

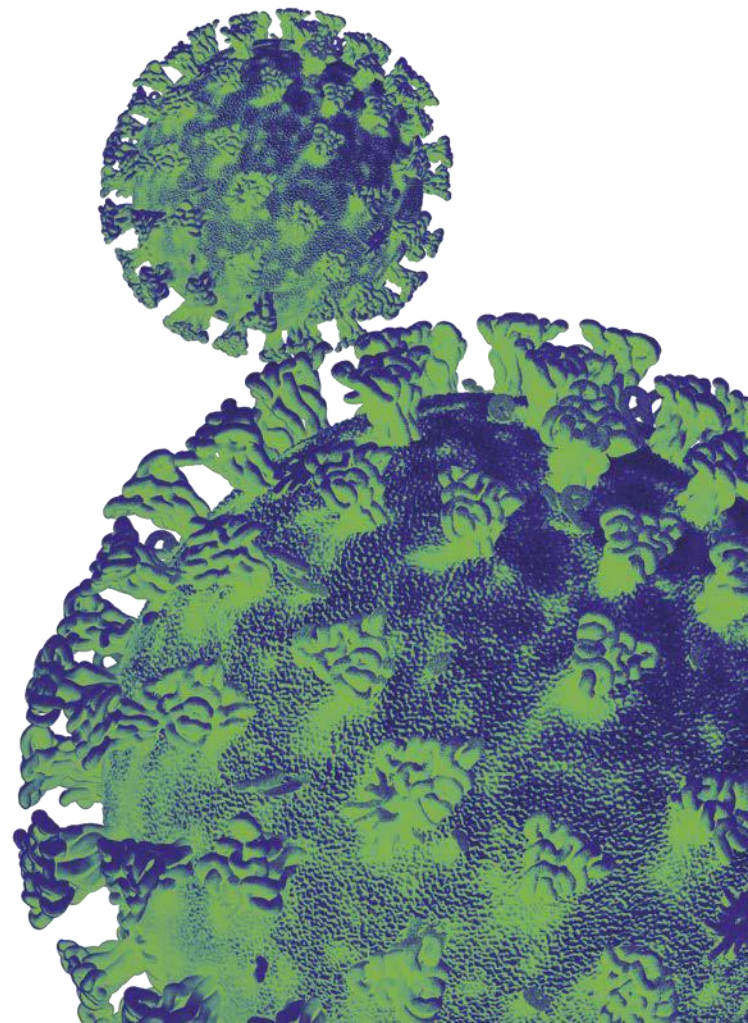
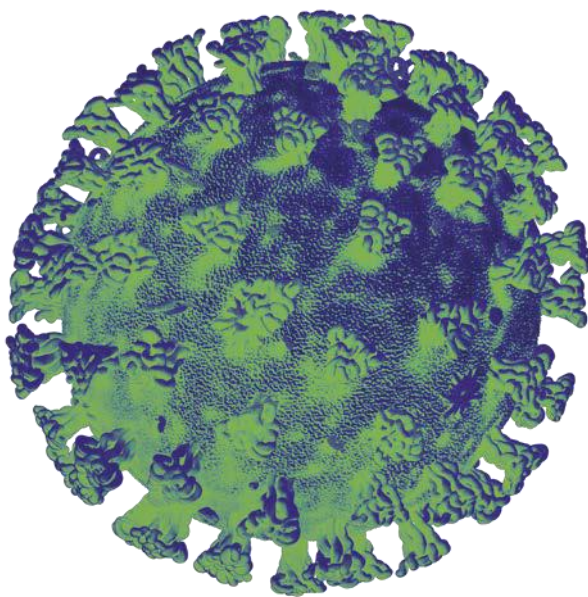


Llywodraeth Cymru  
Welsh Government

# Technical Advisory Group

## Policy modelling update

14<sup>th</sup> October 2021



# Policy modelling update October 2021

## Welsh Government COVID-19 TAG Policy Modelling Subgroup

### 1. Summary

- This paper is one of a series of papers that explores the results of policy modelling carried out by Swansea University and other groups to understand possible futures around the coronavirus pandemic in Wales. All Technical Advisory Cell publications can be found on the Welsh Government website.
- Throughout June to mid July 2021, Wales saw an increase in confirmed COVID-19 cases and positivity. This increase has been highest in young people who have not yet been vaccinated, and typically have more social contacts.
- Following a small dip in COVID-19 cases and test positivity in the second half of July, cases continued to rise again to over 650 cases per 100,000 on 23 September 2021. Following this, case rates have fallen. Positivity rate remained fairly constant around 15% from mid-September onwards though have increased in the week up to 10 October
- The Swansea University epidemiological models have produced estimates of infections and direct COVID-19-related health outcomes until the end of March 2022.
- Overall, the modelled scenarios in this paper estimate that cases, hospitalisations and deaths will continue to decrease following their peaks at the end of September/October 2021. COVID-19 cases were estimated to reach a higher peak than that observed in previous waves. COVID-19 hospitalisations and deaths were estimated to peak at a significantly lower level than previous waves. Hospitalisations and deaths usually peak after cases, however there are indications that earlier peaks could occur due to the currently low average age of cases.
- All of the model scenarios suggest we may have recently surpassed the peak number of COVID-19 cases. However there is still uncertainty and in England, there has been a long plateau in case rates so we may see similar in Wales. Cases are falling at the moment and  $R_t$  is below 1, but that does not necessarily mean COVID-19 pandemic is close to being over. We have a level of equilibrium based on current levels of vaccinations, susceptibility, restrictions and behaviour, but this can change again quite quickly, for instance as people start mixing more indoors with less ventilation in the colder weather, or changes to isolation behaviour.
- A new most likely scenario (MLS) has been chosen. In this scenario the peak is delayed by the mid-July plateau of cases, with the resulting peak following level 0 pushed further into the Autumn. Scenarios in this specific period are

therefore more pessimistic than the previous ones produced in June 2021.

- Because there are relatively few estimated susceptible (neither vaccinated nor infected) people remaining in the model, most scenarios are all quite similar to each other so it is difficult to model a more pessimistic reasonable worst case (RWC) over the short term with current model fitting. However, future scenarios with vaccine escape variants and/or waning immunity can be produced to give a long term RWC.
- Further work is underway to include the impact of booster vaccinations and the recent roll out of vaccines for children aged 12-15.

## 2. Objective

The objective of this paper is to examine scenarios for COVID-19 in Wales from October 2021 to March 2022, which include different assumptions around the impact of new variants, impacts of vaccine efficacies and individuals' ability to continue to follow restrictions and to continue to adopt protective behaviours (labelled in this paper as "adherence").

