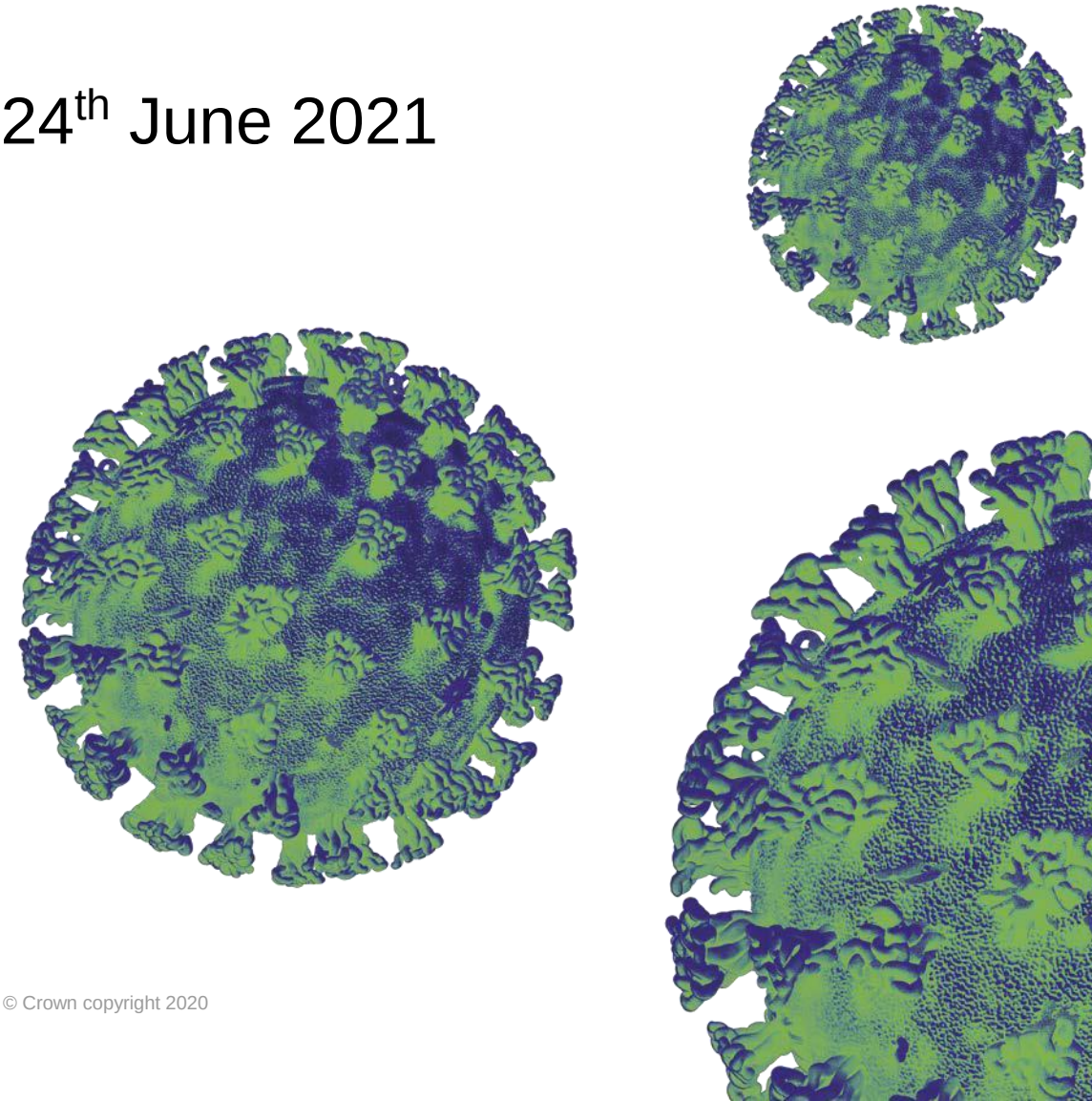
Llywodraeth Cymru
Welsh Government

Technical Advisory Group

Policy modelling update

24th June 2021



Policy modelling update 24th June 2021

Welsh Government COVID-19 TAG Policy Modelling Subgroup

1. Summary

- This paper explores the results of policy modelling carried out by Swansea University to understand possible futures around the coronavirus pandemic in Wales.
- As of mid-June 2021, Wales is seeing an increase in cases and positivity, and England has seen several weeks of rapid growth in cases, so Wales may be following a few weeks behind. This increase has been highest in young people who have not yet been vaccinated, and typically have more social contacts.
- The Swansea University epidemiological models have produced estimates of infections and direct COVID-related harms until the end of March 2022.
- Overall, the modelled scenarios suggest that it is likely cases, hospitalisations and deaths will increase during July, as restrictions are eased further, and as the more transmissible Delta variant supplants the Alpha variant. Cases are likely to peak in late July 2021. Hospitalisations and deaths are likely to peak in August 2021.
- The level of uncertainty now is arguably higher than it has been at other times in the pandemic because we cannot be certain when we might start to see population immunity effects, small network effects, and we cannot be certain how much vaccines have broken the link between infections and other harms.
- It may be another 2-3 weeks before we have a good idea of what to expect in terms of which trajectory we are following; England is a few weeks ahead of Wales in terms of case rates so data for England may be informative in terms of future rates of hospitalisations and deaths.
- So far in 2021, it is likely that restrictions, public responses and the rollout of the COVID-19 vaccines have had an impact in reducing transmission of the virus and reducing hospital admissions and deaths.
- Evidence suggests the Delta variant is 40-80% more transmissible than the previously dominant Alpha variant. This has led to estimated increases in the modelled number of future COVID-19 cases, hospital admissions and deaths.
- Evidence is emerging suggesting that vaccines are reducing onward transmission and are very effective in preventing severe disease, even with the Delta variant. However, there is still uncertainty about duration of effectiveness of available vaccines and plans for booster vaccinations.
- It is likely that future outbreaks will occur in children and young people who have more contacts and have not been vaccinated, so we need to continue to consider what level of virus transmission is acceptable if vaccinations are keeping hospitalisations and deaths low.

