Llywodraeth Cymru
Welsh Government

Winter Modelling 2023-24

September 2023

Science Evidence Advice (SEA)

Providing evidence and advice for Health and Social Services Group on behalf of the Chief Scientific Advisor for Health

gov.wales

Summary

Winter pressures on the NHS occur annually but estimating the extent of those pressures for an upcoming winter can be challenging. In this paper there are several modelled scenarios to suggest what could happen during the 2023-24 winter period. This includes a breakdown of known seasonal illnesses (those which occur more often in the winter months than other times of the year) such as influenza (flu), pneumonia and Respiratory Syncytial Virus (RSV). There are also scenarios for COVID-19, however it's important to note that we do not know yet if COVID-19 is predominantly a winter virus. The continuous rise and fall in the number of Covid infections adds to the demand for healthcare. This demand may put more pressure on the system over the winter months due to the presence of other compounding factors such as higher numbers of respiratory illnesses. This pressure is in addition to the continuous demand that has been seen over the summer months in recent years.

The elective care backlog has been a focal point for NHS system recovery following the Coronavirus pandemic. Scenarios included here show what may happen to these figures in the first winter following the pandemic.

In this paper we also explore other factors that may have more of an impact during winter such as the cost of living crisis and in particular, fuel poverty. The increased cost of living can be exacerbated over the colder months due to the need for heating and warmer clothes. This may result in poorer health for those struggling to pay for these increased needs, resulting in higher demand for care. For example, poor housing conditions like damp and mould tend to get worse in the winter months and can lead to respiratory conditions or exacerbate existing respiratory conditions.

As with all modelling, the scenarios in this paper are not a prediction of what will happen but estimates of what could happen based on historic data. We could also see similar numbers of admissions and occupancy but occurring at a different time in the season. We aim to produce a smaller number of scenarios which may be shifted forwards or backwards in time, rather than a large number of scenarios where one of them is likely to be the correct one. There are also short and medium term projections that give a more accurate short-term picture of likely pressures due to winter viruses.

Background

The demand for healthcare services increases over the winter months in Wales, putting pressure on the NHS to meet this increase. This paper explores some of the main reasons that demand is expected to rise during the 2023-24 winter period but there may be other risks that occur. The five harms framework, can be used to assess where risks could arise from, outlined in table 1. The five harms framework was originally developed to assess the potential impact of the Coronavirus pandemic and can be explored further in the Technical Advisory Group paper - Five harms arising from COVID-19: consideration of potential baseline measures.[1]

[1] technical-advisory-group-5-harms-arising-from-covid-19_0.pdf (gov.wales)

Table 1: Five harms framework applied to potential scenarios in Wales, winter 2023-24

Potential harm	Example of harm
Direct harm	Respiratory infections on those infected
Indirect harm	Mismatch between demand and supply in the NHS
Population-based health protection measures	Long term mental health and wellbeing as a result of isolation
Economic harms	Cost of living crisis, unemployment due to reduced consumer confidence Loss of workforce due to short and long term sickness and caring roles
Exacerbation or introduction of health inequalities	Higher demand for services in more deprived areas, resulting in fewer needs being met for long term conditions

There are many years of data for some conditions which occur more often over the winter period, such as flu and RSV. In addition, we now need to consider potential increases in COVID-19 cases over these months. We have seen a rise in COVID-19 cases over the winter period in 2020-21 and 2021-22 and there is evidence from other countries showing similar patterns, however this may not be enough evidence to be certain that this is a virus that peaks primarily during the winter months.[2] Covid has been rising and falling throughout the spring and summer months of 2023; therefore, there are still some fluctuations in the trends. COVID-19 surveillance is continuously carried out, allowing for preparation for future increases in demand from new variants. The emergence of variant BA.2.86 is currently being closely monitored but, at the time of writing, there is no evidence that this variant will cause hospitalisations to increase above the trends seen in recent months.

In addition to COVID-19, there is also the indirect health risk of the cost-of-living crisis. With inflation rises[3] suggesting that these cost pressures will continue over the winter 2023-24 period, we could see a compound increase in health needs due to a significant proportion of the population experiencing a lack of resources to meet basic needs like keeping warm and eating a nutritious diet.

[2] Is COVID-19 seasonal? A time series modeling approach | medRxiv
[3] Consumer price inflation, UK - Office for National Statistics

Top line summary - respiratory viruses modelling

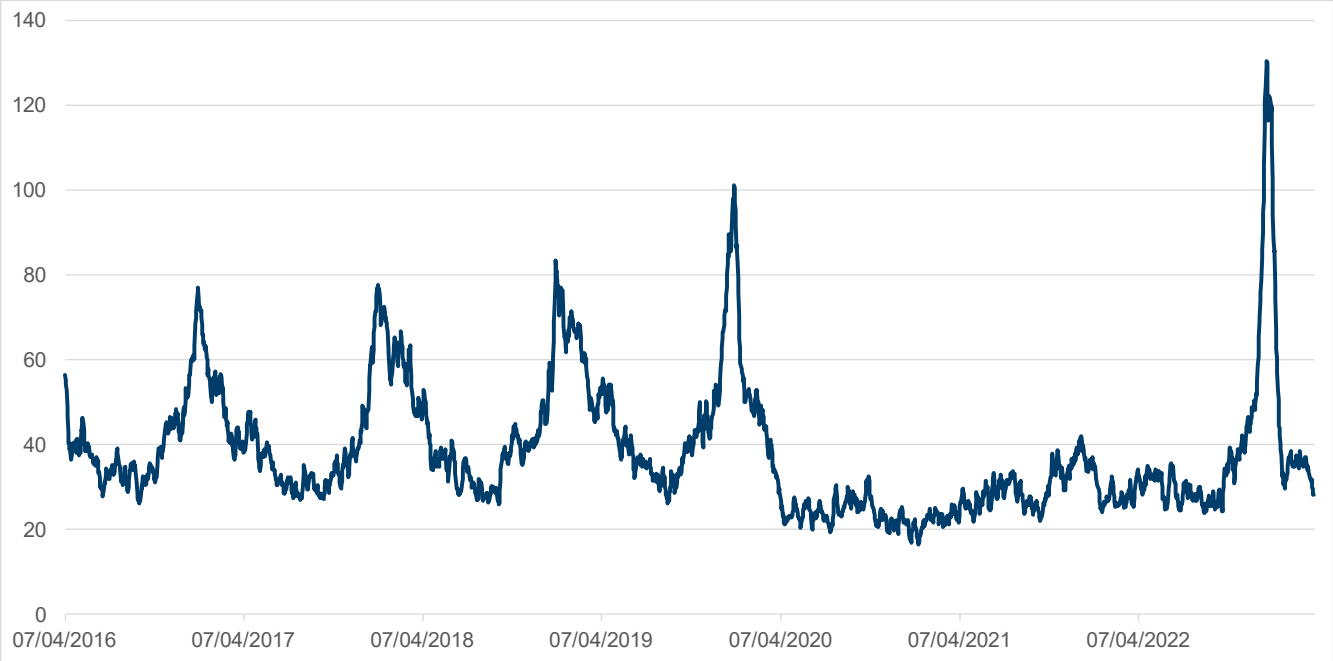
- Modelling scenarios for flu and pneumonia show daily admissions peaking at between 85 (scenario 1) and 125 (scenario 3) and occupancy peaking at 420 (scenario 1) and 630 (scenario 3).
- In scenario 1 for RSV, daily admissions peak at around 30 and occupancy peaks at 60, this scenario is for one large wave. Scenario 2 includes a smaller early wave and a larger later wave, admissions peak at around 10 (first wave) and 30 (second wave), occupancy peaks at around 20 (first wave) and 45 (second wave). As many RSV-related admissions are for short time periods (many less than 24 hours), occupancy peaks are almost simultaneous with admissions peaks.
- Modelling scenarios for COVID-19 were provided by Swansea University and include multiple waves. With the optimistic wave plateauing for most of the season and decreasing towards the end. The most likely scenario peaks every two-months. The reasonable worst case and COVID-19 urgent scenarios have 2 peaks occurring 3 months apart. For the most likely scenario, daily admissions peak at around 55 and occupancy peaks at around 645.
- Combined scenarios include flu and pneumonia, RSV and COVID-19. In the most likely scenario, daily admissions peak at around 145 and occupancy peaks at around 1,060. This compares to a 5-year average daily admissions peak of around 165 and occupancy peak of around 920. In the reasonable worst case scenario admissions peak at around 205 and occupancy peaks at around 1,690. The NHS in Wales has around 10,300 beds so this would represent around 10-16% of beds occupied due to winter viruses.

Flu and pneumonia

1. Actual data

Following a fairly constant, low level of influenza and pneumonia admissions from spring 2020 to summer 2022, the 2022-23 winter season saw a peak in admissions approximately 1.5x the levels usually seen before the COVID-19 pandemic. However, the actual total number of admissions seen throughout the season was slightly lower than pre-COVID-19 levels. The peak fell in mid-December 2022, which is a similar timing to the seasons seen before the COVID-19 pandemic.

Figure 1: Influenza and pneumonia admissions (rolling 7 day average) – April 2016



Source: Digital Health and Care Wales

Notes:

1. Data includes diagnosis codes J09 to J18 (influenza and pneumonia) from the International Classification of Diseases, version 10 (ICD-10)

Table 2: Total influenza and pneumonia admissions by season (seasons run from 1st April – 31st March)

Season (April-March)	Total admissions
2016-17	15,268
2017-18	15,560
2018-19	16,093
2019-20	16,730
2020-21	8,610
2021-22	10,774
2022-23	14,603
Pre-Covid (2016-17 to 2019-20) average	15,913

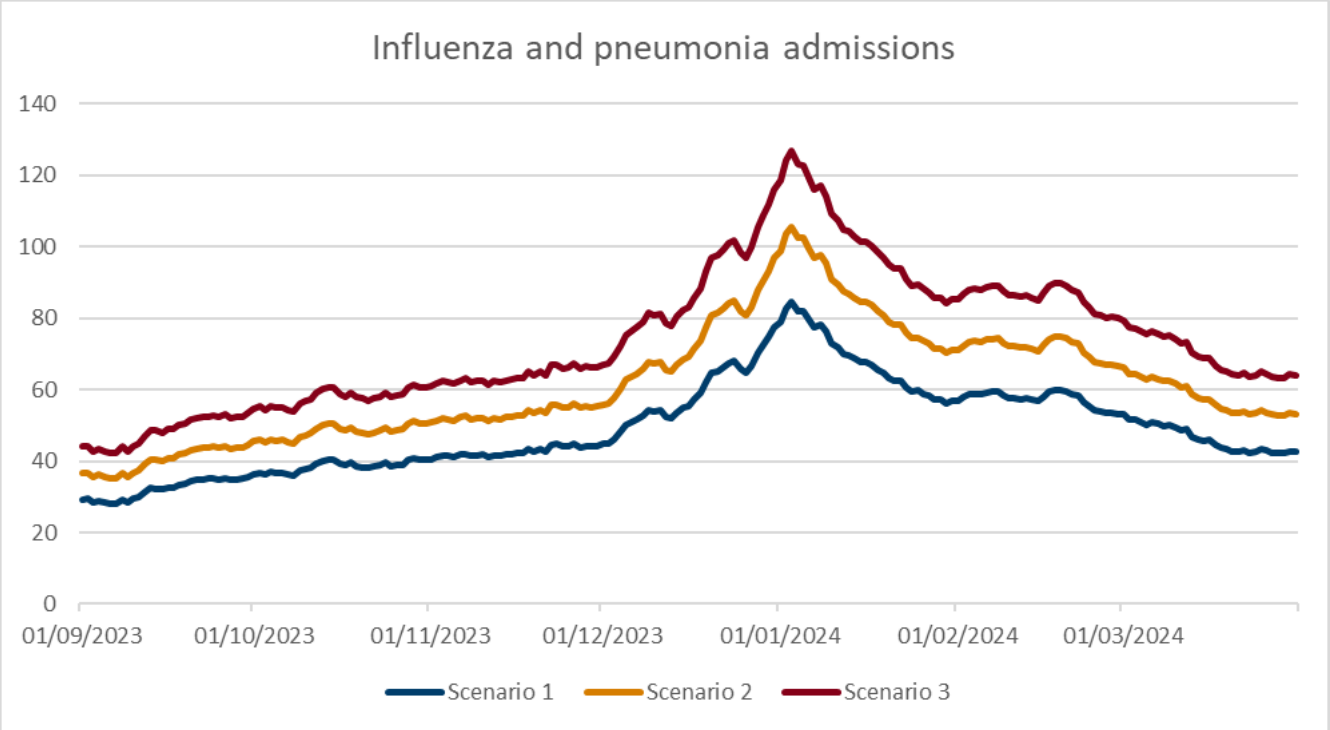
2. Winter 2023-24

Following the higher peak seen in winter 2022-23, the following scenarios were developed for winter 2023-24:

1. A flu season with the peak in admissions at the average height seen between 2016 and 2020
2. A season with the peak in admissions at 1.25x the average height seen between 2016 and 2020
3. A season with the peak in admissions at 1.5x the average height seen between 2016 and 2020

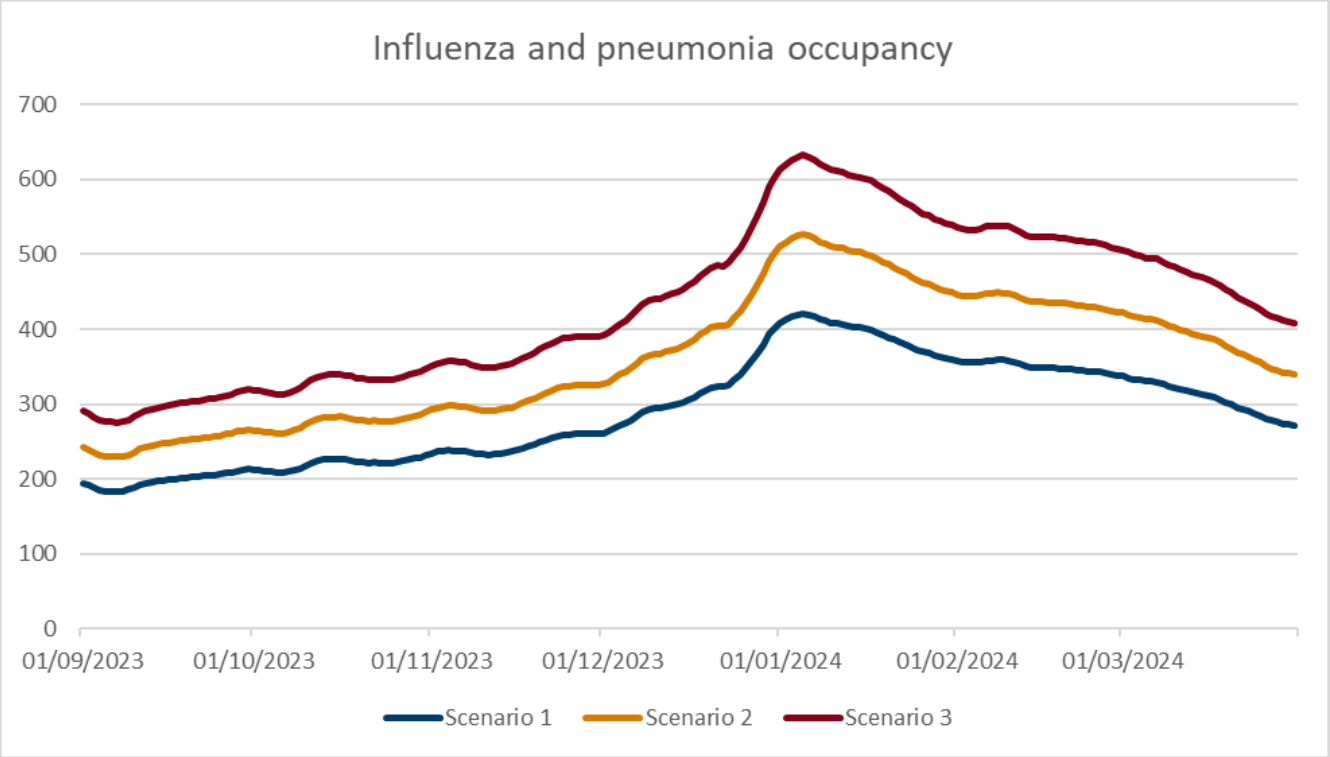
No models were run for a season hitting earlier or later than usual, given the normal timing seen last year, and that at the time of writing, Public Health Wales were reporting a baseline (low) level of influenza activity.[4]

Figure 2: Daily influenza and pneumonia admissions scenarios – Winter 2023-24



[4] Weekly Influenza and Acute Respiratory Infection Report - Public Health Wales (nhs.wales)

Figure 3: Daily influenza and pneumonia occupancy scenarios – Winter 2023-24



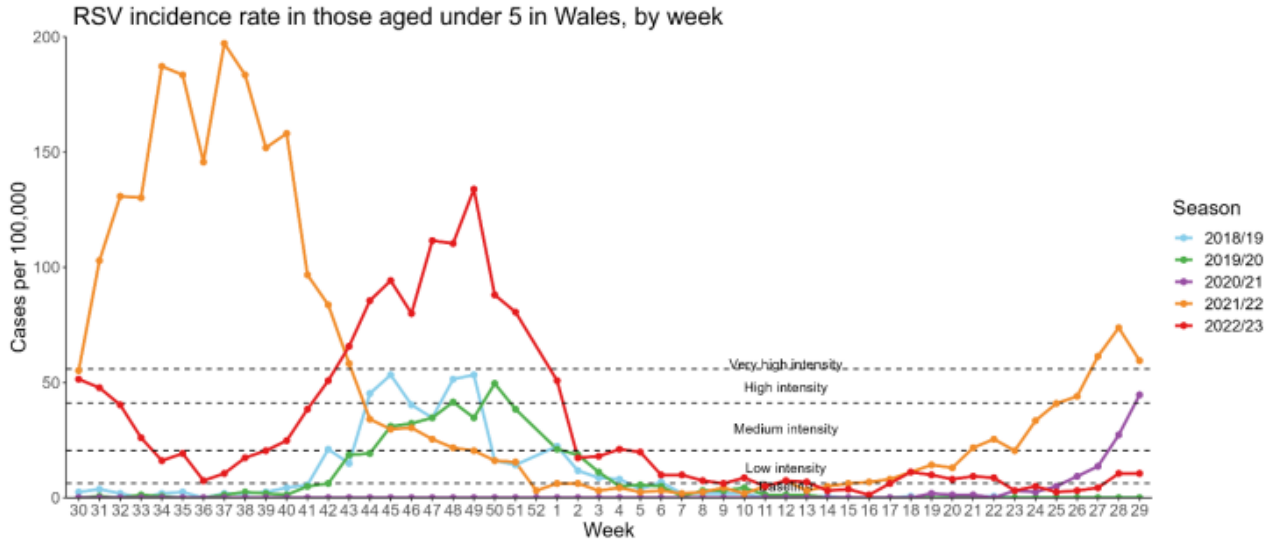
Respiratory syncytial virus (RSV)

RSV admissions are typically for bronchiolitis, and occur most often in children under 5, especially children in the first year of life.

