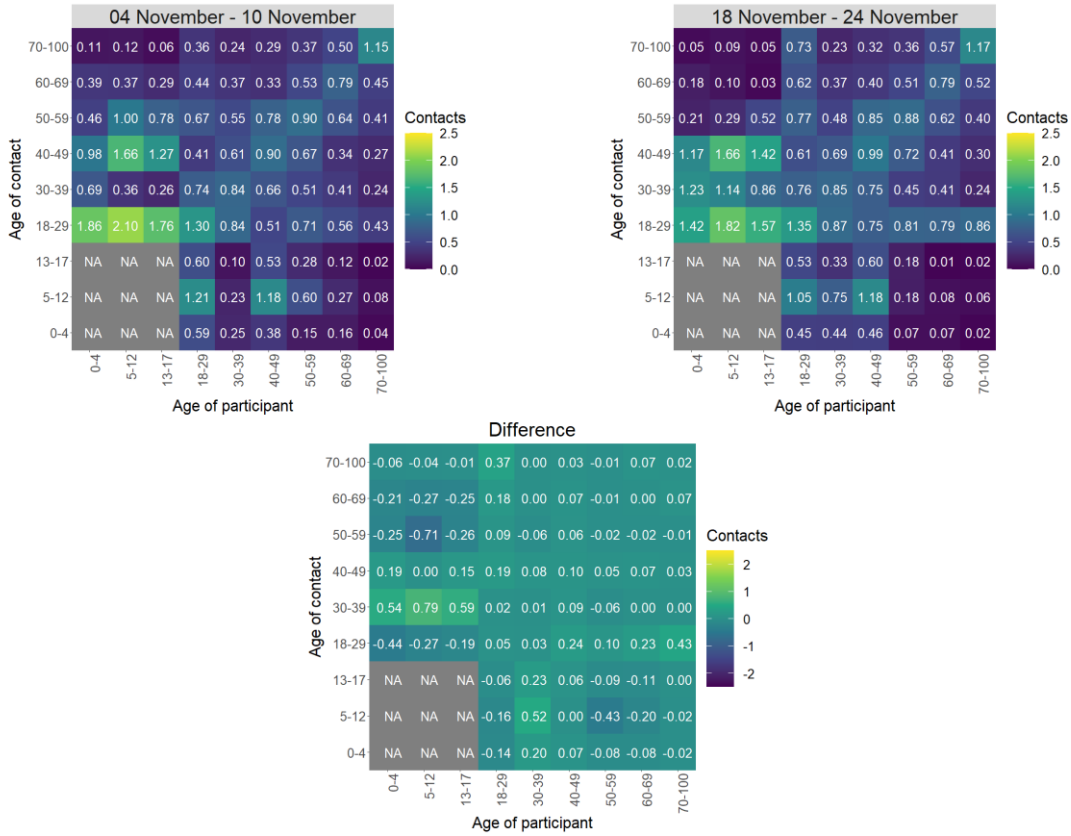


Figure 5 shows how contacts change across age group and setting. Differences across age groups are largely driven by changes in contacts within the workplace. Those aged between 18-49 have all reported an increase in contacts within the last two weeks, rising by at least 12%. Individuals aged between 50-69 decreased their overall contacts by at least 14%.

Figure 5: 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 6 show the mean overall contacts between age groups for the weeks relating to 4th November - 10th November and 18th November - 24th November, and the difference between these periods. Those aged between 30-39 have reported the biggest increase in interactions with those aged under 18 in the last two weeks.

Figure 6: Overall mean contacts by age group before for the weeks relating to 4th November - 10th November and 18th November - 24th November.



As shown in Figure 7, the biggest change in the proportion of participants visiting different locations, though slight, is seen in those visiting an non-essential shop, increasing from 42% to 44% in the last two weeks.

Figure 7: Locations visited by participants at least once for panel A and B (from SCS).

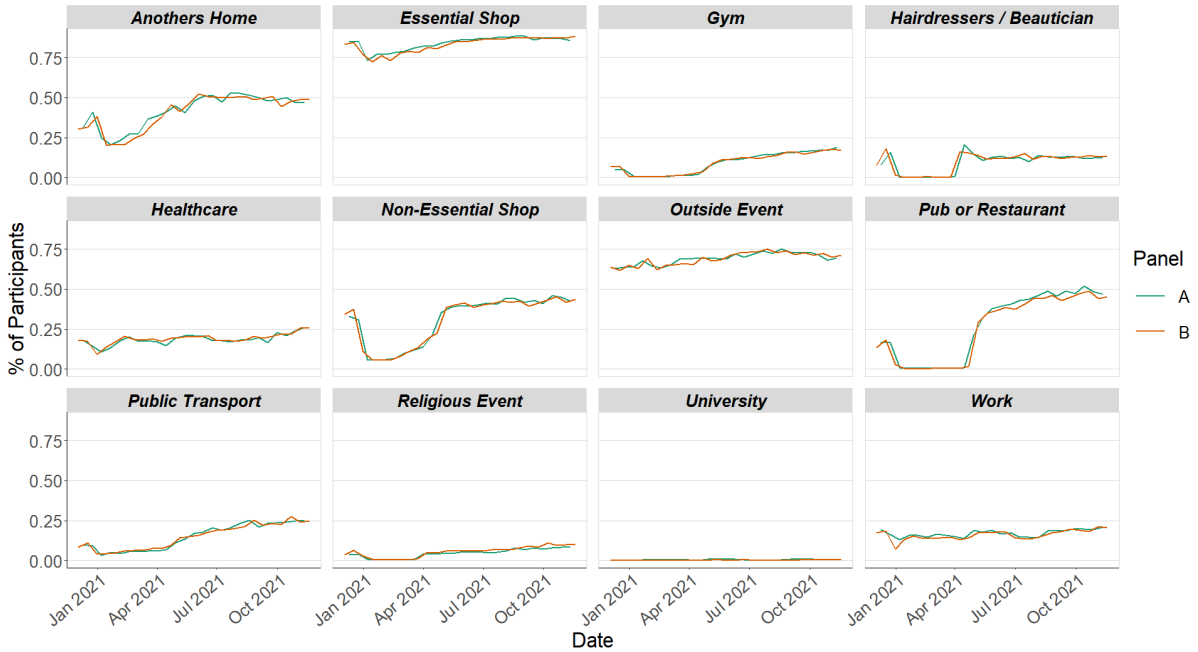


Figure 8 shows the difference in contacts between those who work from home compared to those who have a workplace outside of the home. This shows that those who do not work from home have higher and more variable contacts than those who work from home. This also shows that contacts had within the work place make up the majority of overall contacts for those who do not work at home, therefore changes in work contacts has proportionate impact on overall contacts.

Figure 8: Overall mean contacts by work location (home or away from home) for each panel for adults in Scotland, truncated to 100 contacts per participant (from SCS).