- Key uncertainties are: the level of adherence to social distancing and other restrictions; the impact of vaccines on transmission and whether they remain effective against the Delta variant; the impact of Delta and other potential new variants; and, the possibility of waning immunity.
- The current modelled scenarios do not include the impact of further antigenic drift or waning immunity; so are likely to be robust for the next few months, but further modelling is required in advance of Winter 2021/22.
- Continued surveillance of infections in schools, supply, uptake and effectiveness of vaccines, and impact and spread of variants is crucial in helping to understand what trajectory Wales is following in terms of the pandemic, and in fine-tuning future policy formulations to deal with the pandemic while reducing other health, educational and socioeconomic harms and inequalities.
- This paper also includes a new reasonable worst case (RWC) and most likely scenario (MLS) which will be used for planning in Wales.

2. Objective

The objective of this paper is to examine scenarios for COVID-19 in Wales from June 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").

This paper focuses only on direct COVID-19 related harms; there are clearly a range of harms related to the pandemic and pandemic response which other groups within Welsh Government are considering. As hospital admissions and deaths become decoupled from covid cases, considering this balance of harms becomes more important because 100 covid cases now do not produce the same harms as 100 covid cases did in November 2020.

3. Background

Wales went into Level 4 restrictions on 20th December 2020 following the identification of the new Variant of Concern 202012/01 (B.1.1.7, now known as Alpha), increasing rates of confirmed COVID-19 case rates, and pressure on the NHS.[1] Over 70% of the population of Wales have now received at least one dose of a vaccine. This includes over 95% of over 80 year olds and more than 88% of 50-54 year olds, the final group in the top nine priority groups Welsh Government targeted, and achieved, to offer a first dose of the vaccine to by 15th April 2021. Vaccination is now open for all those aged 18 year olds and over, and more than 69% of 18-29 year olds have received a first dose as at 20 June 2021. 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 16th June 2021 for Wales is 29 confirmed cases per 100k (7 day rolling sum), positivity is around 2.6%, and case rate and positivity are currently increasing after being low throughout April and May 2021. In addition, prevalence is 0.07% (as measured by the ONS COVID Infection Survey in the week to 12th June 2021) and antibody prevalence was 88.7% in the week to 10th June 2021 (as measured by the COVID Infection Survey), indicating that a high proportion of people have antibodies present either following natural infection or vaccination.

[1] Written Statement: Alert level four restrictions

4. Evidence Summary

The latest information about the COVID-19 situation in Wales can be found on the Welsh Government website.[2]

5. Updated modelling scenarios from Swansea University

Swansea University produced a range of modelled scenarios (60 in total) for the time period up to end of March 2022. The methods have been described previously.[3]

Wales recently received model results from Warwick University and Imperial College London as part of roadmap modelling carried out for SPI-M-O. This modelling was really useful in triangulating the modelling that is produced by Swansea University but has not been included here because it was produced before the Delta variant started to become dominant so has been superseded. The box below describes the current model run.

Model Run	21/06/21 'Slowed' Slowed scenario (remain in level 1 for 4 more weeks), increased uptake, increased efficacy assumptions following Scotland EAVEII test positive estimates (14/06/21) and PHE hospitalisation update (Technical briefing 16: 18/06/21).

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.[4] The first phase of the move to alert level 1 took place in Wales on 7 June 2021.[5]

[2] Technical advisory Cell: summary of advice 2 April 2021
[3] https://gov.wales/sites/default/files/publications/2021-03/technical-advisory-cell-modelling-update12-february-2021.pdf
[4] Coronavirus Control Plan: Alert levels in Wales (14 December 2020).
[5] First Minister confirms phased move to alert level one | GOV.WALES

In the Swansea University model, the levels of restrictions are currently planned 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
7 June	Alert level 1.5
19 July	Alert level 1
01 Aug	Alert level 0.5
01 Dec	Alert level 0

The Swansea University roadmap modelling scenario has therefore changed since the previous 'accelerated' scenario (included in previous modelling update, 5th May 2021) to move to alert level 2 (17th May instead of 24th May) and with a delay of moving fully to alert level 1. The most recent published contact survey (COMIX) data for Wales still shows lower mixing than pre-covid, but mobility data suggests that mobility has increased since the end of May, although the biggest increase has been for parks, which indicates people meeting up outside which has a lower transmission risk.

Effectiveness of vaccines

A range of vaccine efficacy levels was chosen to reflect general 'low', 'medium' and 'high' efficacy scenarios based on current knowledge. This is a development from previous model runs in that the model separates out effectiveness in preventing cases from effectiveness in preventing severe disease.

