Coronavirus (COVID-19): Analysis

Coronavirus (COVID-19): modelling the epidemic in Scotland (Issue No. 73)

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 7th October 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 1.0, with the growth rate between -3% and 0%.

Key Points

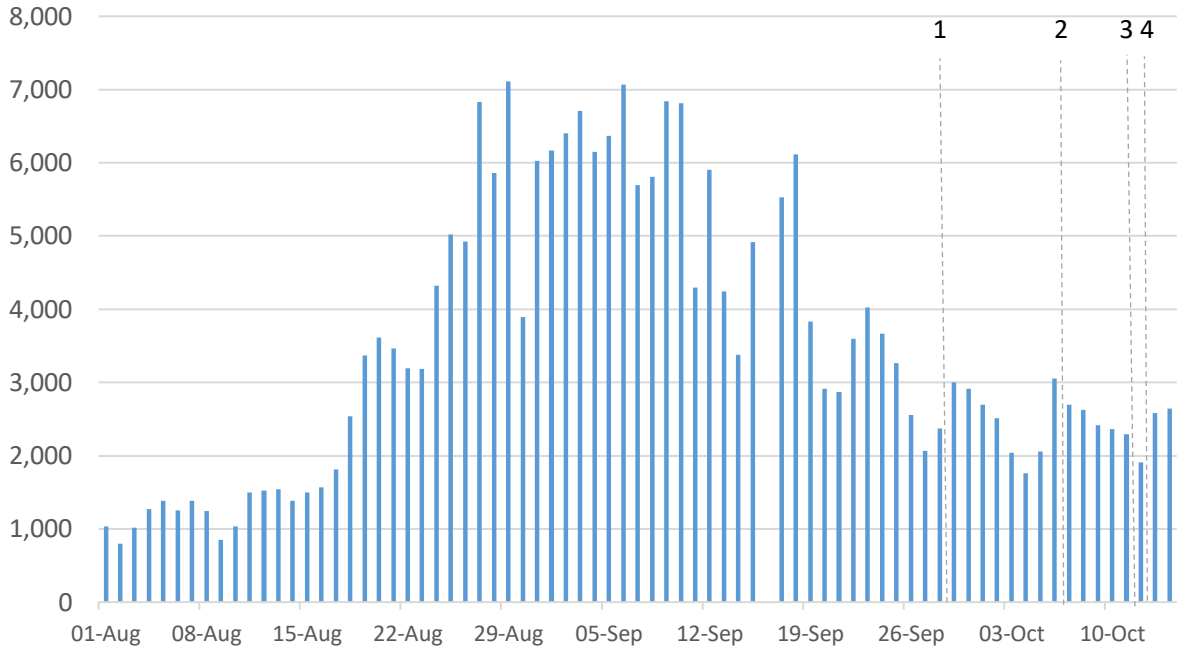
- The reproduction rate R in Scotland is currently estimated as being between 0.8 and 1.0, as of 28th September. The lower limit has increased since last week.
- The number of new daily infections for Scotland is estimated as being between 94 and 142, per 100,000 people. The lower and upper limits have decreased since last week.
- The growth rate for Scotland is currently estimated as between -3% and 0%.
- Average contacts have decreased by 7% in the last two weeks (comparing surveys pertaining to 16th September - 22nd September and 30th September - 6th October) with a current level of 4.6 daily contacts.
- Mean contacts within the home have increased by 9% whereas contacts in the other setting (contacts outside home, school or work) have decreased by 22% in the last two weeks. Contacts within the work setting have remained at a similar level over the same period.

- Those aged between 30-59 reported an increase in overall contacts whereas all remaining age groups reported a decrease, with those aged 18-29 reducing by half in the last two weeks. The decrease within the 18-29 is largely driven by a drop in contacts within the work setting.
- The proportion of individuals visiting a healthcare facility increased from approximately 17% to 23% with individuals visiting a pub or restaurant decreasing from 49% to 47% in the last two weeks.
- The proportion of contacts reported to have been indoors only has increased from 61% to 68% within the last two weeks.
- The number of people wearing a face covering where they have at least one contact outside of the home remains at a similar level to two weeks prior, currently at 81%.
- Hospital and ICU occupancies have plateaued, and are falling slowly. 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 11th October indicate that, for the week commencing 24th October 2021, there are 29 local authorities which are expected to exceed 50 cases per 100k with at least 75% probability.
- There is one local authority (Dundee) which is expected to exceed 300 cases per 100k with at least 75% probability. There are no local authorities which are expected to exceed 500 cases per 100k with at least 75% probability.
- Nationwide, after a recent plateau, levels of Covid-19 in wastewater resumed falling this week, down around 40% from last week. Reductions in sampled levels at the major cities drove this decrease, though there remain high amounts of variability.
- Modelling of long Covid estimates that on 31st October 2021 between 1.1% and 2.4% 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 upper limit of the estimate is higher than last week.

Recent cases

Figure 1 shows the number of Covid-19 cases reported in Scotland between July and October 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 14th October 2021[1]



R, growth rate and incidence are as of 28th September (dashed line 1). The Scottish Contact Survey uses data to 6th October (dashed line 2). The medium term projections by the Scottish Government of infections, hospitalisations and ICU beds, the modelled rates of positive tests per 100k and the long Covid analysis use data to 11th October (dashed line 3). Wastewater analysis uses data to 12th October (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,

[1] On 16 September 2021, daily data on new cases and tests were not refreshed due to a technical issue affecting the availability of the data.

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.

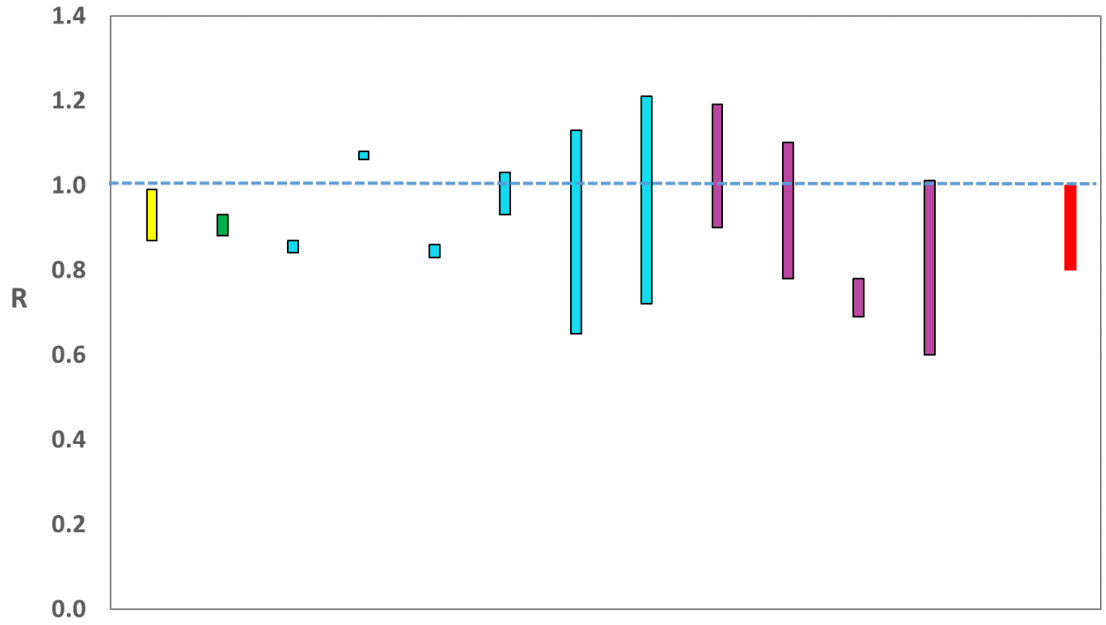
UKHSA's consensus view across these methods, was that the value of R as at 28th September[2] in Scotland was between 0.8 and 1.0 (see Figure 2)[3].

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.

[2] Using data to 11th October 2021.
[3] 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 28th September, including 90% confidence intervals, produced by EMRG[4].