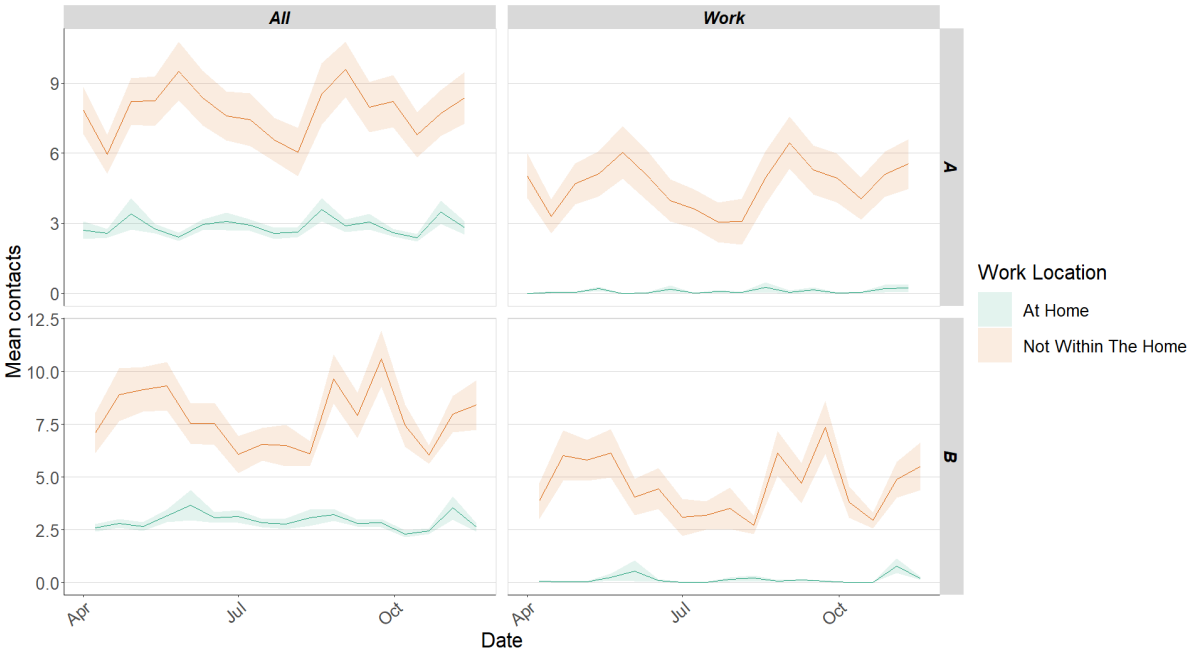
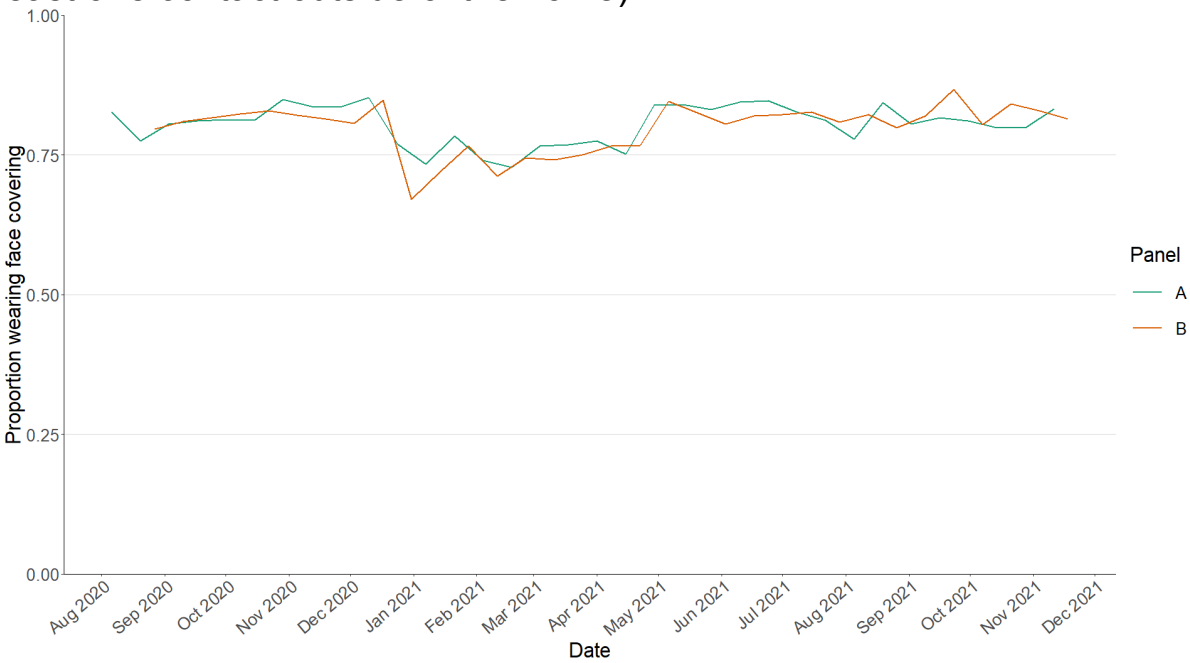


Figure 9 shows the number of people wearing a face covering where they have at least one contact outside of the home. This has decreased in the last two weeks from 83% to 81%.

Figure 9: Proportion of adults wearing a face coverings over time (with at least one contact outside of the home).



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 10 shows three projections over the three weeks to 20th December.

'Central' assumes that infections will fall. 'Worse' assumes a rise in transmission from the current level. 'Better' assumes a larger drop in transmission[4]. As it is too soon to take account of the potential impact of the Omicron variant, all three scenarios are based on the Delta variant. **Therefore depending on the current number of Omicron cases and its characteristics, the actual number of infections, hospital occupancy and ICU occupancy over the next few weeks could be higher than projected here.**

[4] All scenarios are based on current vaccine roll-out plans and efficacy assumptions. Data to 29th November.

Figure 10. Medium term projections of modelled total new daily infections, adjusting positive tests[5] to account for asymptomatic and undetected infections, from Scottish Government modelling, based on positive test data reported up to 29th November[6].

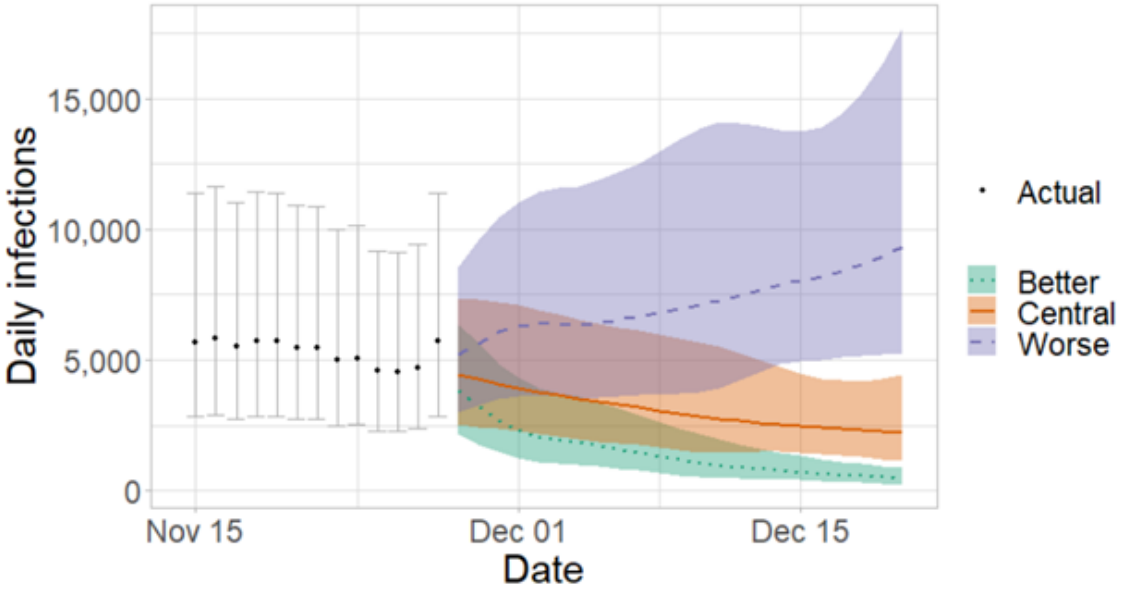


Figure 11 shows the impact of the projections on the number of people in hospital. The modelling includes all hospital stays, whereas the actuals only include stays up to 28 days duration that are linked to Covid-19.