Vaccine Efficacy (3 scenarios representing uncertainty in each variant ribbon plot)		
Scenario	Test positive	Hospital / ICU / Death
Low	60%	85% (VEclin = 0.625)
Mid	70%	94% (VEclin = 0.80)
High	80%	98% (VEclin = 0.90)

Uptake of vaccines was as follows:

Vaccine Uptake (maximum at end of roll out)	
40+ years	95%
30-39 years	90%
18-29 years	85%

Levels of 'adherence'

Each of the scenarios modelled in this paper is presented with differing 'adherence' levels in these scenarios are modelled on the assumption of both:

- 'Good adherence' (where 'adherence' is at a level equivalent to what was seen during the autumn firebreak in Wales)
- 'Low adherence' (where 'adherence' is at a level equivalent to what was seen during December 2020 in Wales).

In this analysis, low or good adherence is in reference to individual's numbers of contacts, which may change as a result of motivation to comply, but also depending on ability to comply, for instance if workplaces require them to return to working onsite. So it is not only about adherence with the rules, but also how many contacts people are having which may still be within the rules. We know that so far in the

pandemic, adherence has been high and there has been a huge collective effort to reduce contacts, take precautions (such as meeting outside, wearing face covering, handwashing, etc) and control the virus. In these scenarios, good adherence is similar to the reduction in contacts seen in the October 2020 firebreak, while low adherence is more like the number of contacts seen in December 2020.

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, 'low delta' and 'high delta' are the lower and higher estimates respectfully of the new dominant Delta variant. These represent scenarios where Delta is 30% and 80% more transmissible than Alpha respectfully. In this case 30% was chosen rather than 40% as a lower bound because this would represent a mixture of Delta and Alpha.

In addition some other variants were modelled as shown below, but are not shown in all charts as we have cut down to the most relevant scenarios.

Variant Assumptions	
Blue	Original (*m* = 1)
Red	Original + 20% (early Alpha assumption) (*m* = 1.2)
Green	Alpha = Original + 40% (Alpha) (*m* = 1.4)
Purple	Delta = Alpha + 30% (low estimate) (*m* = 1.9)
Orange	Delta = Alpha + 80% (high estimate) (*m* = 2.7)

6. Results Summary

All model scenarios predict an increase in cases in July 2021, with a peak in cases in late July and a peak in hospitalisations and deaths in August 2021. If the Delta variant effect is initially 30% more transmissible than Alpha variant (named low delta scenarios), then there are estimated to be peaks of between around 700 and 2,800 COVID-19 cases per day. If it's 80% more transmissible (named high delta scenarios), there are estimated to be peaks of between around 3,400 and 7,700 COVID-19 cases per day. In reality, we may see the peak number of COVID-19

(symptomatic) cases falling somewhere between the low Delta and high Delta scenarios.

For each scenario, there are different levels of vaccine effectiveness which have a big impact on the overall trend in cases, hospital admissions and deaths. These scenarios suggest that the transmissibility of the Delta Variant of Concern (VOC) has the greatest impact on the number of cases, hospitalisations and deaths, with a

smaller but important contribution from vaccine effectiveness.

Figures 1, 2 and 3 compare actuals with model-estimated cases, hospital admissions and deaths under different scenarios of transmission (low Delta: 30% increased transmission relative to Alpha, high Delta: 80% increased transmission), adherence (low, good) and vaccine effectiveness (low, mid and high).

These figures illustrate the uncertainty around the size and timing of the third COVID-19 wave, with the peak in daily cases ranging from well below the second wave peak in December 2020 to more than twice the height of the second wave's peak under different scenarios. The uncertainty in model estimates are driven by the uncertainty in effectiveness of vaccines on the Delta variant, increased transmissibility of the Delta variant and adherence levels.

Figure 1. Modelled COVID-19 cases from 1st December 2020 to 1st December 2021; under different scenarios of Delta increased transmission, different levels of adherence and different levels of vaccine effectiveness. Source: SU model. Actuals from PHW.