The scenarios in this paper also include waning immunity from COVID-19 vaccines.

This paper focuses mainly on direct COVID-19 related harms. As the ratio of cases to hospital admissions and deaths falls, the social harms of COVID-19 are reduced, and policy makers need to continue to weigh up these against non-COVID-19 harms.

## 3. Background

Over 90% of the population of Wales aged over 16 have now received at least one dose of a vaccine. Vaccination is now open for all those aged 12 year olds and over. Wales has led the way in terms of vaccination coverage in countries with populations above three million people. This vaccination uptake will produce a reduction in hospitalisations and deaths in vaccinated individuals compared to non-vaccinated individuals.

The case rate as of 4 October 2021 for Wales is 493 confirmed cases per 100k (7 day rolling sum), positivity is around 15%; the case rate is showing signs of falling, following an increase throughout August until 23 September, and positivity remained fairly stable throughout the last 2 weeks of September. In addition, prevalence is 1.87% (as measured by the ONS COVID Infection Survey in the week to 2 October 2021) and antibody prevalence was 91.2% of adults in the week beginning 23 August 2021 (as measured by the COVID Infection Survey),<sup>1</sup> indicating that a high proportion of people have antibodies present either following natural infection or vaccination. However, this percentage has fallen slightly over the past few weeks indicating possible evidence of waning of COVID-19 antibodies in the population of Wales. However, the credible intervals for the past few weeks overlap so caution

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<sup>1</sup> [Coronavirus \(COVID-19\) latest insights - Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/coronavirus/latest-insights)

should be taken in interpreting decreases.

## 4. Evidence Summary

The latest information about the COVID-19 situation in Wales can be found on the Welsh Government website.<sup>2</sup>

## 5. Updated modelling scenarios from Swansea University

Swansea University produced a range of modelled scenarios for the time period up to end of March 2022. The methods have been described previously.<sup>3</sup> The box below describes the current model run on 3 September 2021.

<b>Model Run</b>	30/09/21 'Waning immunity'
	'Waning immunity' refers to the default scenario where immunity to vaccines is assumed to wane 12 months post one dose of a COVID-19 vaccine.
	These scenarios have been updated to reflect the mixing in children which is assumed to have returned to normal (pre-pandemic) levels.

### Level of restrictions in place across Wales

The Welsh Government has set out four alert levels for public response to threat levels that require measures designed to control the spread of the virus and protect people's health.<sup>4</sup> The move to alert level 0 took place in Wales on 7 August 2021.<sup>5</sup>

In the "standard" Swansea University model, the levels of restrictions are assumed to be eased according to the following schedule in 2021:

Opening Schedule	
12 April	School Return plus level 3.5
03 May	Alert level 3
17 May	Alert level 2

<sup>2</sup> [Technical advisory Cell: summary of advice 2 April 2021](#)

<sup>3</sup> <https://gov.wales/sites/default/files/publications/2021-03/technical-advisory-cell-modelling-update-12-february-2021.pdf>

<sup>4</sup> [Coronavirus control plans | GOV.WALES](#)

<sup>5</sup> [Wales moves to alert level zero | GOV.WALES](#)

7 June	Alert level 1.5
19 July	Alert level 1
07 Aug	Alert level 0

For Alert Level 0 this set of modelling scenarios is not the same as Alert Level 0 in July modelling paper,<sup>6</sup> which was a complete easing of restrictions whereas Wales has retained a set of baseline measures – so we are currently more similar to Alert level 0.5 in the July paper.

Compared with the previous paper, the model scenarios have been fitted to more recent data and in particular take into account the shorter hospital length of stay (LOS) that has been observed in the third wave. This means the hospital occupancy peaks are much lower than previous scenarios. The most recent published contact survey (COMIX) data<sup>7</sup> for Wales still shows lower mixing than pre-COVID-19 and shows higher reported wearing of face coverings in Wales than in England, where face coverings are no longer mandated in many places. The models also fit more to children moving back towards normal levels of contacts, whereas adult contacts are still reduced compared to before the pandemic.

### Effectiveness of vaccines

A range of vaccine efficacy levels was chosen to reflect general ‘low’, ‘medium’ and ‘high’ efficacy scenarios based on current knowledge. The next set of model runs will start to include boosters but they are not included currently.

<b>Vaccine Efficacy</b> (3 scenarios representing uncertainty in each variant ribbon plot)			
Scenario	Test positive	Hospital / ICU	Death
Low	70%	91%	95%
Mid	80%	96%	98%
High	90%	98%	99%

<sup>6</sup> [technical-advisory-group-policy-modelling-update-12-july-2021.pdf \(llyw.cymru\)](#)

<sup>7</sup> [Comix Report Survey Week 79 \(cmmid.github.io\)](#)

Uptake of vaccines in the model was assumed as follows:

<b>Vaccine Uptake (maximum at end of roll out)</b>	
75+ years	97%
70-74 years	96.5%
60-69 years	94.5%
50-59 years	91%
40-49 years	85%
30-39 years	77.5%
18-29 years	76.5%
16-17 years	70%
12-15 years	75%

Clinically vulnerable population = 14%, Clinically vulnerable vaccine uptake = 97%

### **Levels of 'adherence'**

Adherence is as described in previous reports. Previously we looked at difference levels of 'adherence' which was number of contacts compared to normal. However since there are few restrictions and the data fit closest to the 'good adherence' scenarios these will be used in future.

### **Impact of Variants**

Current analysis from England suggests that the Delta variant is 40-80% more transmissible than the previously dominant Alpha variant. On the charts below, all scenarios represent a high transmission of Delta, at around 80% more transmissible than Alpha.

In addition, some other variant assumptions were modelled. This is partly to provide a comparison to historic patterns, but also to model the periods of transition when two variants were present before a dominant variant emerged. Historic variants are not shown in all charts for clarity as we have cut down to the most relevant scenarios.



## 6. Swansea University Modelling Scenario Results

All Swansea University (SU) model scenarios estimated an increase in cases from August 2021 with peaks likely late September to mid-October and likely peaks in hospitalisations and deaths in October 2021.

Assuming Delta is 80% more transmissible, there are estimated to be maximum number of between around 2,000 and 2,300<sup>8</sup> COVID-19 cases per day from 1 October 2021. Shortly after 7 August 2021, the cases (and subsequently the hospital admissions and deaths) in the model began to increase. The peaks for all scenarios are remarkably similar but this may suggest an artificially high level of certainty; this effect is driven by the models reaching a point of a small number of people who remain susceptible, too few to sustain transmission in the model.