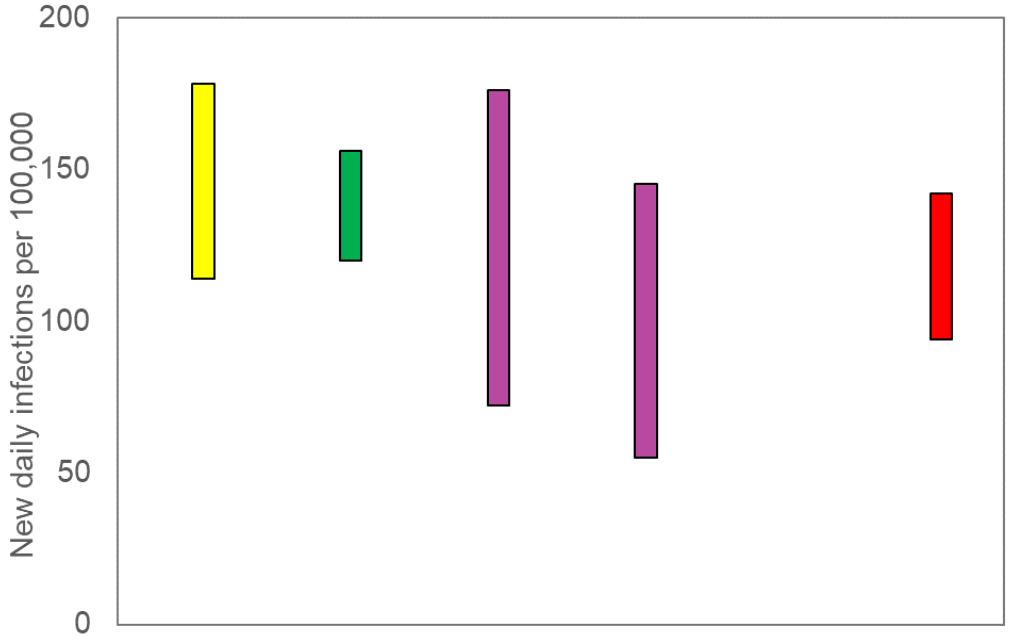


Source: EMRG

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 28th September, was that the incidence of new daily infections in Scotland was between 94 and 142 new infections per 100,000. This equates to between 5,100 and 7,800 people becoming infected each day in Scotland. The lower and upper limits have decreased since last week.

[4] 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 11th October. R, incidence and growth rate as of 28th September.

Figure 3. Estimates of incidence for Scotland, as at 28th September, including 90% confidence intervals, produced by EMRG[4].



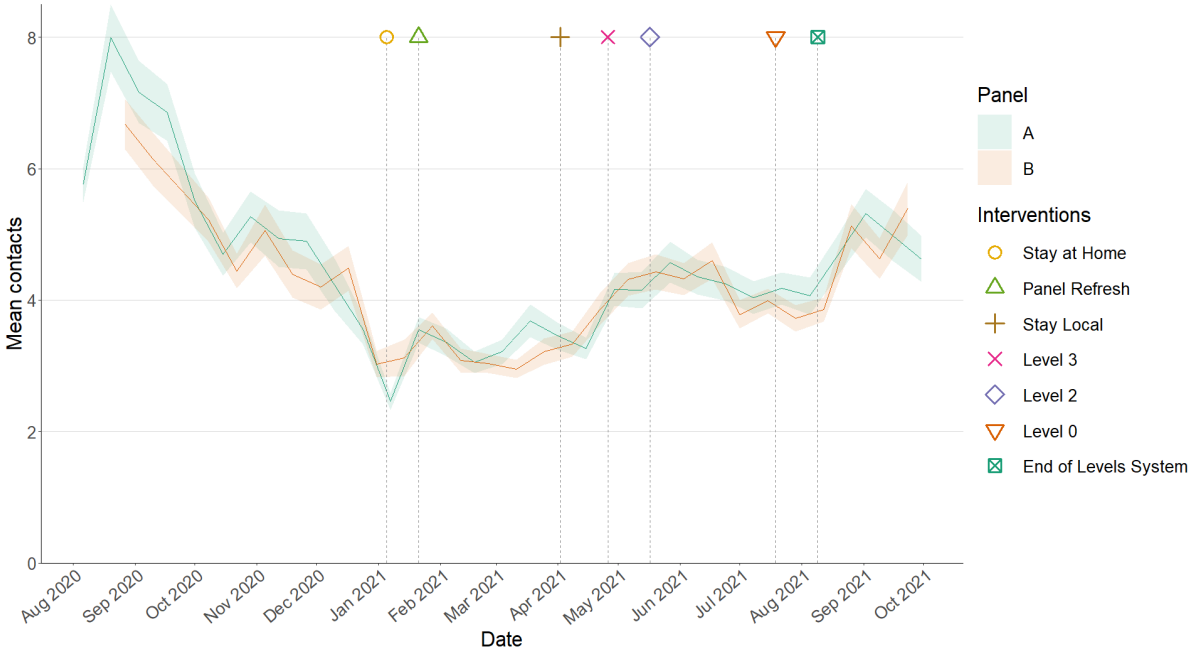
Source: EMRG

The consensus from UKHSA for this week is that the growth rate in Scotland is between -3% and 0% per day as at 28th September. The lower and upper limits have increased since last week.

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

Average contacts have decreased by 7% in the last two weeks (comparing surveys pertaining to 16th September - 22nd September and 30th September - 6th October) with a current level of 4.6 daily contacts as seen in Figure 4. Mean contacts within the home have increased by 9% whereas contacts in the other setting (contacts outside home, school and work) have decreased by 22% in the last two weeks. Contacts within the work have remained at a similar level over the same period.

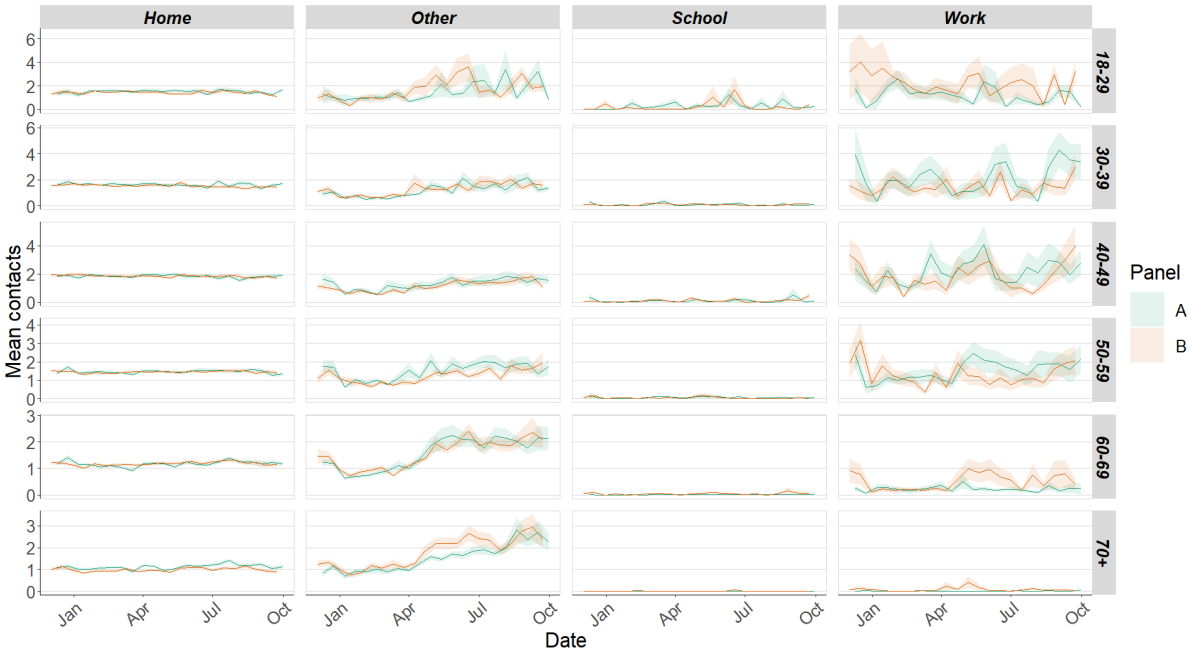
Figure 4: Mean Adult Contacts (truncated at 100) from SCS.



Contacts tend to be lower during half terms and holidays, with term times varying across Scotland. During the October half term in 2020, overall contacts reduced by approximately 15%, with contacts within the work setting decreasing by around 32%. This was followed by an uptick in contacts after the end of half term.