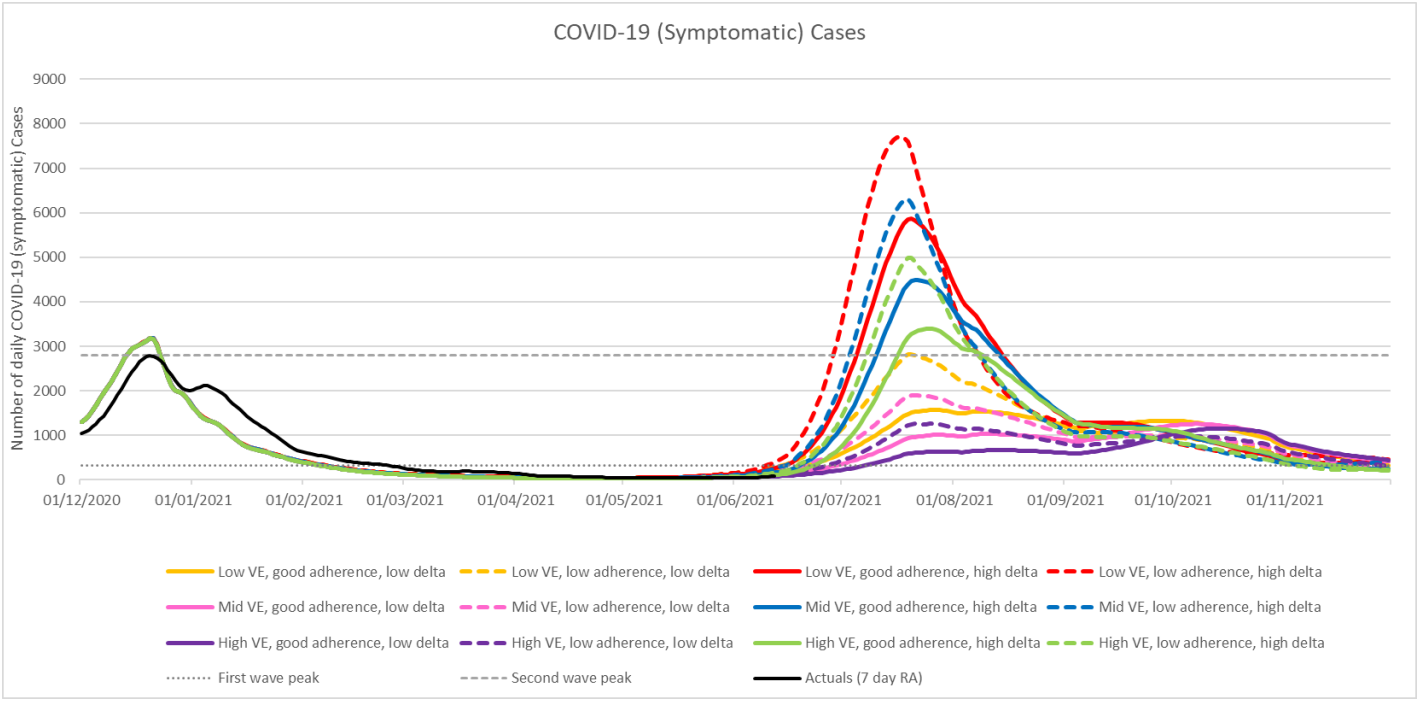


Figure 2 COVID-19 hospital admissions from 1st December 2020 to 1st December 2021; under different scenarios of Delta increased transmission, different levels of adherence and different levels of vaccine effectiveness. Source: SU model

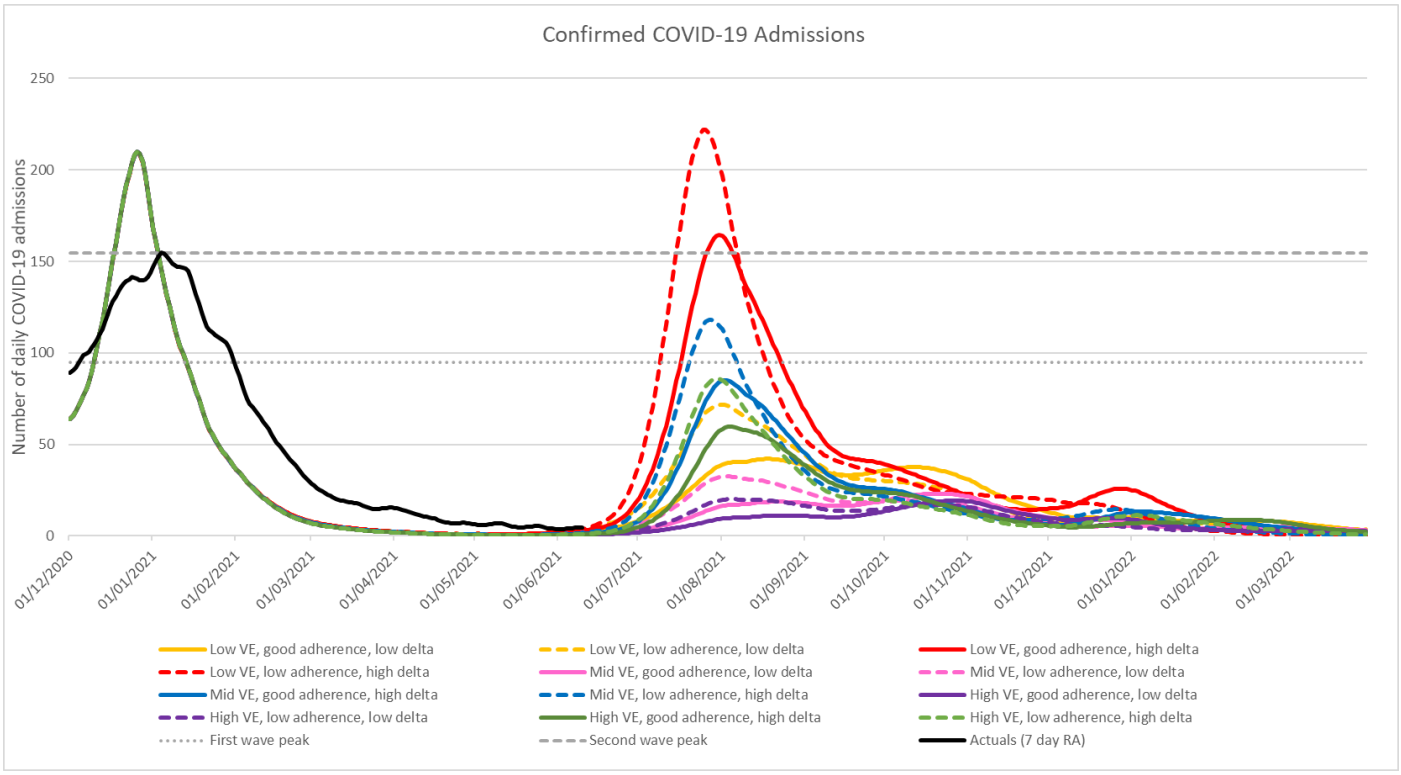


Figure 3 COVID-19 deaths from 1st December 2020 to 1st December 2021; under different scenarios of Delta increased transmission, different levels of adherence and different levels of vaccine effectiveness. Source: SU model. Actuals from PHW.