For each Swansea University model scenario, there are different levels of vaccine effectiveness (low, mid, and high) which have an impact on the overall trend in cases, hospital admissions and deaths.

Figures 1, 2 and 3 compare actuals with model-estimated cases, hospital admissions and deaths under different scenarios of different vaccine effectiveness combined with good adherence and high Delta (80% increased transmission). All scenarios account for waning immunity. The peak in daily cases in all scenarios are slightly more than the height of the second wave's peak in December 2020. The uncertainty in model estimates are driven by the uncertainty in effectiveness of vaccines on the Delta variant.

The SU models estimate a peak followed by a fall in cases as we see acquired population immunity effects. This would represent the first decline in cases in the absence of substantial NPIs, though ongoing TTP efforts continue to contribute significantly (as well as vaccination and other baseline measures). There is some evidence of this in some parts of North West England such as Bolton and Blackburn.

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<sup>8</sup> This equates to between 490 and 580 cases per 100,000 of the population in Wales (7 day rolling sum).

Figure 1. Modelled Swansea University (SU) COVID-19 cases from 1<sup>st</sup> December 2020 to 30 March 2022; under high Delta, good adherence, and different levels of vaccine effectiveness, with waning immunity included. Sources: SU model. Actuals from PHW Tableau.

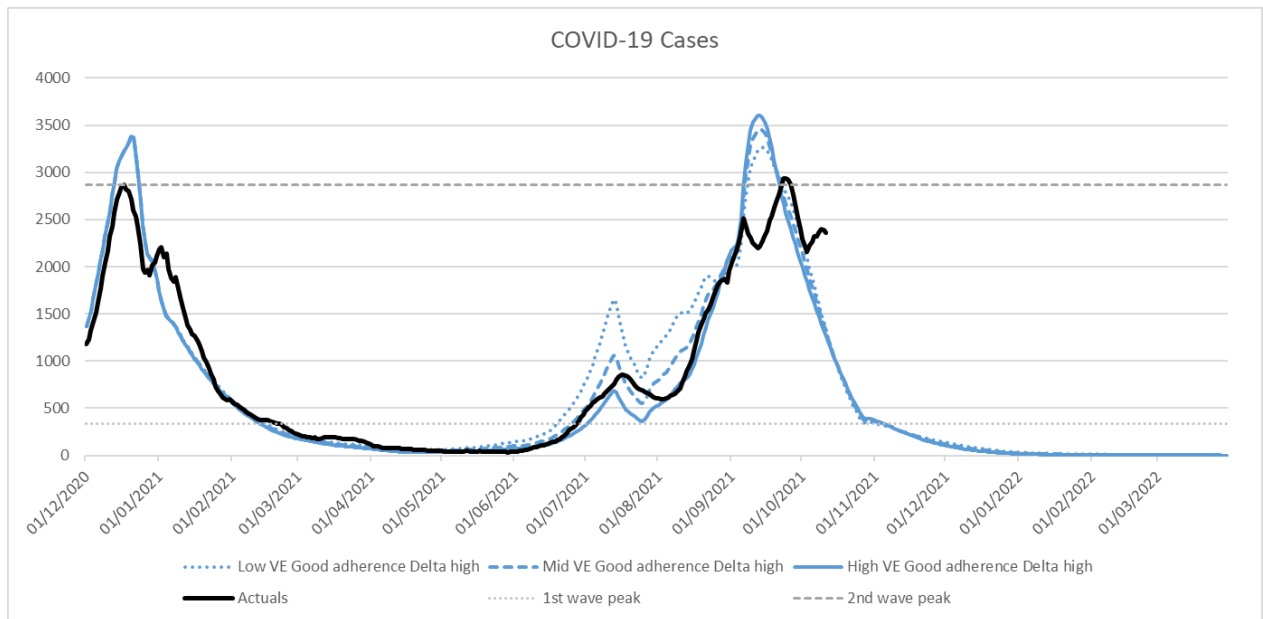


Figure 2: COVID-19 hospital admissions from 1<sup>st</sup> December 2020 to 30 March 2022; under different scenarios of high Delta transmission, good adherence and different levels of vaccine effectiveness, with waning immunity included. Sources: SU model, Actuals from PHW ICNet.

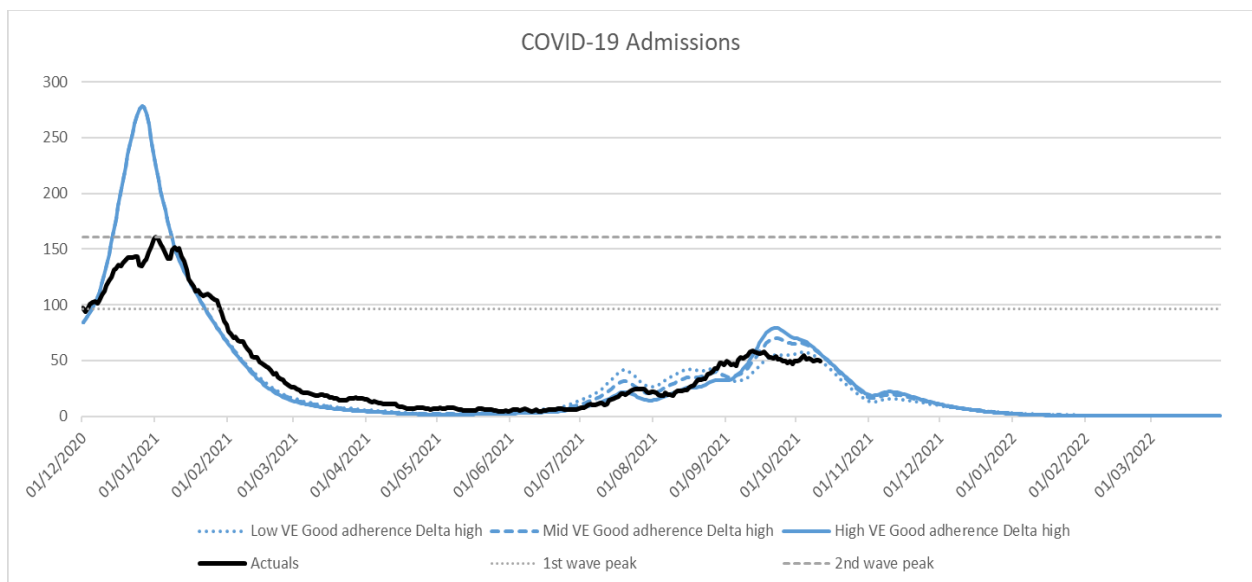




Figure 3: COVID-19 deaths from 1<sup>st</sup> December 2020 to 30 March 2022; under different scenarios of high Delta transmission, good adherence and different levels of vaccine effectiveness, with waning immunity included. Sources: SU model, Actuals from PHW ICNet.