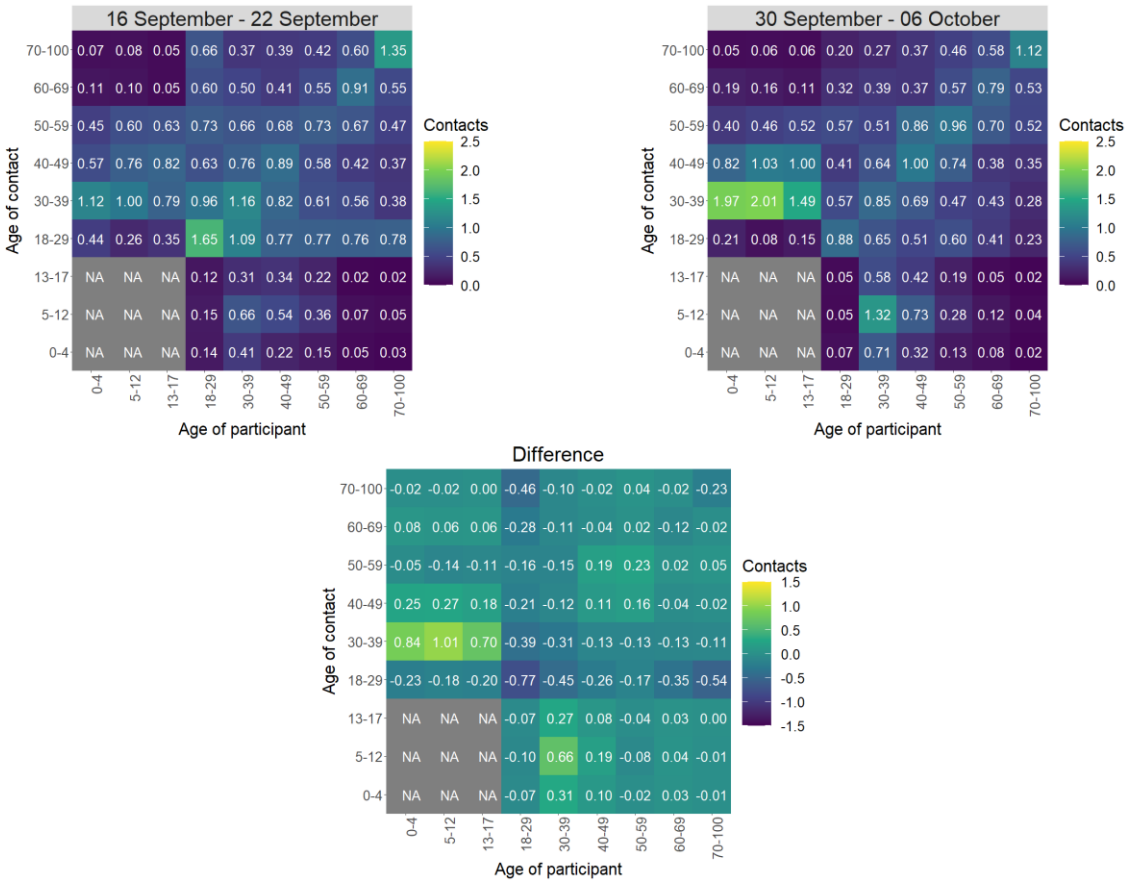
Figure 5 shows how contacts change across age group and setting. Those aged between 30-59 reported an increase in overall contacts whereas all remaining age groups reported a decrease, with those aged 18-29 reducing by half in the last two weeks. The decrease within the 18-29 year group is largely driven by a drop in contacts within the work setting.

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 16th September - 22nd September and 30th September - 6th October 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. Interactions between the 18-29 age group with each other has shown the biggest decrease.

Figure 6: Overall mean contacts by age group before for the weeks relating to 16th September - 22nd September and 30th September – 6th October.



As seen in Figure 7, the proportion of participants visiting different locations remains at similar levels across the majority of locations. The biggest differences are seen with those visiting a healthcare facility and also individuals visiting a pub or restaurant. The proportion of individuals visiting a healthcare facility increased from approximately 17% to 23% with individuals visiting a pub or restaurant decreasing from 49% to 47% in the last two weeks.

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

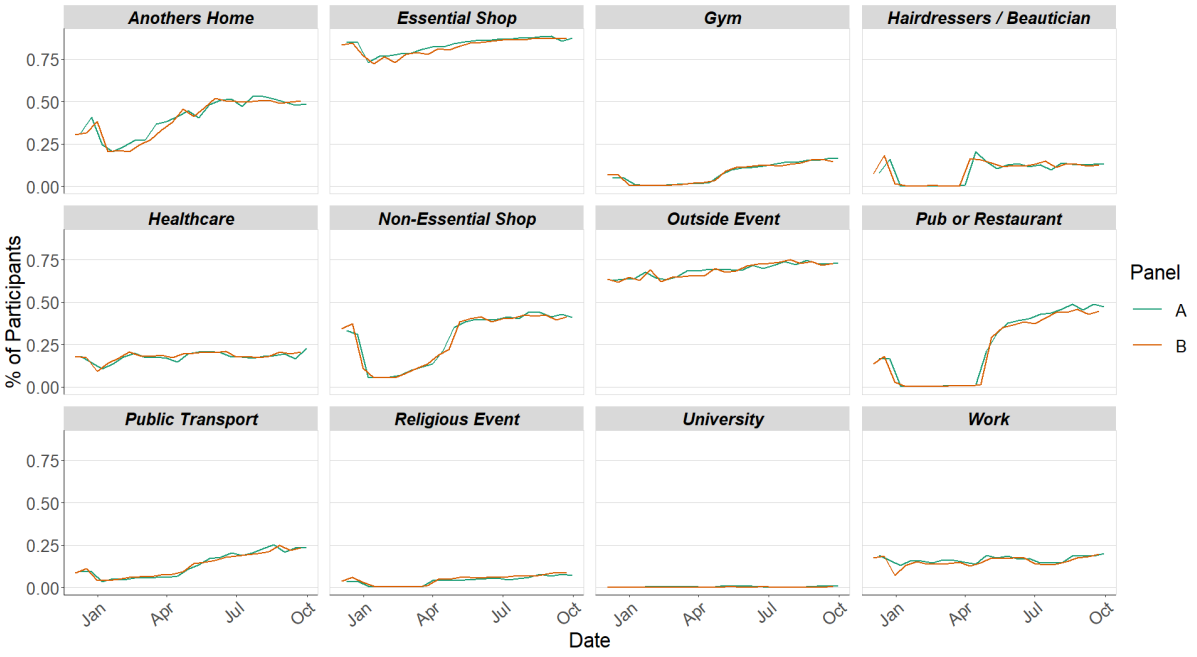


Figure 8 shows the proportion of participants that reported contacts had indoors and outdoors for contacts individually reported for panel A. A contact can also be recorded as both indoor and outdoor. The proportion of contacts reported to have been indoors only has increased from 61% to 68% within the last two weeks.

Figure 8: Proportion of participants reported indoors and outdoors for contacts individually reported for panel A.