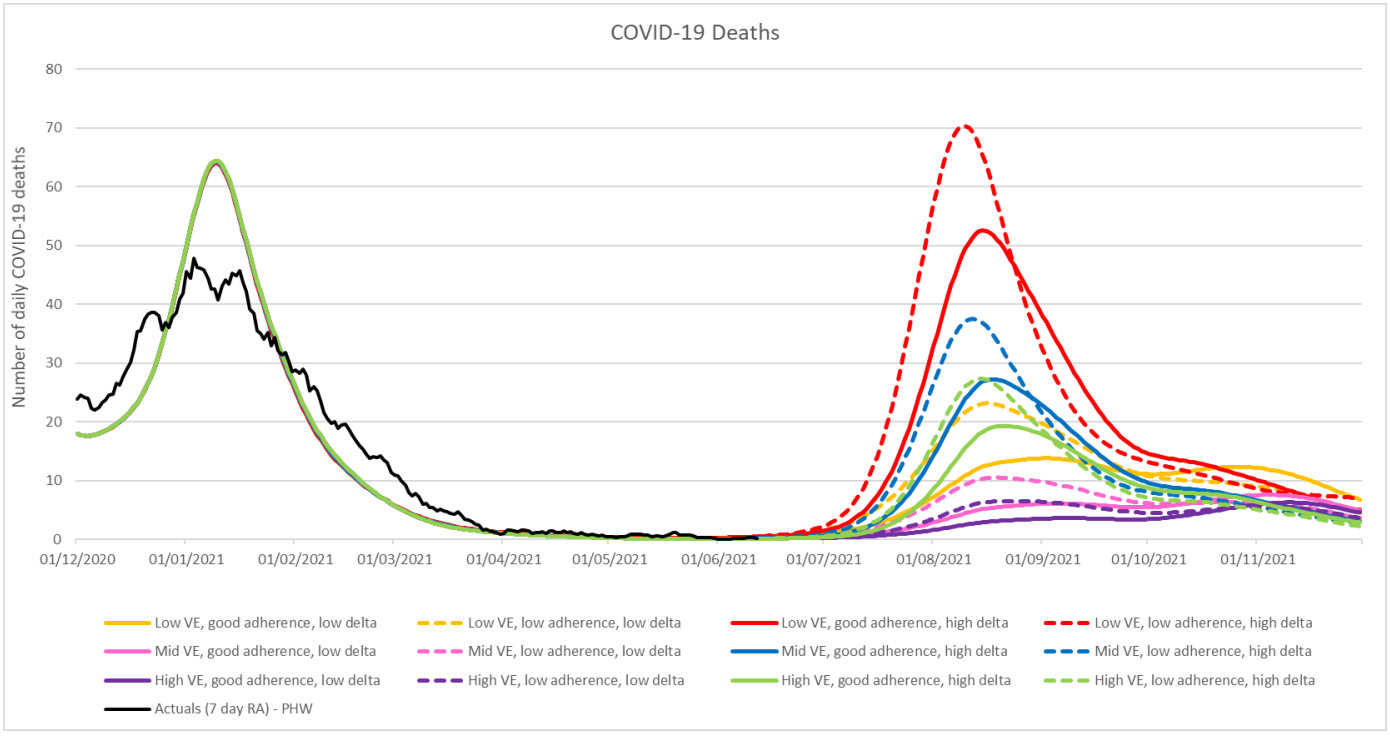


Table 1A shows the total symptomatic cases (in future labelled as “cases”), deaths, admissions and ICU admissions between 1 June 2021 and 31 August 2021 predicted for each scenario. For all scenarios, the number of cases and deaths reduce as vaccine efficacy increases or adherence to restrictions improves.

Table 1B shows the daily peaks of COVID-19 cases, deaths, admissions and ICU admissions between 1 June 2021 and 31 August 2021 predicted for each scenario. For all scenarios, the maximum number of cases and deaths reduce as vaccine efficacy increases or adherence to restrictions improves.

Table 1A: Totals (between 1 June 2021 and 31 August 2021)

Scenario	**Cases**	**Deaths**	**Admissions**	**ICU Admissions**
Vacc 0.6 Gd Adh Low Delta	90,700	480	2,100	130
Vacc 0.6 Low Adh Low Delta	138,900	870	3,400	210
Vacc 0.7 Gd Adh Low Delta	59,400	200	900	50
Vacc 0.7 Low Adh Low Delta	98,200	380	1,600	90
Vacc 0.8 Gd Adh Low Delta	38,100	120	500	30
Vacc 0.8 Low Adh Low Delta	67,500	230	1,000	60
Vacc 0.6 Gd Adh High Delta	243,200	1,770	6,700	410
Vacc 0.6 Low Adh High Delta	285,600	2,400	8,300	500
Vacc 0.7 Gd Adh High Delta	196,100	880	3,500	210
Vacc 0.7 Low Adh High Delta	235,700	1,260	4,500	270
Vacc 0.8 Gd Adh High Delta	155,000	600	2,500	150
Vacc 0.8 Low Adh High Delta	192,800	890	3,400	200

Cases and admissions are rounded to the nearest 100. Deaths and ICU admissions are rounded to the nearest 10.