1. 2022-23 models comparison to actual data

Following very low levels of RSV during Winter 2020-21 when COVID-19 interventions were being implemented, there was demand for modelling to be carried out to project what level of hospital activity may be seen in relation to RSV, to allow hospitals to plan and prepare. RSV can cause particular pressures on paediatric intensive care unit (PICU) beds, which in the past has sometimes necessitated children being conveyed by ambulance to PICUs in England.

Figure 4: RSV incidence rate in those aged under 5 in Wales, by week 2018-19 to 2022-23



*RSV seasons are monitored from W30 to W29, the most recent data is presented in red

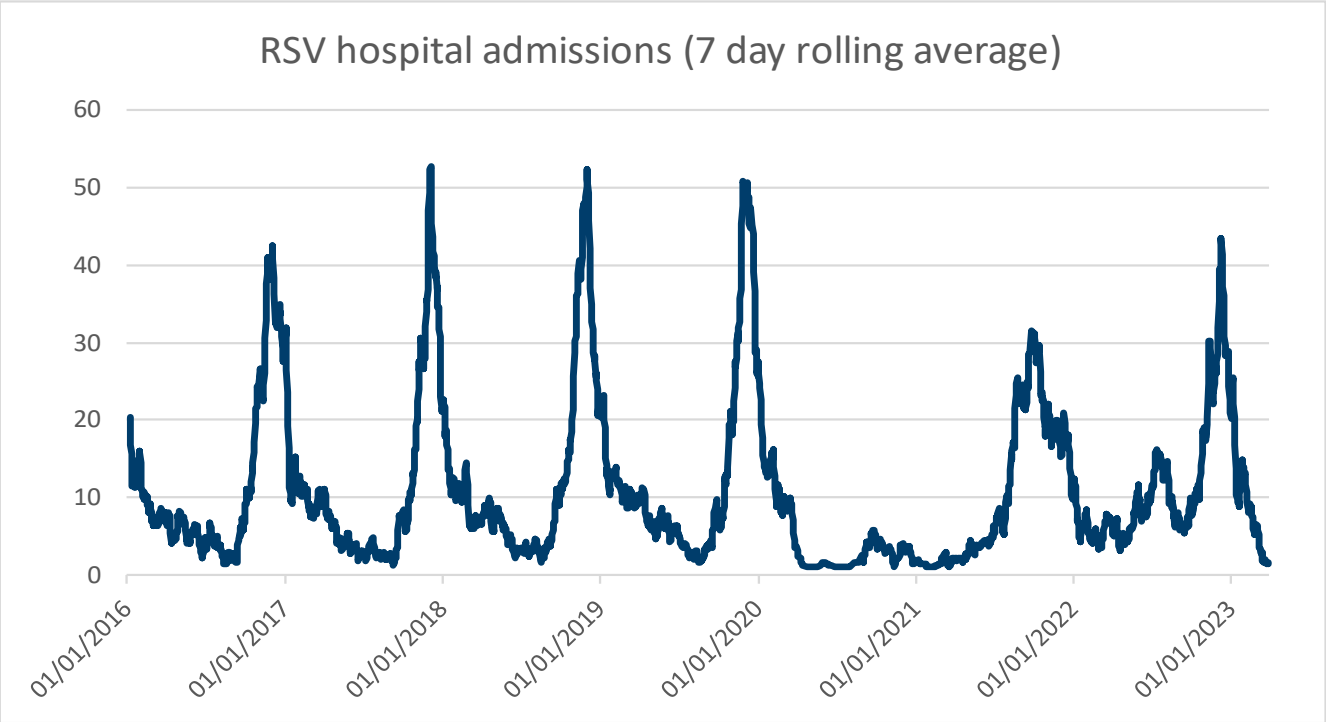
Source: Public Health Wales

It is difficult to compare the incidence in Figure 4 between seasons, as the amount of testing carried out each winter is not necessarily consistent (there is also positivity data which is potentially more comparable), however it does give a good comparison of the timing of each RSV season. You can see the early winter 2021-22 season in the orange line, when levels started to rise from around week 25 (21 June 2021, beginning on the purple line for the 2020-21 season), with a peak spanning from week 34 (23 August 2021) to week 38 (20 September 2021), then decreasing rapidly until the end of October, with lower levels of activity until the end of 2021. In 2022, incidence began to rise at the start of May (week 18, shown above in the orange line), giving the impression that the RSV season may once again arrive early.

As such, the Welsh Government SEA team began to develop scenarios for an early season, similar to that seen in 2021. These were published in October 2022.[5] However, incidence began to fall from around week 28 (11 July 2022), returning to low intensity by mid-August. While intensity of incidence does not necessarily indicate the same in hospital activity, as the amount of testing being carried out may be higher or lower than in previous seasons, and it appears this summer peak was a lot smaller than the previous peak so it was likely that further RSV activity would be seen in the winter. As expected, it began to rise again in early September. At this point, the published models were revised, for a season closer to “normal” (pre-pandemic) timing, with a scenario for a peak the height of the 2021-22 season, plus a scenario showing the same, less the proportion of the population already infected in the small summer peak. These were published in January 2023. [6] The incidence ultimately peaked at the start of December and returned to low intensity by the end of January 2023.

[5] Science Evidence Advice: Winter modelling 2022 to 2023 | GOV.WALES
[6] Science Evidence Advice: Winter modelling paper update - December 2022 | GOV.WALES

Figure 5: RSV paediatric hospital admissions, 1 January 2016 to 28 March 2023 (7 day rolling average)



Source: Digital Health and Care Wales

Figure 5 above gives a more reliable comparison of the actual levels of RSV seen, from hospital admissions from the PEDW data. The early winter 2021 peak was about two thirds of the height of a pre-COVID-19 season. This includes hospital admissions with the diagnosis codes J20 and J21 from the International Classification of Diseases, version 10 (ICD-10). This covers all acute bronchitis and acute bronchiolitis which may differ to other data for RSV due to the broader definition used. The scenarios in this paper are also created using the diagnosis codes J20 and J21.

Total numbers of RSV admissions across the whole season returned close to pre-COVID-19 levels in 2021-22, although this wave came early. Numbers reached the pre-COVID-19 average in 2022-23, although split across a smaller summer wave and larger winter wave.

Table 3: Total RSV paediatric admissions by season (1st April to 31st March)

Season (April-March)	Total admissions
2016-17	4,358
2017-18	4,092
2018-19	4,744
2019-20	4,684
2020-21	528
2021-22	4,249
2022-23	4,433
Pre-COVID-19 (2016-17 to 2019-20) average	**4,469.5**

2. Winter 2023-24

Following the larger wave in 2022-23 hitting at a similar time to pre-COVID-19 RSV seasons, the following two scenarios were agreed for Winter 2023-24:

1. Normal timed single peak, average numbers

2. Small, early peak (arriving later than last year's) plus a larger, on time peak (25% of admissions arriving in the early peak and 75% in the later wave)

Figure 6: RSV Winter 2023-24 modelling scenarios for daily paediatric hospital admissions, Wales

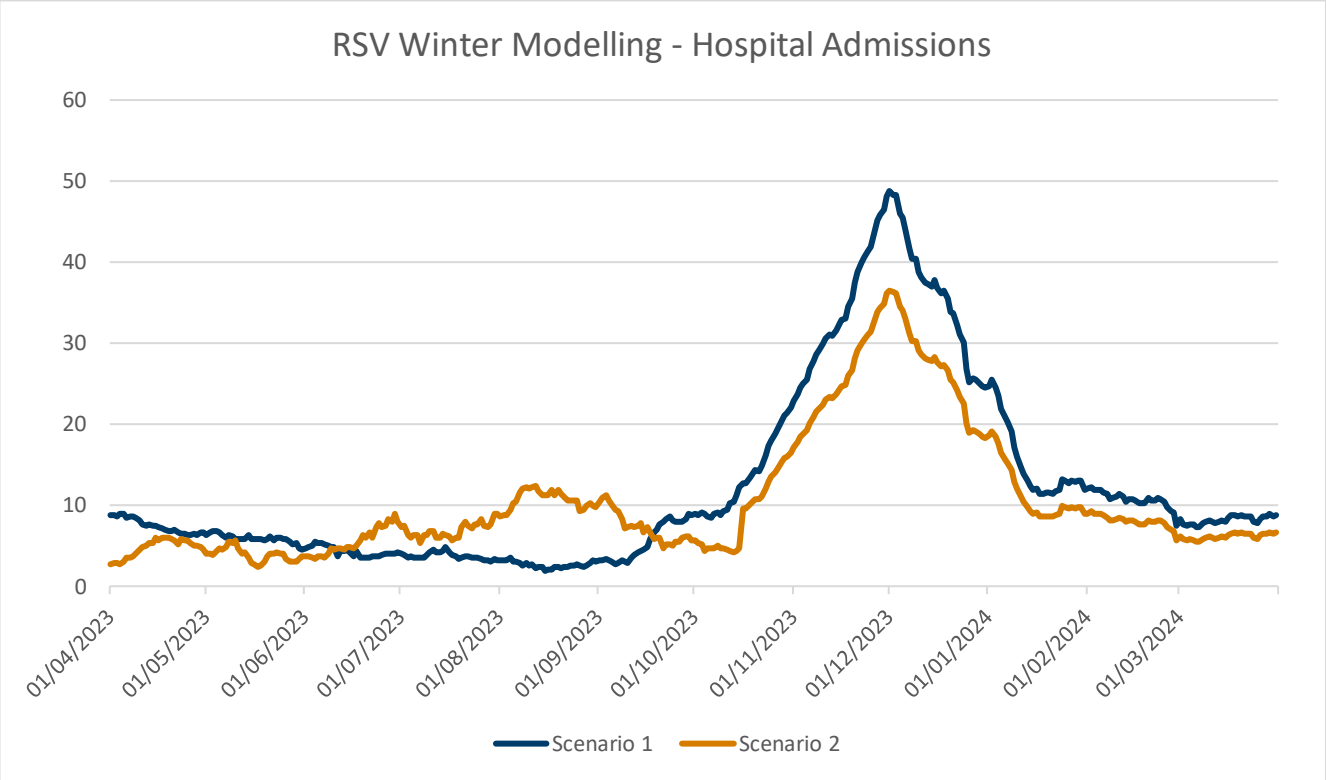
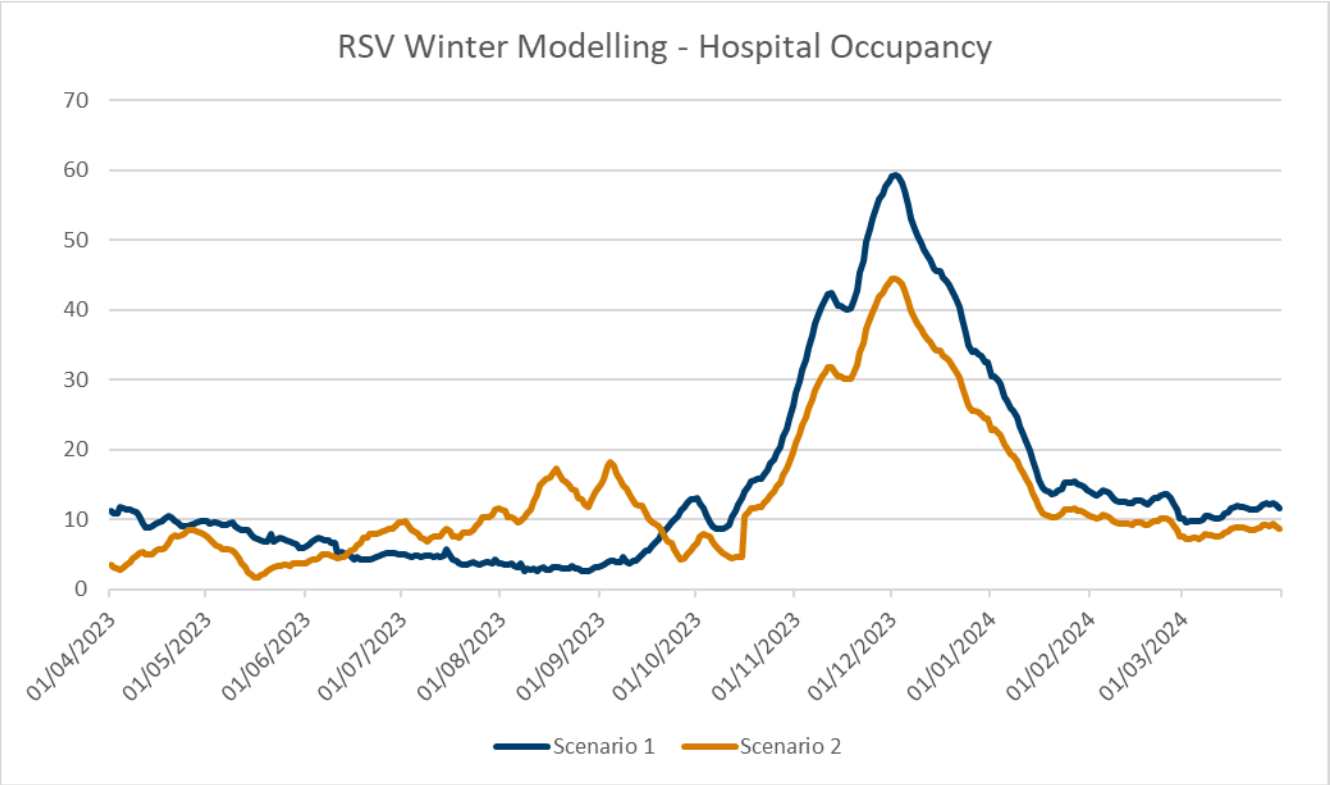
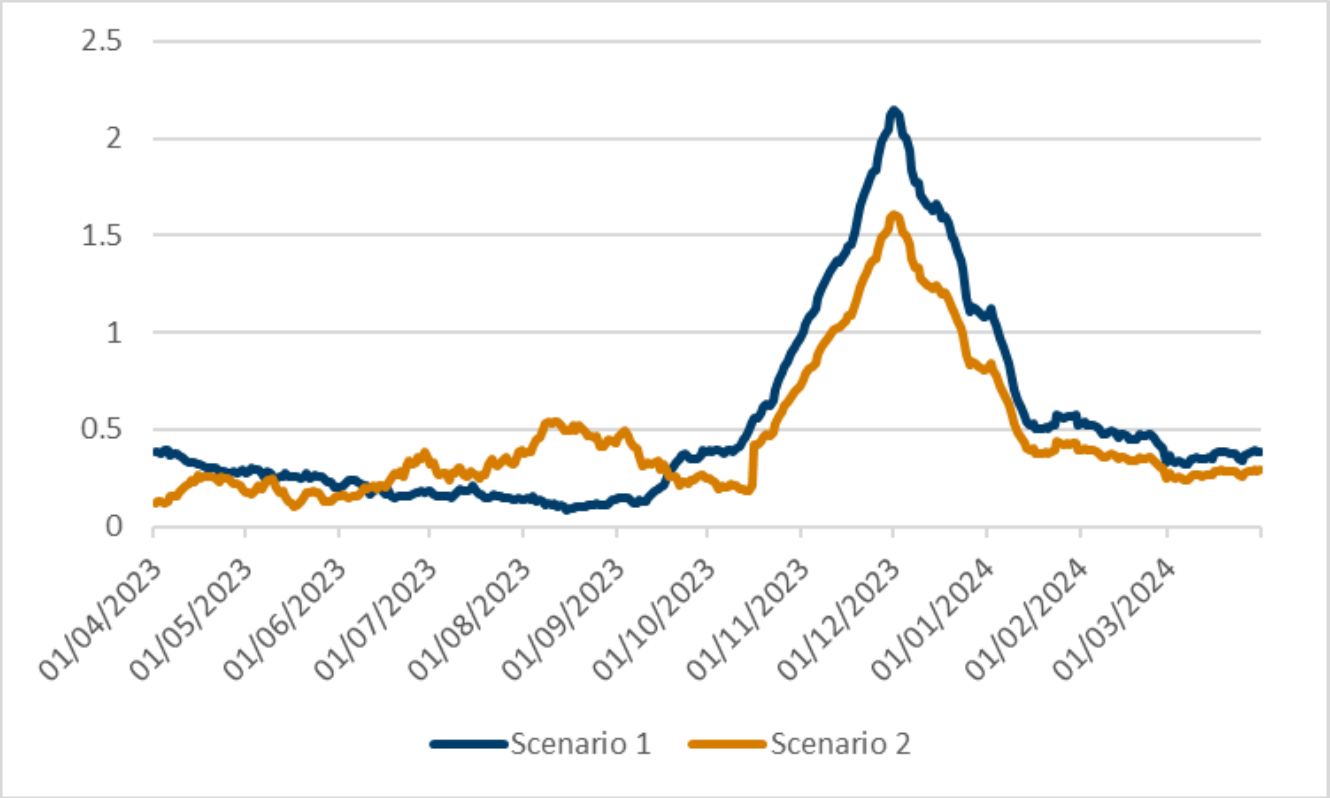


Figure 7: RSV Winter 2023-24 modelling scenarios for daily paediatric hospital occupancy, Wales



The following scenarios consider the number of daily RSV paediatric intensive care unit (PICU) admissions over the winter period, using a proportion of admissions (4%) based on Public Health Wales critical care data.