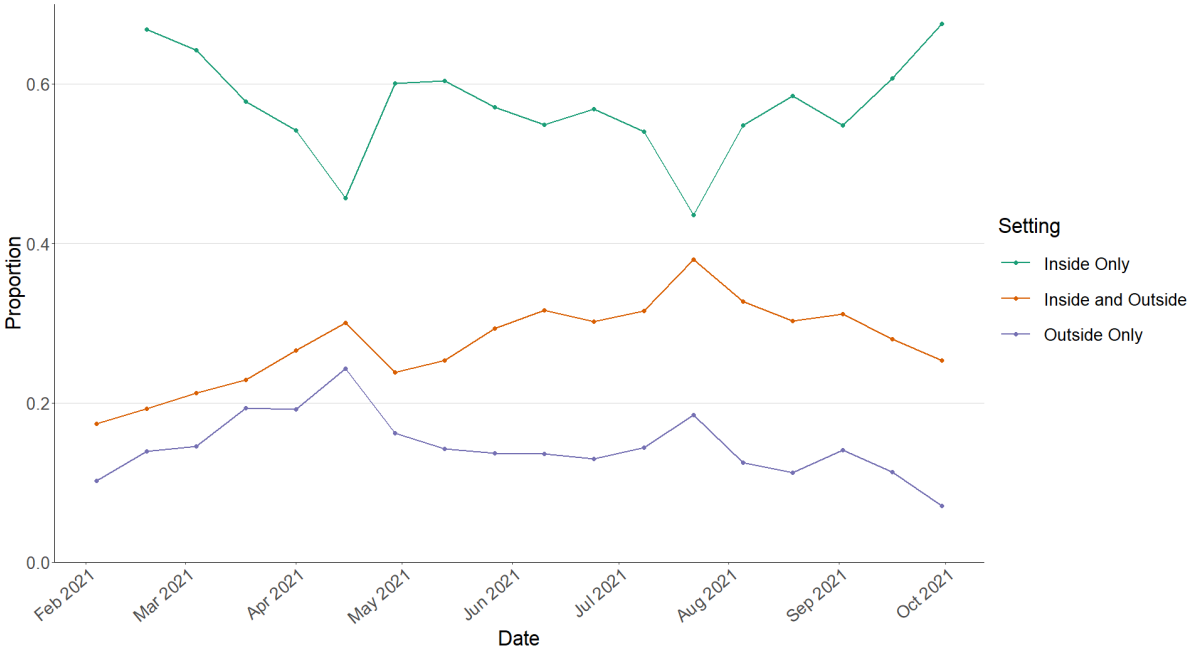
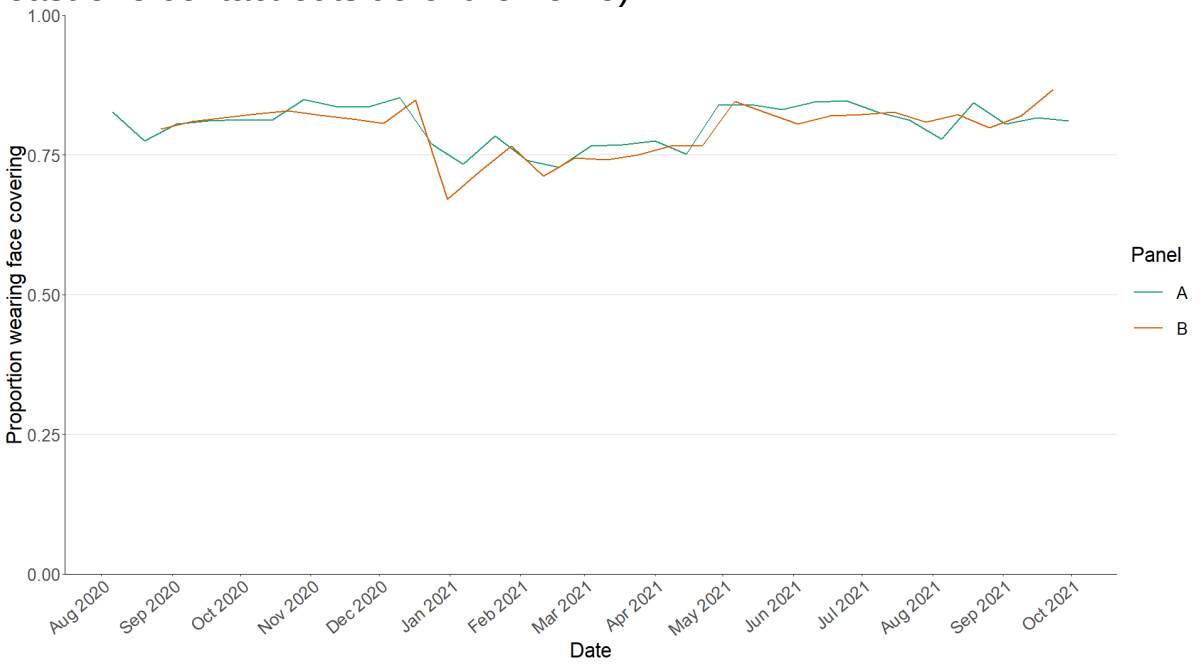


Figure 9 shows the number of people wearing a face covering where they have at least one contact outside of the home. This remains at a similar level to two weeks prior, currently at 81%.

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 31st October.

'Worse' assumes a rise in transmission similar to that seen in June and August. 'Central' assumes that infections will plateau at the current level. 'Better' assumes that infections will fall[5].

As noted earlier, contacts tend to be lower during half term and holidays. The modelling accounts for a reduction in transmission from schools being closed. At present, we are seeing relatively constant case numbers, which could begin to rise again when schools return. This can be seen towards the end of the three weeks modelled.

[5] All scenarios are based on current vaccine roll-out plans and efficacy assumptions. Data to 11th October.

Figure 10. Medium term projections of modelled total new daily infections, adjusting positive tests[6] to account for asymptomatic and undetected infections, from Scottish Government modelling, based on positive test data reported up to 11th October.

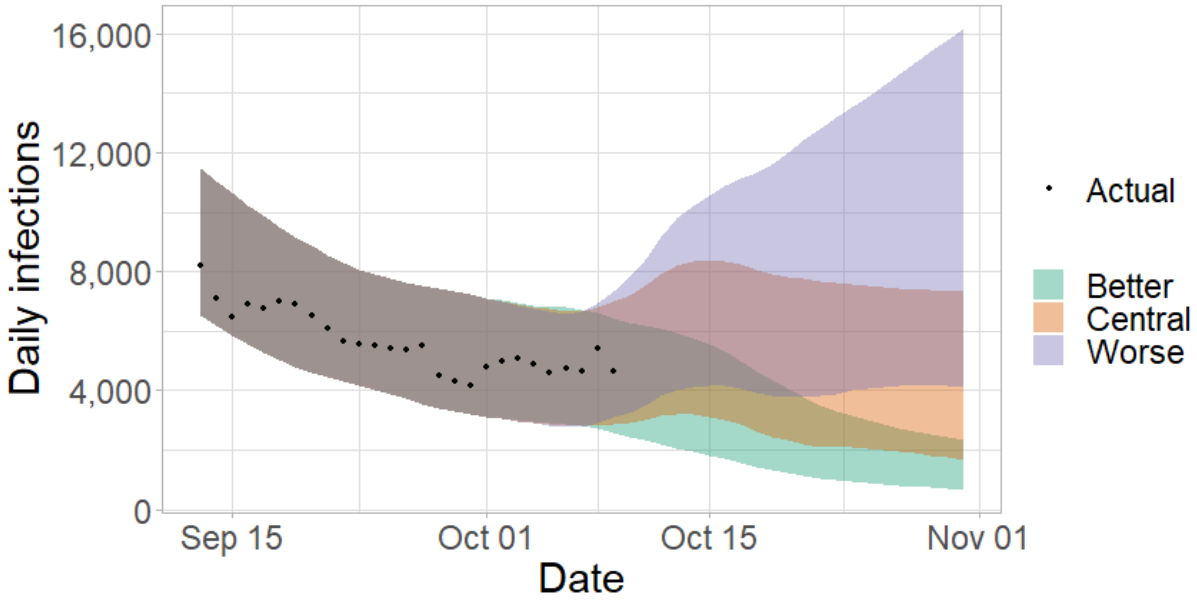


Figure 11 shows the impact of the projections on the number of people in hospital. The modelling includes all hospital stays, whereas the actuals only include stays up to 28 days duration that are linked to Covid-19.