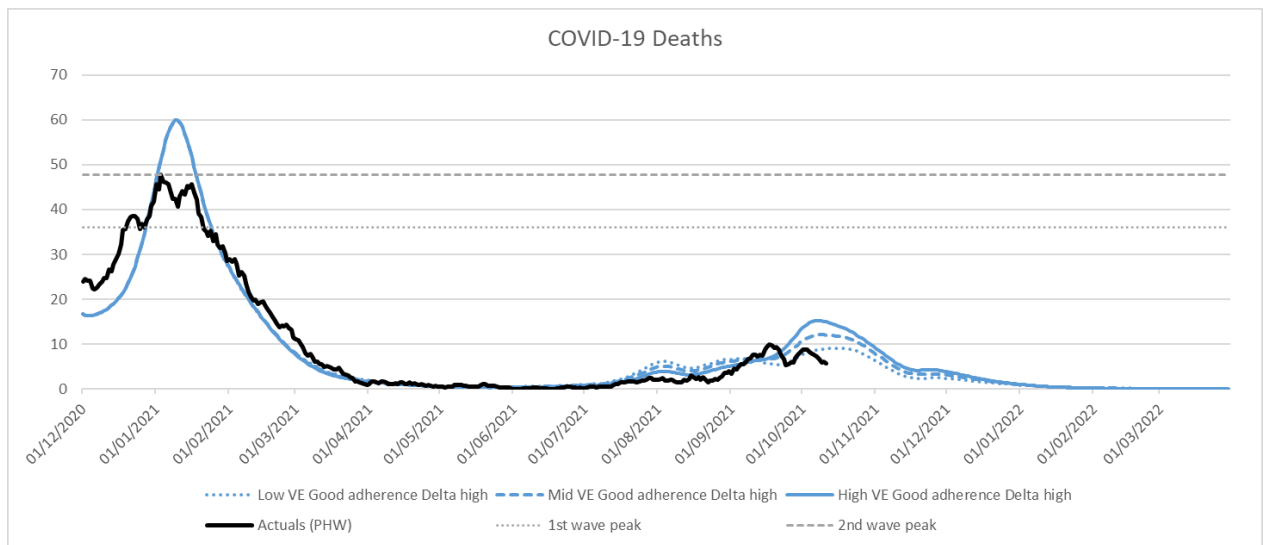


Table 1 shows the total symptomatic cases (in future labelled as “cases”), deaths, admissions and ICU admissions between 1 October 2021 and 31 December 2021 estimated for each scenario. For all scenarios, the number of cases and deaths reduce as vaccine efficacy increases. Cases are rounded to the nearest 100. Deaths and ICU bed occupancy are rounded to the nearest 10. Total admissions are rounded to the nearest 100. Peak daily admissions are rounded to the nearest 10.

Table 1: Totals (between 1 October 2021 and 31 December 2021) for the scenarios taking waning immunity into account

Scenario	Cases	Deaths	Admissions	ICU Admissions
Waning_Low VE Good Adherence__Delta High	42,300	410	1,800	160
Waning_Mid VE Good Adherence__Delta High	41,300	540	2,000	170
Waning_High VE Good Adherence__Delta High	39,900	600	2,100	160

## **Interpretation – new Reasonable Worst Case (RWC) and Most Likely Scenario (MLS)**

Within Wales, the reasonable worst case scenario (RWC) and most likely scenario (MLS) are used for planning for the NHS and others. The new October MLS was presented publicly on 8 October.<sup>9</sup> It makes sense to update the RWC and MLS over time as our understanding changes. Previously, because the current Swansea scenarios were all very similar, we have opted to not adopt a new RWC as none of them are particularly pessimistic in relation to other scenarios. This latest modelling includes a waning vaccine effectiveness scenario. However, the inclusion of boosters and vaccines in 12-15 year olds in future may reduce the impact of waning and/or enhance immunity and efficacy.

We consider the new October 2021 MLS to be the following:

- MLS scenario: “good” adherence of existing restrictions, mid vaccine efficacy (80% effective against COVID-19 cases and 96% effective against COVID-19 confirmed hospital admissions and ICU admissions, and 98% effective against deaths due to COVID-19), and high Delta variant transmissibility which represents a scenario where Delta is 80% more transmissible than Alpha (“low Delta” scenario). The scenario chosen takes waning immunity from vaccines into account.

These scenarios provide similar results for each scenario. It is not therefore appropriate to choose a reasonable worst case (RWC) from the scenarios provided since it would not differ sufficiently from the MLS.

Tables 3A and 3B show the totals and daily peaks between 1 October 2021 and 31 December 2021 for the new proposed MLS scenarios. Figures 4 to 8 show the new chosen MLS scenario along with the observed data (actuals) and the previous June 2021 MLS for comparison.

The new scenarios can be compared to the previous ones produced in June 2021. The data tracked most closely to the Delta Low scenarios. The main difference is the timing of the rise in cases following relaxation of NPIs. Several June scenarios showed peaks earlier in the summer, even at realistic delta transmission assumptions. Such an early rise in cases was not realised. One possible reason for the stalling of cases in mid-July could be the very high prevalence of individuals isolating at this point in time (the so called “pingdemic”). This plateau in transmission is accounted for in the current model scenarios, with the effect of delaying the rise in cases to the period following the move to alert level zero on 7 August. Thus current scenarios have higher numbers of cases, admissions and deaths in the September to November 2021 period. Taking into account this shift of the summer peak, it could be argued that the data tracked more closely to the June Delta Mid-High scenarios.

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<sup>9</sup> <https://gov.wales/slides-and-datasets-first-ministers-coronavirus-briefing-8-october-2021>

In all of the following tables, COVID-19 cases are rounded to the nearest 100. Deaths and ICU admissions are rounded to the nearest 10. Total COVID-19 admissions are rounded to the nearest 100 and peak daily COVID-19 admissions are rounded to the nearest 10.

