Coronavirus (COVID-19): Analysis

Coronavirus (COVID-19): modelling the epidemic in Scotland (Issue No. 70)

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 16th September 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 2%.

Key Points

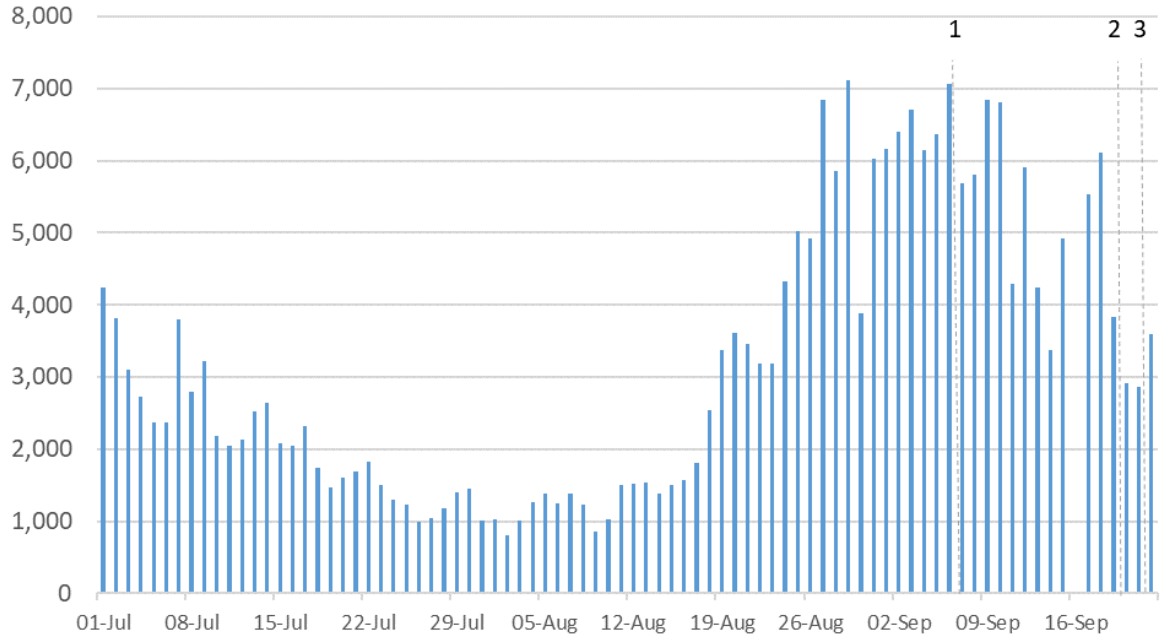
- The reproduction rate R in Scotland is currently estimated as being between 0.8 and 1.1, as of 7th September. The lower and upper limits have decreased since last week.
- The number of new daily infections for Scotland is estimated as being between 219 and 394, per 100,000 people. The lower and upper limits have increased since last week.
- The growth rate for Scotland is currently estimated as between -3% and 2%. The lower and upper limits have decreased since last week. While the R number and growth rate have decreased this week, they have been consistently above 1 and 0% respectively for several weeks previously, indicating a growing epidemic, corresponding to an increasing incidence.
- Average contacts have decreased by 6% in the last two weeks (comparing surveys pertaining to 2nd September - 8th September and 16th September - 22nd September) with a current level of 5 daily contacts.

- Mean contacts within the work have decreased by approximately 17% whereas contacts in the other setting (contacts outside home, school and work) have increased by 6% in the last two weeks. Contacts within the home have remained at a similar level over the same period.
- Although overall adult contacts have decreased, mean contacts for those within the 18-28 age group and individuals 60 and over have increased contacts within the last two weeks, all other age groups have reported a decrease by at least 17%. Increases in contacts are largely driven by contacts within the other setting (contacts outside home, school and work).
- Those aged between 18-59 have reported a decrease in interactions with those aged under 18. The biggest increase in interactions in the last two weeks is seen between those within 18-29 with each other, rising by around 50%.
- The proportion of individuals visiting a pub or restaurant increased from approximately 46% to 49% with individuals visiting a healthcare facility decreasing from 20% to 17% in the last two weeks.
- The proportion of contacts reported to have been indoors only has increased from 55% to 61% within the last two weeks whereas the proportion of contacts occurring outside only has shown a decrease over the same period.
- The number of people wearing a face covering where they have at least one contact outside of the home has remained at a similar level, currently at 82%.
- Hospital and ICU occupancies have plateaued. The scale of any future increase or decrease in hospital occupancy and intensive care use is highly uncertain, and depends on the number of infections.
- Modelled rates of positive tests per 100K using data to 20th September indicate that, for the week commencing 3rd October 2021, there are 29 local authorities which are expected to exceed 50 cases per 100k with at least 75% probability.
- Of these, 2 local authorities are expected to exceed 300 cases per 100k with at least 75% probability. These are South Ayrshire and Stirling.
- There are no local authorities which are expected to exceed 500 cases per 100k with at least 75% probability.
- Nationwide, levels of Covid-19 in wastewater have declined since the previous week.
- Modelling of Long Covid gives estimates that on 10th October 2021 between 1.0% and 2.2% of the population are projected to experience symptoms for 12 weeks or more after their first suspected Covid infection in Scotland. The upper limit is unchanged from last week.

Recent cases

Figure 1 shows the number of cases reported in Scotland between July and September 2021[1]. 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 22nd September 2021



R, growth rate and incidence are as of 7th September (dashed line 1). The medium term projections by the Scottish Government of infections, hospitalisations and ICU beds, the modelled rates of positive tests per 100k, the wastewater analysis and the long Covid analysis use data to 20th September (dashed line 2). Contact pattern data is to 22nd September (dashed line 3).

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.

[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.

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, Public Health England (PHE) and the Joint Biosecurity Centre. Estimates are considered, discussed and combined at the Epidemiology Modelling Review Group (EMRG), which sits within the UKHSA.

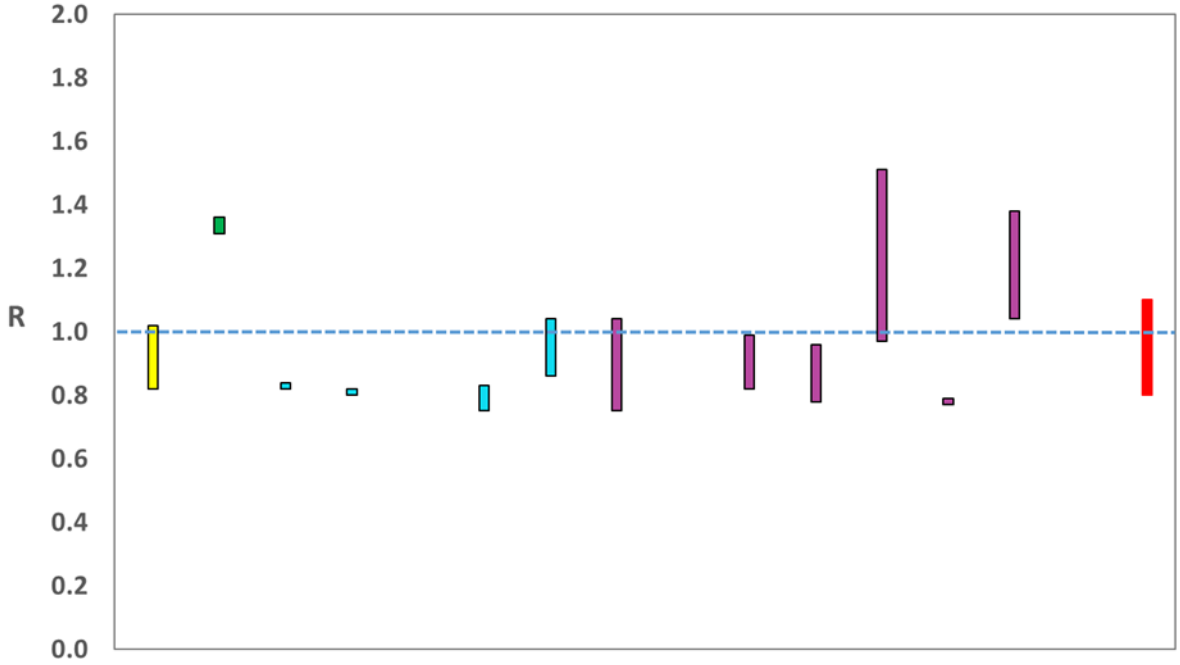
UKHSA's consensus view across these methods, was that the value of R as at 7th September[2] in Scotland was between 0.8 and 1.1 (see Figure 2)[3].