There continues to be uncertainty over hospital occupancy and intensive care in the next three weeks.

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

[6] Actual infections are uncertain, with the range displayed representing between a 25% (higher infections) and 100% (lower infections) ascertainment rate for positive tests. This uncertainty is not reflected in the projected range, which is based on a 50% ascertainment rate.

Figure 11. Medium term projections of modelled hospital bed demand, from Scottish Government modelling, based on positive test data reported up to 29th November.

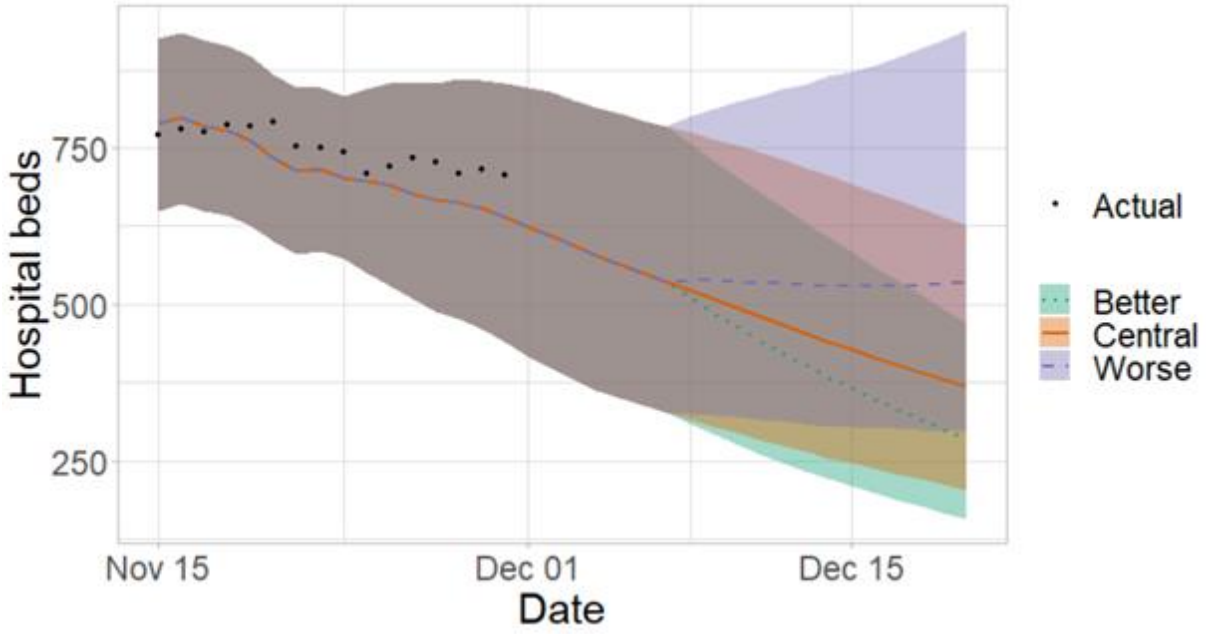
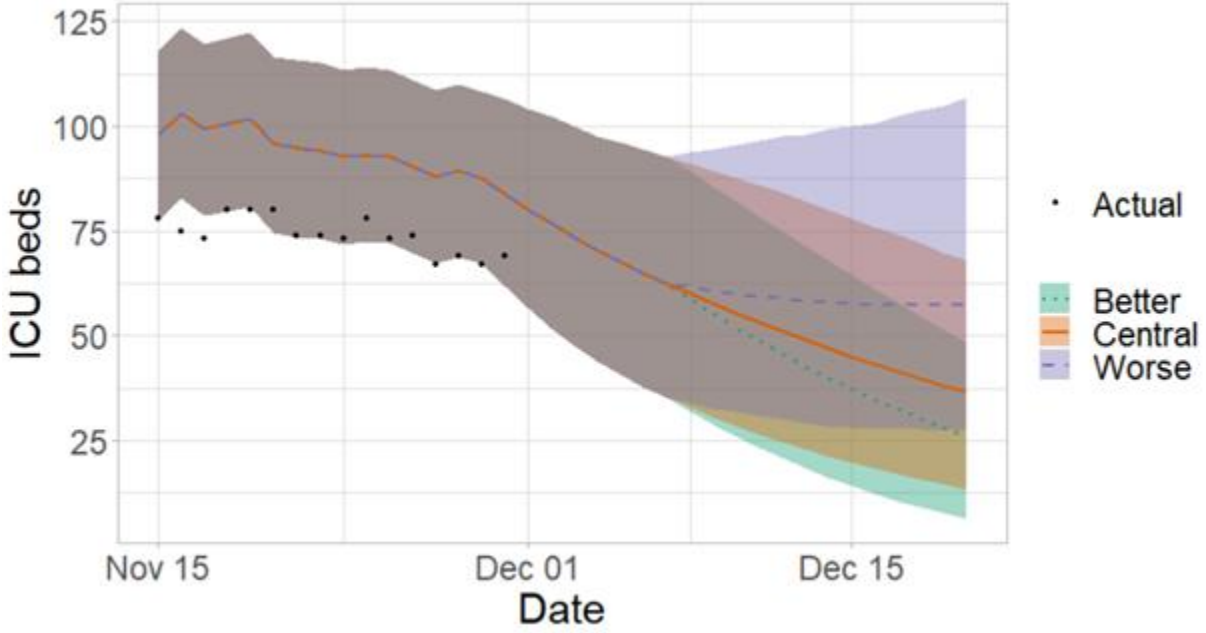


Figure 12 shows the impact of the projection on ICU bed demand.

Figure 12. Medium term projections of modelled ICU bed demand, from Scottish Government modelling[7], based on positive test data reported up to 29th November.



[7] 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.

The methodology for estimating projections is included in the Technical Annex. Also included is a comparison of the actual data against historical projections.

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

SPI-M produces projections of the epidemic[8] (Figures 13 and 14), combining estimates from several independent models (including the Scottish Government's logistics modelling, as shown in Figures 10 to 12). 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 22nd November and **do not include the effects of any future increase in the Omicron variant, or future policy or behavioural changes**.