Figure 8: RSV paediatric intensive care unit daily hospital admissions scenarios



COVID-19

In May 2023, the World Health Organisation (WHO) made a statement declaring that COVID-19 is no longer classified as a global health emergency. However, WHO also added that there is still a risk of the evolution of the virus with new variants emerging meaning that despite observing an overall downward trend in pressures we could still expect to see the impact of the virus on the population for some time to come. The scenarios included here modelled on the data available currently and this could change year on year.

Based on historical data, Swansea University have modelled long term pressures including hospital admissions and bed occupancy, Intensive Care Unit (ICU) admissions, cases, and deaths, that stretch into and throughout the winter period 2023-24. A range of scenarios were produced under varying assumptions: the mathematical method used to introduce the new variant in the model, the natural immunity length, and the new variant scalar.

Three different methods of introducing a new variant were explored – introducing a new variant immediately every three months (scalar), gradually introducing a new variant that dominates every three months (cos wave) and repeating observed dynamics, but with scaled up transmission rate to allow for evasion of immunity (repeat schedule). The cos wave scenarios include the introduction of a new variant every three months which then becomes dominant. This was deemed the most realistic based on how they fit historical data.

The natural immunity length ranged from 100 to 300 days and this had an impact on the height of the different pressures in the scenarios. The new variant scalar is the amount each new variant is scaled by in terms of transmission potential (this effectively models immunity evasion) and was applied using the scalars 1, 1.2 and 1.5. Note that these factors do not exactly correspond to precise immunity evasion parameters, but rather the overall impact of the new variant.

Initially the scenarios were narrowed down to the more realistic cos wave scenarios, then low, medium and high scenarios were selected based on natural immunity length 300, 200 and 100 days with new variant scalar 1, 1.2 and 1.5 respectively as optimistic, reasonable worst case and Covid urgent scenarios respectively. Recent wave peaks have been fairly consistent so last winter's actual data was selected as the most likely scenario for this coming winter. If a significant new variant was circulating we could see an increased wave, possibly similar to the reasonable worst case scenario in figures 9 to 13.

In our modelling paper for winter 2022-23, we had a 'covid urgent' scenario that was roughly double the peak occupancy of the 'covid urgent' scenario we have used this year. This is because the last 12 months has seen continued evolution of the virus but no sign of a variant that would negate the considerable amount of immunity that has built up in the population from repeated infections and vaccine booster doses. However, in future if a variant with significant immune escape properties emerged, then a new reasonable worst case may be produced.

Figure 9: Daily COVID-19 hospital admissions scenarios

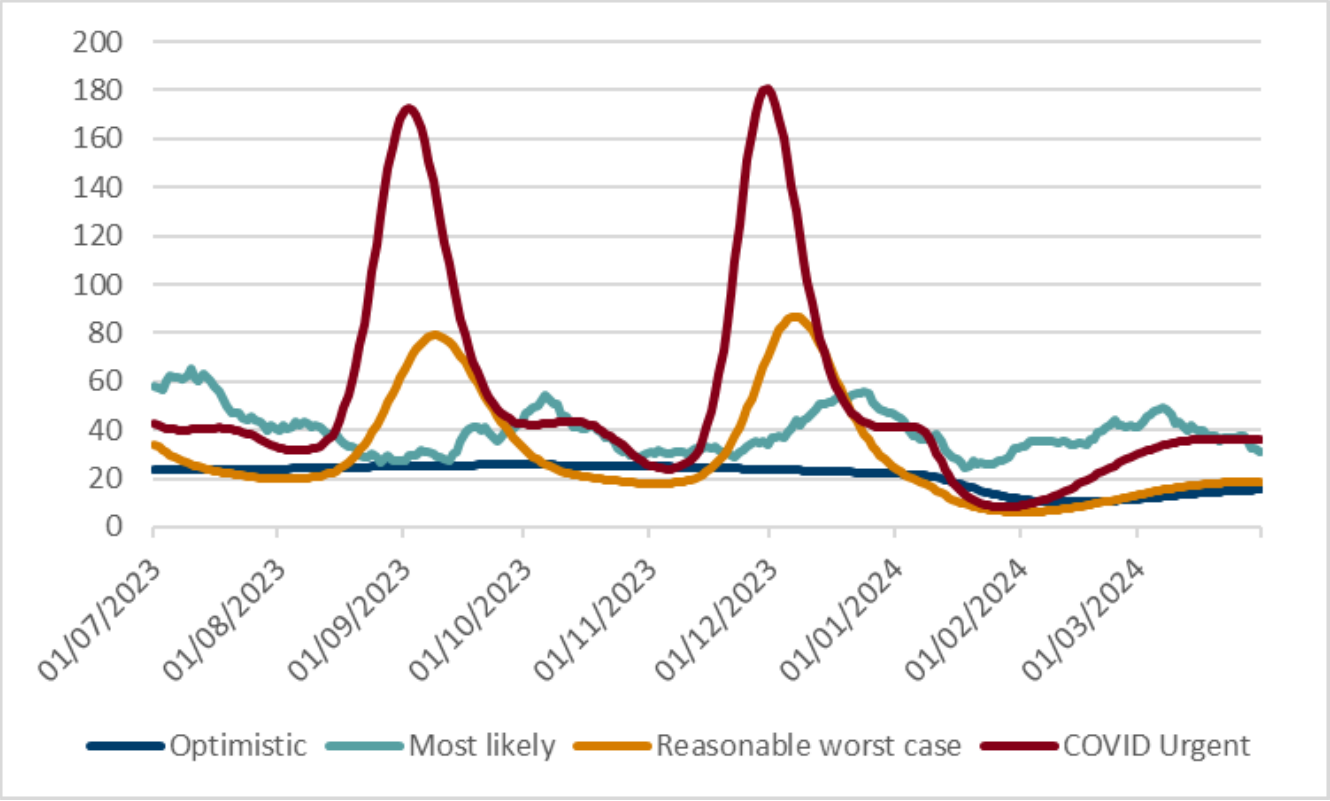


Figure 10: Daily COVID-19 hospital bed occupancy scenarios

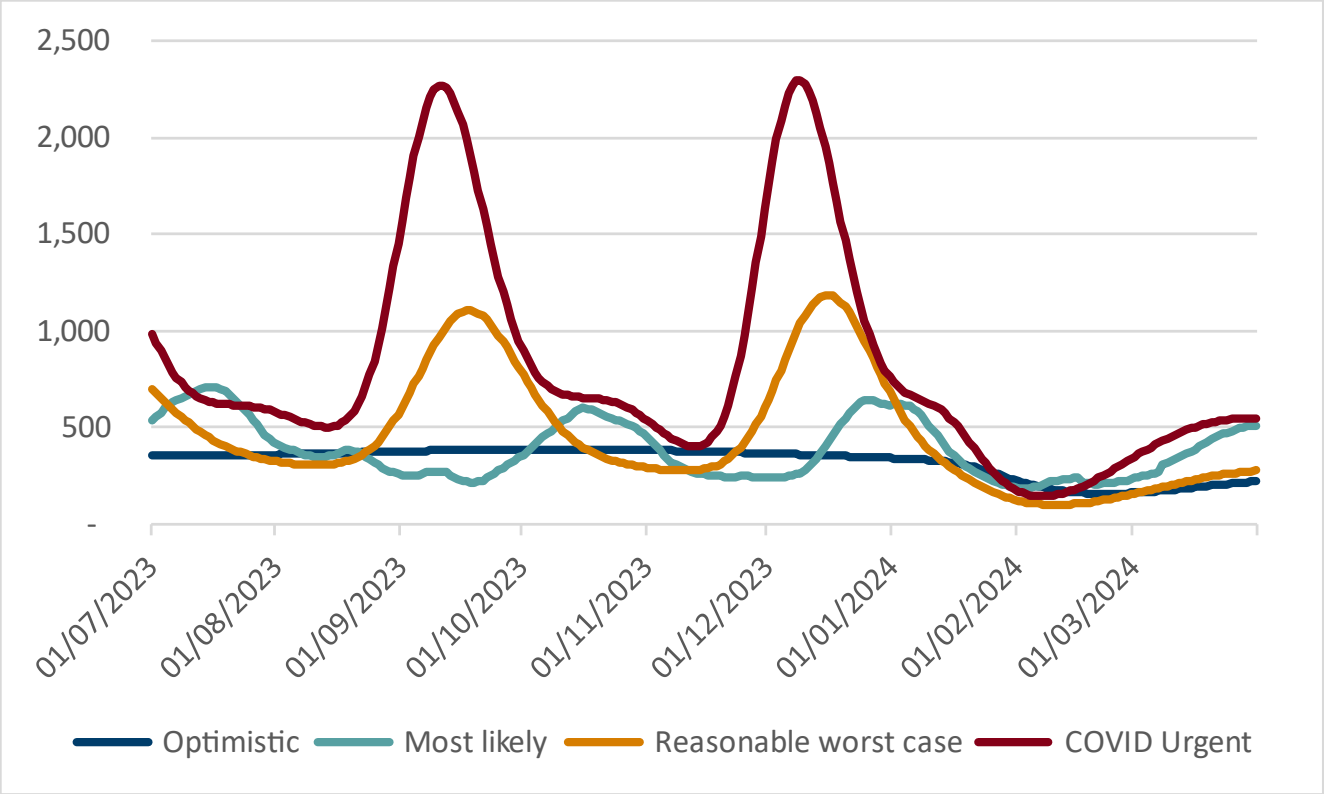
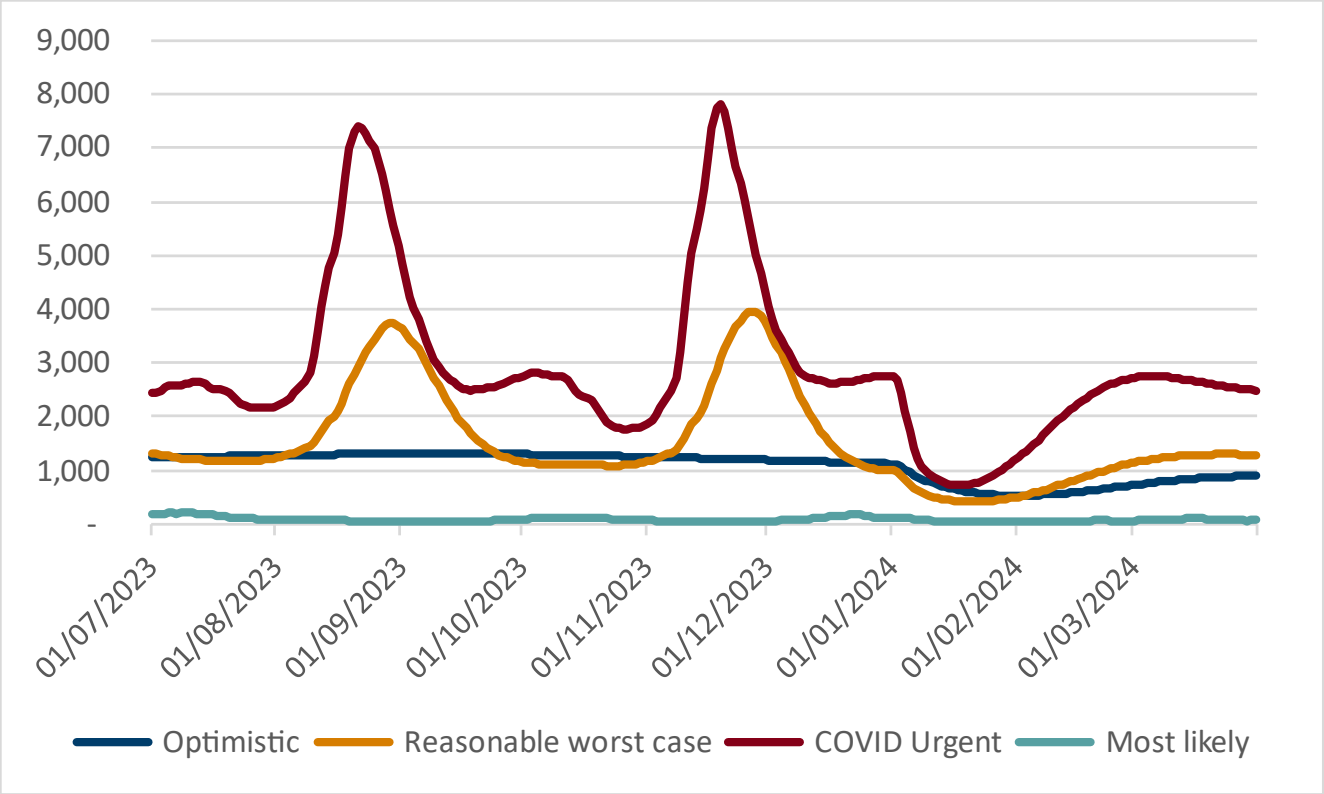


Figure 11: Daily COVID-19 cases scenarios



Notes:

1. There was a change in testing/definition of a COVID-19 case, and therefore the most likely scenario, based on last years' data only, is showing as lower than the other scenarios which are modelled based on all historic data.