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

[2] Using data to 20th September.
[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.

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.

Figure 2. Estimates of R_t for Scotland, as of 7th September, including 90% confidence intervals, produced by EMRG[4].

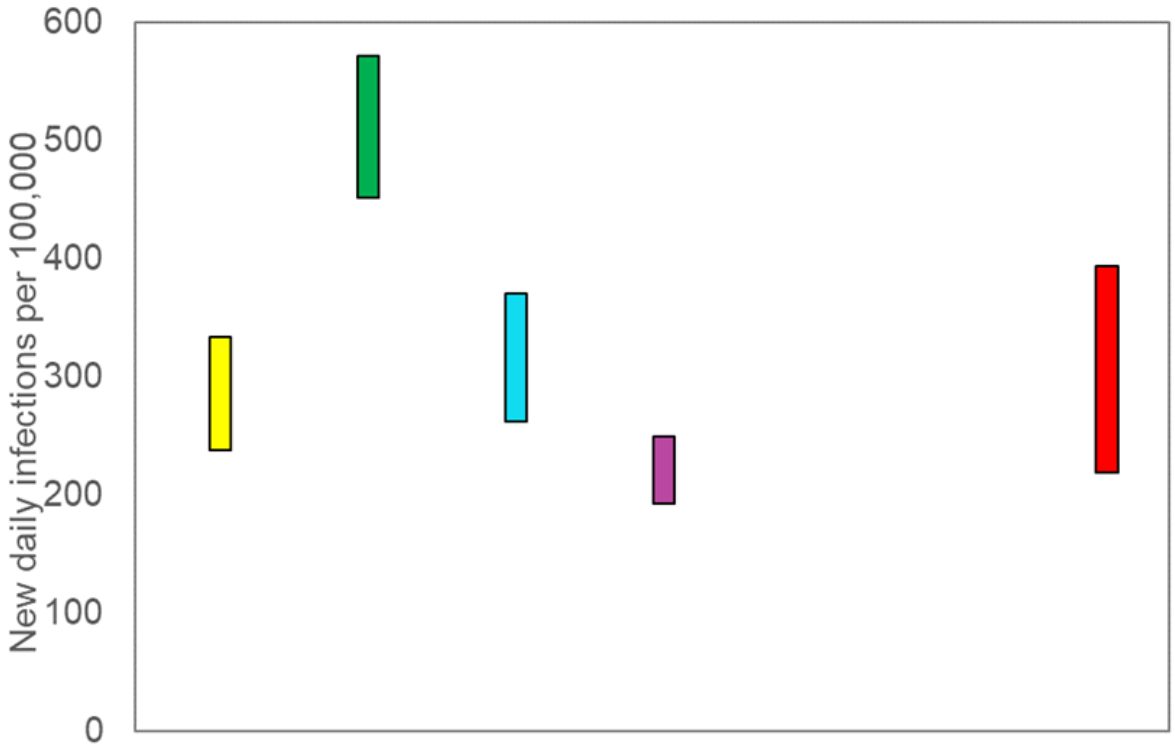


Source: EMRG

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 7th September, was that the incidence of new daily infections in Scotland was between 219 and 394 new infections per 100,000. This equates to between 12,000 and 21,500 people becoming infected each day in Scotland.

[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 20th September R, incidence and growth rate as of 7th September.

Figure 3. Estimates of incidence for Scotland, as at 7th September, including 90% confidence intervals, produced by EMRG[2].



Source: EMRG

The consensus from UKHSA for this week is that the growth rate in Scotland is between -3% and 2% per day as at 7th September. The lower and upper limits have decreased since last week.

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

Average contacts have decreased by 6% in the last two weeks (comparing surveys pertaining to 2nd September - 8th September and 16th September - 22nd September) with a current level of 5 daily contacts as seen in Figure 4. Mean contacts within the work have decreased by approximately 17% whereas contacts in the other setting (contacts outside home, school and work) have increased by 6% in the last two weeks. Contacts within the home have remained at a similar level over the same period.

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

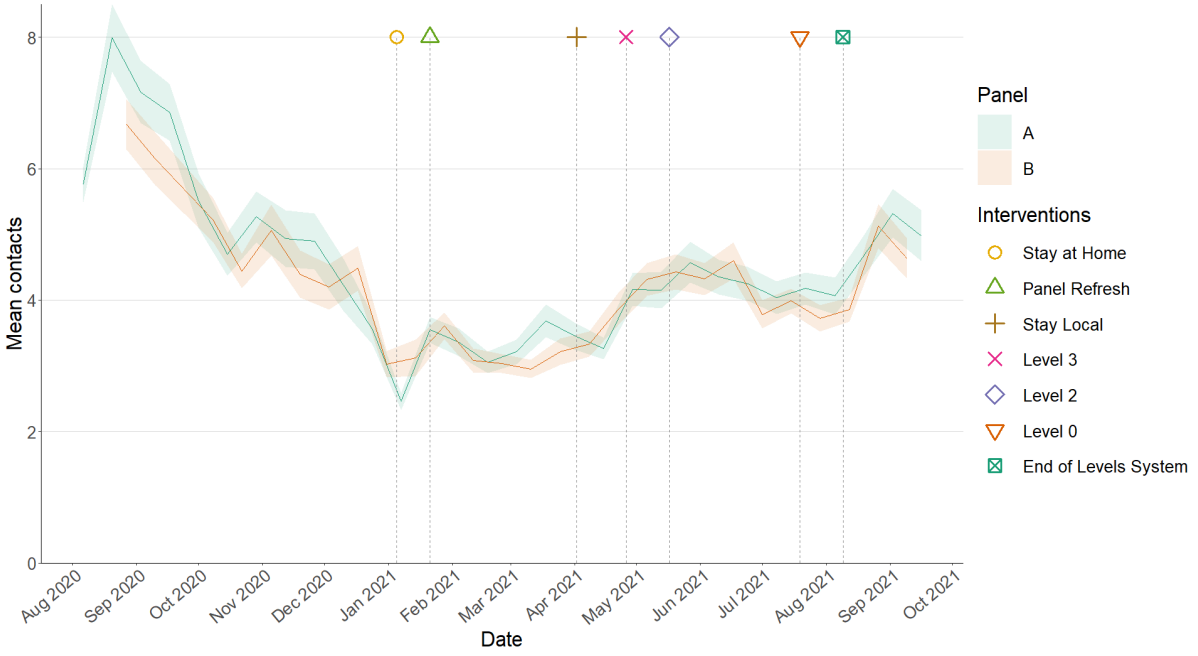
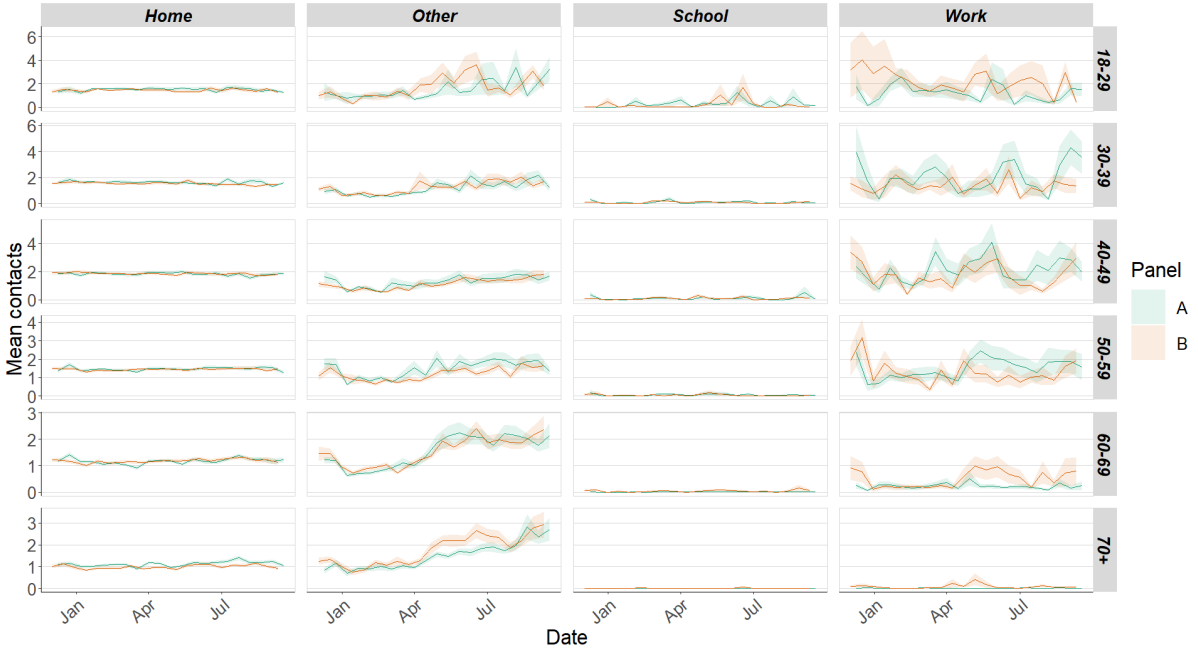