The delay between infection, developing symptoms, the need for hospital care, and death means they cannot fully reflect the impact of behaviour changes in the two to three weeks prior to 22nd November. Projecting forwards is difficult when the numbers of admissions and deaths fall to very low levels, which can result in wider credible intervals reflecting greater uncertainty. The interquartile range should be used, with judgement, as the projection from which estimates may be derived until 21st December.

These projections include the potential impact of vaccinations over the next few weeks. Modelling groups have used their expert judgement and evidence from UKHSA, Scottish Universities & Public Health Scotland, and other published efficacy studies when making assumptions about vaccine effectiveness.

These projections do not consider the potential impact of the Omicron variant.

[8] Three week projections are provided here.

Figure 13. SPI-M medium-term projection of daily hospitalisations in Scotland, at 50% and 90% credible intervals.

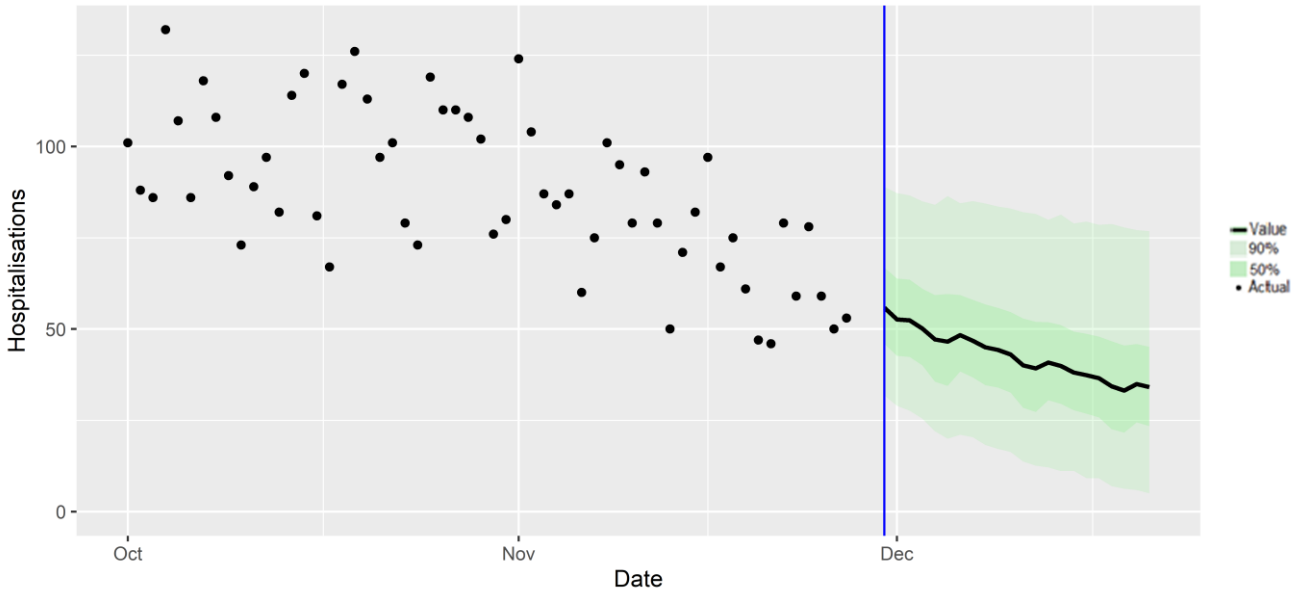
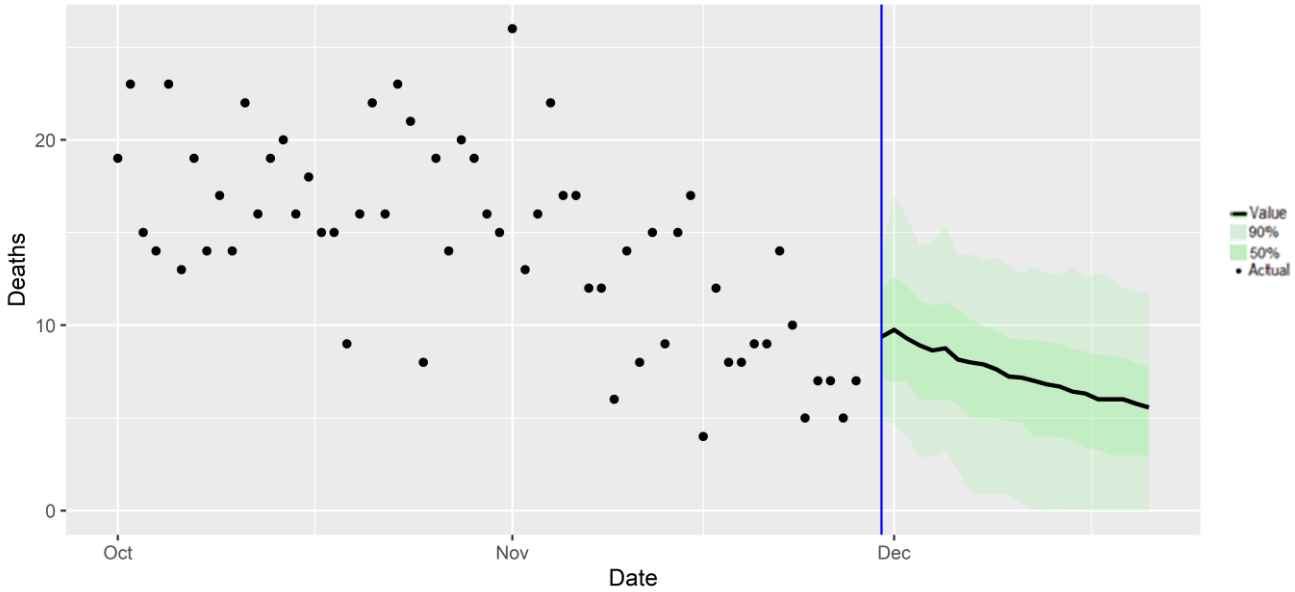


Figure 14. SPI-M medium-term projection of daily deaths in Scotland, at 50% and 90% credible intervals.



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 using data to 29th November 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 UKHSA 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.

There is uncertainty in regions with smaller populations, and hence lower test counts, in particular in regions such as Na h-Eileanan Siar, Orkney Islands and Shetland Islands.