Figure 12: Daily COVID-19 ICU admissions scenarios

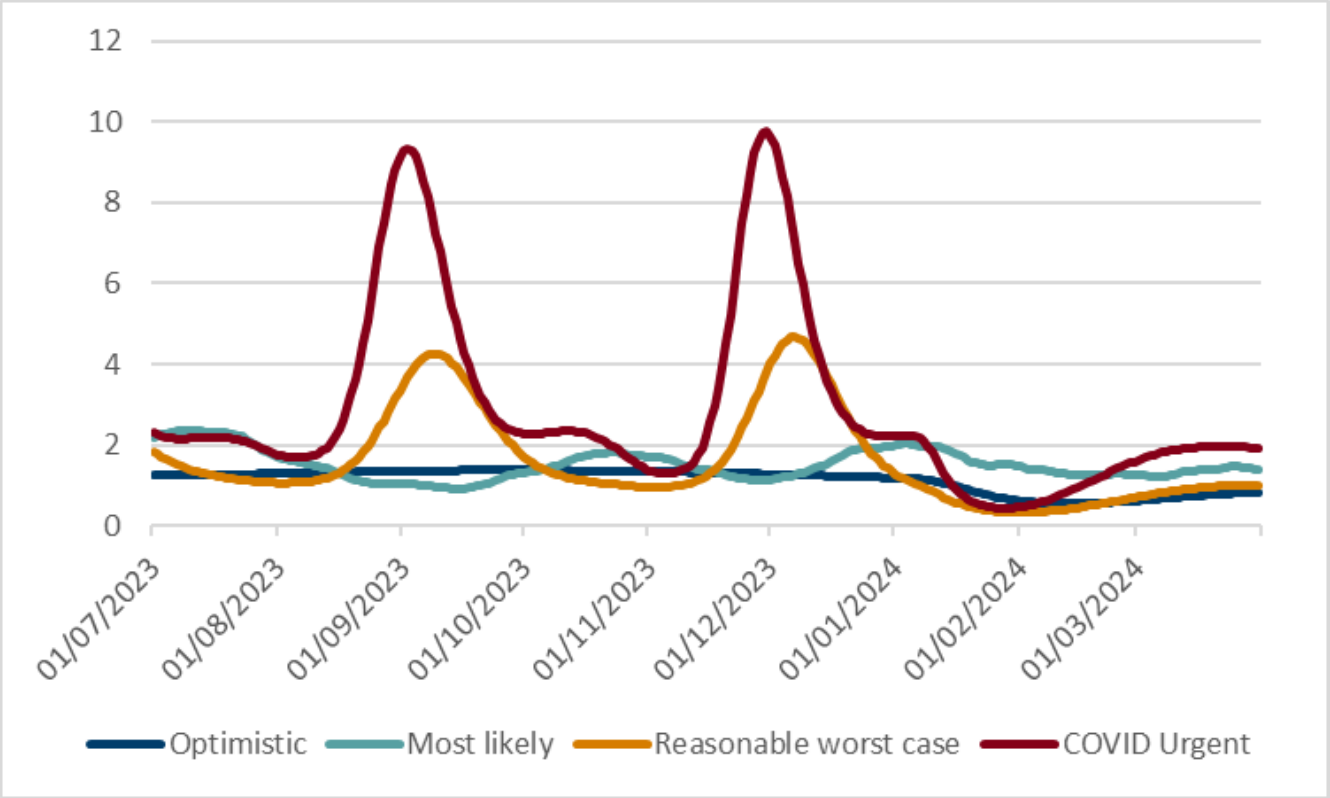
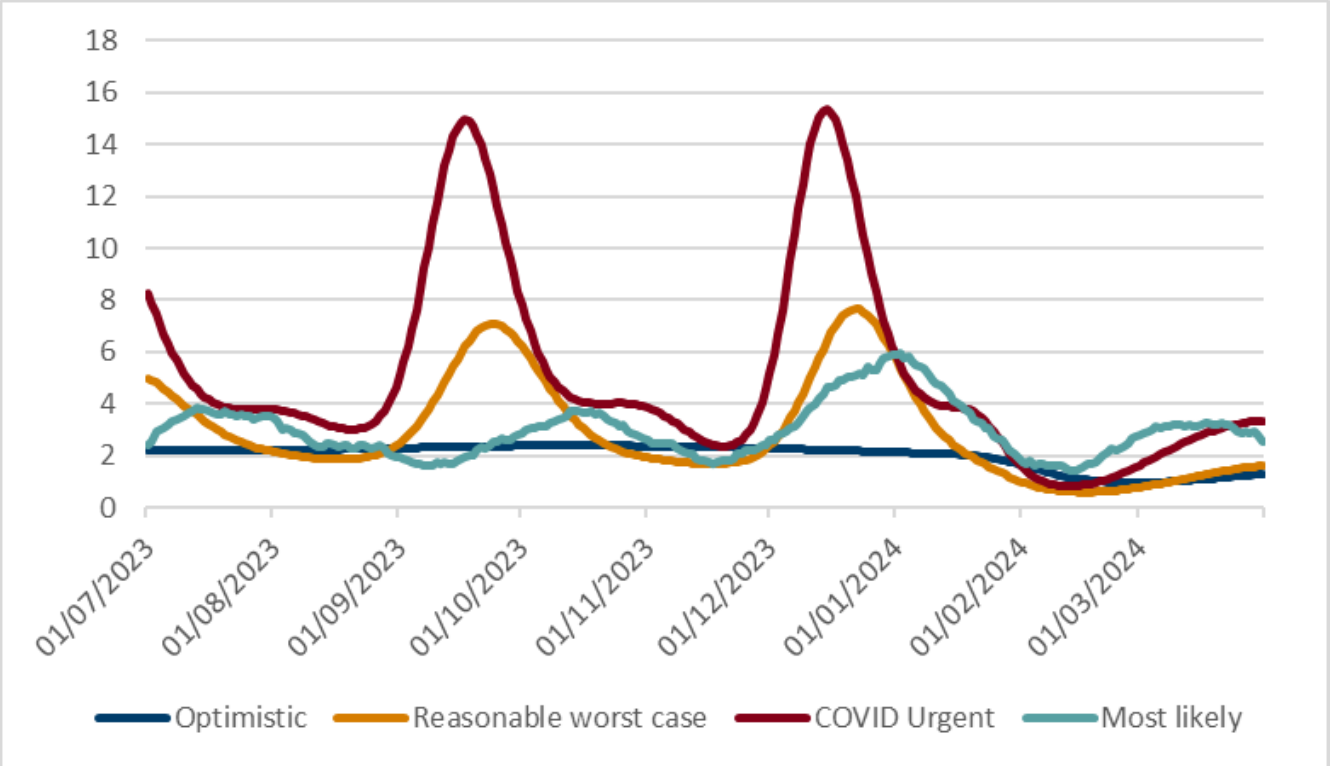
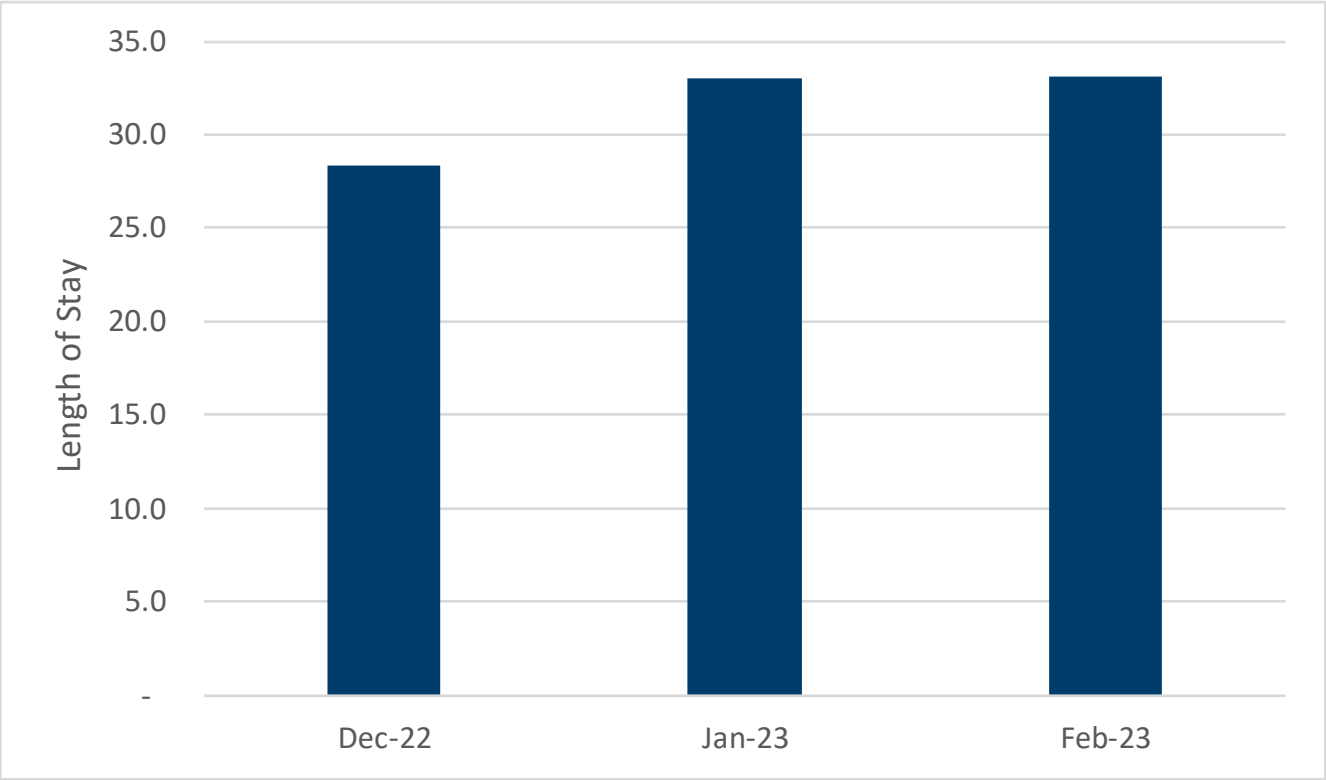


Figure 13: Daily COVID-19 deaths scenarios



Length of Stay (for COVID-19 admissions) winter 2022-23

Figure 14: Monthly average length of stay in days, December 2022 - February 2023



Source: Digital Health and Care Wales

The above chart shows the average monthly length of stay for Covid admissions from December 2022 to February 2023. Note that there is still some right truncation of the data, with some patients admitted during the winter months still being treated in hospital at the time of writing (data available is to the end of June 2023). The overall average length of stay for the period December 2022 to February 2023 was 31.5 days. This is slightly longer than, though fairly consistent with, the previous December to February 2021-2022, when the average length of stay was 27.8 days. The increase in average length of stay in the year is likely due to the increase in proportion of nosocomial cases (hospital-acquired infection) - so patients are in hospital for a longer period of time for treatment for other healthcare issues and there is a relationship between time in hospital and risk of infection.

Combined scenarios

In order to examine the potential impacts to the NHS of these three key winter viruses, a most likely scenario and a reasonable worst case scenario was selected for each, and these were combined.

The **Most Likely Scenario** combines the following three scenarios from above:

- COVID-19 - “Most Likely Scenario”, which is a repeat of last year’s actual data
- Influenza & pneumonia – “Scenario 2”, which is a season of average pre-Covid levels
- RSV – “Scenario 2”, which describes a small early peak plus a larger on time peak (25% of admissions arriving in the early peak and 75% in the later wave)

For additional context, the historical five-year average is shown on the following combined scenario charts. The number of daily admissions in the most likely scenario is comparable to the five-year average, but the peak daily hospital occupancy is slightly higher than the five-year average. This is because the five-year average includes two pre-Covid years; we are expecting hospital occupancy to be slightly lower than the last three years that have included hospital occupancy due to the pandemic.

Figure 15: Combined most likely scenario – daily hospital admissions

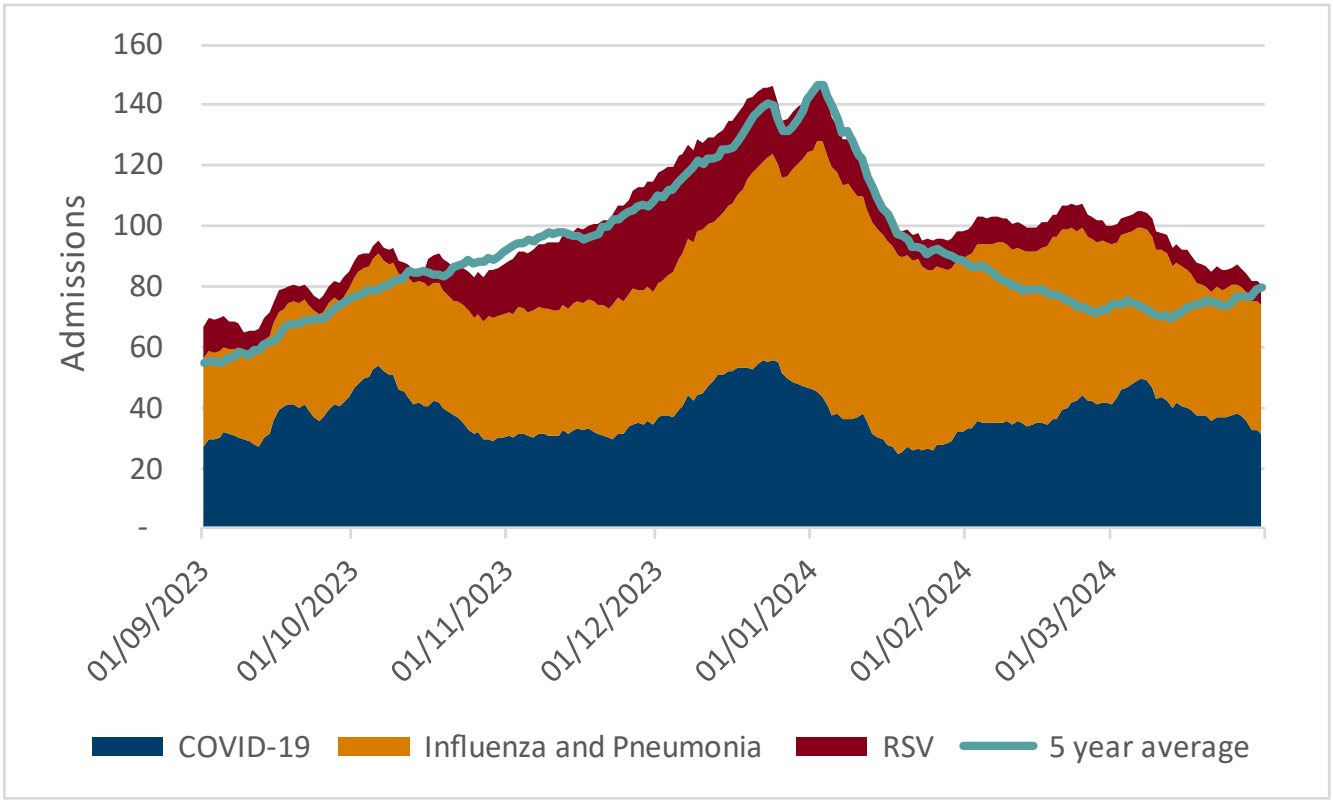
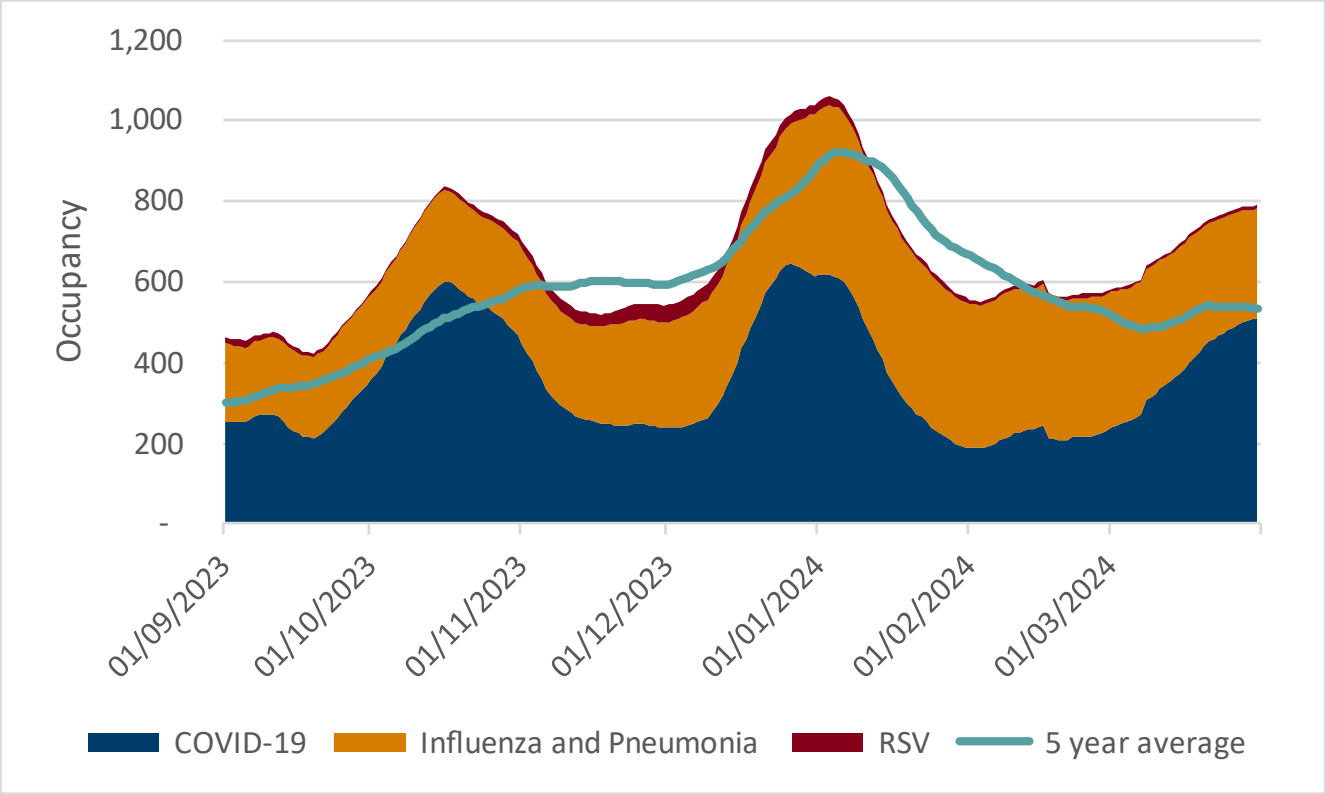


Figure 16: Combined most likely scenario – daily hospital bed occupancy



The **Reasonable Worst-Case** scenario combines the following three scenarios:

- COVID-19 “Reasonable worst case”, based on a cos wave method for introducing a new variant, natural immunity length 200 with new variant scalar 1.2.
- Influenza & pneumonia – “Scenario 3”, which is a season at 1.5x average pre-Covid levels (in line with last year's peak)
- RSV – “Scenario 1”, which has a normal timed single peak, average numbers