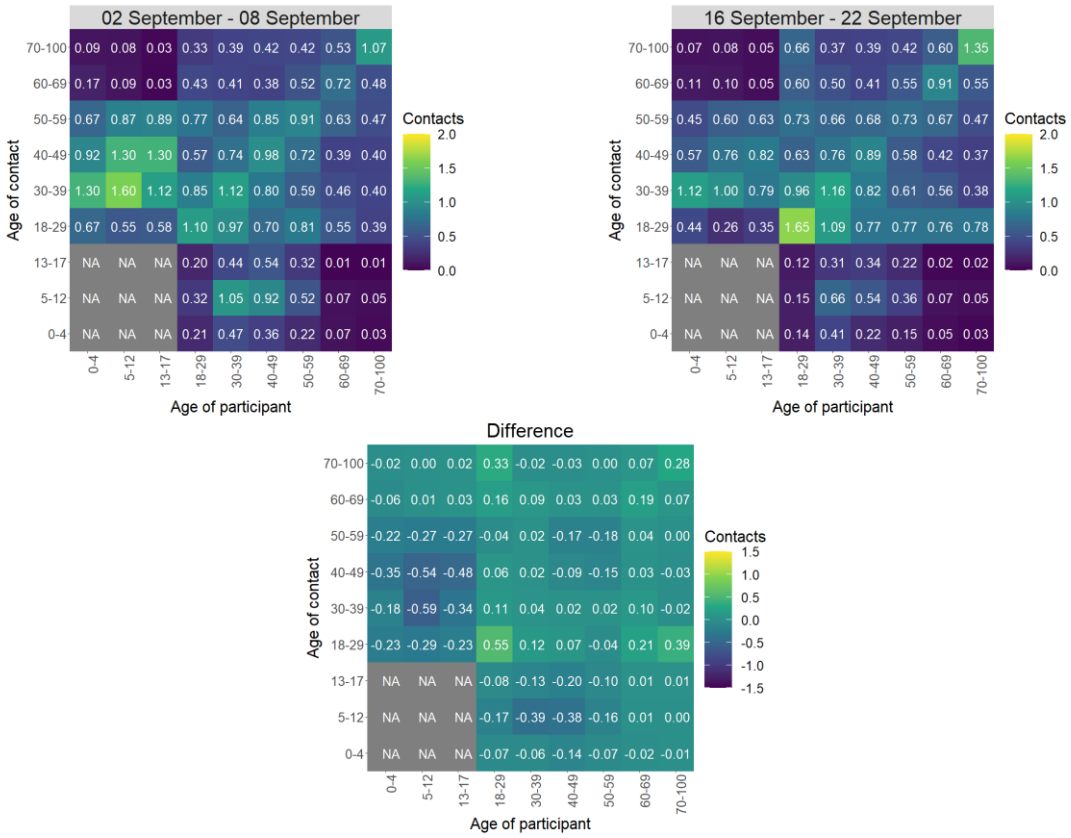
Figure 5 shows how contacts change across age group and setting. Although overall adult contacts have decreased, mean contacts for those within the 18-28 age group and individuals 60 and over have increased contacts within the last two weeks, all other age groups have reported a decrease by at least 17%. Increases in contacts are largely driven by contacts within the other setting (contacts outside home, school and work).

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 2nd September - 8th September and 16th September - 22nd September and the difference between these periods. Those aged between 18-59 have reported a decrease in interactions with those aged under 18. The biggest increase in interactions in the last two weeks is seen between those within 18-29 with each other, rising by around 50%.

Figure 6: Overall mean contacts by age group for the weeks relating to 2nd September - 8th September and 16th September - 22nd September.



As seen in Figure 7, the proportion of participants visiting different locations remains at similar levels across the majority of locations. The biggest changes are seen with those using visiting a pub or restaurant and also individuals visiting a healthcare facility. The proportion of individuals visiting a pub or restaurant increased from approximately 46% to 49% with individuals visiting a healthcare facility decreasing from 20% to 17% in the last two weeks.

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

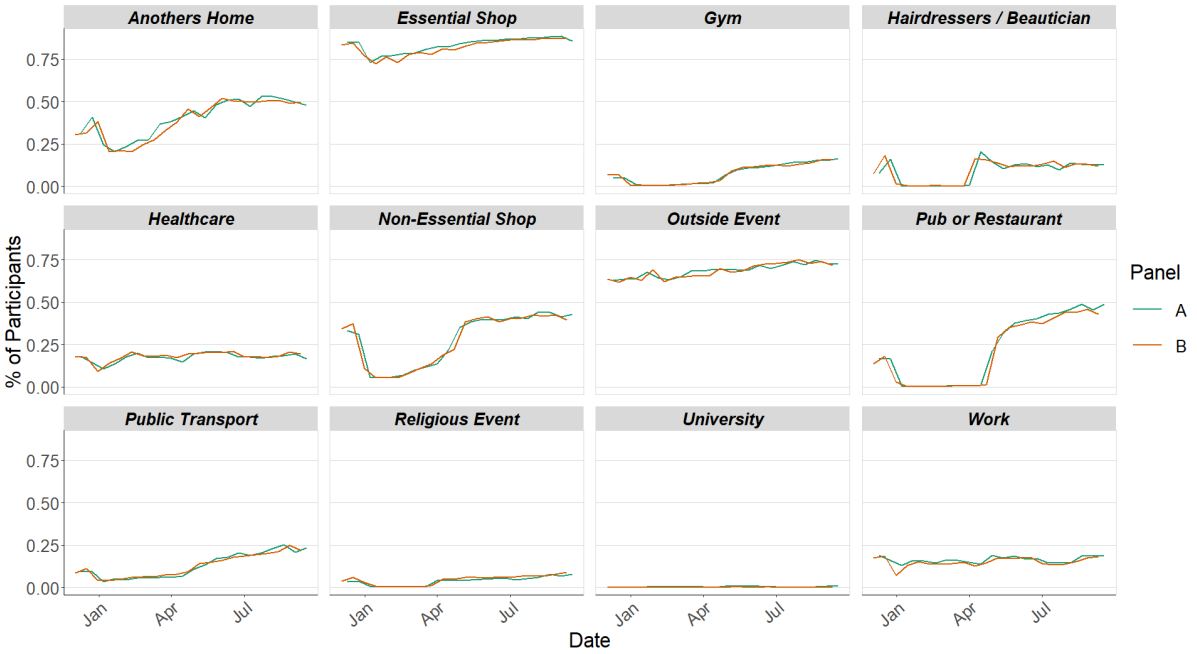


Figure 8 shows the proportion of participants that reported contacts had indoors and outdoors for contacts individually reported for panel A. A contact can be recorded as both indoor and outdoor. The graph also shows contacts reported as outside only and indoor only. The proportion of contacts reported to have been indoors only has increased from 55% to 61% within the last two weeks whereas the proportion of contacts occurring outside only has shown a decrease over the same period.