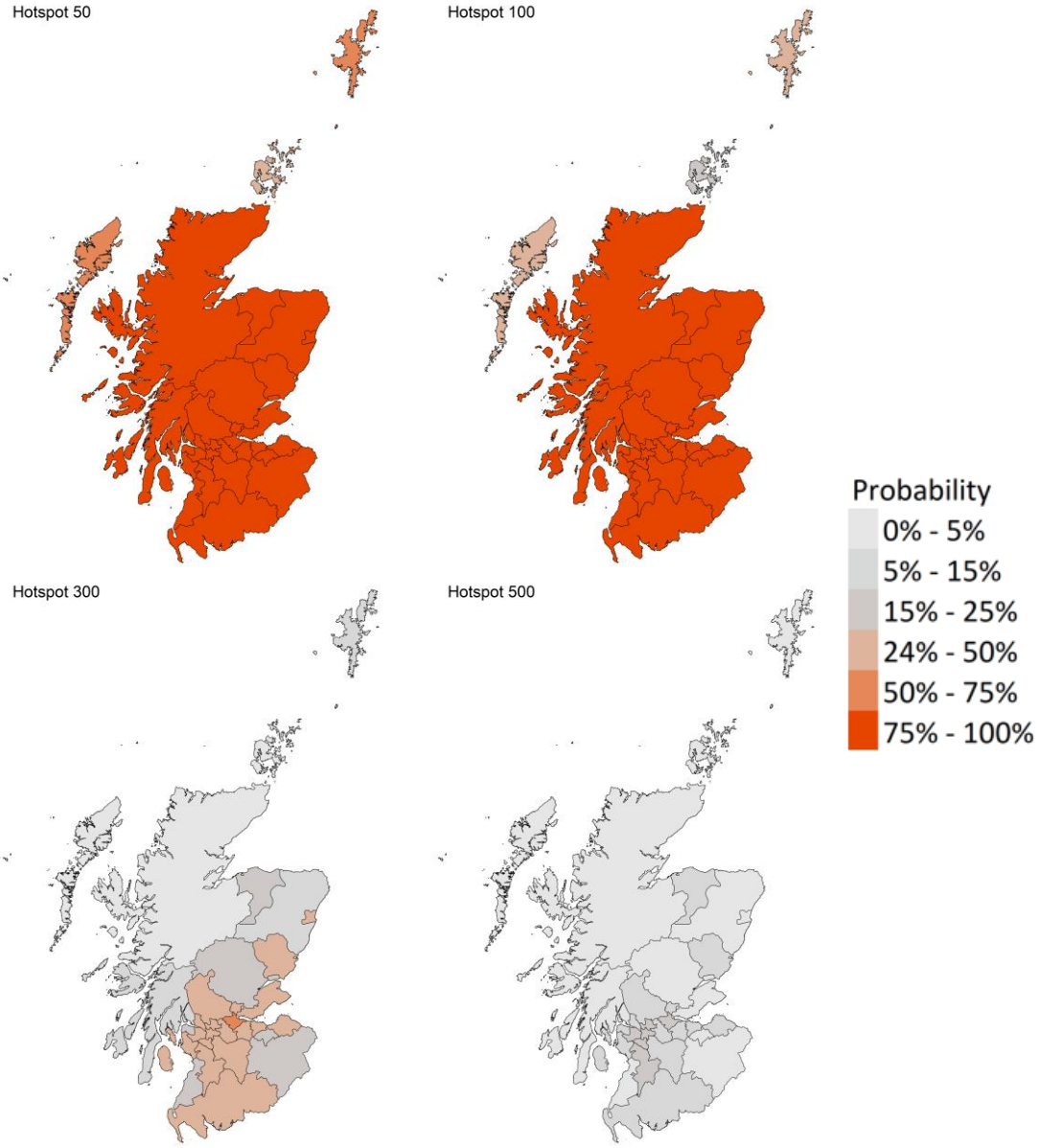
Modelled rates of positive tests per 100K using data to 29th November (Figure 15) indicate that, for the week commencing 12th December 2021, 29 of the 32 local authorities are expected to exceed 50 cases per 100K with at least 75% probability. These 29 local authorities are also expected to exceed 100 cases per 100K with this probability[9].

There are no local authorities which are expected to exceed 300 cases per 100K with at least 75% probability[10].

These models are based on the Delta variant only.

[9] The exceptions are Na h-Eileanan Siar, Orkney Islands and Shetland Islands.
[10] Values are included in Table 1 in the Technical Annex.

Figure 15. Probability of local authority areas exceeding thresholds of cases per 100K (12th to 18th December 2021), data to 29th November.



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

Levels of Covid-19 RNA in wastewater (WW) collected at a number of sites around Scotland are adjusted for population and local changes in intake flow rate (or ammonia levels where flow is not available) and compared to 7-day average daily new case rates derived from Local Authority and Neighbourhood (Intermediate Zone) level aggregate data.

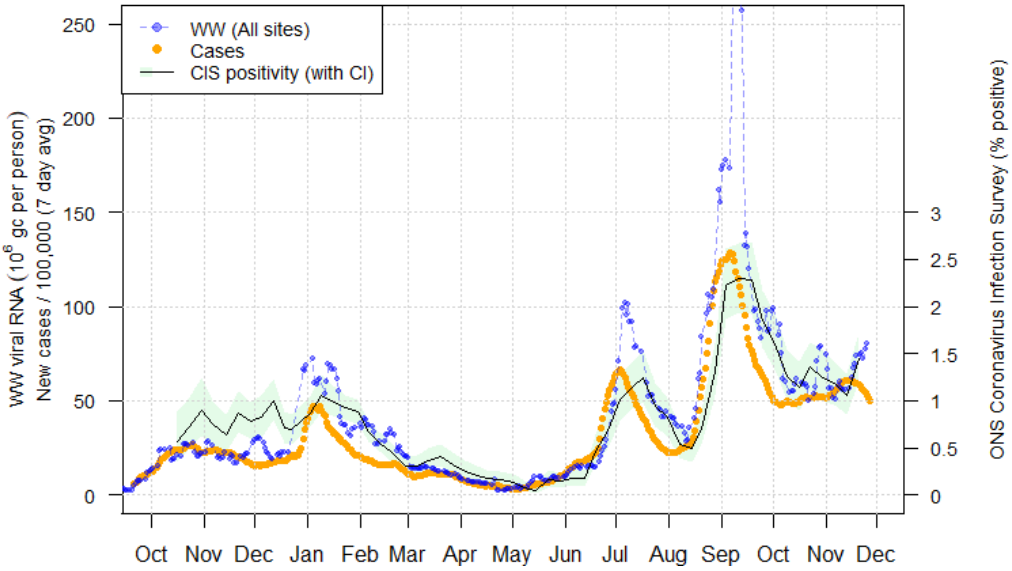
See Technical Annex in Issue 34 of these Research Findings for the methodology.

Nationwide, wastewater Covid-19 levels have continued to increase, with the week ending on 25th November seeing levels of around 80 million gene copies per person per day (Mgc/p/d), up from around 70 Mgc/p/d in the previous week (week ending 18th November). This creates an apparent discrepancy with case rates, which have decreased slightly in recent times, but does match an increase seen in the Office of National Statistics' Coronavirus Infection Survey.

Figure 16 shows the national running average trend (over a 7-day period) for the full set of sampled sites, with a small number of unrealistically large outliers excluded. WW Covid-19 levels appear to have increased (though to a lesser extent than last week) across most of Scotland but this change is not as yet reflected in the case rate, which has shown a continued decrease during the past week across much of Scotland. Due to periods of public holiday the last samples obtained for the WW analysis have been from 25th November, and thus the data are slightly outdated this week. Further, unforeseen building closure at SEPA's facilities has meant that no further samples could be processed this week. However, the week's sampling total stands at 205 samples, an improvement from last week.