Figure 17: Combined reasonable worst case – daily hospital admissions

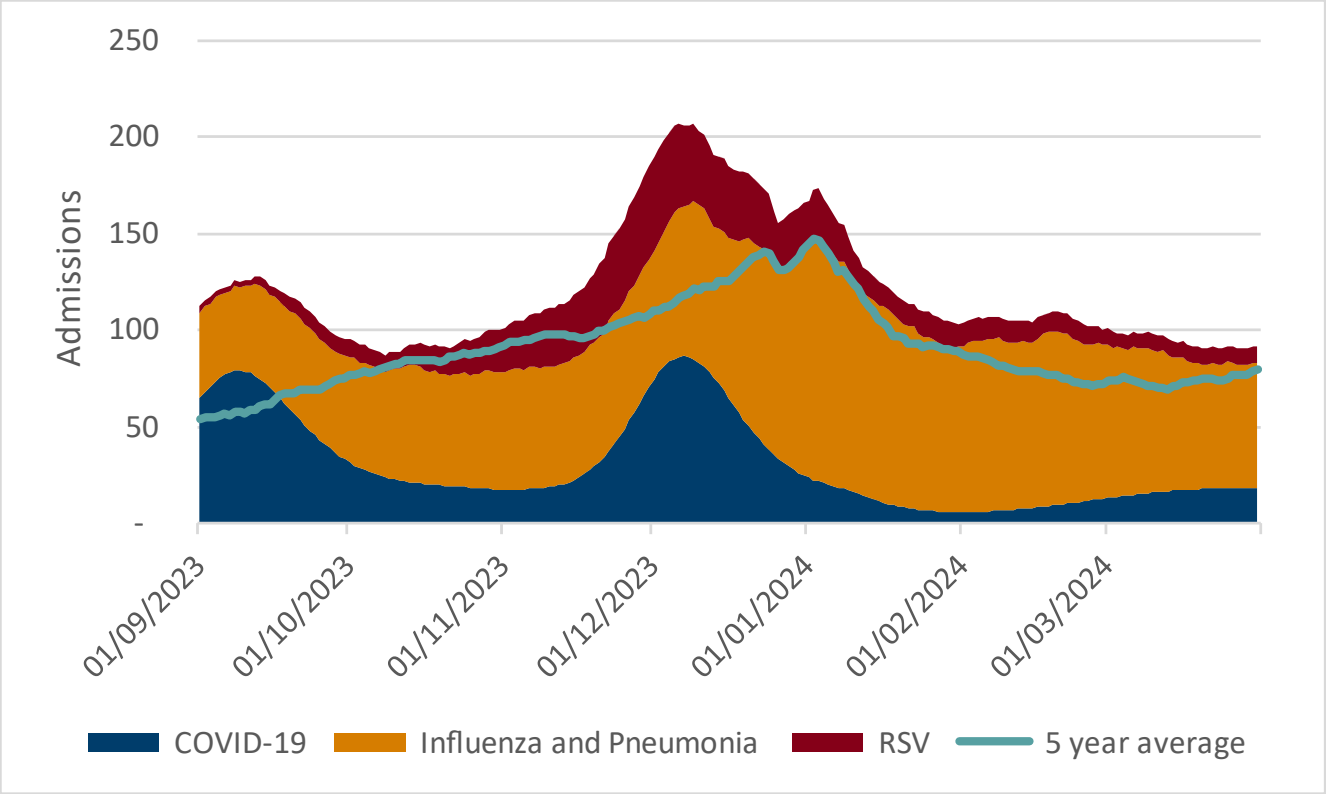
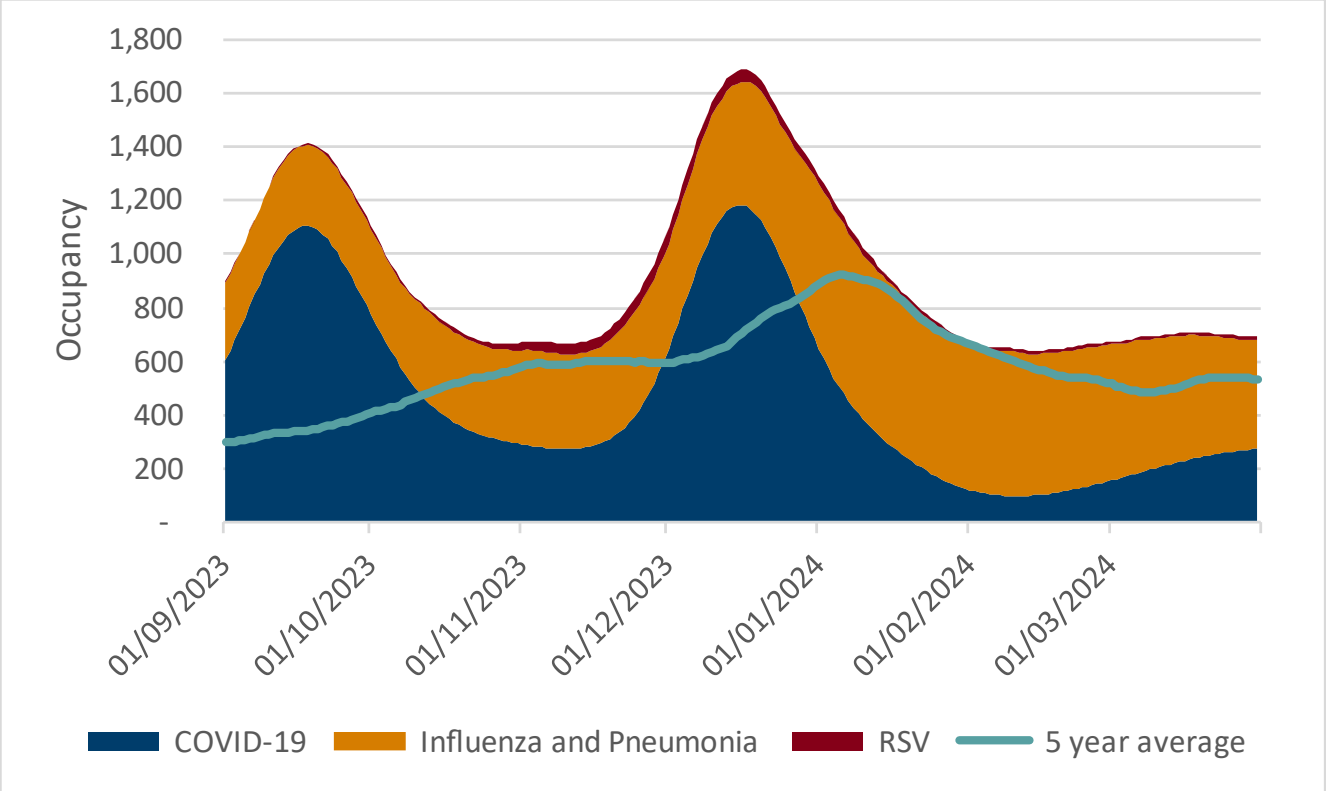


Figure 18: Combined reasonable worst case – daily hospital bed occupancy



The charts below present the overall peak bed capacity under the two combined scenarios detailed earlier.

The maximum potential bed capacity for the winter 2023-24 period is expected to be consistent with the current total available beds, which is at around 9,200.

The baseline demand has been calculated as the average number of beds during the previous winter 2022-23 in the most likely scenario, whereas it is the maximum number of beds to date in the reasonable worst case.

Figure 19: Peak hospital bed occupancy

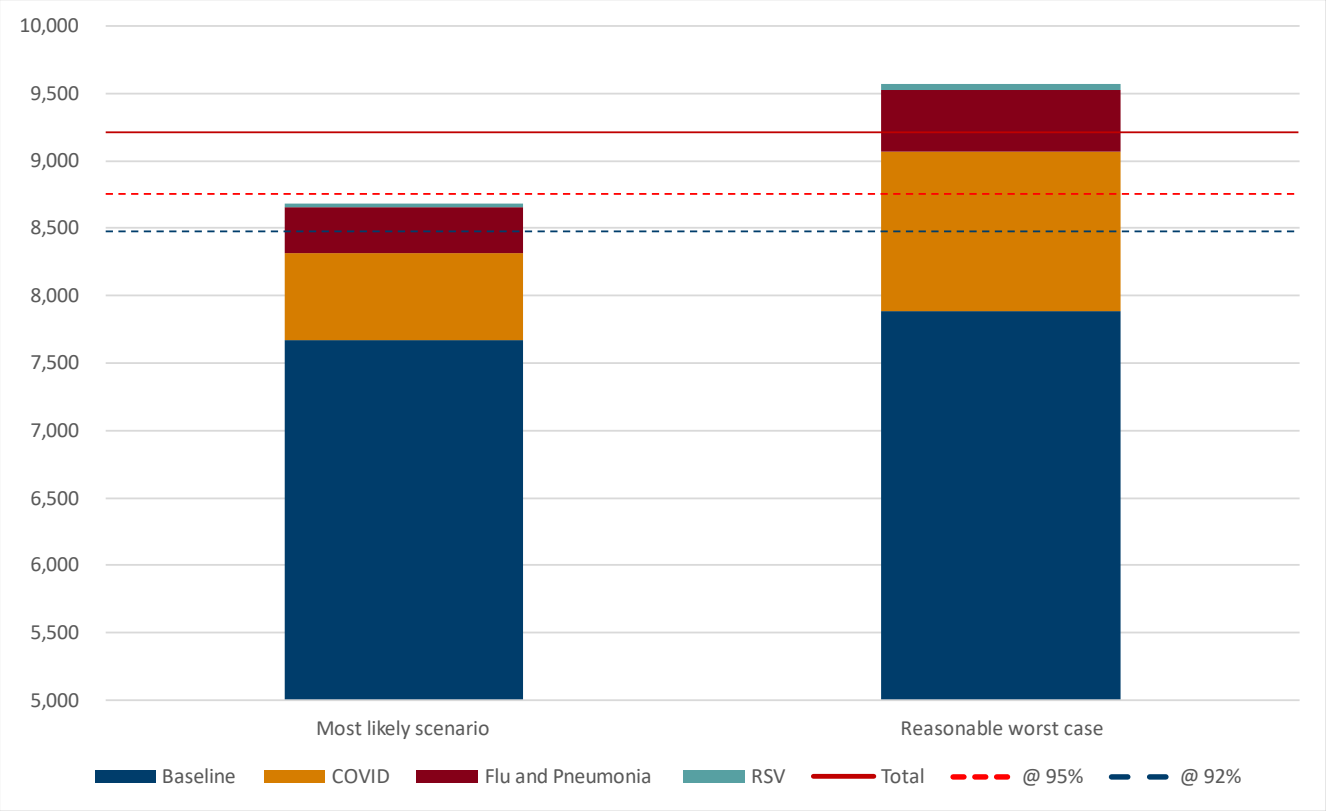


Table 4 below summarises these scenarios. In the most likely scenario, occupancy would peak around 94%. In the reasonable worst case scenario, implied occupancy would peak above 100%, but in reality this might produce local decision making, like elective activity being cancelled or people discharged earlier than normal.

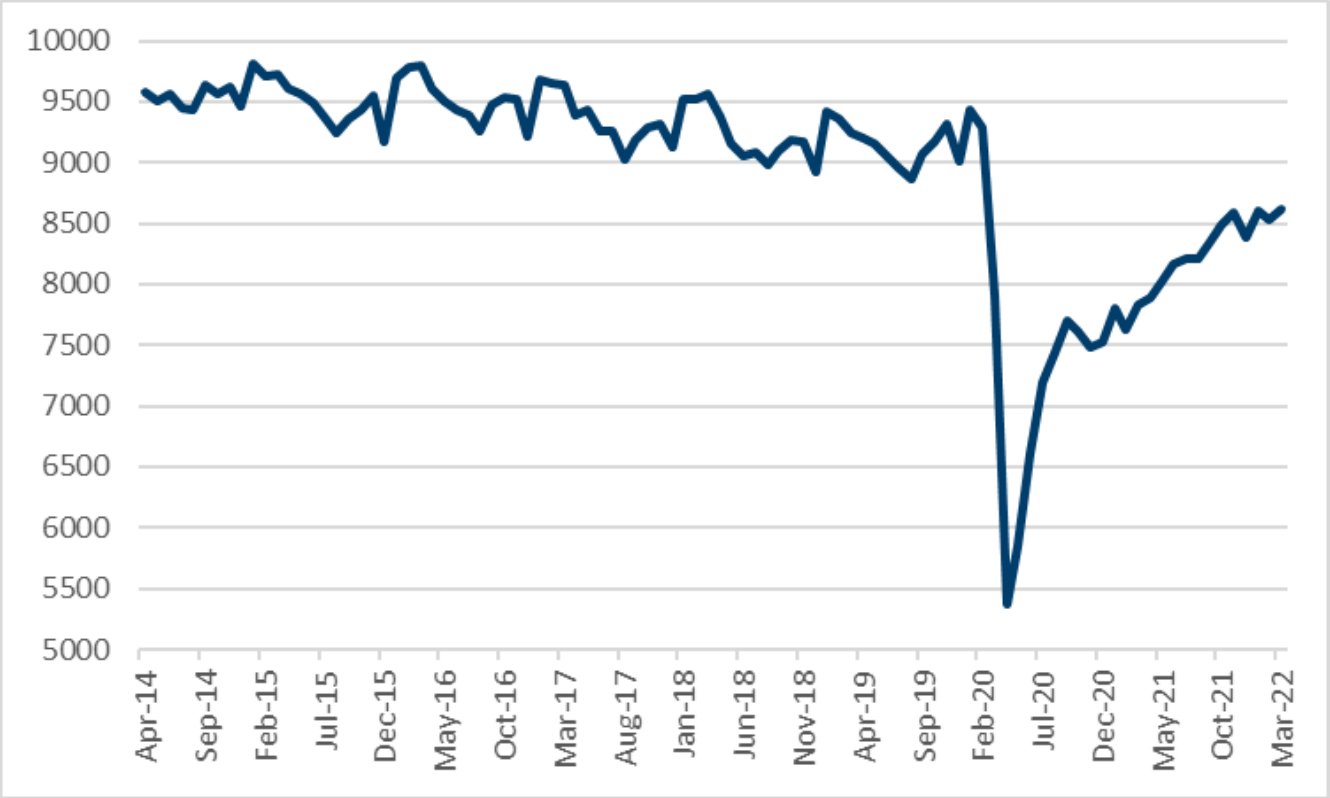
Table 4: Peak hospital bed occupancy in Wales, most likely and reasonable worst case scenarios, winter 2023-24

	Most likely scenario	Reasonable worst case
Total General and Acute Beds	9,212	9,212
Baseline	7,668	7,882
COVID	644	1,184
Flu and Pneumonia	348	458
RSV	26	45
Total demand	**8,685**	**9,569**
Implied peak occupancy	**94.28%**	**103.87%**

For context, the following chart shows the average daily occupied beds per month between April 2014 and March 2022. In 2020 and 2021, beds occupied significantly dropped below levels seen in previous years; levels have started returning to, though they haven't quite reached, pre-pandemic numbers. Bed demand excluding COVID-19 is still below pre-pandemic levels, but the trend has been increasing. Figure 20 also shows how the system pressure on the NHS has not reduced over the summer months as clearly as in the years before the pandemic. In Wales there was only a 5% variation in the average number of admissions over the summer months compared to the previous summer months from winter 2020-21 to summer 2023 (winter months; 5 April to 12 July, summer months; 1 November to 1 March – dates chosen due to data availability for summer 2023).[7] This consistent demand could mean a high level of respiratory virus admissions would result in demand above capacity being reached more quickly than if there was a reduced number of admissions over the summer months.

[7] NHS hospitalisations by date and local health board (gov.wales)

Figure 20: Average daily occupied beds, April 2014 to March 2022



Source: QueSt1 return, Digital Health and Care Wales (DHCW) Monthly NHS beds data by measure, site and specialty, March 2014 onwards (gov.wales)

Paediatric bed capacity

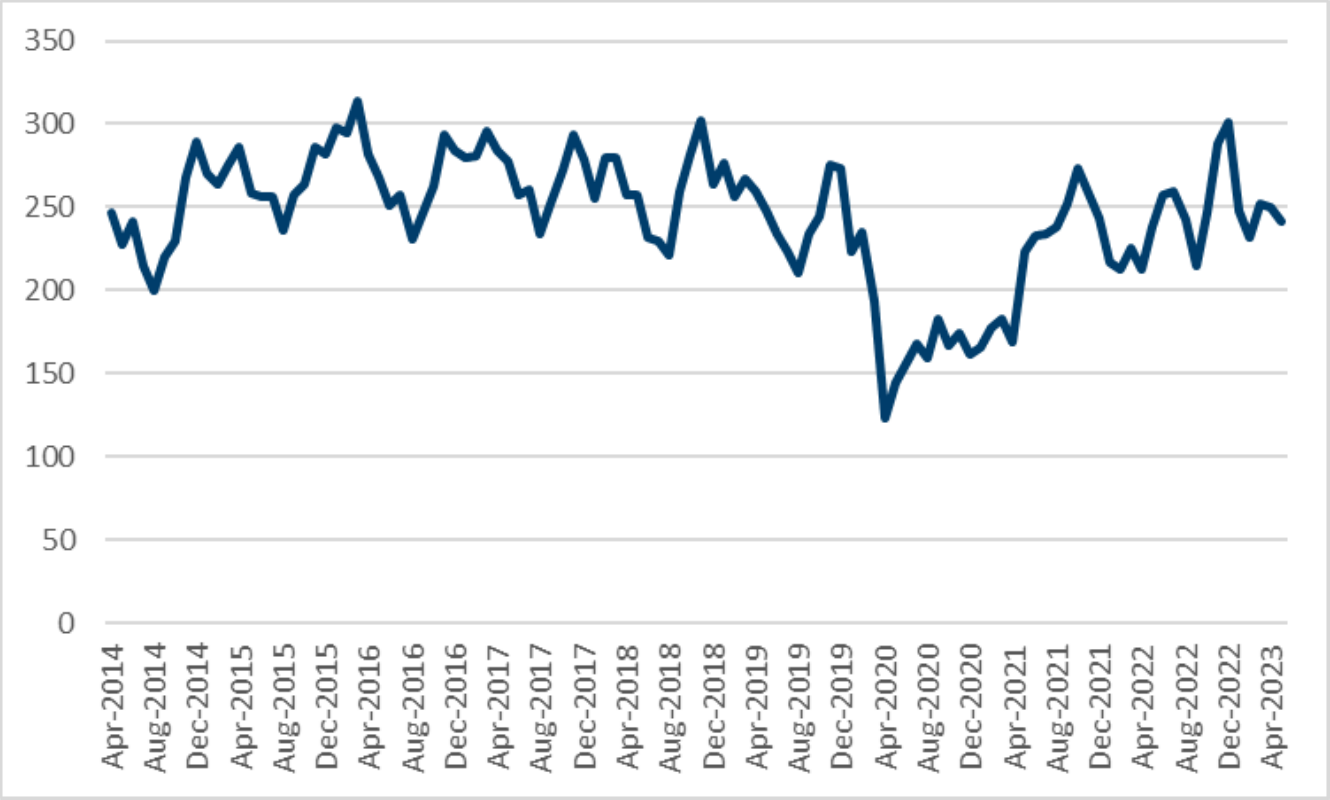
Top line Summary

- **Scenario 1:** This model estimates that bed occupancy will return to previous winter peaks, reaching around 293 beds occupied in November which is incidentally comparable to the figure seen last November when there was a spike due to the number of Strep A cases.
- **Scenario 2:** This model estimates that paediatric beds occupied will reach around 289 in December 2023, but calculating the 95% confidence interval suggests that the upper estimate of paediatric beds occupied could reach up to 462 that month which is 31 more than the current number of available beds (431).

Another potential system pressure during the winter 2023-24 is paediatric bed capacity. At the start of the pandemic, paediatric beds occupied significantly dropped (to a low of 123 average daily beds occupied), but the trend has been increasing since. There was also a spike in November to December during the previous winter period due to the number of Strep A cases (average daily beds occupied reached 301 out of 458 available beds, equating to 65.8% percentage occupancy) – see the next

section on Strep A for additional information. There is concern over the number of paediatric beds needed in the medium term because of a potential increase in the number of measles cases due to the drop in uptake of the MMR vaccine, particularly during the coronavirus pandemic.