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

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

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

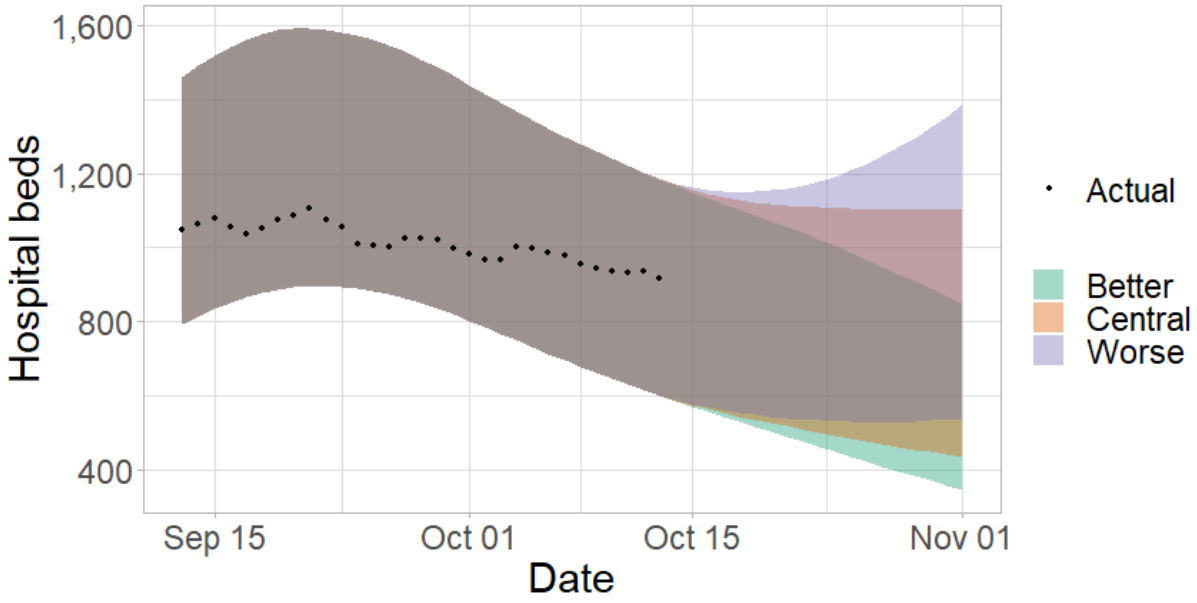
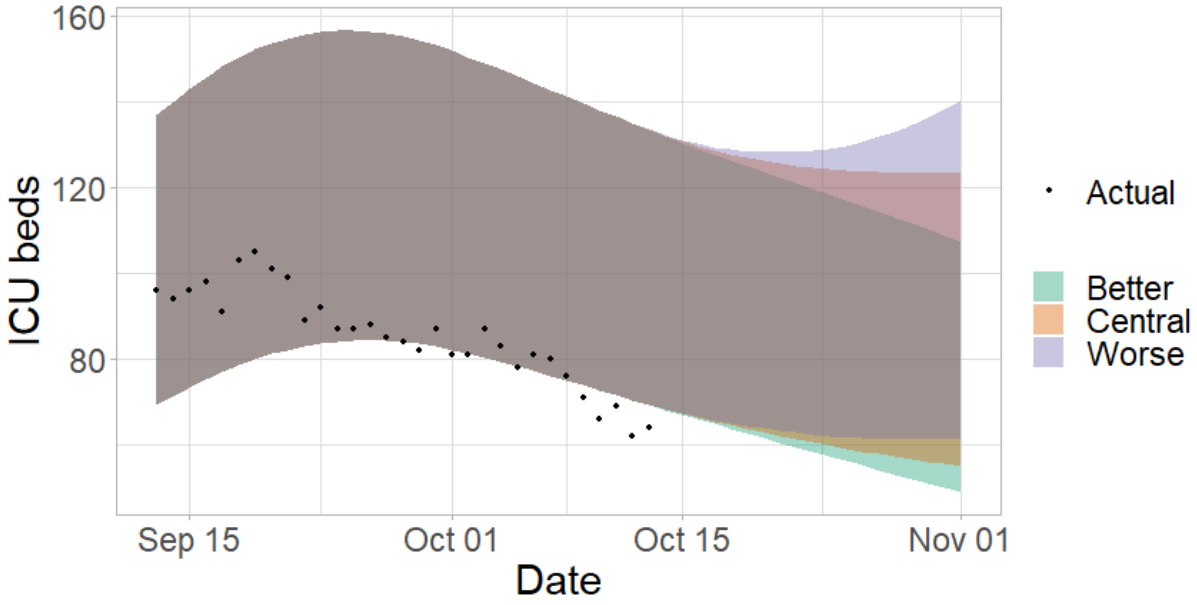


Figure 12 shows the impact of the projection on ICU bed demand.

Figure 12. Medium term projections of modelled ICU bed demand, from Scottish Government modelling[7], based on positive test data reported up to 11th October.



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

[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.

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 10-12). 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 11th October and **do not include the effects of any 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 11th October. 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 the 2nd November.

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.

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

Figure 13. SPI-M medium-term projection of daily hospitalisations in Scotland, at 50% credible intervals[9].

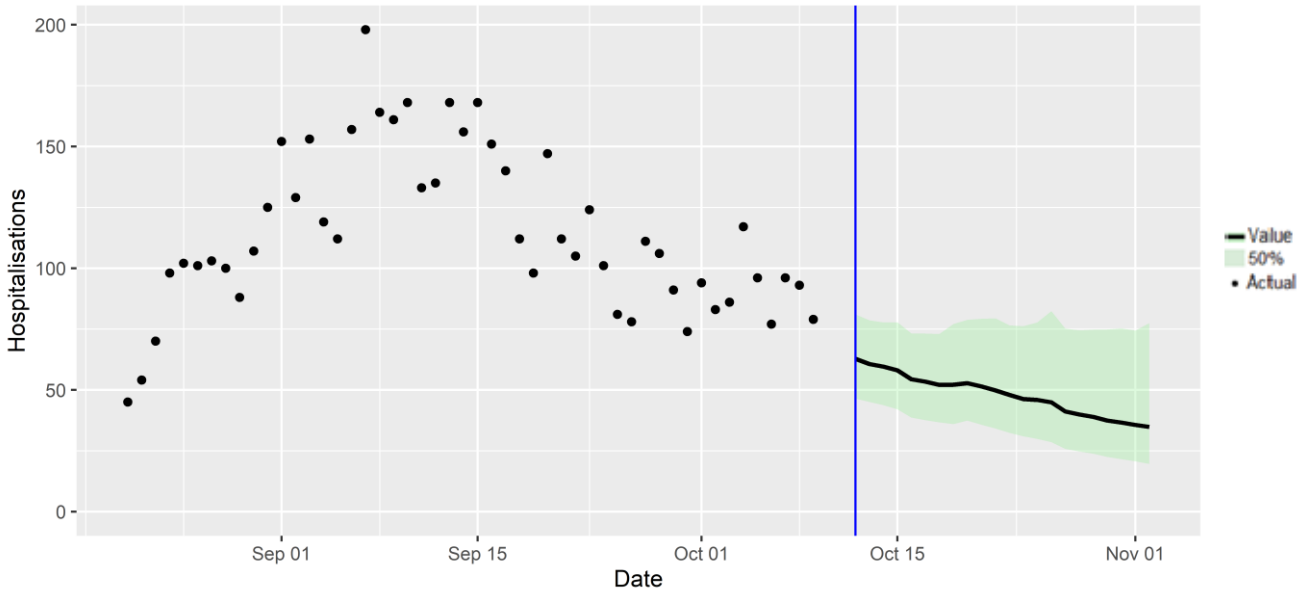
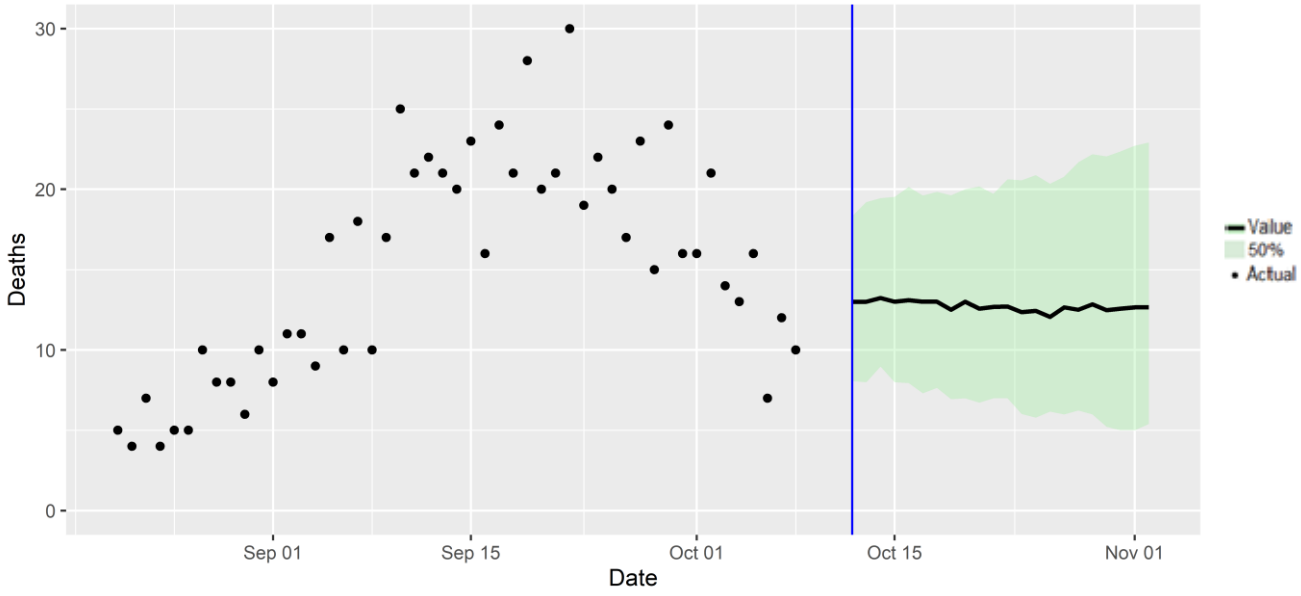


Figure 14. SPI-M medium-term projection of daily deaths in Scotland, at 50% credible intervals.