Table 3A: Totals for new chosen October 2021 MLS between 1 October 2021 and 31 December 2021

	Cases	Deaths	Admissions	ICU Admissions
MLS	41,300	540	2,000	170

Table 3B: Daily peaks for new chosen October 2021 MLS between 1 October 2021 and 31 December 2021

	Cases	Deaths	Admissions	Bed occupancy	ICU bed occupancy
MLS	2,100	10	70	500	50

Figure 4: COVID-19 cases under potential new chosen October 2021 MLS compared with the previous June MLS scenarios, actuals included (source: PHW tableau)

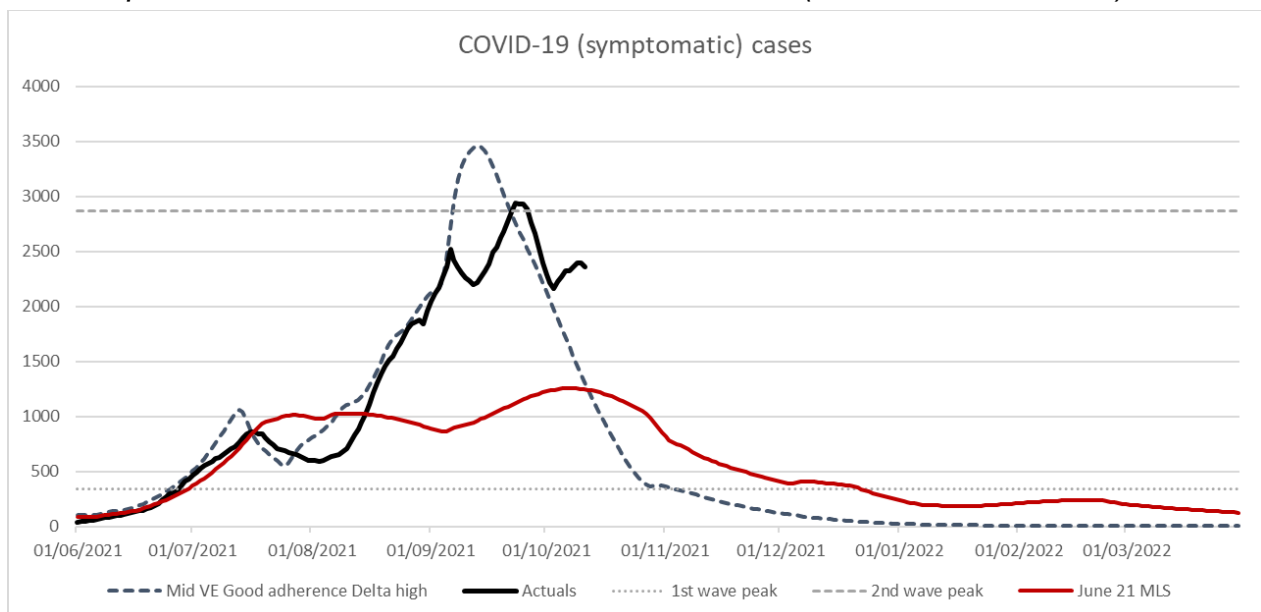


Figure 5: COVID-19 hospital admissions for new chosen October 2021 MLS compared with the previous June MLS scenarios, actuals included (source: PHW ICNet)

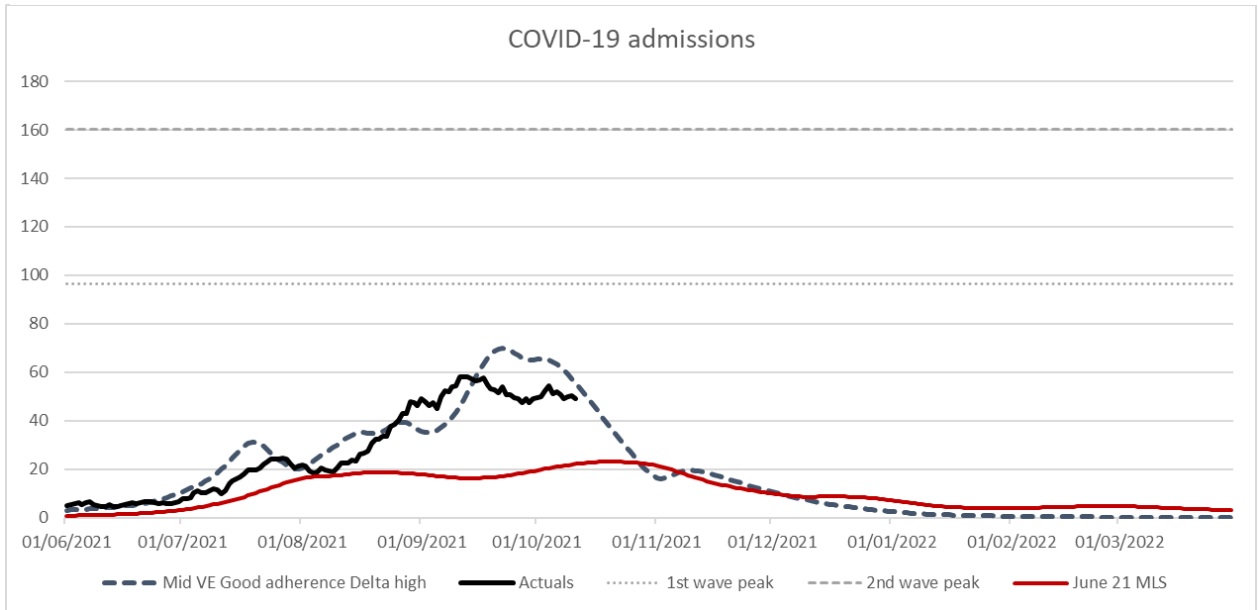


Figure 6: COVID-19 deaths under new chosen October 2021 MLS compared with the previous June MLS scenarios, actuals included (source: PHW ICNet)