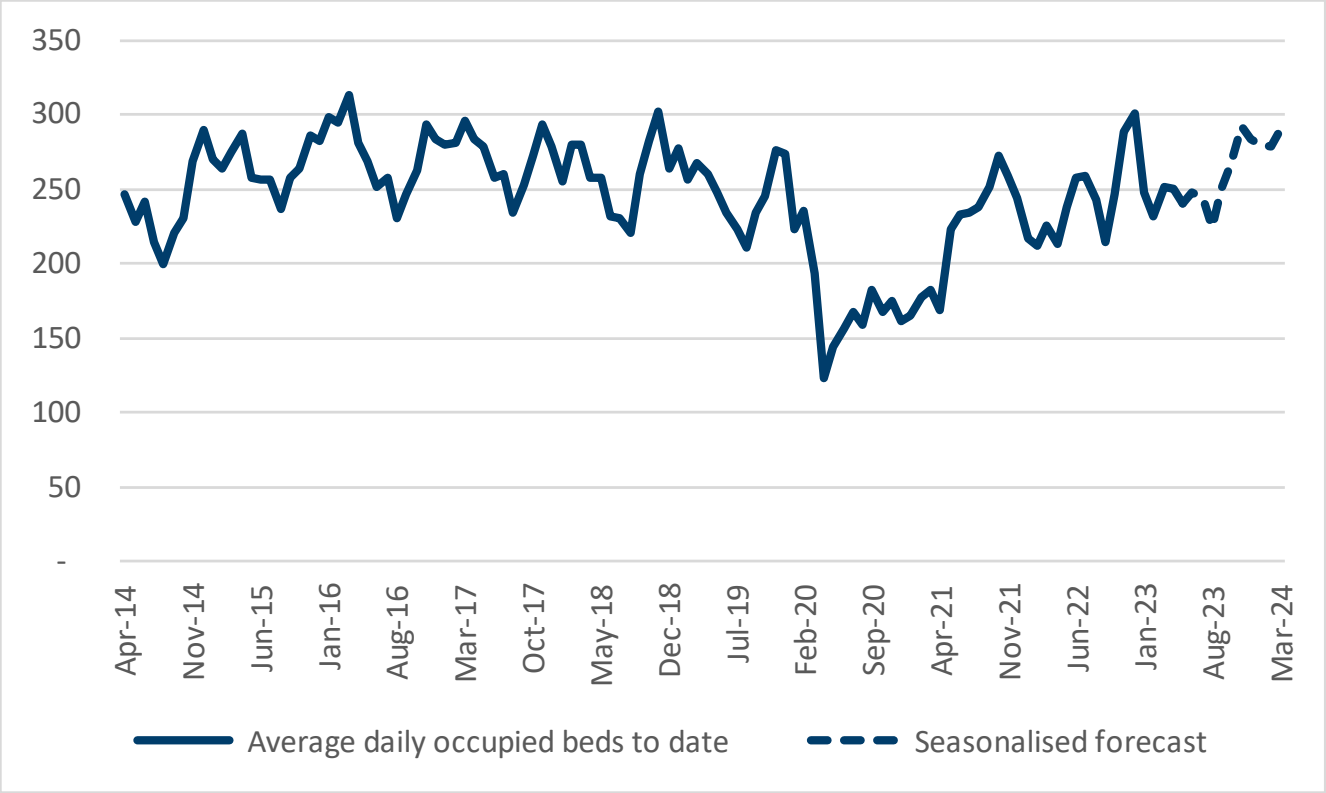
Figure 21: Average daily paediatric beds occupied



Source: Digital Health and Care Wales (DHCW)

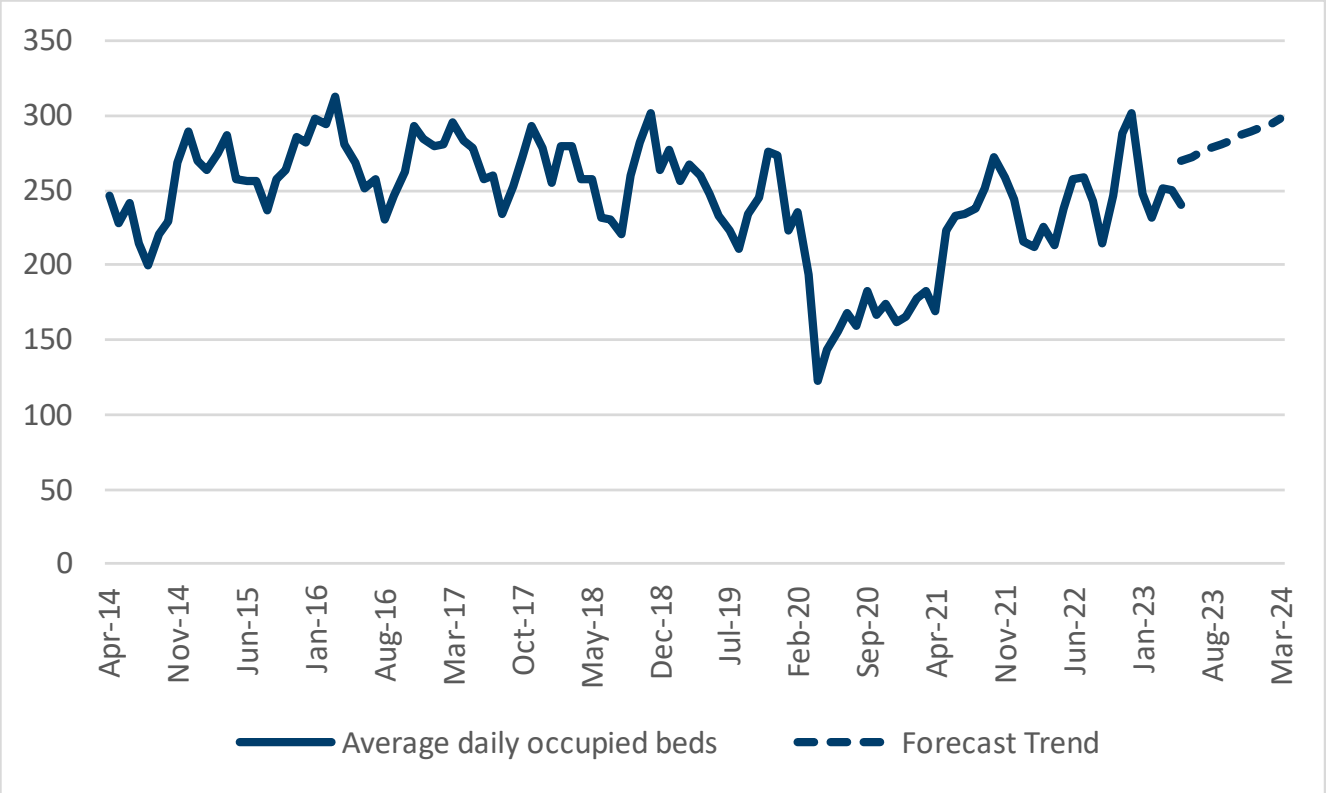
Using paediatric bed occupancy data provided by Digital Health and Care Wales (DHCW), figures are modelled for the winter period 2023-24. This was done in two ways: firstly, using a linear regression with seasonality based on pre-pandemic data and, secondly, using a linear regression based on the latest available data since the early months of the pandemic.

Figure 22: Average daily paediatric beds occupied forecast, first scenario



The first model is based on the premise that before the Coronavirus pandemic there was an annual seasonal pattern to paediatric bed occupancy, and that in recent months numbers have, approximately, returned to pre-pandemic levels. This model estimates that bed occupancy will return to previous winter peaks, reaching around 293 beds occupied in November which is comparable to the figure seen last November when there was a spike due to the number of Strep A cases.

Figure 23*:* Average daily paediatric beds occupied forecast, second scenario



The second model extrapolates forwards from data recorded at the start of the Coronavirus pandemic and assumes that the underlying increasing trend will continue in the coming months. This trend suggests that paediatric beds occupied will reach around 289 in December 2023, but calculating the 95% confidence interval suggests that the upper estimate of paediatric beds occupied could reach up to 462 that month which is 31 more than the current number of available beds (431).

Estimates in both scenarios, with a degree of uncertainty, suggest that paediatric beds occupied will not exceed the number of beds likely to be available.

Strep A

Top line Summary

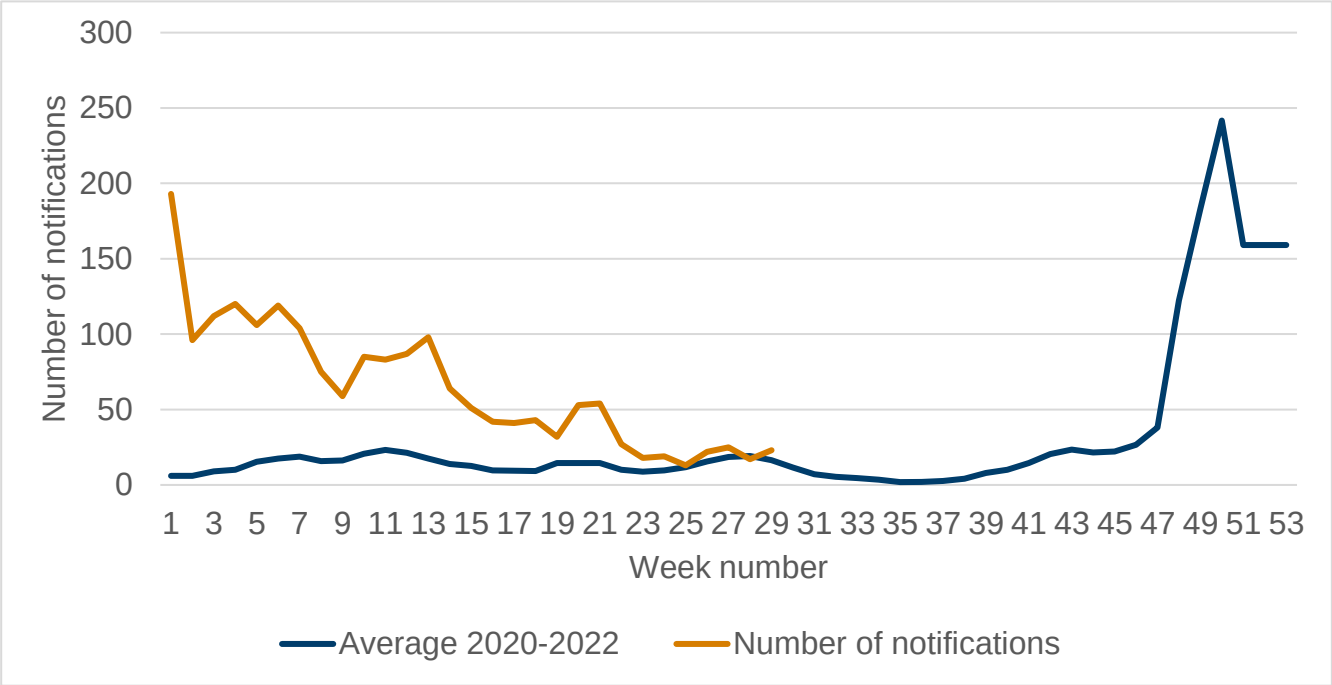
- In 2022 there were 3,928 notifications of scarlet fever in Wales (125.2 per 100,000 people). This was 3,487 and 3,746 more notifications than in 2020 and 2021 respectively.
- The rise in notifications is likely to be partially explained by an increase in testing and awareness, related to the rise in media coverage of scarlet fever and iGAS infections.
- Although the number of notifications leading to hospital admission is relatively low it is important that scarlet fever and iGAS continues to be monitored over the 2023-24 winter period to analyse if there has been a longer term shift in the trend for this infection.

Over the 2022-23 winter period there was a rise in the number of cases of scarlet fever in Wales. Scarlet fever is a contagious infection caused by Group A streptococcal (GAS) infection that mostly affects young children. GAS infection is a group of bacteria which causes infections in the throat and skin and is easily treated with antibiotics. Sometimes severe GAS disease may occur when bacteria get into parts of the body where bacteria are usually not found, such as the blood, muscles, or the lungs. These infections are known as invasive Group A Streptococcal disease (iGAS) and may include serious conditions, such as toxic shock syndrome.[8]

The heightened awareness of scarlet fever and iGAS can have a large impact on services, as seen over the 2022-23 winter period. In December 2022, when media attention for this condition was at its peak, there were over 18,000 calls to NHS 111 Wales over one weekend, more than double the number of calls received on the same weekend the previous year. A symptoms checker tool was launched as a result of the rise in calls in 2022, which may reduce such a rise occurring in winter 2023-24.[9]

[8] Streptococcus A (strep A), Scarlet Fever and iGAS - Public Health Wales (nhs.wales)
[9] New support for parents on Strep A as NHS 111 Wales inundated with concerned callers. - Public Health Wales

Figure 24: Notifications of scarlet fever per week for 2023 and three week moving average of notifications over previous three years, data as of 31 July 2023

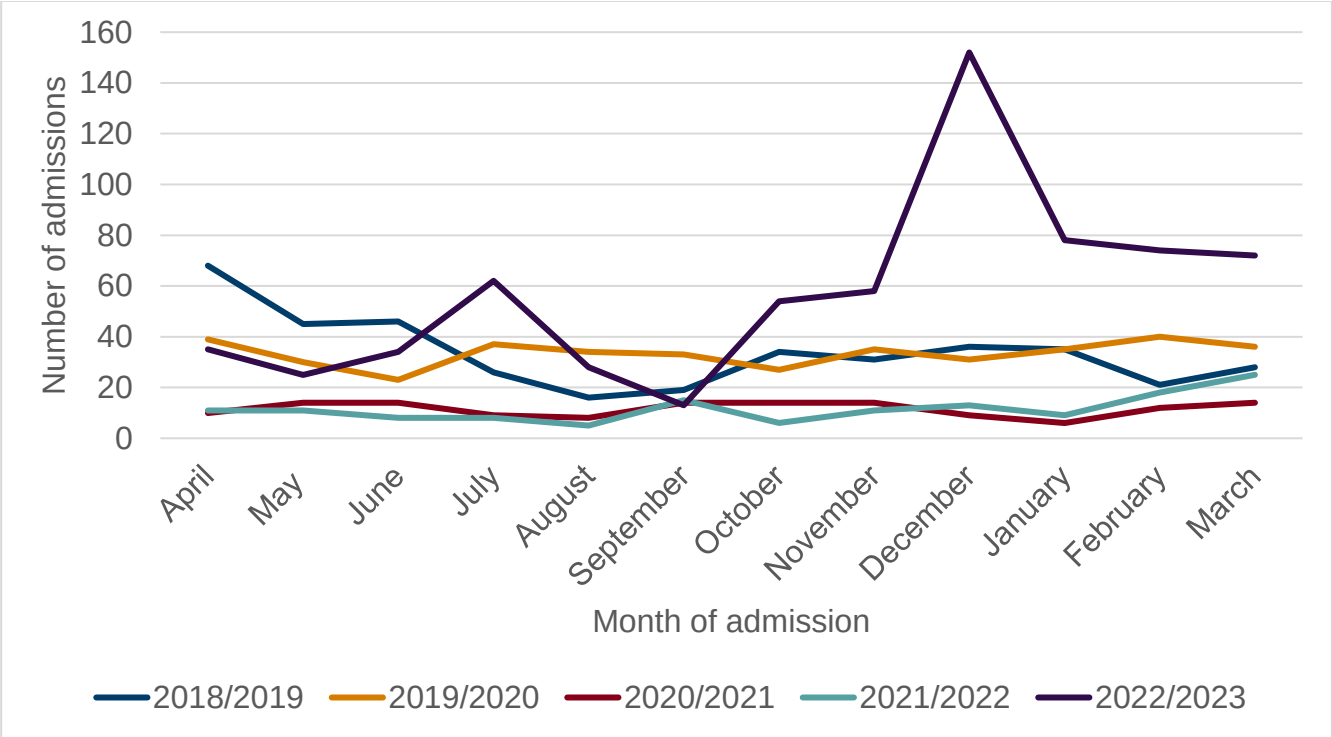


Source: Public Health Wales Tarian case and incident management reporting system

In 2022 there were 3,928 notifications of scarlet fever in Wales (125.2 per 100,000 people). This was 3,487 and 3,746 more notifications than in 2020 and 2021 respectively. Up to week 29 of 2023 the number of notifications remained above the three-week moving average of notifications over the previous three years in most weeks (figure 24).[10]

[10] Notifications of SCARLET FEVER in Wales | Tableau Public

Figure 25: Number of Strep A hospital admissions in Wales April 2018 to March 2023 by month of admission



Source: Digital Health and Care Wales (DHCW)

Figure 27 shows between April 2022 and March 2023 there were 685 cases of Strep A hospital admissions in all ages, of which 47 (6.7%) admissions had this as the primary diagnosis. This was a 389.3% increase (545 admissions) compared to April 2021 to March 2022. There were 373 admissions for those aged 0 to 17 years, of which 16 were for Strep A as the primary diagnosis. This was a rise from 47 admissions and 1 primary diagnosis admission between April 2021 to March 2022. The rise in notifications is likely to be partially explained by an increase in testing and awareness, related to the rise in media coverage of scarlet fever and iGAS infections. The data included here shows that of the 3,928 infection notifications in Wales in 2022, 513 (13.1%) were for people admitted to hospital. Although the number of notifications leading to hospital admission is relatively low it is important that scarlet fever and iGAS continues to be monitored over the 2023-24 winter period to analyse if there has been a longer term shift in the trend for this infection. Awareness of symptoms may also lead to an increase in diagnoses and treatment for other illnesses that have similar symptoms.

Excess deaths

Since the start of the Coronavirus pandemic, excess deaths have been high in Wales. In earlier periods, during the peaks of the pandemic (2020 and early 2021), excess deaths counts could be explained largely by COVID-19 deaths. In recent years excess deaths counts are no longer consistently explained by COVID-19 deaths (July to December 2021 and May to December 2022).