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 11th October from several academic groups to give us an

[9] This week we are only showing the interquartile range of the projections for both hospitalisations and deaths. SPI-M-O agreed that the interquartile range represented their consensus view of the likely trajectory of the epidemic in Scotland this week.

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.

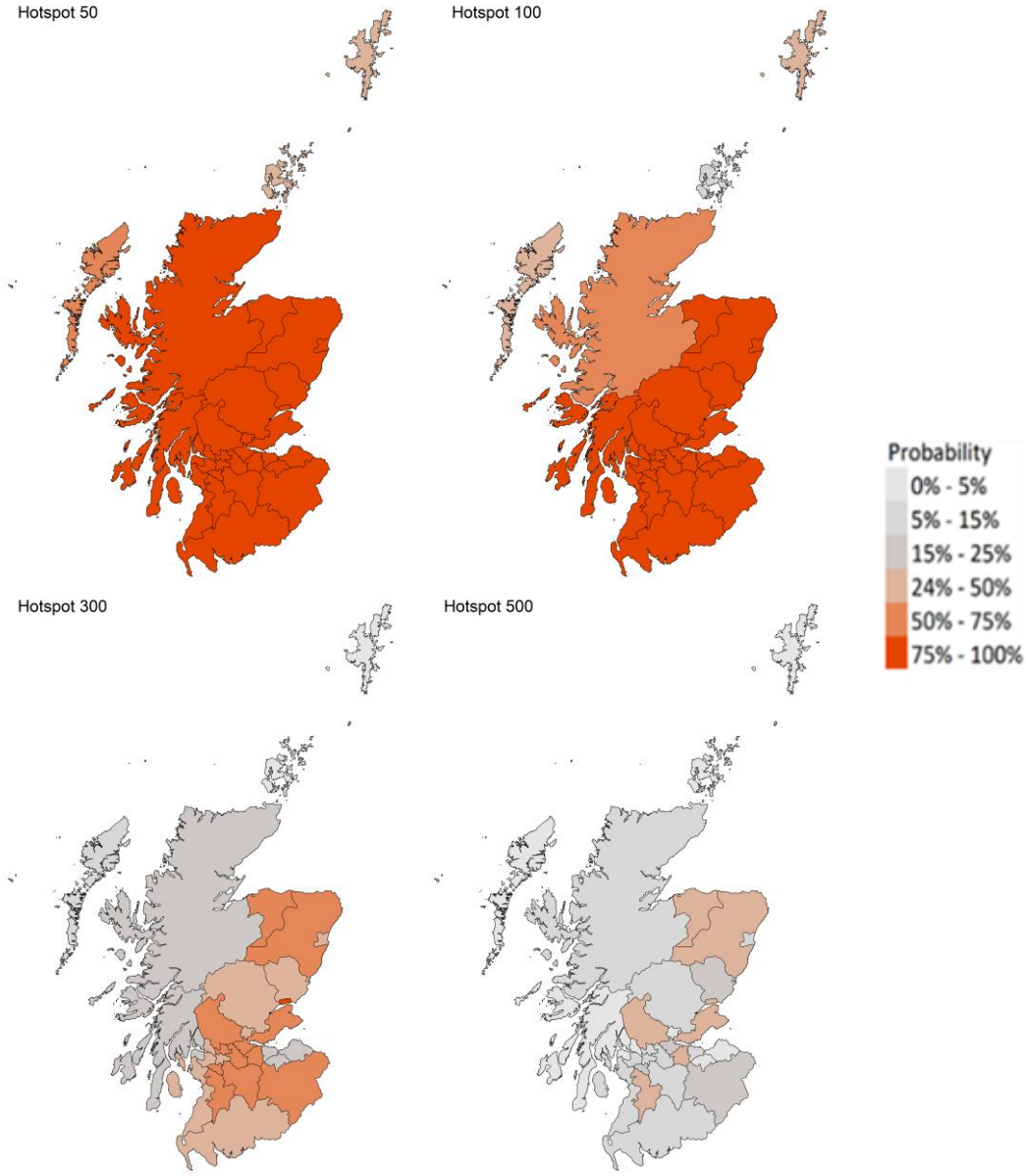
Modelled rates of positive tests per 100K using data to 11th October (Figure 15) indicate that, for the week commencing 24th October 2021, there are 29 local authorities which are expected to exceed 50 cases per 100k with at least 75% probability[10].

There is one local authority (Dundee) which is expected to exceed 300 cases per 100k with at least 75% probability.

There are no local authorities which are expected to exceed 500 cases per 100k with at least 75% probability[11].

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

Figure 15. Probability of local authority areas exceeding thresholds of cases per 100K (24th to 30th October 2021), data to 11th October.



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

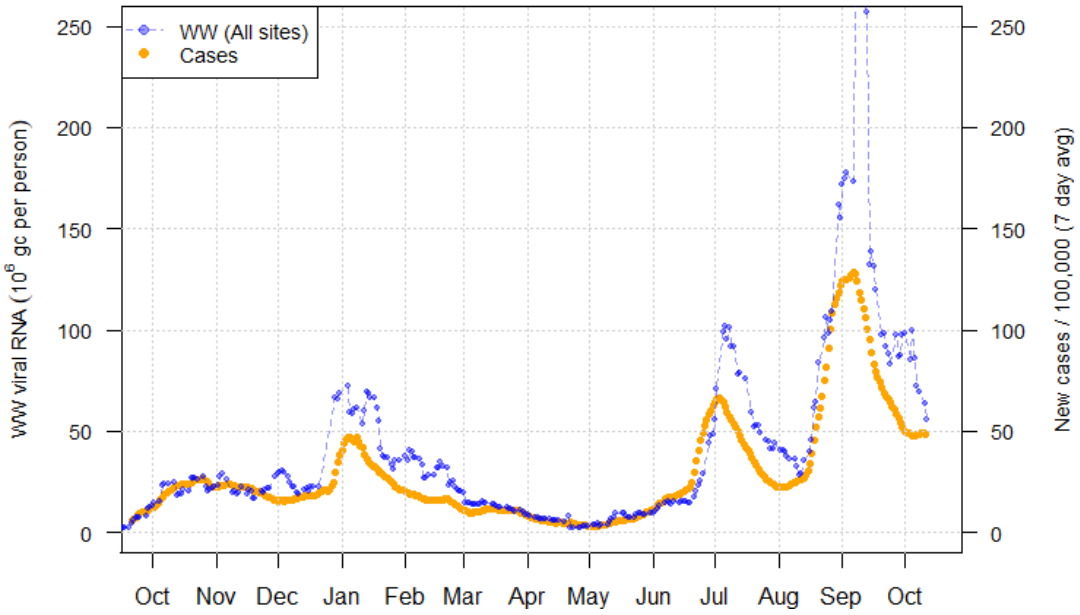
Levels of Covid-19 RNA in wastewater (WW) collected at a number of sites around Scotland are adjusted for population and local changes in intake flow rate and compared to 7 day average daily new case rates derived from Local Authority and Neighbourhood (Intermediate Zone) level aggregate data. See Technical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

Nationwide, after seeming to plateau recently, levels of WW Covid-19 resumed falling this week, reaching around 56 million gene copies per

person per day (Mgc/p/d) in the week ending 12th October, down around 40% from the week ending 5th October. Reductions in sampled levels at the major cities drove this decrease, though there remain high amounts of variability.

Figure 16 shows the national running average trend for the full set of sampled sites, with a small number of unrealistically large outliers excluded. The number of wastewater samples analysed continues to be at a reduced level, standing at around 100 samples per week. This means caution is required in interpreting levels at some of the smaller sites or less densely populated local authorities.