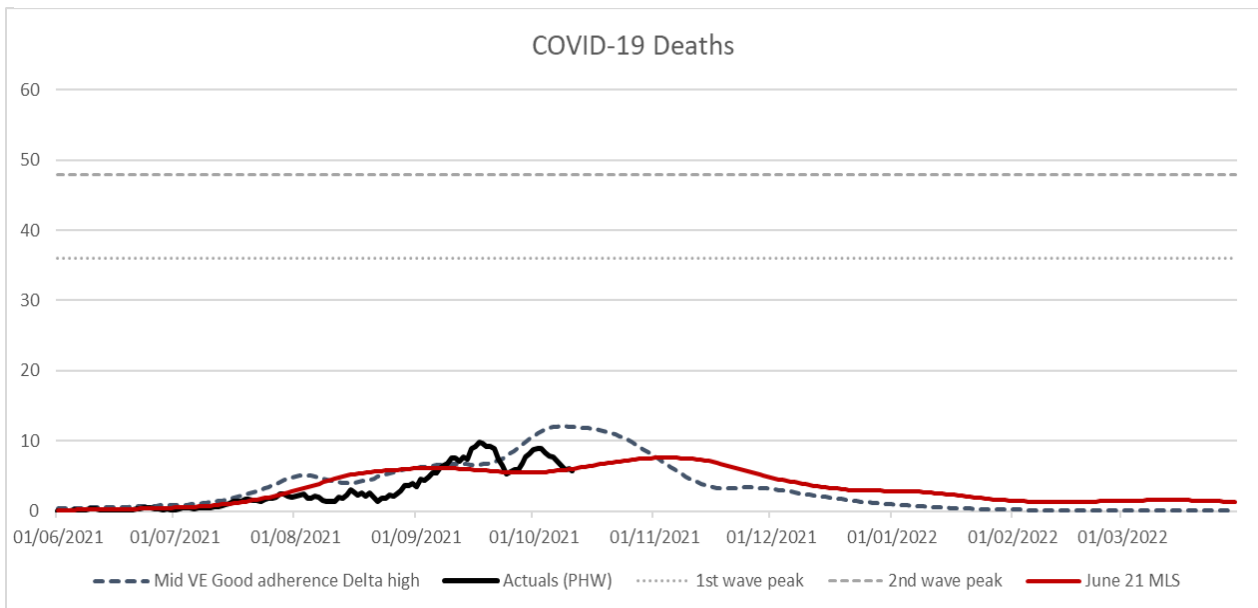


Figure 7: COVID-19 total bed occupancy under new chosen October 2021 MLS compared with the previous June MLS scenarios, actuals included (source: StatsWales)

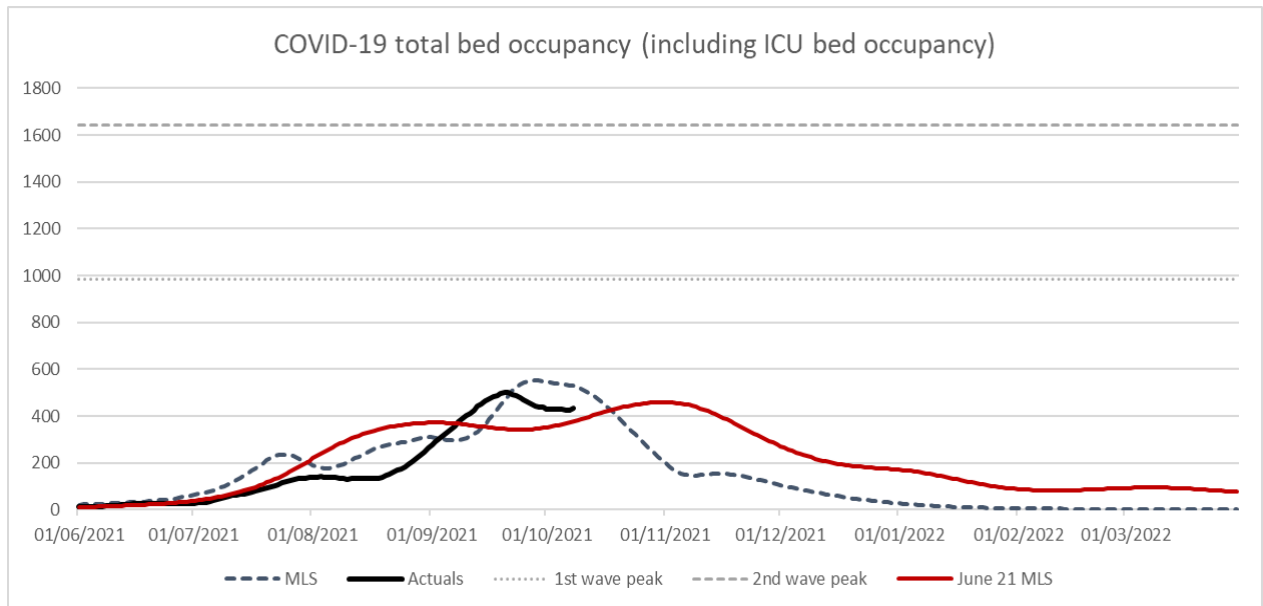
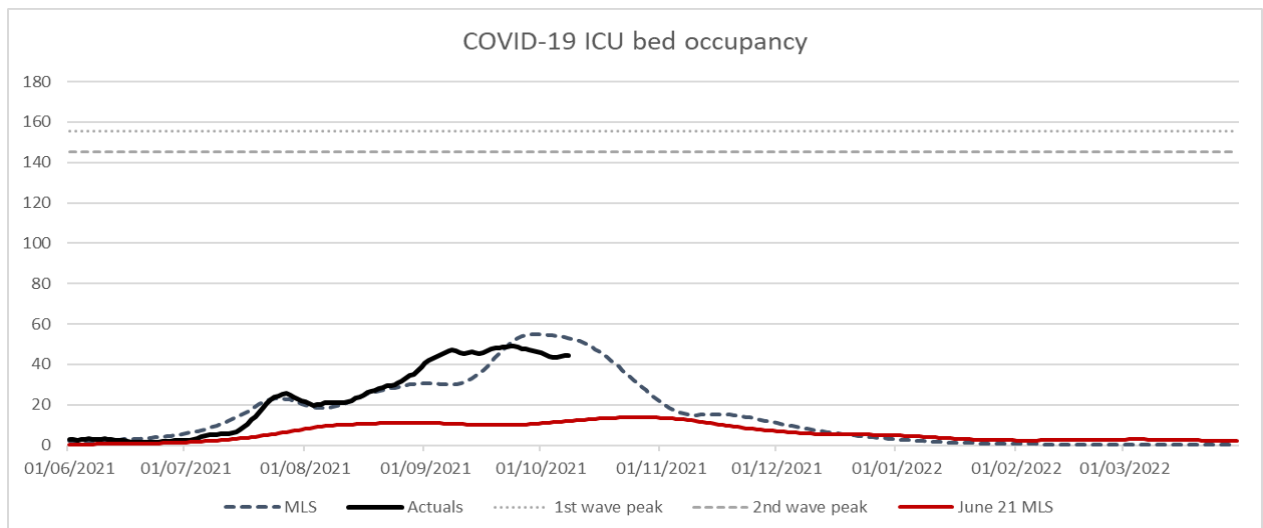


Figure 8: COVID-19 ICU bed occupancy under new chosen October 2021 MLS compared with the previous June MLS scenarios, actuals included (source: StatsWales)



## 7. COVID-19, RSV and flu combined

Each year in Wales, we expect to see an influenza ('flu') and respiratory syncytial virus (RSV) season in the winter months. However, due to the COVID-19 restrictions in place last winter, the usual peaks in flu and RSV admissions did not occur. This is largely due to the reduction in mixing of people in the population.