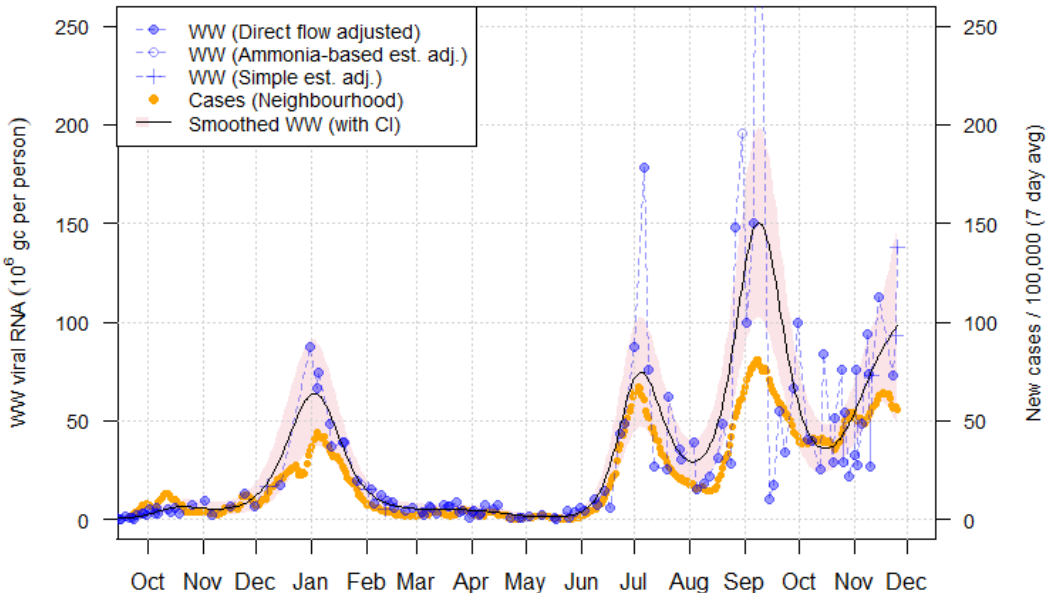
In Figure 16 we also show data from the Office of National Statistics' Coronavirus Infection Survey, with positivity estimates up to 20th November. In contrast to reported case rates, this survey data shows an increase of Covid-19 prevalence in line with wastewater Covid-19 levels, although further monitoring of both wastewater and ONS data is required to fully assess this apparent alignment.

Figure 16. National running average trends in wastewater Covid-19 and daily new case rates (7-day moving average) up until 25th November[11].



One example of the recent discrepancy between WW and new case rates is at Nigg, which covers nearly 80% of Aberdeen City (Figure 17). A similar trend in relationship is observed in other areas, for example, NHS Lothian.

Figure 17. Wastewater Covid-19 and daily case rate (7 day moving average) for Nigg, covering most of Aberdeen (covered pop: 218k)[12].



[11] Anomalously high values, one in Seafield (Edinburgh) in mid-February (see Issue 40), one in Dunblane in mid-June, and two in Daldowie in January, were removed. For this graph, a wastewater RNA average using the last 7-days of data is computed at every sampling date. Positivity estimates from the CIS are overlaid, with a scale chosen to approximately match the displayed peak of the survey percentage to the recent peaks in the rate of new cases.

[12] The black line and red shaded area provide a smoothed curve and confidence interval for WW Covid-19 that is estimated from a generalised additive model based on a Tweedie distribution.

Figures 18 and 19 present respective trends seen in NHS Greater Glasgow & Clyde, and NHS Lanarkshire, which have seen small numbers of reported cases of the new Covid-19 Omicron variant. In both health boards a similar discrepancy can be observed between wastewater and case rates, as seen on the national level. Indeed the rise in WW viral levels in these health boards is very close to the national average.

Figure 18. Average trends in wastewater Covid-19 and daily case rates (7 day moving average) in NHS Greater Glasgow and Clyde (pop: 1147k)

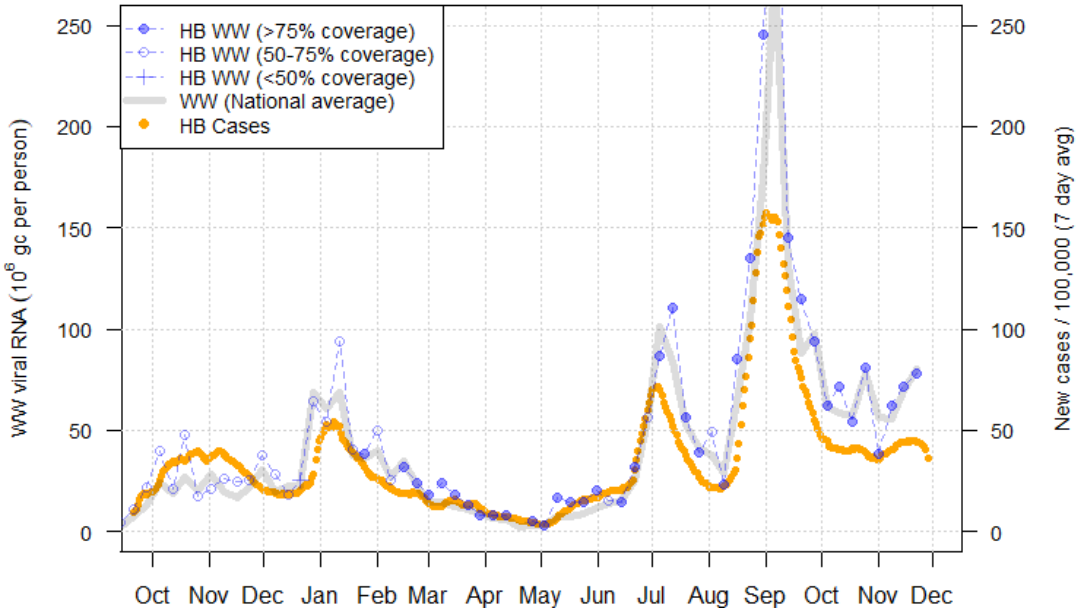
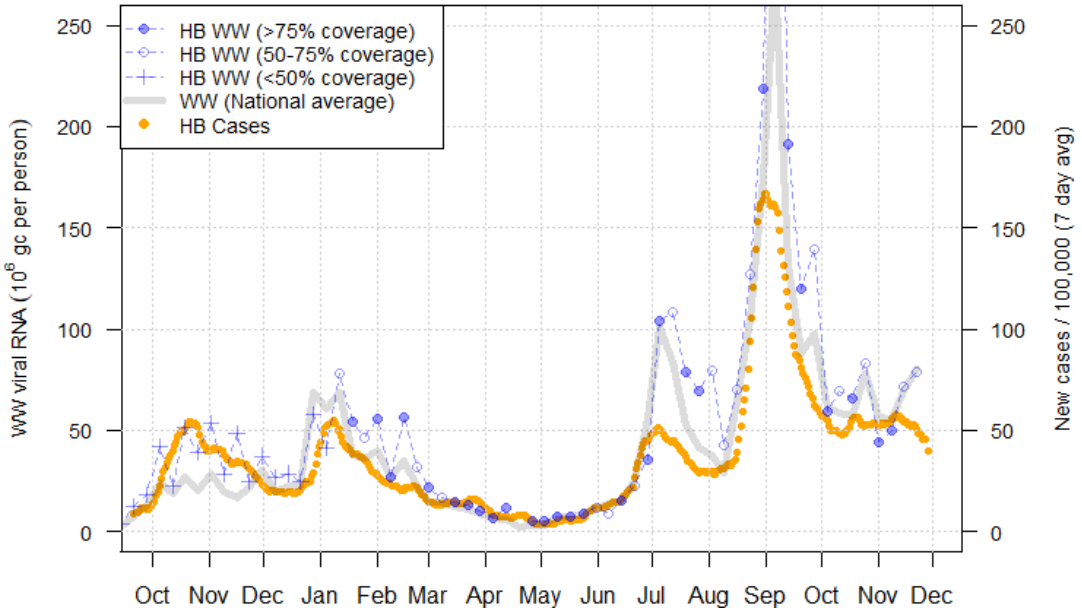