Figure 16. National running average trends in wastewater Covid-19 and daily new case rates (7 day moving average), with samples taken up until 12th October[12].



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

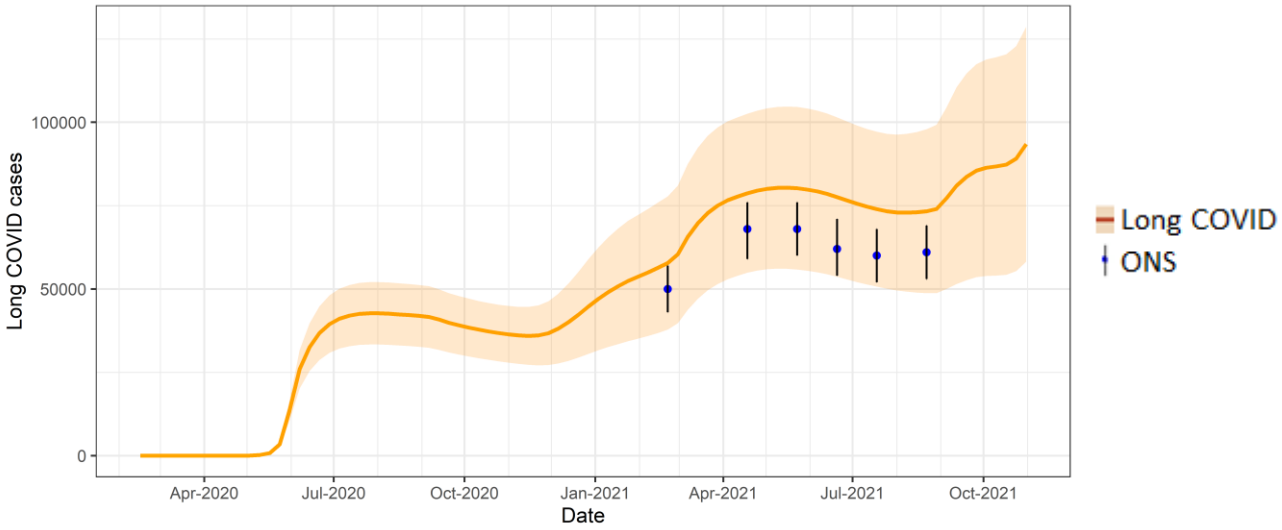
The Scottish Government is modelling the number of people likely to experience long Covid symptoms. This gives a projection of estimated self-reported long Covid rates in the future, based on Scottish Government medium term projection modelling, as set out in Figure 17.

[12] 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.

This modelling estimates that at 31st October 2021 between 58,000 (1.1% of the population) and 129,000 (2.4%) people are projected to self-classify with long Covid for 12 weeks or more after their first suspected Covid infection in Scotland.

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

Figure 17. Estimates of self-classified long Covid prevalence at 12 weeks from 16th February 2020 to 31st October 2021 (showing 95% confidence interval). ONS estimates of self-reported long Covid with range also shown.



See the Technical Annex 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. 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.

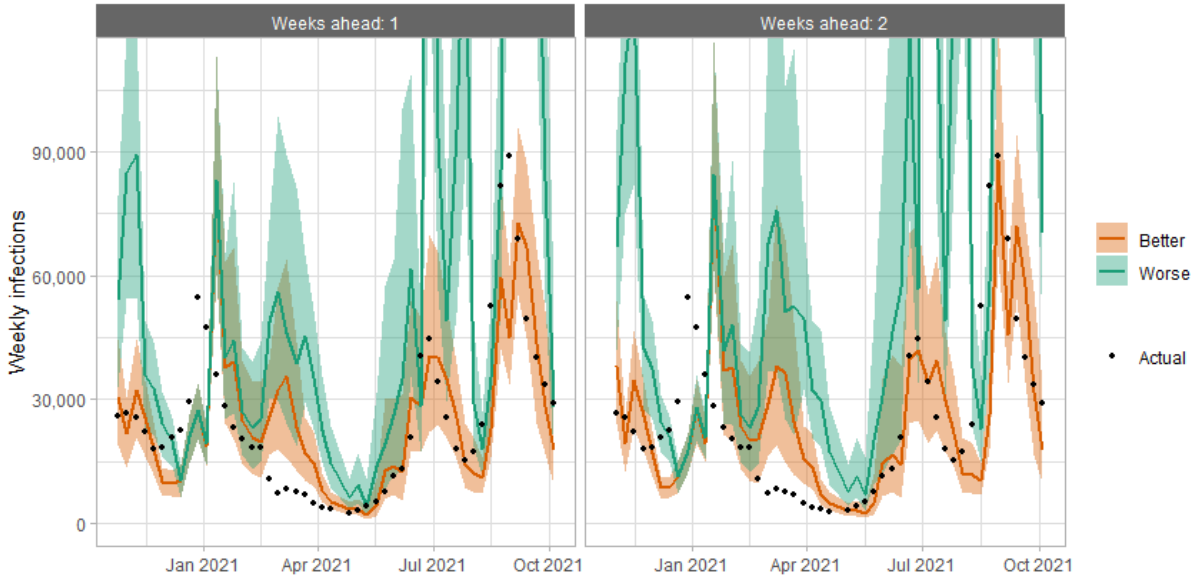
Modelling also allows us to make short-term forecasts of what may happen with a degree of uncertainty. These can be used in health care and other planning. The modelling in this research findings is undertaken using different types of data which going forward aims to both model the progress of the epidemic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

How the modelling compares to the real data as it emerges

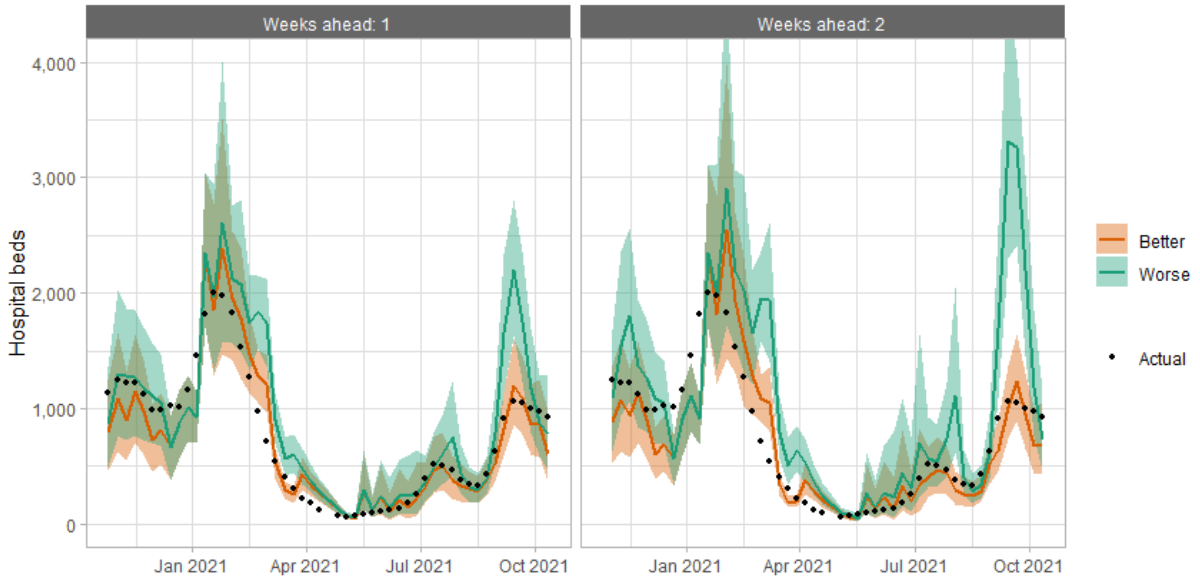
The following charts show the history of our modelling projections in comparison to estimates of the actual data. The infections projections were largely accurate during October to mid-December 2020 and from mid-January 2021 onwards. During mid-December 2020 to mid-January 2021, the projections underestimated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

Figure 18. 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.