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

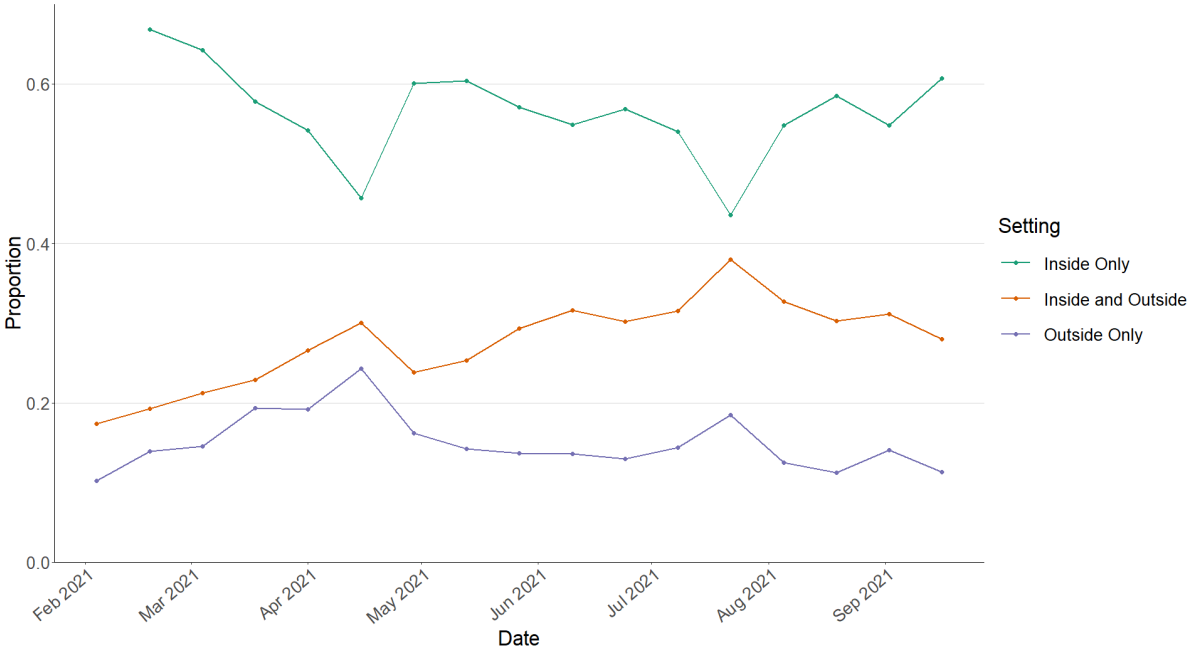
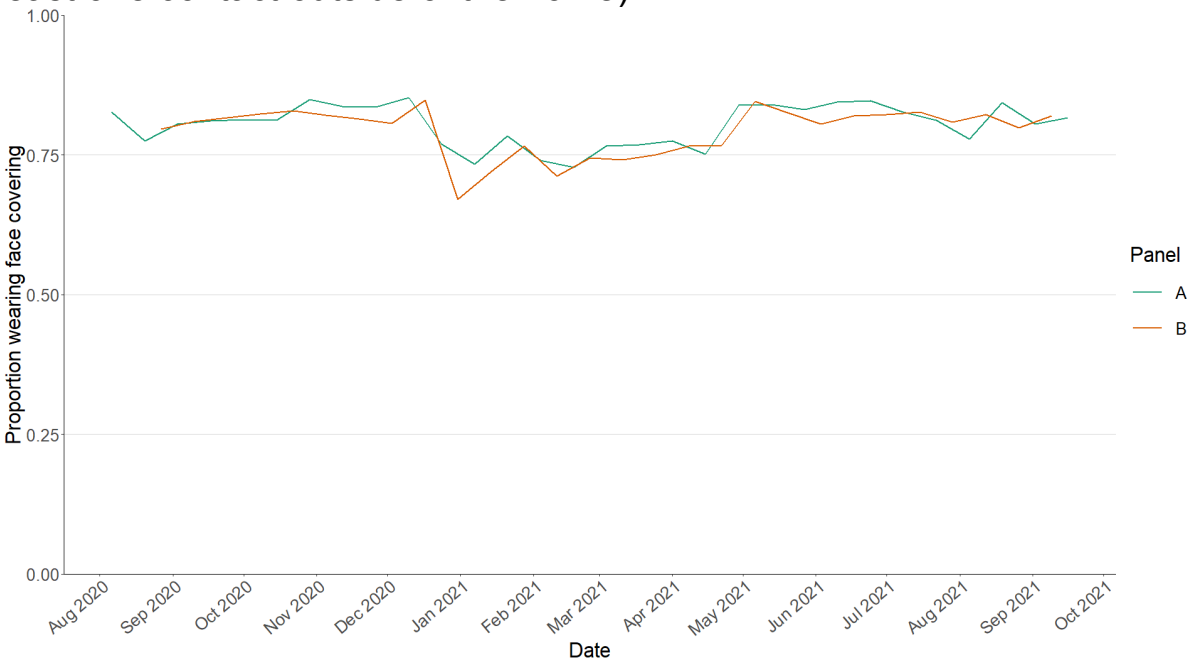


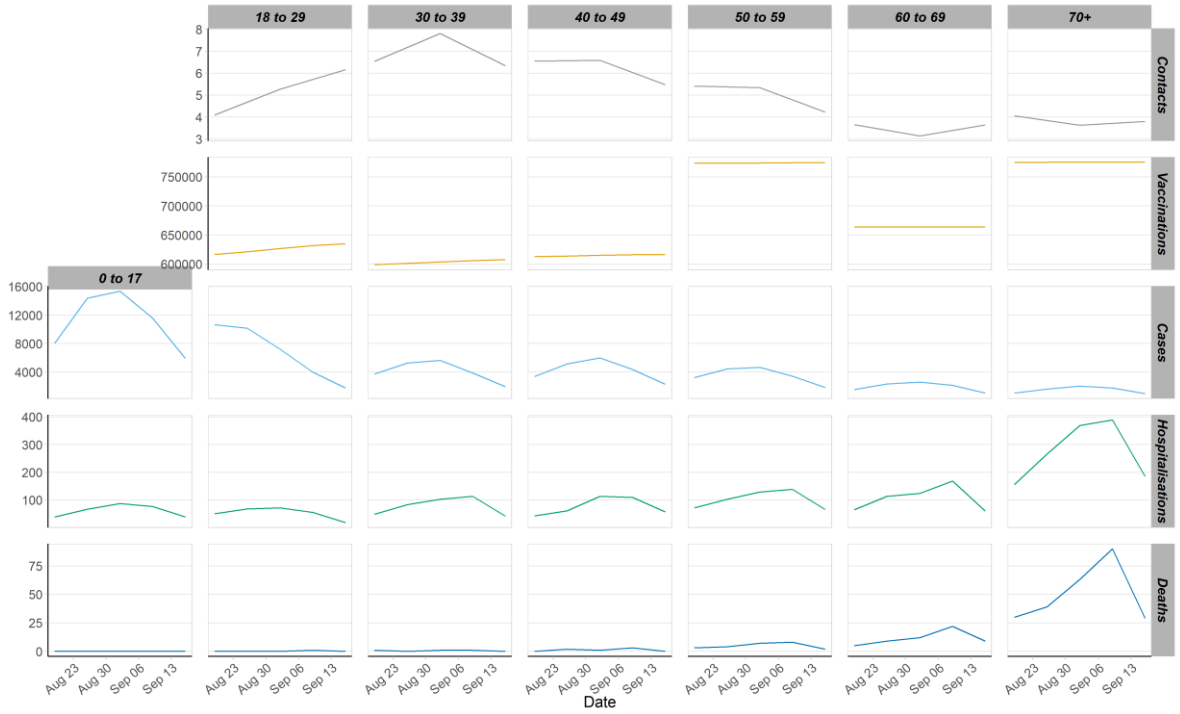
Figure 9 shows the number of people wearing a face covering where they have at least one contact outside of the home. This has remained at a similar level, currently at 82%.

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



From Figure 10, it can be seen that the oldest age group has lower levels of contacts and higher vaccinations than the youngest age groups, they also have the lowest weekly case number comparatively to the younger age groups. Despite that they have higher weekly hospitalization levels and deaths to that seen with the younger age groups.