Figure 19. Average trends in wastewater Covid-19 and daily case rates (7 day moving average) in NHS Lanarkshire (pop: 668k)



This week's data has shown a noticeable decrease from a previous peak in Kirkwall's WW viral levels and case rates. Meanwhile, Lerwick in the Shetland Islands (covered population 8k) has shown a large increase in WW viral levels to match a recent increase in case rates, though the most recent data shows that case rates have since considerably decreased.

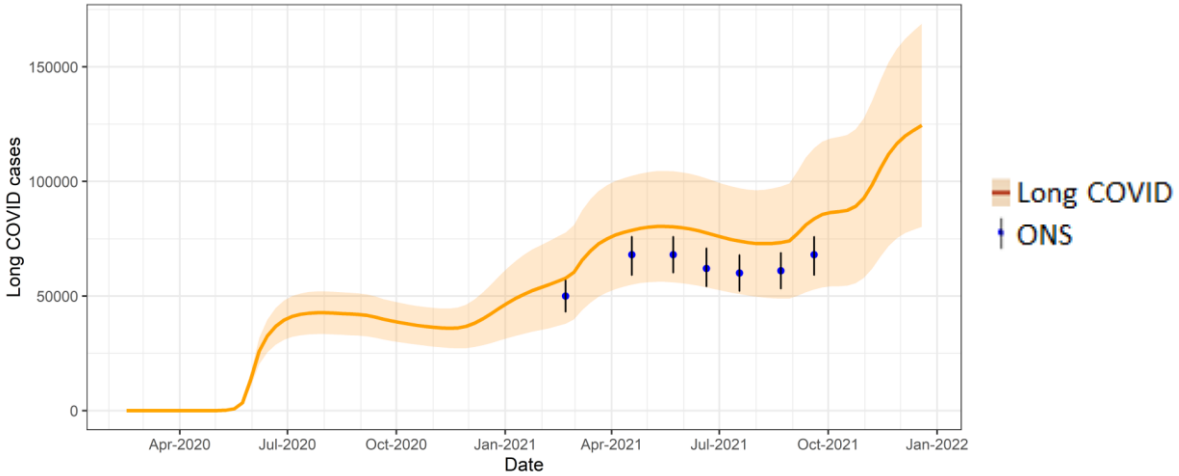
What estimates do we have of the number of people experiencing long Covid symptoms?

The Scottish Government is modelling the number of people likely to experience long Covid symptoms. This gives a projection of estimated self-reported long Covid rates in the future, based on Scottish Government medium term projection modelling, as set out in Figure 20.

This modelling estimates that at 19th December 2021 between 80,000 (1.5% of the population) and 169,000 (3.1%) people are projected to self-classify with long Covid for 12 weeks or more after their first suspected Covid infection in Scotland. The lower and upper limits of the estimate are higher than last week.

These are preliminary results, further data on rates of long Covid and associated syndromes as research emerges are required.

Figure 20. Estimates of self-classified long Covid prevalence at 12 weeks from 16th February 2020 to 19th December 2021 (showing 90% confidence interval). ONS estimates also shown[13].



[13] See the Technical Annex in issue 73 for information about the methodology.

What next?

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.

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.

How the modelling compares to the real data as it emerges

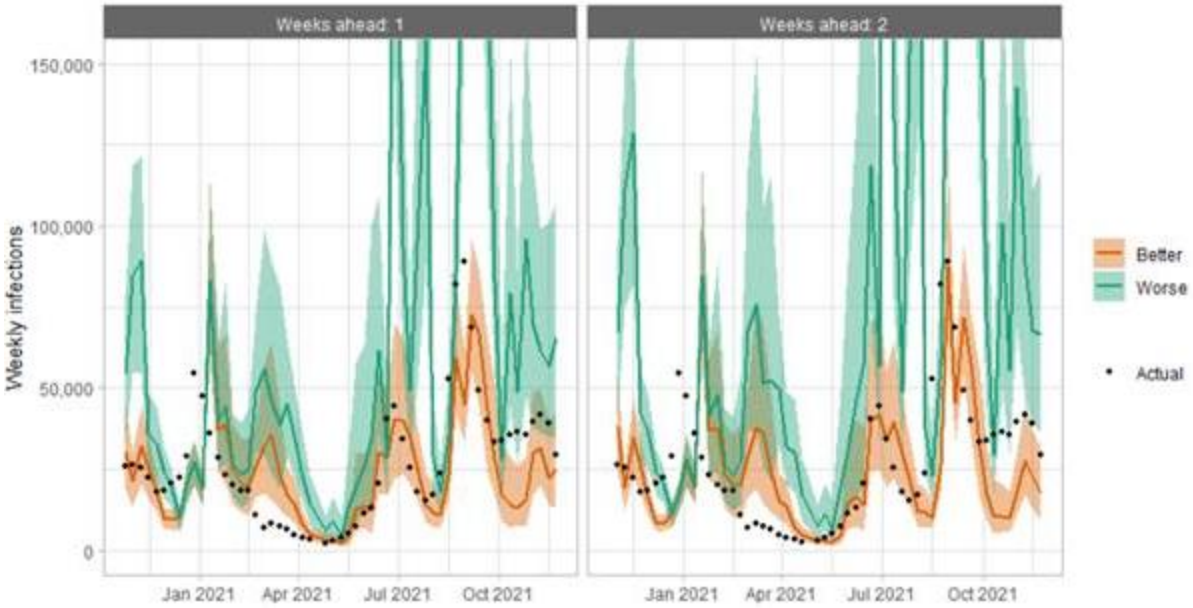
The method of producing the medium term projections (figures 10 - 12) uses the published actual numbers of infections, hospital admissions and ICU admissions directly, rather than modelling them from the beginning of the epidemic. This means the projections begin from the point the published data ends.

There is no prediction interval around the actual infections in Figure 10 because there is no longer any uncertainty from simulating infections during this period. There is still uncertainty in the ascertainment rate, which is represented by the whiskers around the actual infections.

The prediction intervals around the actual hospital and ICU occupancy in figures 11 and 12 now represent uncertainty in the assumptions for the hospitalisation rate and hospital length of stay, rather than uncertainty in the number of infections. These confidence intervals are created by applying sensitivity analysis to the assumptions.