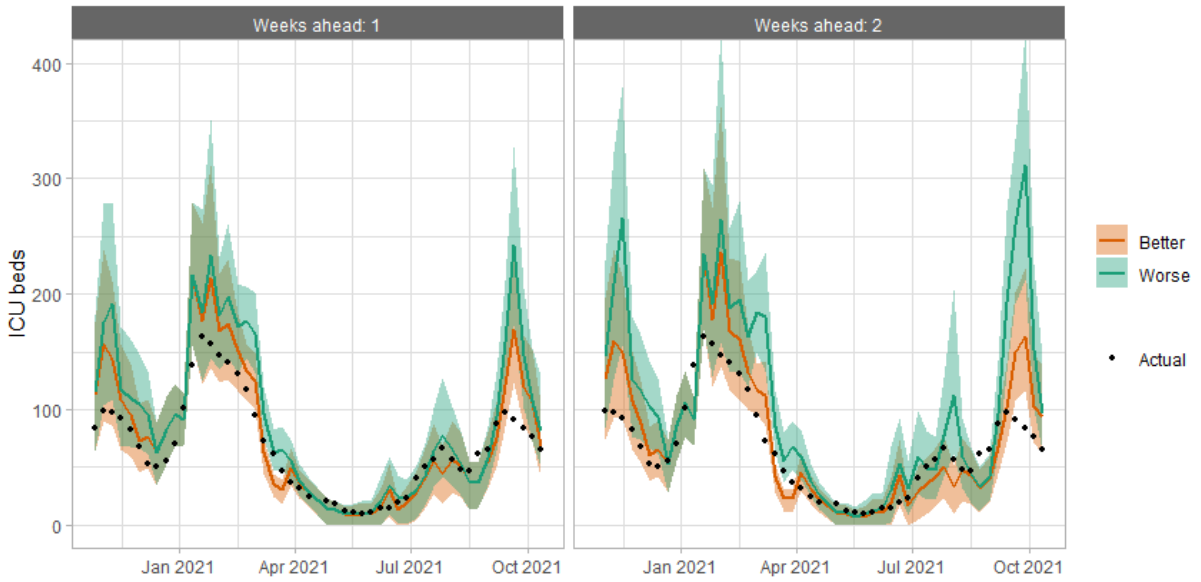
Figure 19. Hospital bed projections versus actuals, for historical projections published between one and two weeks before the actual data came in.



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



Long Covid

Long Covid is a complex condition, with an emerging, but limited, evidence base. It is characterised by ongoing symptoms for several weeks or months after acute Covid-19. As the available evidence accrues, techniques need to be developed to assess the prevalence of long Covid at national level in Scotland to inform health board planning.

Emerging evidence shows that many people infected with Covid-19 go on to have long-term needs. This is not limited just to intensive care and those who received acute hospital care, for whom needs can be complex and varied. Some people that were asymptomatic or experienced mild illness following infection may also experience a range of longer lasting symptoms.

The condition can present with clusters of symptoms, often overlapping, which may change over time and affect several systems within the body. Common symptoms include (but are not limited to): fatigue, persistent high temperature, breathlessness, cognitive impairment, generalised pain, and mental health problems[13].

[13] Illnesses and long-term conditions: Long term effects of COVID-19 - gov.scot (www.gov.scot)

The term long Covid is commonly used to describe signs and symptoms that continue or develop after acute Covid-19 and are not explained by an alternative diagnosis. It includes both ongoing symptomatic Covid-19 (from 4 to 12 weeks) and post-Covid-19 syndrome (12 weeks or more)[14] . The ONS has published estimates of the number of people in the community population in Scotland with self-reported long Covid[15]. The ONS has also reported estimates of the prevalence of post-acute symptoms among people with coronavirus (Covid-19)[16].

The estimates of long Covid from Scottish Government modelling are based on estimated infections (derived from SG infection modelling) and the estimated self-reported rates of long Covid symptoms, based on ONS surveys. ONS findings showed that up to around 12% of people infected with Covid-19 self-classify as having long Covid-19 12 weeks after the initial infection. These results are based on self-reported data provided by a sample of Coronavirus Infection Survey (CIS)[17] participants.

The ONS estimates of self-reported long Covid, also using responses to the CIS, are included alongside the SG estimates to aid interpretation. Assessing how common long Covid is depends on how it is measured. The ONS self-reported long COVID estimates SG includes for comparison are based on surveys of individuals in private households only, rather than the whole population.

[14] NICE, RCGP and SIGN publish guideline on managing the long-term effects of COVID-19 | News and features | News | NICE
[15] Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK - Office for National Statistics (ons.gov.uk)
[16] Technical article: Updated estimates of the prevalence of post-acute symptoms among people with coronavirus (COVID-19) in the UK - Office for National Statistics (ons.gov.uk).
[17] COVID-19 Infection Survey: methods and further information - Office for National Statistics.

Table 1. Probability of local authority areas exceeding thresholds of cases per 100K (24th to 30th October 2021), data to 11th October.

	Probability of exceeding (cases per 100k)					
Local Authority (LA)	50	100	300	500	750	1000
Aberdeen City	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
Aberdeenshire	75-100%	75-100%	50-75%	25-50%	15-25%	5-15%
Angus	75-100%	75-100%	25-50%	15-25%	5-15%	5-15%
Argyll and Bute	75-100%	75-100%	15-25%	0-5%	0-5%	0-5%
City of Edinburgh	75-100%	75-100%	15-25%	5-15%	0-5%	0-5%
Clackmannanshire	75-100%	75-100%	25-50%	0-5%	0-5%	0-5%
Dumfries & Galloway	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
Dundee City	75-100%	75-100%	75-100%	25-50%	15-25%	5-15%
East Ayrshire	75-100%	75-100%	50-75%	25-50%	0-5%	0-5%
East Dunbartonshire	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
East Lothian	75-100%	75-100%	15-25%	0-5%	0-5%	0-5%
East Renfrewshire	75-100%	75-100%	50-75%	15-25%	5-15%	0-5%
Falkirk	75-100%	75-100%	50-75%	15-25%	5-15%	0-5%
Fife	75-100%	75-100%	50-75%	25-50%	5-15%	0-5%
Glasgow City	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
Highland	75-100%	50-75%	15-25%	5-15%	0-5%	0-5%
Inverclyde	75-100%	75-100%	15-25%	0-5%	0-5%	0-5%
Midlothian	75-100%	75-100%	15-25%	0-5%	0-5%	0-5%
Moray	75-100%	75-100%	50-75%	25-50%	15-25%	15-25%
Na h-Eileanan Siar	50-75%	25-50%	5-15%	0-5%	0-5%	0-5%
North Ayrshire	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
North Lanarkshire	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
Orkney Islands	25-50%	5-15%	0-5%	0-5%	0-5%	0-5%
Perth and Kinross	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
Renfrewshire	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
Scottish Borders	75-100%	75-100%	50-75%	15-25%	15-25%	5-15%
Shetland Islands	25-50%	25-50%	0-5%	0-5%	0-5%	0-5%
South Ayrshire	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
South Lanarkshire	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
Stirling	75-100%	75-100%	50-75%	25-50%	15-25%	15-25%
West Dunbartonshire	75-100%	75-100%	25-50%	0-5%	0-5%	0-5%
West Lothian	75-100%	75-100%	50-75%	25-50%	5-15%	0-5%

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 29th September and 6th October, 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[18].

Table 2. Average daily cases per 100k as given by WW data[19].

Local authority (LA)	w/b 29th September	w/b 6th October	Coverage
Aberdeen City	100	38	80%
Aberdeenshire	91	55	26%
Angus	83	64	43%
Argyll and Bute	–	–	0%
City of Edinburgh	67	35	96%
Clackmannanshire	125	35	70%
Dumfries & Galloway	–	64	37%
Dundee City	100	64	100%
East Ayrshire	99	45	57%
East Dunbartonshire	154	95	99%
East Lothian	67	33	65%
East Renfrewshire	74	36	95%
Falkirk	84	72	59%
Fife	87	70	74%
Glasgow City	115	72	98%
Highland	41	33	32%
Inverclyde	24	37	92%
Midlothian	67	47	88%
Moray	44	66	70%
Na h-Eileanan Siar	–	–	0%
North Ayrshire	38	32	93%
North Lanarkshire	155	62	80%
Orkney Islands	12	16	34%
Perth and Kinross	–	48	38%
Renfrewshire	64	45	57%
Scottish Borders	23	34	50%
Shetland Islands	1	2	29%
South Ayrshire	101	45	77%
South Lanarkshire	81	47	52%
Stirling	32	–	0%
West Dunbartonshire	106	95	48%
West Lothian	155	114	58%

[18] 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.

[19] Coverage as at the week beginning 6th October 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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