Figure 10: Average contacts for Panel A, weekly cases, covid-19 hospital admissions and deaths[5] and cumulative vaccinations by age band[6]



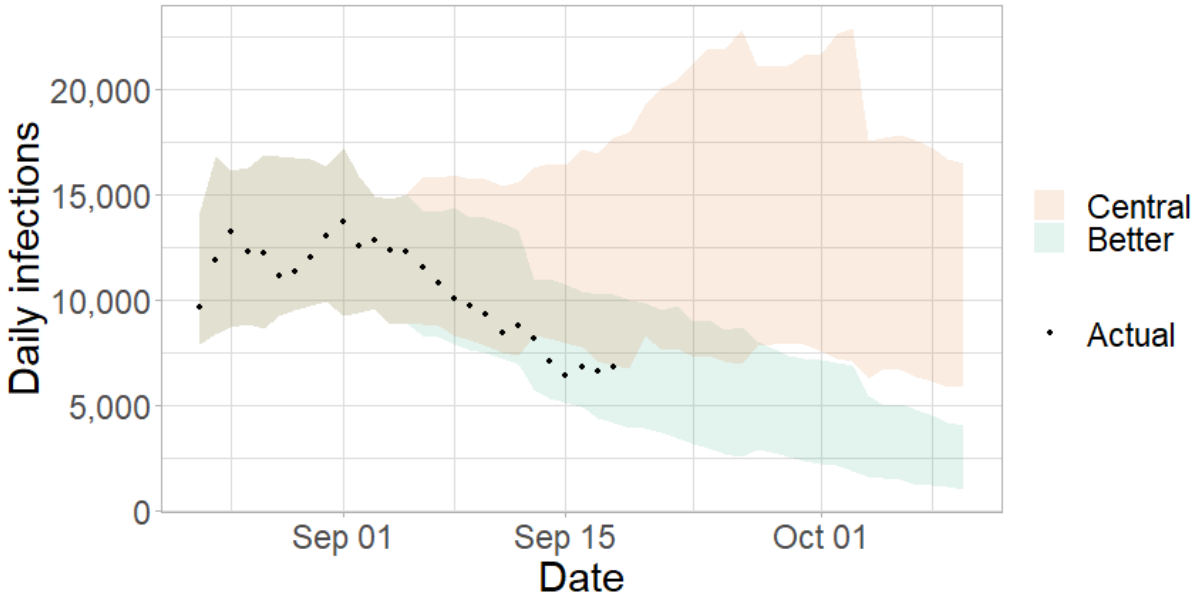
What the modelling tells us about estimated infections as well as Hospital and ICU bed demand

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 11 shows two projections over the three weeks to 10th October.

'Central' assumes that infections have plateaued. 'Better' assumes that infections continue to fall[7].

[5] Deaths, Cases and Hospitalisations from PHS COVID-19 daily cases in Scotland dashboard.
[6] 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.
[7] All scenarios are based on current vaccine roll-out plans and efficacy assumptions. Data to 20th September.

Figure 11. Medium term projections of modelled total new daily infections, adjusting positive tests[8] to account for asymptomatic and undetected infections, from Scottish Government modelling, based on positive test data reported up to 20th September.



There is uncertainty as to how much infections will increase or decrease in coming weeks.

Figure 12 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.

Hospital and ICU occupancies have plateaued. The scale of any future increase or decrease in hospital occupancy and intensive care use is highly uncertain, and depends on the number of infections.

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

Figure 12. Medium term projections of modelled hospital bed demand, from Scottish Government modelling, based on positive test data reported up to 20th September.

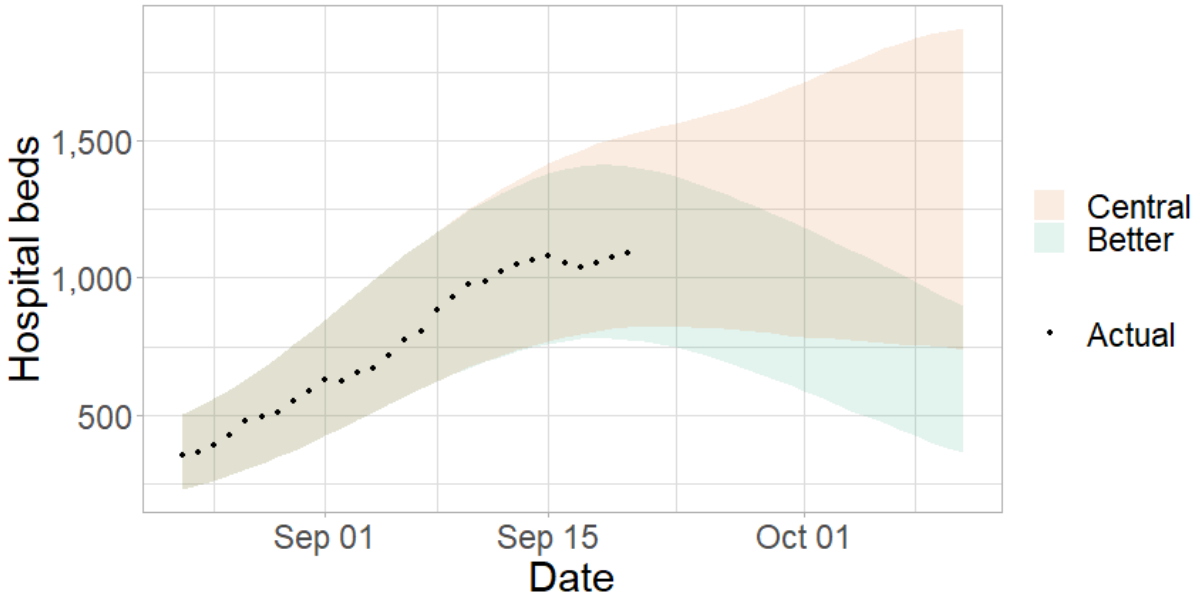
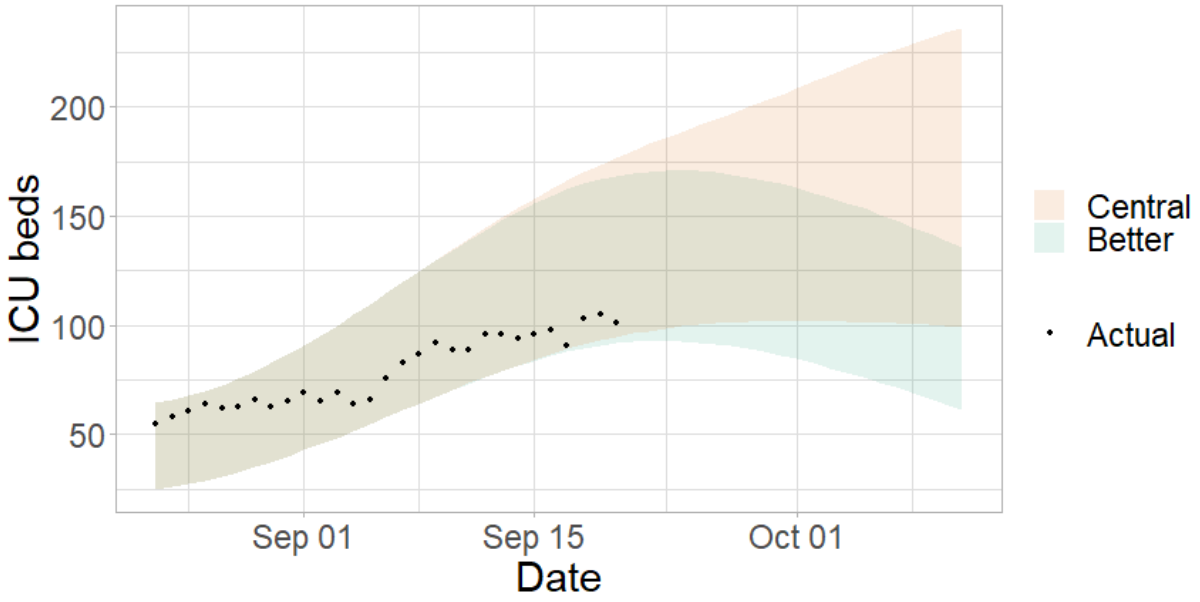


Figure 13 shows the impact of the projection on ICU bed demand.

Figure 13. Medium term projections of modelled ICU bed demand, from Scottish Government modelling[9], based on positive test data reported up to 20th September.



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

[9] 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[10] (Figures 14 and 15), combining estimates from several independent models (including the Scottish Government's logistics modelling, as shown in Figures 11-13). 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 20th September 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 20th September. 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 can be used, with judgement, as the projection from which estimates may be derived until the 5th October, albeit at lower confidence than the 90% credible interval.