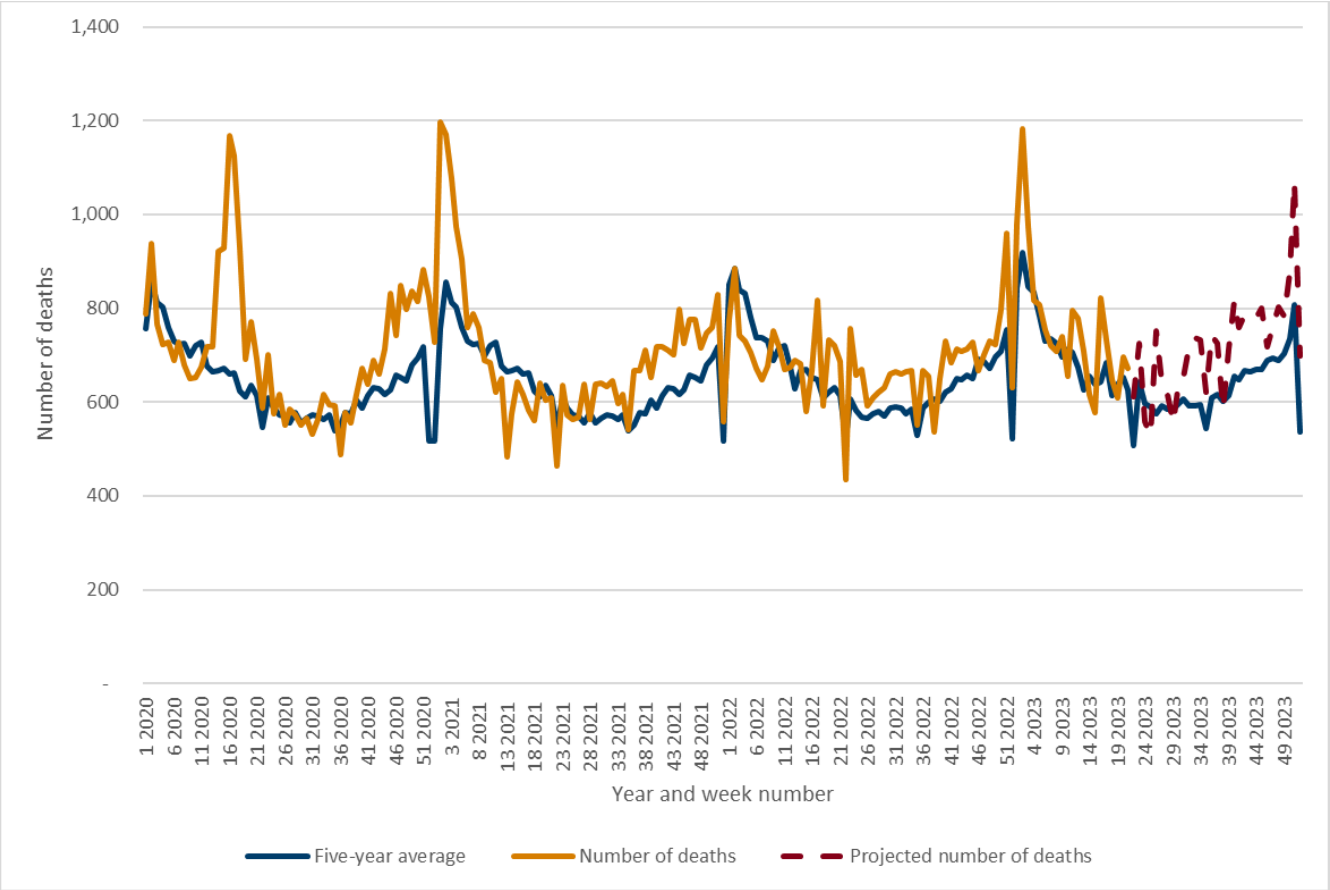
Excess deaths in this paper are quoted by comparison with an average of five earlier years, in line with the current Office for National Statistics (ONS) approach. ONS decided, in the context of COVID-19, to omit 2020 from the taking of averages – the volume of COVID-19 deaths made it an outlier in overall death counts. This makes 2020 the last year in which excess deaths would have been considered in comparison to continuous preceding years (2015 to 2019). In 2021 comparison was again made to 2015 to 2019. In 2022 comparison was made to 2016 to 2019 and 2021 (5 years but not including 2020). In 2023 comparison is being made to 2017 to 2019 and 2021, 2022.

There is an ongoing review being carried out by the cross-UK excess mortality baseline technical working group of how excess deaths are measured.[11] Once the recommendation from this review is published and implemented the numbers of excess deaths referred to in this paper may differ to the refreshed data and projections may also change.

In the first 21 weeks of 2023 (data available to week 21 when analysis began), Wales experienced an average of 48 excess deaths. In the first 21 weeks of 2022, Wales did not, on average, experience any excess deaths (average of *minus* 6 excess deaths). The difference between them, 54 deaths, could be applied to 2022's excess deaths in weeks 32 to 52 to arrive at a projection for excess deaths for in weeks ending 11 August to 29 December 2023. This can in turn be added to 5-year average deaths to arrive at a projection of deaths in the early part of winter 2023-24.

[11] How do we measure expected and excess deaths? | National Statistical (ons.gov.uk)

Figure 26: Number of deaths and projected deaths due to all causes compared to five-year average in Wales by week 2020 to 2023



Source: ONS

Notes:

1. Caution should be taken when comparing weeks where bank holidays fall as these may not be consistent every year. The number of deaths registered in a week with a bank holiday and the following week can be impacted due to the closure of registration offices.

As indicated in figure 26, the latter part of 2023 may produce more excess deaths. Self-identified severe Long Covid (fatigue, breathlessness, neurocognitive impairment) is not thought to be the cause of excess deaths, but COVID-19 does appear to have elevated risks of stroke[12], cardiovascular disease[13], diabetes[14] amongst other conditions in the population. In some cases, COVID-19 may be a direct cause – a past infection leaving scarring. In some cases, COVID-19 may be an indirect cause – individuals reduced their health-seeking behaviour during the pandemic, so that now when they present to healthcare their condition has deteriorated versus what it should have been at the time of first presentation. Which of these two causes predominates may have a bearing on how long elevated death levels persist. Adverse reactions to

[12] Heart-disease risk soars after COVID — even with a mild case (nature.com)
[13] excess-deaths-involving-cvd-in-england_an-anlysis-and-explainer.pdf (bhf.org.uk)
[14] https://www.diabetes.org.uk/about_us/news/new-worse-cases-coronavirus

COVID-19 vaccines have caused a very small number of deaths (56 deaths registered in England and Wales from March 2020 to June 2023)[15] so are not a plausible explanation for excess deaths.

This is the first time the Science Evidence Advice team have produced excess death projections. The methods used will be continued to be revised and monitored against actual data over the winter period. Continued surveillance of deaths due to the conditions identified above is required to confirm if conditions relating to COVID-19 infection is impacted excess deaths. This could also be analysed against the new excess methodology once this becomes available.

Elective care back log

Top line Summary

- It is anticipated that elective admissions will continue increasing approximately linearly from around February 2021, with levels of elective admissions will likely be comparable to the sorts of figures seen before the pandemic (in 2019).

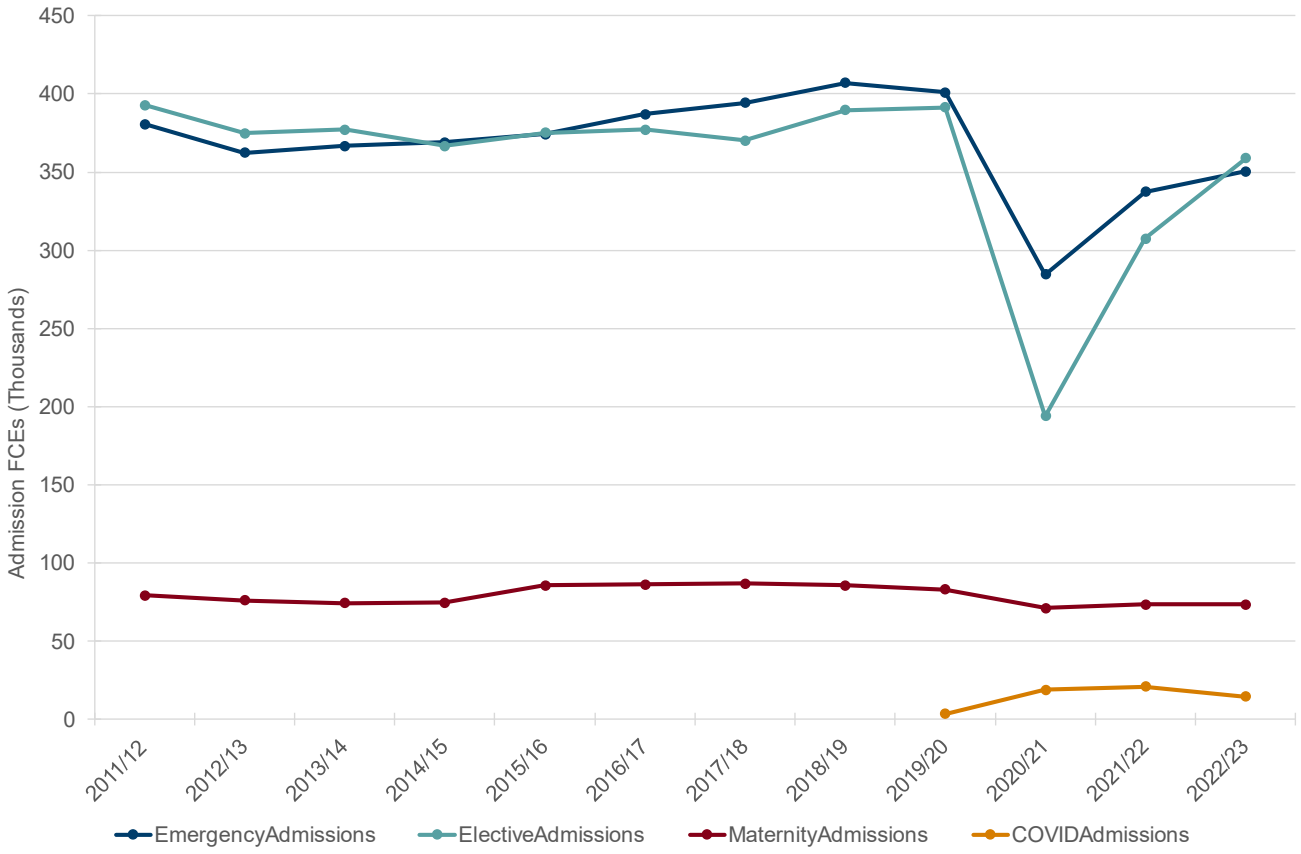
Waiting lists for planned care have been a problem for the NHS for several years, though this problem was also significantly exacerbated by the Coronavirus pandemic, when treatment often had to be postponed causing waiting times to lengthen. There are currently waiting list targets[16], although the target of eliminating two year waits by March 2023 was missed. The following section looks more closely at recent elective care admissions numbers and waiting times, and the subsequent section considers these trends and what these figures could look like during the winter months for the coming year.

Recent data

Elective care admissions finished consultant episodes (FCEs) fell in the first full financial year of the Coronavirus pandemic (April 2020 to March 2021) but have been increasing since. The annual admissions figures don't quite appear to have reached pre-pandemic levels (elective admissions for financial year 2022-23 were 358,839 compared with 391,348 for financial year 2019-2020, 92%). The latest monthly figures are mostly no closer to pre-pandemic levels with the 2022 to 2019 comparisons for October, November and December being 88%, 96% and 88% respectively. There were 31,120 elective admissions for the month January 2023 compared with 34,951 in the month January 2020, 89%.

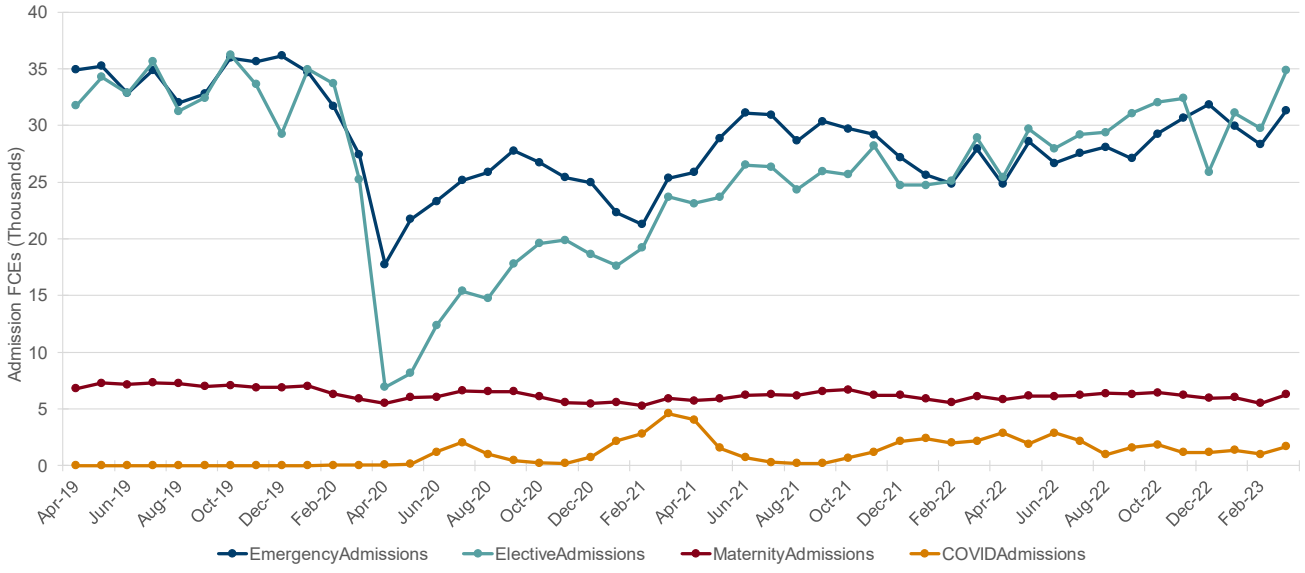
[15] Monthly mortality analysis, England and Wales - Office for National Statistics (ons.gov.uk)
[16] Our programme for transforming and modernising planned care in Wales and reducing the waiting lists (gov.wales)

Figure 27: Number of admission episodes by admission method 2011-12 to 2022-23



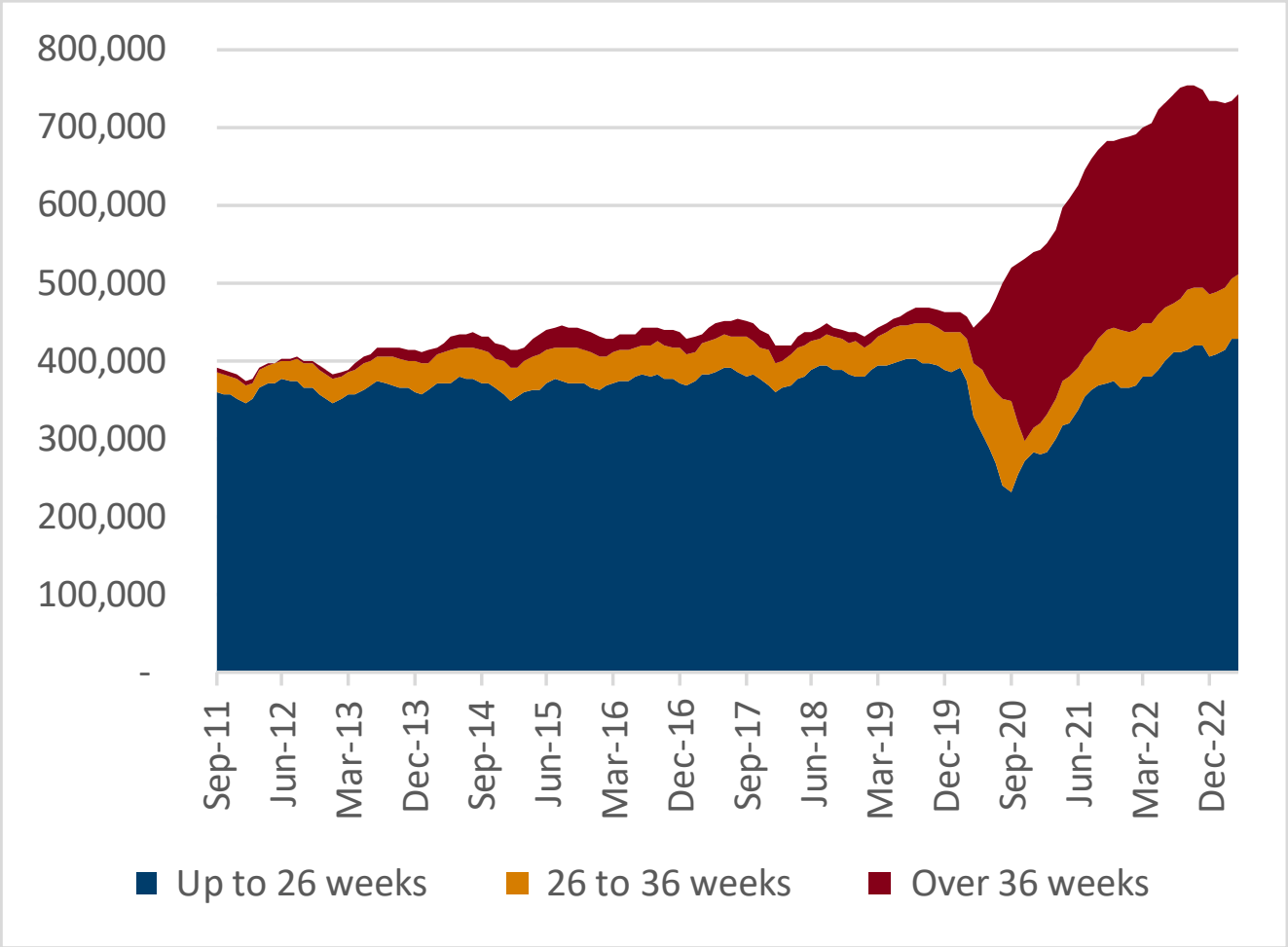
Source: Digital Health and Care Wales

Figure 28: Number of admission episodes by admission method and by month



Source: Digital Health and Care Wales

Figure 29: Referral to treatment waiting times for patient pathways waiting (open pathway)



Source: Referral to treatment times (RTT), Digital Health and Care Wales (DHCW)

Patient pathways waiting to start treatment[17] increased in the month to April 2023, to 743,339, from 734,721 in March 2023. This is, however, a decrease from the maximum recorded figure of 753,293 recorded in October 2022. There is a seasonal pattern to the number of patient pathways waiting to start treatment, with maxima typically occurring in August, and minima typically occurring in January, during pre-pandemic years. This seasonality could contribute to the decrease observed between October 2022 and March 2023 and the increase observed in the month to April 2023. Overall, the trend has slowed in recent months when compared with the trend seen between April 2020 and September 2022 when there was consecutive growth.