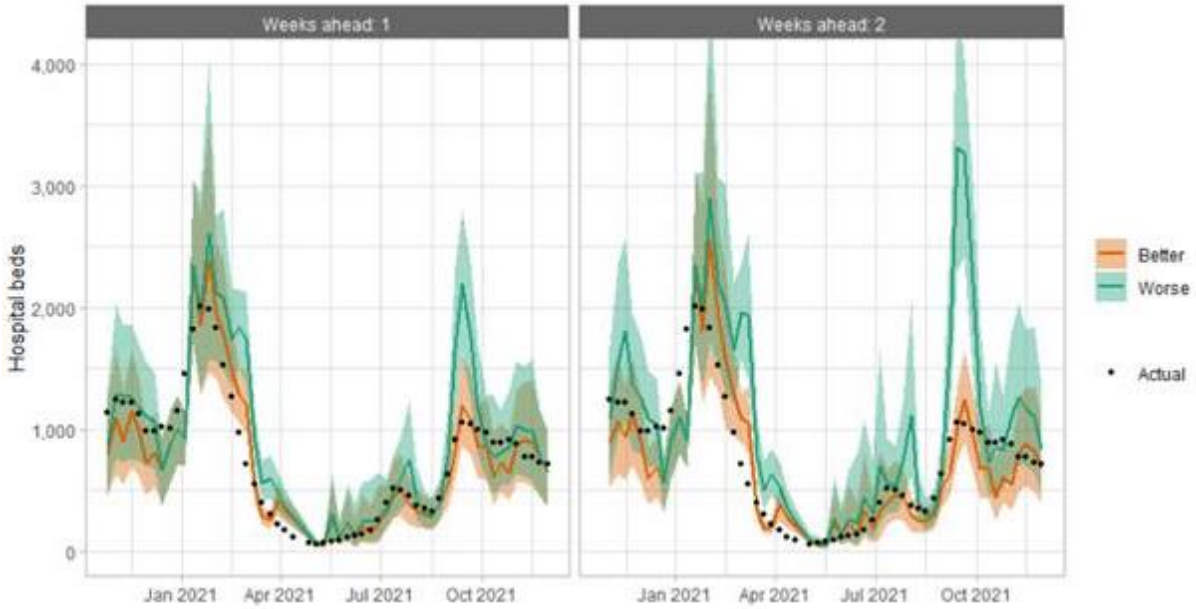
The following charts show the history of our modelling projections in comparison to estimates of the actual data. The infections projections were largely accurate during October to mid-December 2020 and from mid-January 2021 onwards. During mid-December 2020 to mid-January 2021, the projections underestimated the number of infections, due to the unforeseen effects of the new variant.

Figure 21. Infections projections versus actuals, for historical projections published between one and two weeks before the actual data came in.



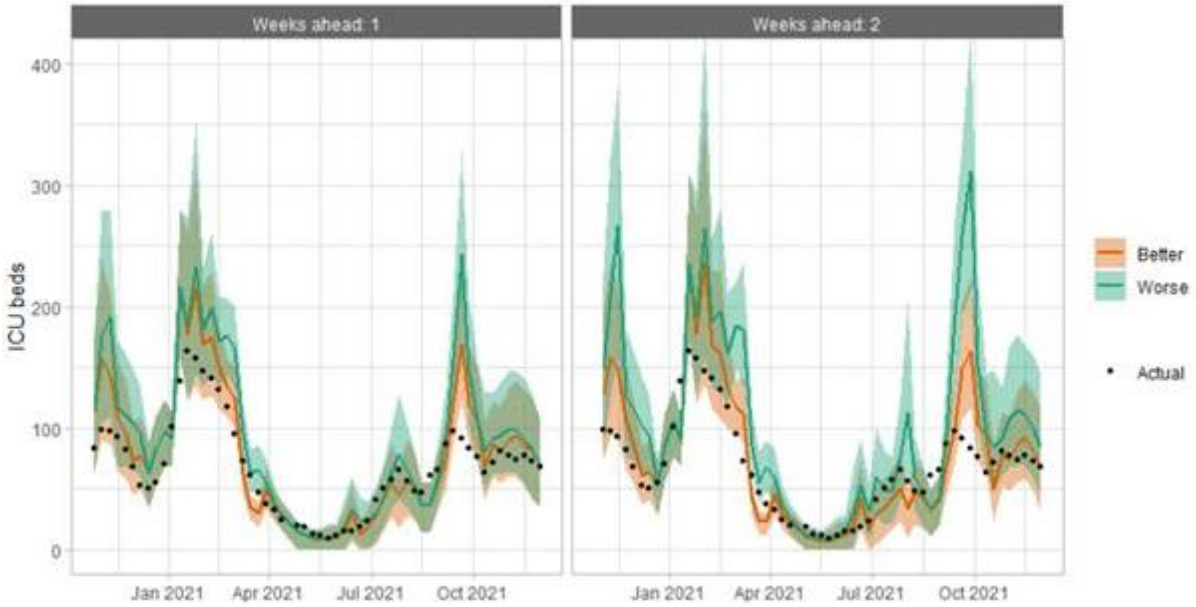
Hospital bed projections have generally been more precise than infections estimates due to being partially based on already known information about numbers of current infections, and number of people already in hospital. The projections are for number of people in hospital due to Covid-19, which is slightly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

Figure 22. Hospital bed projections versus actuals, for historical projections published between one and two 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 2021, after which they include people in ICU over the 28 day limit.

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



Which local authorities are likely to experience high levels of Covid-19 in two weeks' time

Table 1. Probability of local authority areas exceeding thresholds of cases per 100K (12th to 18th December). Data to 29th November.

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

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

Table 2 provides population weighted daily averages for normalised WW Covid-19 levels in the weeks beginning 12th November and 19th November 2021, 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[14].

Table 2. Average daily cases per 100k as given by WW data[15].

Local authority (LA)	w/b 12th November	w/b 19th November	Coverage
Aberdeen City	110	110	99%
Aberdeenshire	75	76	52%
Angus	91	98	68%
Argyll and Bute	–	–	3%
City of Edinburgh	49	76	98%
Clackmannanshire	81	82	92%
Dumfries & Galloway	64	95	39%
Dundee City	65	90	100%
East Ayrshire	67	60	57%
East Dunbartonshire	104	105	99%
East Lothian	50	107	74%
East Renfrewshire	51	64	95%
Falkirk	62	105	96%
Fife	101	87	84%
Glasgow City	78	86	71%
Highland	55	70	44%
Inverclyde	44	57	98%
Midlothian	55	75	88%
Moray	82	84	28%
Na h-Eileanan Siar	–	–	0%
North Ayrshire	29	70	93%
North Lanarkshire	83	79	41%
Orkney Islands	135	26	34%
Perth and Kinross	87	95	45%
Renfrewshire	62	61	97%
Scottish Borders	66	51	59%
Shetland Islands	10	41	29%
South Ayrshire	60	63	88%
South Lanarkshire	66	79	83%
Stirling	49	51	63%
West Dunbartonshire	68	76	98%
West Lothian	56	52	95%

[14] 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 provides population weighted daily averages for normalised WW Covid-19 levels with the outliers removed. See Technical Annex in Issue 60 of these Research Findings for further details.

[15] Coverage as for week beginning 19th November 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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