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

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

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

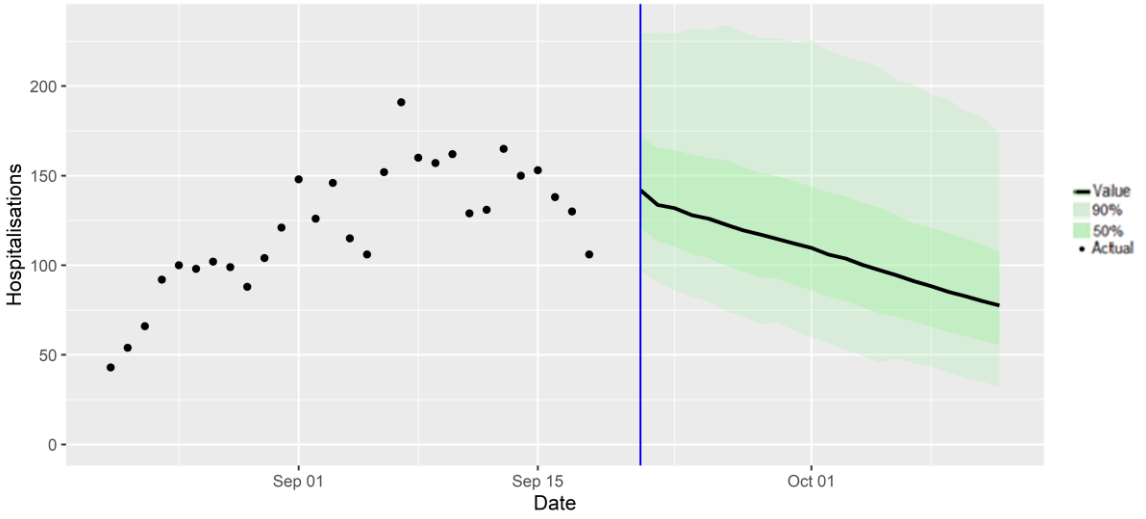
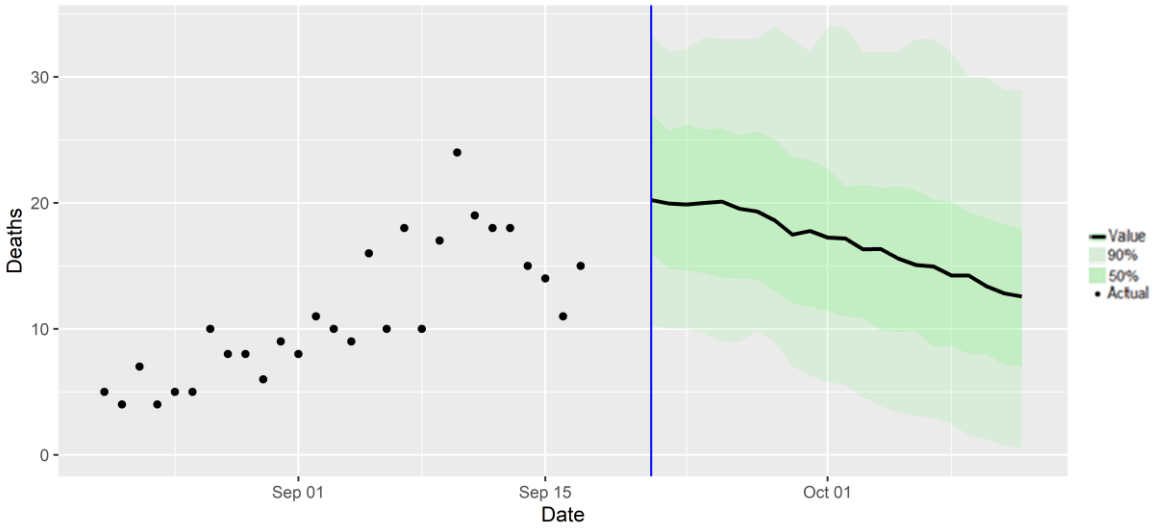


Figure 15. SPI-M medium-term projection of daily deaths in Scotland, including 50% and 90% credible intervals.



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 20th September 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.

Because infections may still be rising rapidly in some areas, the local projections may not fully reflect this.

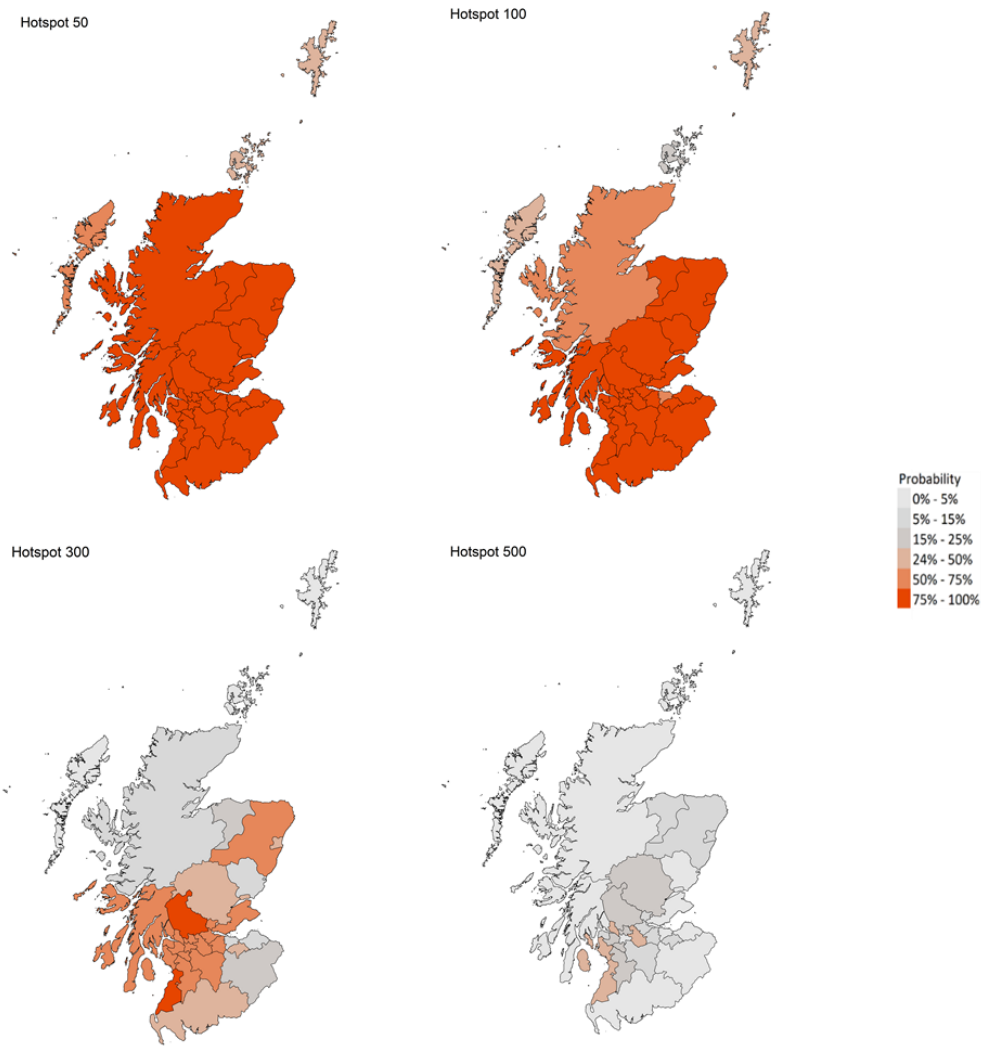
Modelled rates of positive tests per 100K using data to 20th September (Figure 16) indicate that, for the week commencing 3rd October 2021, there are 29 local authorities which are expected to exceed 50 cases per 100k with at least 75% probability[11].

Of these, 2 local authorities are expected to exceed 300 cases per 100k with at least 75% probability. These are South Ayrshire and Stirling.

There are no local authorities which are expected to exceed 500 cases per 100k with at least 75% probability[12].

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

Figure 16. Probability of local authority areas exceeding thresholds of cases per 100K (3rd to 10th October 2021), data to 20th September[13].



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

Levels of Covid-19 in wastewater 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.