The patient pathway backlog, especially those with referral to treatment waiting times over 36 weeks is high. In the early stages of the pandemic, referral to treatment waits

[17] Patient pathways waiting to start treatment by month, grouped weeks and stage of pathway (gov.wales)

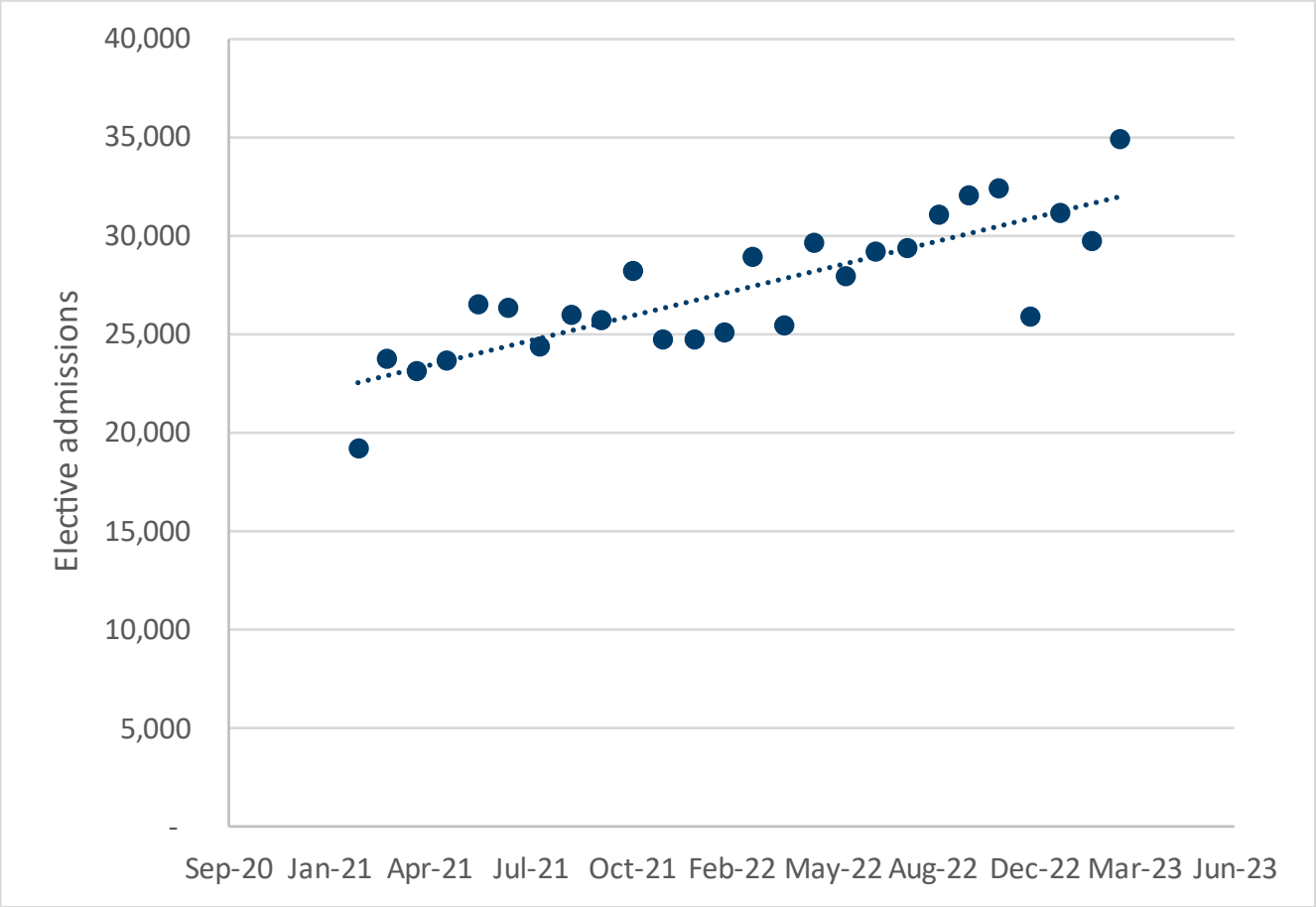
over 36 weeks increased drastically from around 30,000 in early 2020 to over 200,000 in the end of that year and have remained over 200,000 since. The trend had been falling since August 2022, but increased in the month to April 2023. Waiting times of up to 26 weeks decreased significantly from February 2020 (at just over 390,000) to September 2020 (at around 230,000), but these have been steadily increasing back to pre-pandemic levels. Referrals are being added faster than they can be dealt with - non-backlog patient pathways up to 26 weeks are rising by an average of over 6,000 per month (September 2020 through to latest).

Elective care backlog winter 2023-24

In order to estimate the numbers of elective admissions and patient pathways waiting to start treatment during the winter period 2023-24, regression analyses were carried out on recent data.

It is anticipated that elective admissions will continue increasing approximately linearly from around February 2021, after the initial fluctuations in elective admissions towards the start of the pandemic.

Figure 30: Recent trend in elective admissions – since February 2021



Following this trend through to the coming winter period 2023-24 gives the following 95% confidence intervals for monthly elective admissions:

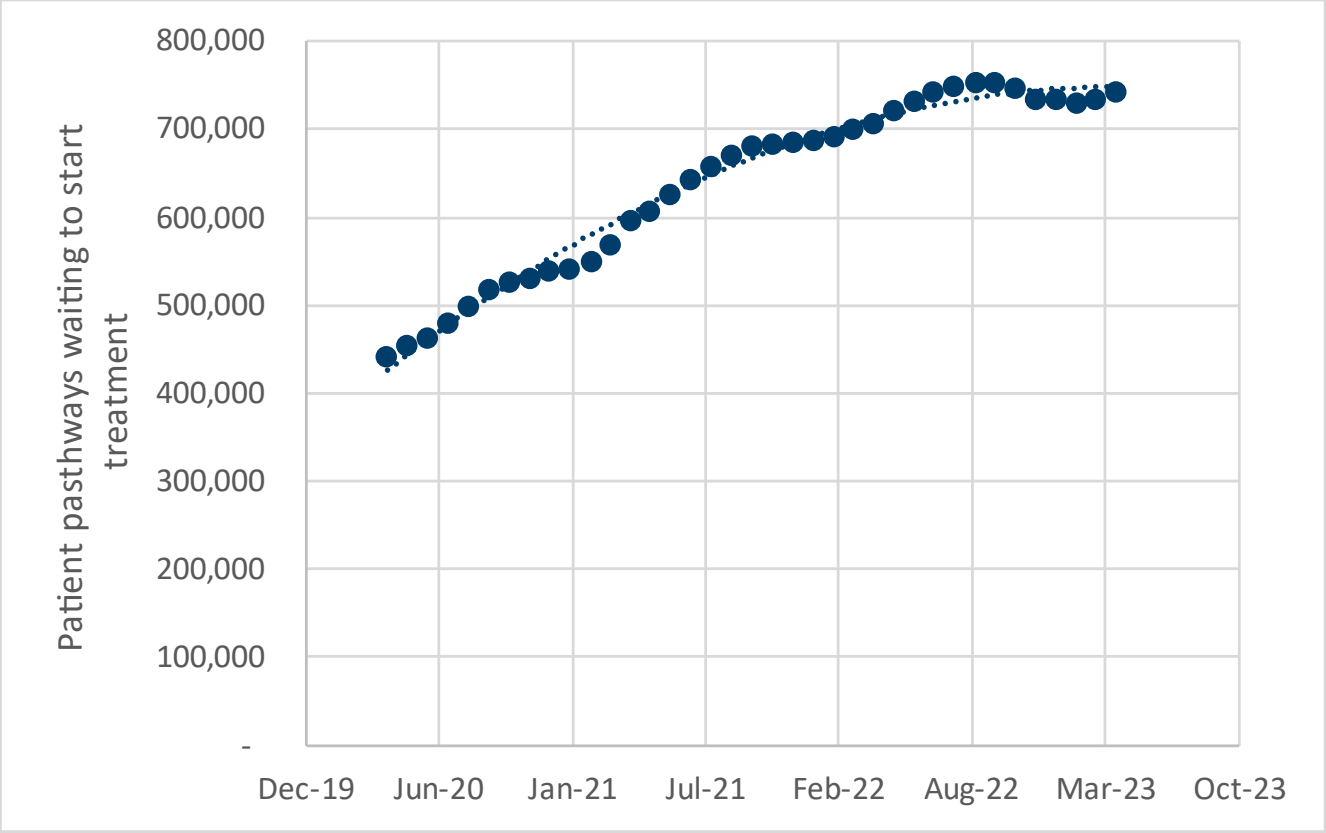
Table 5: Elective admissions over the winter period 2023-24 95% confidence interval

	Lower	Upper
Nov-23	34,200	35,900
Dec-23	34,600	36,200
Jan-24	35,000	36,600
Feb-24	35,400	37,000
Mar-24	35,700	37,400

These figures suggest that levels of elective admissions will likely be comparable to the sorts of figures seen before the pandemic (in 2019).

Recent trends in patient pathways waiting to start treatment (since April 2020) have closely followed a quadratic pattern, though with some seasonal variation:

Figure 31: Recent trend in patient pathways waiting to start treatment - since April 2020



Extending this trend to winter 2023-24 using a quadratic regression analysis with a seasonal adjustment gives the following 95% confidence intervals:

Table 6: Patient pathways waiting to start treatment over the winter period 2023-24 95% confidence interval

	Lower	Upper
November 2023	729,000	748,000
December 2023	716,000	736,000
January 2024	706,000	725,000
February 2024	697,000	716,000
March 2024	696,000	716,000

This suggests that there could be an overall decrease in patient pathways waiting to receive treatment, beyond seasonal trends, when compared with the most recent data.

The modelling in the section is based on regression of trends and does not include the impact of new policies. Since the start of the pandemic, waiting lists have continued to reach record highs although this trend does appear to be slowing. Huge efforts are being made to reduce these waiting lists and with time we will have further clarity on how these measures are having an impact on waiting lists, especially when combined with the easing of the effects of the pandemic lessening pressures on the healthcare system.

Cost of living

Top line Summary

- During the winter 2022-23 period, 18% of those living in the most deprived areas had a direct debit, standing order, or bill they were not able to pay in the past month, compared to 5% in the least deprived areas.
- Fuel poverty charity National Energy Action reports, based on modelling from the World Health Organisation, cold homes cause 4,020 excess winter deaths last year in England and Wales.
- The impact of the cost of living crisis is likely to be increased through poorer physical and mental health and wellbeing amongst those living in the most deprived areas in Wales.

The cost of living in the UK has risen in recent years which has had an impact on people's behaviour in order to cover their costs. The public opinions and social trends survey conducted between 25 January and 5 February 2023 revealed how people's lives had been affected by rising costs.[18] Around 9 in 10 (94%) adults in Great Britain

[18] Public opinions and social trends, Great Britain - Office for National Statistics

reported their cost of living had increased compared to the previous year. The most commonly reported reasons for the rise in cost of living were the price of food shopping (95%) and gas or electricity bills (73%). Accessing resources for good nutrition and a warm home are both factors that contribute to overall health. If people feel they need to reduce either of these costs their health may be impacted and they could develop or see a deterioration in long and short term conditions. With winter viruses circulating during the colder months there is also an increased risk of becoming ill and requiring healthcare during the winter period. These factors are more likely to occur for those living in more deprived areas, who may experience more issues with the condition of their homes (e.g., damp, mould, drafts).

Cold homes and poor health

In 2020-2021 figures for Excess Winter Deaths in England and Wales from the ONS report an estimated 13,400 more deaths occurred in the winter period (December 2021 to March 2022) compared with the average non-winter periods.[19] Fuel poverty charity National Energy Action reports, based on modelling from the World Health Organisation, cold homes cause 4,020 excess winter deaths last year in England and Wales.[20]

Living in a cold home can increase the risk of cardiovascular disease, respiratory illnesses and stroke. It can also exacerbate pre-existing respiratory conditions such as chronic obstructive pulmonary disease (COPD)[21]. Previous research has shown warmth and energy improvements in poorer households with children can reduce respiratory problems, and even improve mental health (Thomson et al 2013[22]; Marmot Review Team 2011[23]; Liddell and Morris 2010[24]).

A Local Government Briefing paper published in 2019 stated the NHS spends at least £2.5 billion a year treating people with illnesses directly linked to living in cold, damp and dangerous conditions[25]. Over 25,000 people die each year in the UK as a result of living in cold temperatures, such as a living in poorly heated home[10]. The most common aliments seen for poorly heated homes are circulatory diseases, respiratory problems and mental ill-health. Other conditions which are influenced or exacerbated by cold housing include the common flu and cold, as well as arthritis and rheumatisms[8]. These would most likely lead to increased GP appointments, A&E visits, potential hospital inpatient stays and the need for (further) social service support.

---

[19] Winter mortality in England and Wales - Office for National Statistics (ons.gov.uk)
[20] Fuel poverty charity reveals 45 people per day die from cold homes - National Energy Action (NEA)
[21] Warmer and safer homes | The King's Fund (kingsfund.org.uk)
[7] Thomson H, Thomas S, Sellstrom E, Petticrew M (2013). 'Housing improvements for health and associated socio-economic outcomes'. Cochrane Database of Systematic Reviews.
[8] Marmot Review Team (2011). The Health Impacts of Cold Homes and Fuel Poverty. London: Friends of the Earth and the Marmot Review Team.
[9] Liddell C, Morris C (2010). 'Fuel poverty and human health: A review of recent evidence'. Energy Policy, vol 38, no 6, pp 2987–97.
[10] https://www.local.gov.uk/sites/default/files/documents/LGA%20briefing%20-%20the%20cost%20of%20unhealthy%20housing%20to%20the%20NHS%20-%20HC%20260219.pdf

Costs of energy bills

Fuel stress is defined as spending more than 10% of your household income on energy. Fuel poverty is defined as being unable to afford to keep one's home adequately heated.

The Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy published a fuel poverty statistics report for 2023[26]. The report includes projections of fuel poverty, estimating that fuel poverty would increase to 14.4 per cent (3.53 million) in England in 2023. Most recent estimates of fuel poverty in Wales by Welsh Government suggest that 196,000 households in Wales were estimated to be living in fuel poverty in 2021, equivalent to 14% of households[27], however following the April 2022 increase in the energy price cap up to 45% (614,000) of households could be in fuel poverty[28].

Energy regulator Ofgem has announced that from 1 July 2023, the energy price cap is set at an annual level of £2,074 reflecting recent falls in wholesale energy prices. This represents a reduction from the Government's Energy Price Guarantee, which caps the typical bill at £2,500.[29] In a statement from Ofgem CEO Jonathan Brearley, he stated that in the medium term, prices are unlikely to return to those seen before the energy crisis[14]; the Resolution Foundation estimate energy bills will remain at twice their pre-crisis level for the rest of the year at least.[30] Fuel poverty levels will reflect these changes in energy bills, but will also be made worse by the wider cost of living crisis.

In March 2021, Welsh Government published targets to ensure that by 2035: no households are estimated to be living in severe or persistent fuel poverty as far as reasonable practicable; no more than 5% of households are estimated to be living in fuel poverty at any one time as far as reasonably practicable; and the number of all households "at risk" of falling into fuel poverty will be more than halved based on the 2018 estimate[31].

Considering there will be a continuation of higher costs compared to pre-pandemic levels, we could expect to see a continued impact of the health of the population from fuel poverty and the cost of living crisis. There is also the risk that persistent higher prices also force more people into fuel poverty as they run out of resources to cover costs in the short term. These pressures may disproportionately affect carers. There is evidence of health inequality related to the cost of living crisis as the factors explored here are more likely to occur for those living in more deprived areas. During the winter 2022-23 period, 18% of those living in the most deprived areas had a direct debit, standing order, or bill they were not able to pay in the past month, compared to 5% in the least deprived areas. The wellbeing of those struggling is also likely to be at risk,

---

[11] Annual fuel poverty statistics report: 2023 - GOV.UK (www.gov.uk)
[12] Fuel poverty modelled estimates for Wales: as at October 2021 (gov.wales)
[13] Fuel poverty modelled estimates for Wales (headline results): as at October 2021 | GOV.WALES
[14] Customers to pay less for energy bills from summer | Ofgem
[30] Hoping-and-coping.pdf (resolutionfoundation.org)
[31] Tackling fuel poverty 2021 to 2035 | GOV.WALES

with 34% of those living in the most deprived areas reporting that they are ‘very worried’ about the rising costs of living compared to 17% of those living in the least deprived areas.[4] Considering these data, the overall impact of the cost of living crisis is likely to be increased through poorer physical and mental health and wellbeing amongst those living in the most deprived areas in Wales.

Discussion

As with every upcoming winter season there is uncertainty about how respiratory viruses will impact demand. The scenarios here however give an insight as to what could happen based on historical data. It is evident throughout this paper that it is not only respiratory viruses that are likely to impact people’s health and the NHS in Wales but also indirect harms such as health inequalities and the cost of living crisis. There is also the potential for a rise in cases in a condition that is not expected, like the case of Strep A in winter 2022-23. Public awareness of health issues has changed since the pandemic and media attention or peer-to-peer knowledge sharing can lead to sudden changes in health seeking behaviour, as was the case with strep A in late 2022 or was also observed for other health conditions like bowel cancer screening after the death of Dame Deborah James.

With the continued demand for healthcare services over the summer months in 2023, a winter period with large numbers of respiratory infections could cause capacity issues within the NHS. The flu and COVID-19 vaccination programmes aim to reduce this impact by protecting the most vulnerable people in our communities. [32] [33]

The modelling included in this paper will be compared to actual data throughout the winter period. Where possible, short and medium term projections will provide insight into what could happen on a shorter term basis throughout these months.

[32] Flu vaccination programme | GOV.WALES
[33] COVID-19 vaccination programme | GOV.WALES