With restrictions being eased, and Wales entering alert level zero on 7 August 2021, mixing has increased again. On top of this, schools returned in September. This has led to an initial RSV peak occurring in July, 15 weeks earlier than in a normal year (before COVID-19 existed) but may be plateauing now. There are still likely to be lots of children susceptible to illness caused by RSV so we may see a second peak in activity later in the Winter. A large part of the increase in RSV compared to previous seasons is likely to be due to increased testing rates. Cases of flu are also increasing slightly but remain low and it remains to be seen whether we will see much of a flu season this Winter; it may also peak later than usual. We can expect further pressure on the NHS this winter due to the spread of respiratory viruses such as flu and RSV which have built up an immunity debt over the previous 18 months.

Previous modelling carried out by the Technical Advisory Cell outlined some flu and RSV scenarios in the [Winter Modelling Paper](#).

In this report, we have combined estimated numbers of flu (all ages) and child bronchitis/bronchiolitis (most often caused by RSV) hospital admissions we may observe with the estimated COVID-19 hospital admissions that are estimated from the Swansea University (SU) models. We have used the flu and bronchitis/bronchiolitis admissions from 2017/18<sup>10</sup> which was a particularly bad year for flu with many more flu cases than usual (and was a typical year for RSV-related admissions which do not vary as much year to year as flu) and applied those numbers to this coming winter (2021/22). In addition, we looked at two further scenarios where we multiplied the 2017/18 flu and bronchitis/bronchiolitis admissions by 1.5 and 2 respectively and applied the numbers to the fast-approaching 2021/22 winter, based on models produced by University of Warwick, Imperial College London, and others, that estimated that flu and RSV seasons could peak at up to roughly double their normal levels of activity. RSV mainly leads to bronchiolitis admissions in younger children, whereas different flu types, subtypes and clades vary hugely in the age distribution of disease burden, with some producing a lot of hospital admissions in under 65s and children, and some affecting older people more.

These admissions were only those coded with a diagnosis of influenza; it may be that there is a much greater burden of disease around pneumonia and other hospital admissions that are caused by flu but not coded as such. We aim to look at this more

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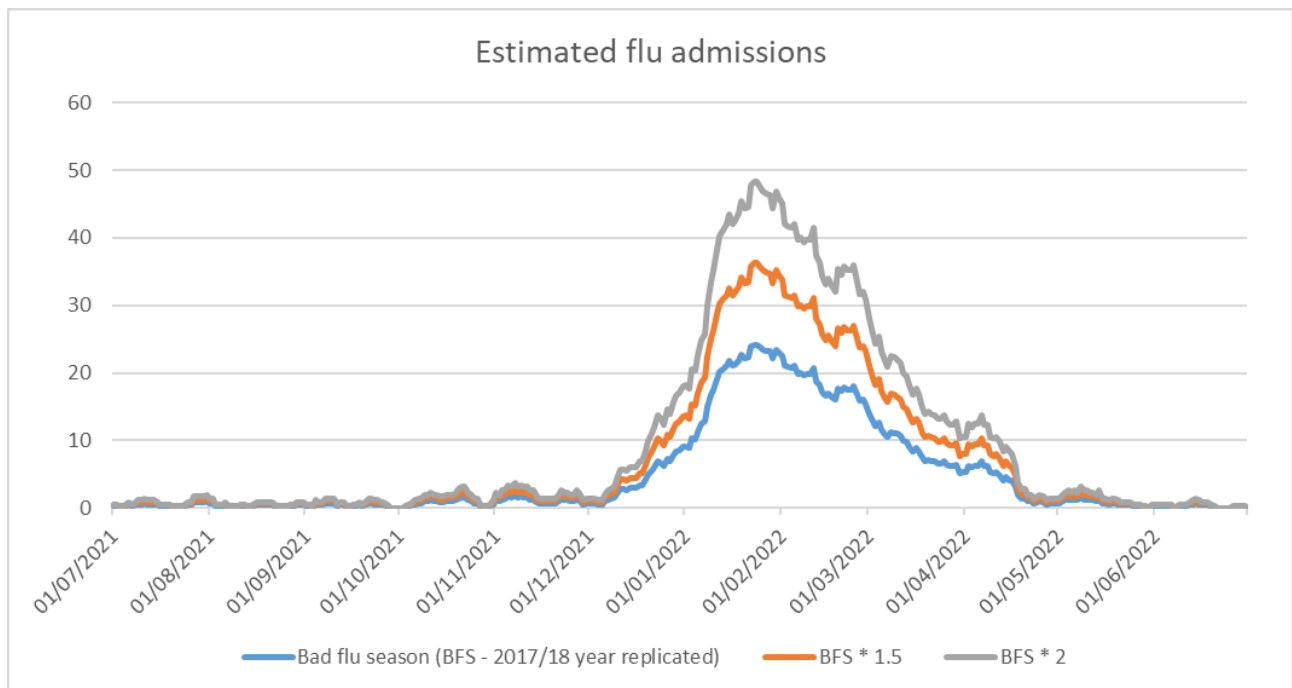
<sup>10</sup> Number of flu and RSV admissions in the 2017/18 year were taken from 1 July 2017 to 30 June 2018.



in future. We have also not included the impact of co-infection with COVID-19 and flu, which may produce longer length of stay in hospital, as well as an increased mortality risk.<sup>11</sup>

Figure 9 shows the different estimated flu scenario, Figure 10 shows the estimates RSV scenarios. And Figure 11 shows the scenarios for the combination of flu, RSV and COVID-19.