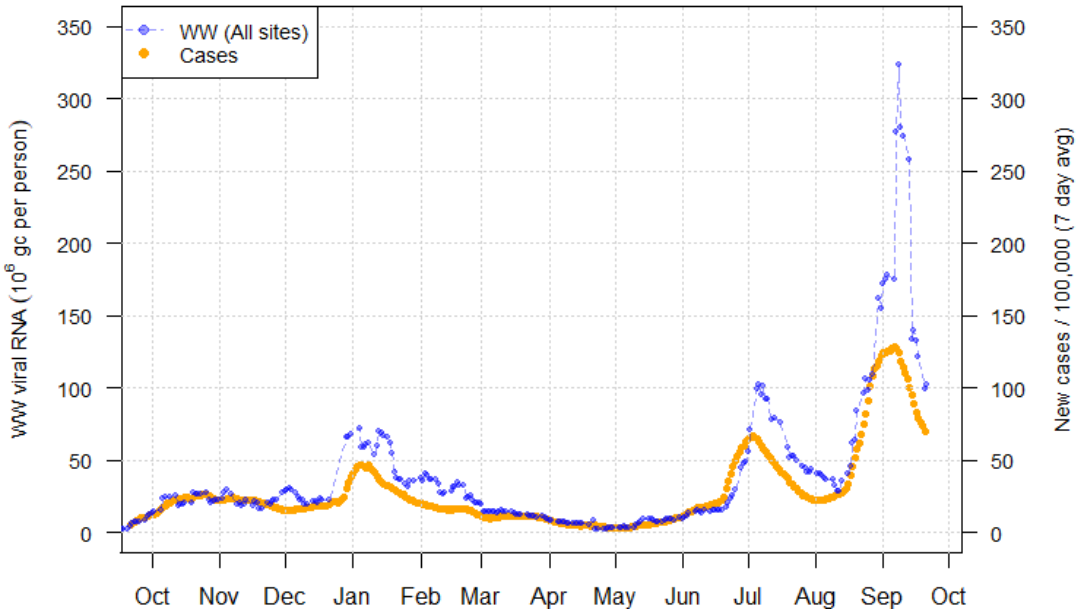
Nationwide, levels of wastewater (WW) COVID-19 RNA have fallen to around 100 Mgc/p/d from between 250 and 300 Mgc/p/d two weeks ago (depending on whether or not potentially anomalous values were

[13] Please note fewer models have contributed than in previous weeks to generate the Local Authority forecasts, which should be considered when using this week's findings.

excluded). This corresponds to the recent fall in the number of new cases.

Figure 17 shows the national running average trend for the full set of sampled sites. Note that in this report a new methodology for visualization of national trends has been introduced (see methodology update).

Figure 17. National running average trends in wastewater Covid and daily new case rates (7 day moving average). 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 Covid average using the last 7 days of data is computed at every sampling date.



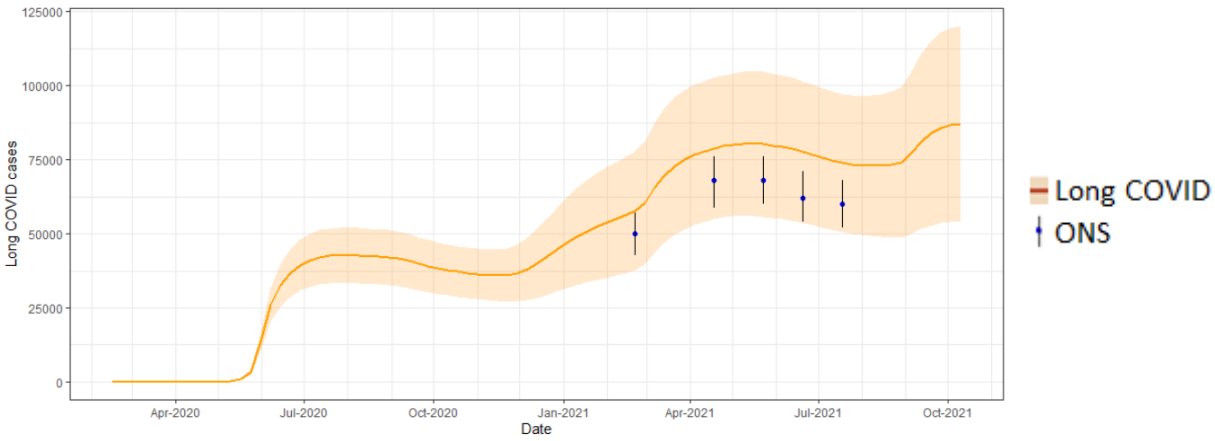
What estimates do we have of the number of people experiencing long Covid symptoms?

The Scottish Government is modelling the number of people likely to experience long Covid symptoms. This has been projected to estimate self-reported long Covid rates in the future, based on Scottish Government medium term projection modelling, as set out in Figure 18.

This modelling estimates that at 10th October 2021 between 54,000 (1.0% of the population) and 120,000 (2.2%) people are projected to experience symptoms 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 18. Estimates of long Covid prevalence at 12 weeks from 16th February 2020 to 10th October 2021 for the better long Covid rates (showing 90% confidence interval). ONS estimates with range also shown.



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.

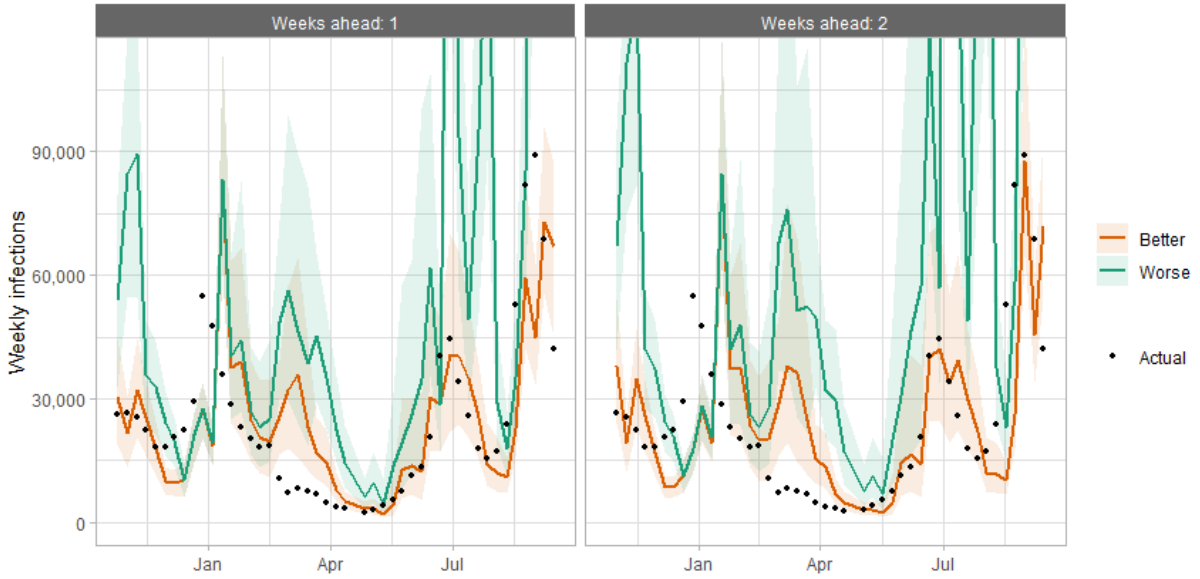
Modelling also allows us to make short-term forecasts of what may happen with a degree of uncertainty. These can be used in health care and other planning. The modelling in this research findings is undertaken using different types of data which going forward aims to both model the progress of the epidemic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

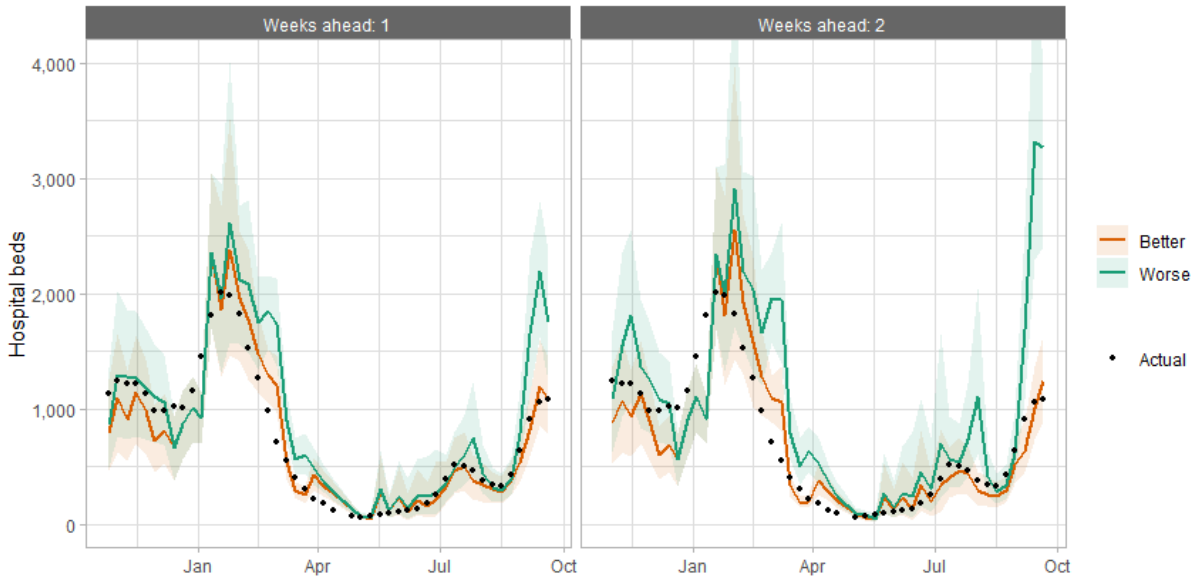
The following charts show the history of our modelling projections in comparison to estimates of the actual data. The infections projections were largely accurate during October to mid-December and from mid-January onward. During mid-December to mid-January, the projections underestimated the number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

Figure 19. 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 20. 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, after which they include people in ICU over the 28 day limit.