Table 1B: Daily peaks (between 1 June 2021 and 31 August 2021)

Scenario	**Cases**	**Deaths**	**Admissions**	**Bed Occupancy**	**ICU Bed Occupancy**
Vacc 0.6 Gd Adh Low Delta	1,600	10	40	800	30
Vacc 0.6 Low Adh Low Delta	2,800	20	70	1,400	40
Vacc 0.7 Gd Adh Low Delta	1,000	10	20	400	10
Vacc 0.7 Low Adh Low Delta	1,900	10	30	600	20
Vacc 0.8 Gd Adh Low Delta	700	-	10	200	10
Vacc 0.8 Low Adh Low Delta	1,300	10	20	400	10
Vacc 0.6 Gd Adh High Delta	5,900	50	160	3,000	100
Vacc 0.6 Low Adh High Delta	7,700	70	220	4,000	130
Vacc 0.7 Gd Adh High Delta	4,500	30	90	1,600	50
Vacc 0.7 Low Adh High Delta	6,300	40	120	2,100	70
Vacc 0.8 Gd Adh High Delta	3,400	20	60	1,100	30
Vacc 0.8 Low Adh High Delta	5,000	30	90	1,600	50

Cases, admissions, and bed occupancy are rounded to the nearest 100. Deaths and ICU bed occupancy are rounded to the nearest 10.

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. For these scenarios, it may be necessary to update the RWC and MLS.

To more accurately reflect the situation with the Delta variant, we therefore consider the new RWC scenario to be: central vaccine efficacy (70% effective against COVID19 cases and 94% effective against hospital admissions and deaths due to COVID19), “low” adherence, and high variant transmissibility which represents a scenario where Delta is 80% more transmissible than Alpha (“high Delta” scenario).

At the same time, we can update the Most Likely Scenario (MLS) with more recent data. We consider that the new MLS is likely to be the following: “good” adherence of existing restrictions, central vaccine efficacy (70% effective against COVID-19 cases and 94% effective against hospitalisations and deaths), and low Delta variant transmissibility which represents a scenario where Delta is 30% more transmissible than Alpha (“high Delta” scenario). However there is such uncertainty at the moment, it may make sense to delay producing a new MLS.

Tables 2A and 2B show the totals and daily peaks between 1 June 2021 and 30 March 2022 for the new proposed RWC and MLS scenarios.

Figures 4, 5 and 6 show the new proposed RWC scenarios. The chart also includes the current April 2021 RWC for comparison as well as the observed data (actuals). Tables 3A and 3B show the totals and daily peaks by quarter for the new proposed RWC scenario.

Figures 7, 8 and 9 show the new proposed MLS scenarios. The chart also includes the current April 2021 MLS for comparison as well as the observed data (actuals). Tables 4A and 4B show the totals and daily peaks by quarter for the new proposed MLS scenario.

There is currently not enough data to determine how much more transmissible the Delta variant will be over the Alpha variant and the true transmission advantage is likely to be in the middle somewhere.

Table 2A: Totals for new proposed RWC and MLS between 1 June 2021 and 30 March 2022

Scenario	Cases	Deaths	Admissions	ICU Admissions
RWC	318,489	2,269	6,839	410
MLS	171,500	1,044	3,191	191

Table 2B: Daily peaks for new proposed RWC and MLS between 1 June 2021 and 30 March 2022

Scenario	Cases	Deaths	Admissions	ICU Admissions
RWC	6,301	38	118	7
MLS	1,255	8	23	1

Table 3A: Totals by quarter for the new proposed RWC scenario

Quarter	Cases	Deaths	Admissions	ICU Admissions
01/06/21 – 31/08/21	235,740	1,256	4,534	274
01/09/21 – 30/11/21	60,209	732	1,586	94
01/12/21 – 28/02/22	22,149	267	700	42

Table 3B: Daily peaks by quarter for the new proposed RWC scenario

Quarter	Cases	Deaths	Admissions	ICU Admissions
01/06/21 – 31/08/21	6,301	38	118	2,124
01/09/21 – 30/11/21	1,128	21	35	1,162
01/12/21 – 28/02/22	536	5	14	274

Figure 4 COVID-19 cases under potential new RWC based on mid vaccine effectiveness.