*Figure 9: Number of estimated daily hospital admissions due to flu, using the same number of admissions from the 2017/18 year (July 2017 to June 2018) and applying it to estimated numbers for the 2021/22 year (from 1 July 2021 to 30 March 2022)*



<sup>11</sup> [Interactions between SARS-CoV-2 and influenza, and the impact of coinfection on disease severity: a test-negative design \(nih.gov\)](#)

Figure 10: Number of estimated daily hospital admissions due to RSV (child bronchitis and bronchiolitis admissions), using the same number of admissions from the 2017/18 year (July 2017 to June 2018) and applying it to estimated numbers for the 2021/22 year (from 1 July 2021 to 30 March 2022)

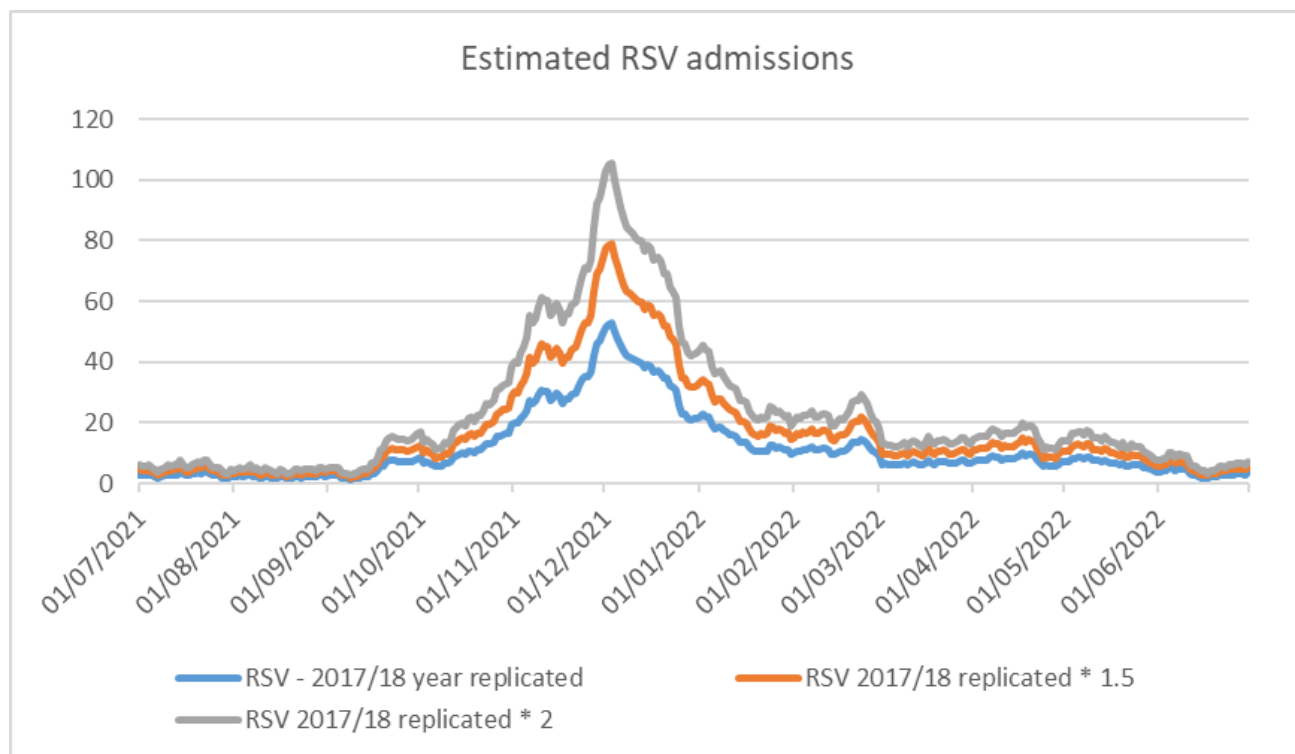


Figure 11: Number of estimated daily hospital admissions due to COVID-19, flu or child bronchitis and bronchiolitis (light blue lines) compared with actual COVID-19 admissions (black line) to 25 September 2021 (Source: PHW ICNet), and the chosen COVID-19 October 2021 MLS scenario (navy dashed line).

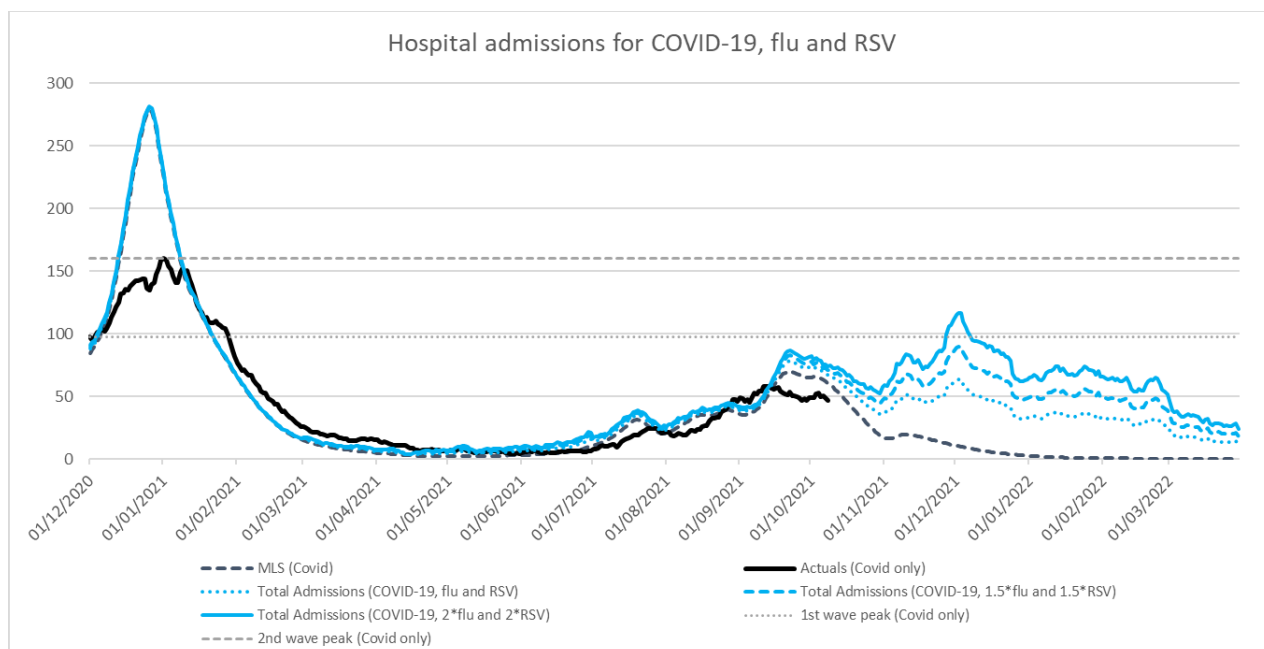


Figure 12: Estimated total bed occupancy (including ICU beds) due to COVID-19, flu or child bronchitis and bronchiolitis (light blue lines) compared with actual COVID-19 admissions (black line) to 25 September 2021 (Source: Stats Wales), and the chosen COVID-19 October 2021 MLS scenario (navy dashed line).