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

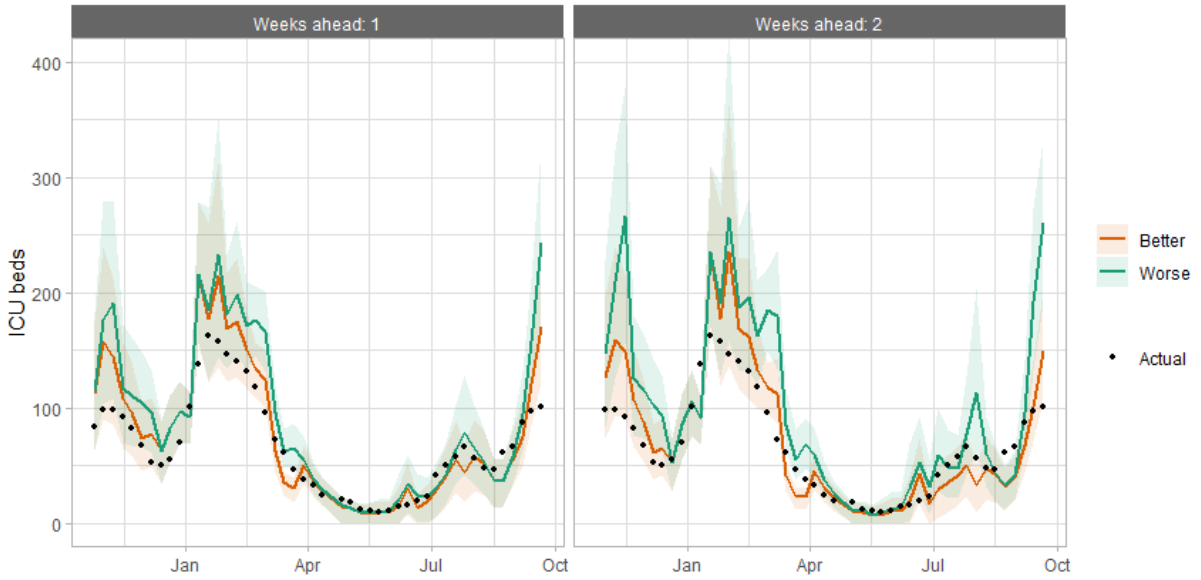


Table 1. Probability of local authority areas exceeding thresholds of cases per 100K (3rd to 10th October 2021), data to 20th September.

	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%	5-15%	0-5%	0-5%
Angus	75-100%	75-100%	5-15%	0-5%	0-5%	0-5%
Argyll and Bute	75-100%	75-100%	50-75%	0-5%	0-5%	0-5%
City of Edinburgh	75-100%	50-75%	5-15%	0-5%	0-5%	0-5%
Clackmannanshire	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
Dumfries & Galloway	75-100%	75-100%	25-50%	0-5%	0-5%	0-5%
Dundee City	75-100%	75-100%	25-50%	0-5%	0-5%	0-5%
East Ayrshire	75-100%	75-100%	50-75%	15-25%	0-5%	0-5%
East Dunbartonshire	75-100%	75-100%	50-75%	15-25%	5-15%	0-5%
East Lothian	75-100%	75-100%	5-15%	0-5%	0-5%	0-5%
East Renfrewshire	75-100%	75-100%	50-75%	15-25%	0-5%	0-5%
Falkirk	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
Fife	75-100%	75-100%	50-75%	0-5%	0-5%	0-5%
Glasgow City	75-100%	75-100%	50-75%	0-5%	0-5%	0-5%
Highland	75-100%	50-75%	5-15%	0-5%	0-5%	0-5%
Inverclyde	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
Midlothian	75-100%	75-100%	25-50%	5-15%	0-5%	0-5%
Moray	75-100%	75-100%	15-25%	5-15%	0-5%	0-5%
Na h-Eileanan Siar	50-75%	25-50%	0-5%	0-5%	0-5%	0-5%
North Ayrshire	75-100%	75-100%	50-75%	25-50%	0-5%	0-5%
North Lanarkshire	75-100%	75-100%	50-75%	25-50%	0-5%	0-5%
Orkney Islands	25-50%	15-25%	0-5%	0-5%	0-5%	0-5%
Perth and Kinross	75-100%	75-100%	25-50%	15-25%	5-15%	5-15%
Renfrewshire	75-100%	75-100%	50-75%	15-25%	0-5%	0-5%
Scottish Borders	75-100%	75-100%	15-25%	0-5%	0-5%	0-5%
Shetland Islands	25-50%	25-50%	0-5%	0-5%	0-5%	0-5%
South Ayrshire	75-100%	75-100%	75-100%	25-50%	15-25%	5-15%
South Lanarkshire	75-100%	75-100%	50-75%	5-15%	0-5%	0-5%
Stirling	75-100%	75-100%	75-100%	15-25%	5-15%	0-5%
West Dunbartonshire	75-100%	75-100%	50-75%	25-50%	0-5%	0-5%
West Lothian	75-100%	75-100%	50-75%	5-15%	0-5%	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 8th and 15th September, 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.

Local authority (LA)	Average daily WW case estimate, with outliers included		Average daily WW case estimate, with outliers removed		Coverage[15]
	w/b 8th September	w/b 15th September	w/b 8th September	w/b 15th September	
Aberdeen City	10	41	10	41	80%
Aberdeenshire	64	59	53	59	37%
Angus	114	130	114	130	56%
Argyll and Bute	--	--	--	--	3%
City of Edinburgh	105	87	105	87	97%
Clackmannanshire	170	71	133	71	92%
Dumfries & Galloway	122	39	119	39	39%
Dundee City	114	146	114	146	100%
East Ayrshire	225	70	225	70	72%
East Dunbartonshire	181	--	181	--	0%
East Lothian	98	87	98	87	56%
East Renfrewshire	91	150	91	150	95%
Falkirk	94	93	94	93	69%
Fife	166	106	166	106	52%
Glasgow City	186	149	186	149	63%
Highland	82	75	82	75	31%
Inverclyde	111	62	111	62	93%
Midlothian	105	100	105	100	88%
Moray	38	33	38	33	70%
Na h-Eileanan Siar	0	10	0	10	21%
North Ayrshire	100	44	100	44	93%
North Lanarkshire	278	183	278	183	74%
Orkney Islands	36	13	36	13	34%
Perth and Kinross	99	107	99	107	44%
Renfrewshire	112	126	112	126	57%
Scottish Borders	36	18	36	18	48%
Shetland Islands	12	7	12	7	29%
South Ayrshire	225	41	225	41	88%
South Lanarkshire	220	129	220	129	78%
Stirling	51	--	51	--	10%
West Dunbartonshire	180	5	180	5	50%
West Lothian	114	136	114	136	74%

[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 both with and without the outliers removed. See Technical Annex in Issue 60 of these Research Findings for further details.

[15] Coverage as at the week beginning 15th September 2021, when outliers are excluded.

A new methodology has been introduced for visualisation of national trends in wastewater. Instead of computing average wastewater viral RNA levels at weekly intervals, the computation is now done as a running average at each date a sample was taken. Specifically, all samples taken in the seven days up to each date are considered, computing averages for each site with a sample and combining the sites using a population weighting.

The advantage of this methodology is that it gives a greater temporal resolution to the visualization of changes in viral levels. Note that individual jumps in the aggregate value may correspond to changes in the composition of sites sampled, especially if the frequency of samples at each site has changed over time.

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: 978-1-80201-409-9

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

Produced for
the Scottish Government
by APS Group Scotland
PPDAS945846 (09/21)
Published by
the Scottish Government,
September 2021

ISBN 978-1-80201-409-9

Web Publication

PPDAS945846 (09/21)