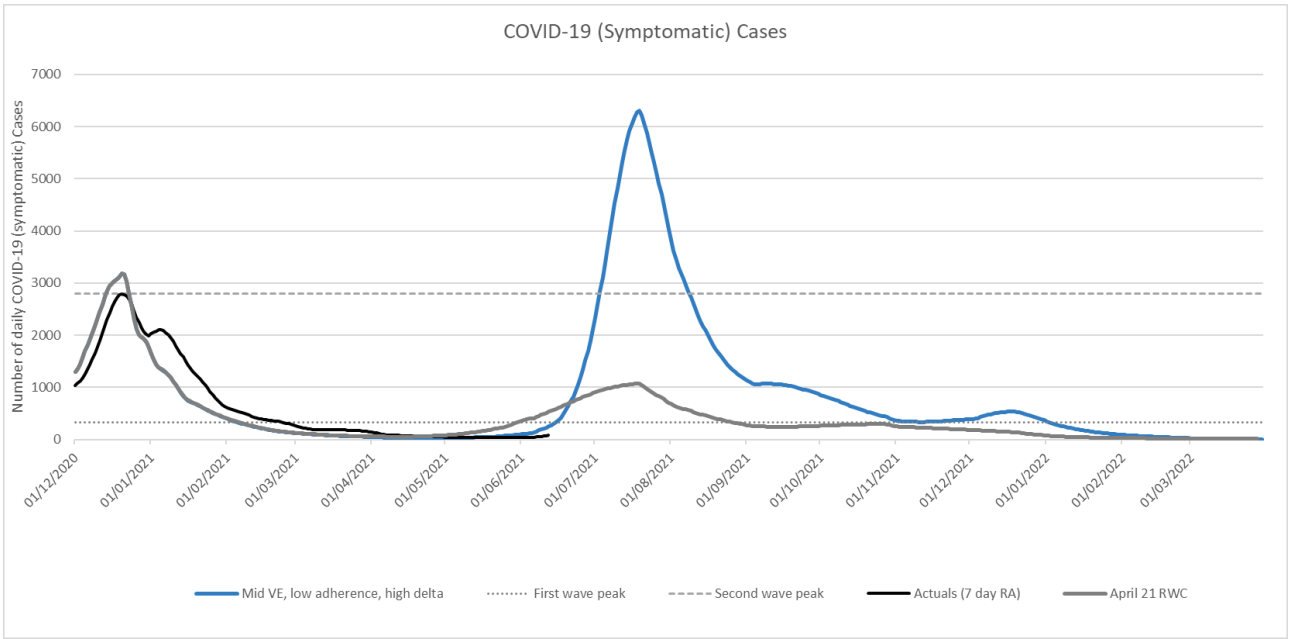


Figure 6 COVID-19 hospital admissions for new RWC with mid vaccine effectiveness for preventing admissions

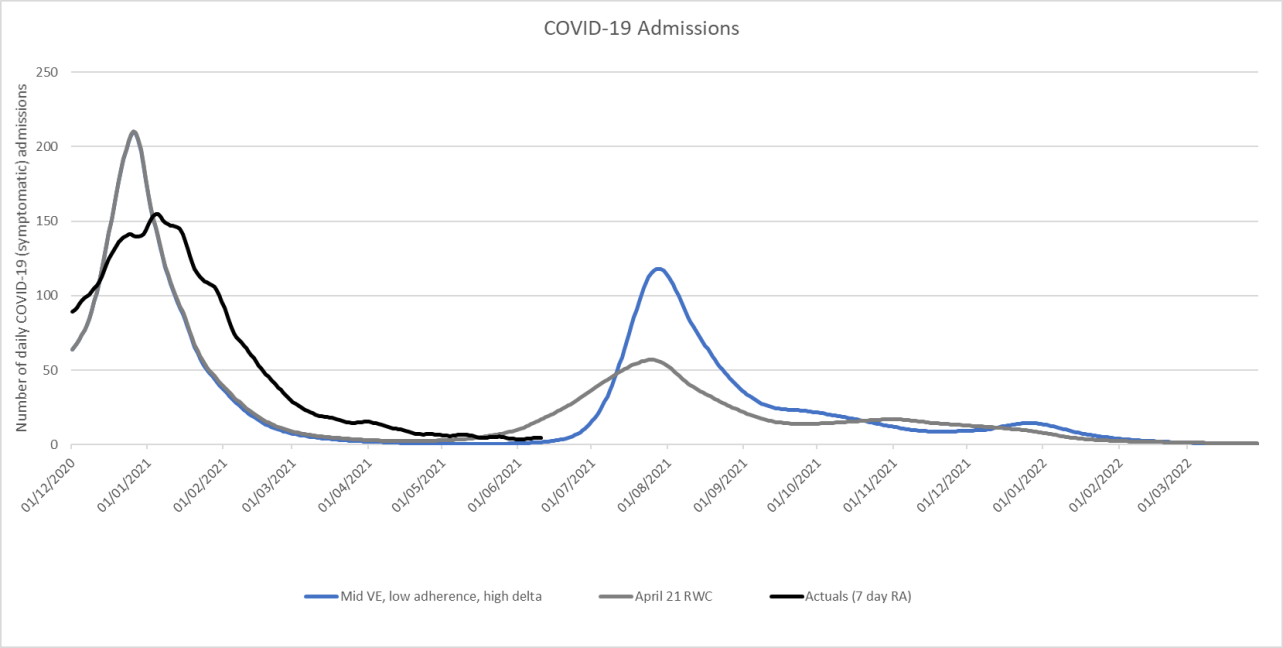


Figure 5 COVID-19 deaths under new RWC assuming mid vaccine effectiveness in preventing deaths.

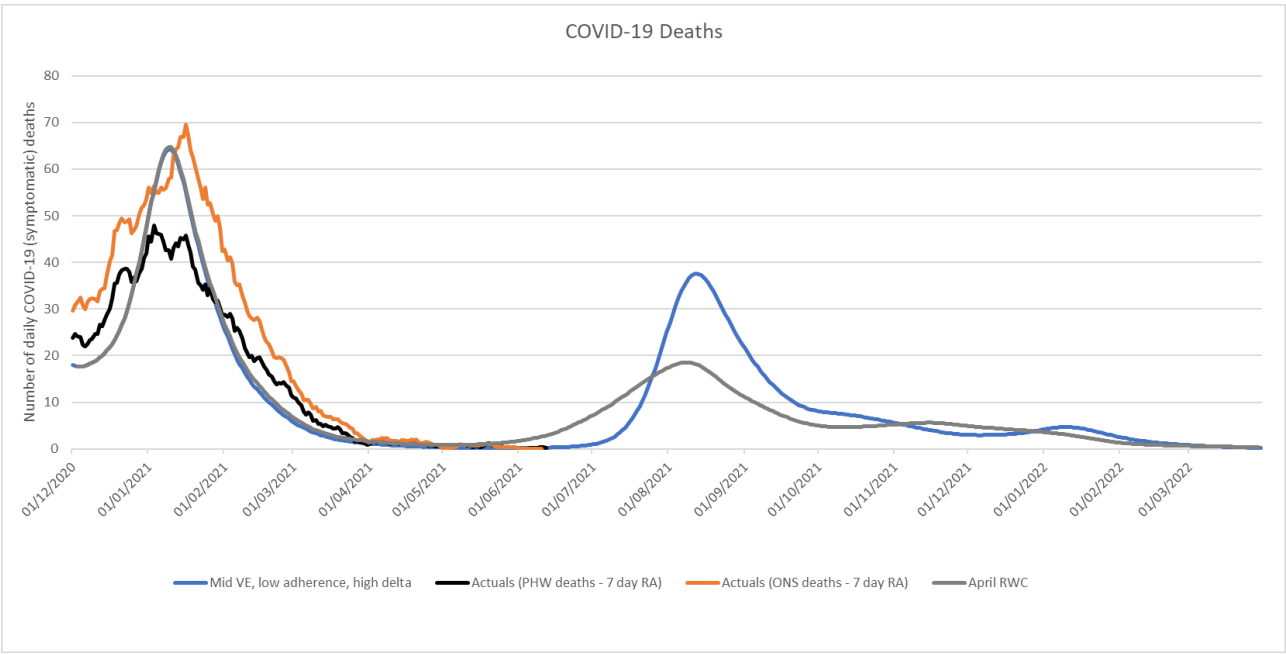


Table 4A: Totals by quarter for the new proposed MLS scenario

Quarter	Cases	Deaths	Admissions	ICU Admissions
01/06/21 – 31/08/21	59,449	202	876	54
01/09/21 – 30/11/21	83,750	579	1,654	99
01/12/21 – 28/02/22	23,545	218	824	49

Table 4B: Daily peaks by quarter for the new proposed MLS scenario

Quarter	Cases	Deaths	Admissions	ICU Admissions
01/06/21 – 31/08/21	1,027	6	19	371
01/09/21 – 30/11/21	1,255	8	23	459
01/12/21 – 28/02/22	486	4	13	257

Figure 7 COVID-19 Cases under new MLS (most likely scenario).

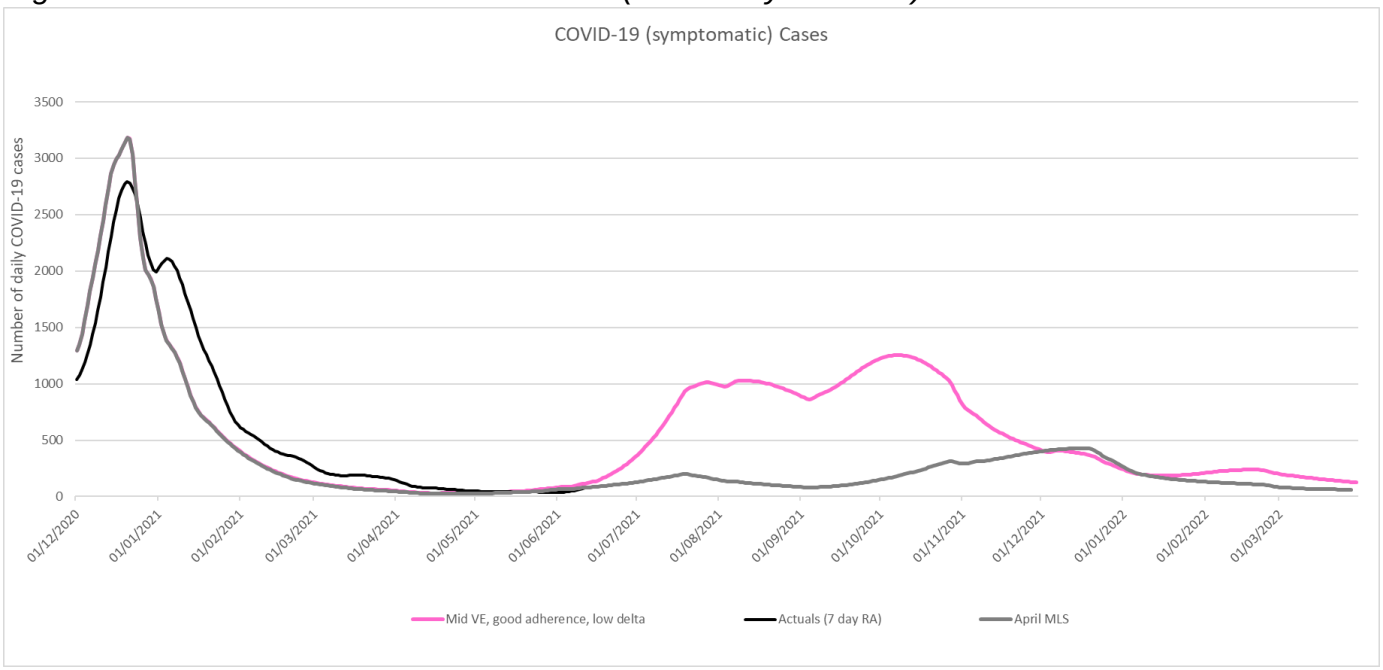


Figure 9 COVID-19 hospital admissions under potential new MLS (most likely scenario)

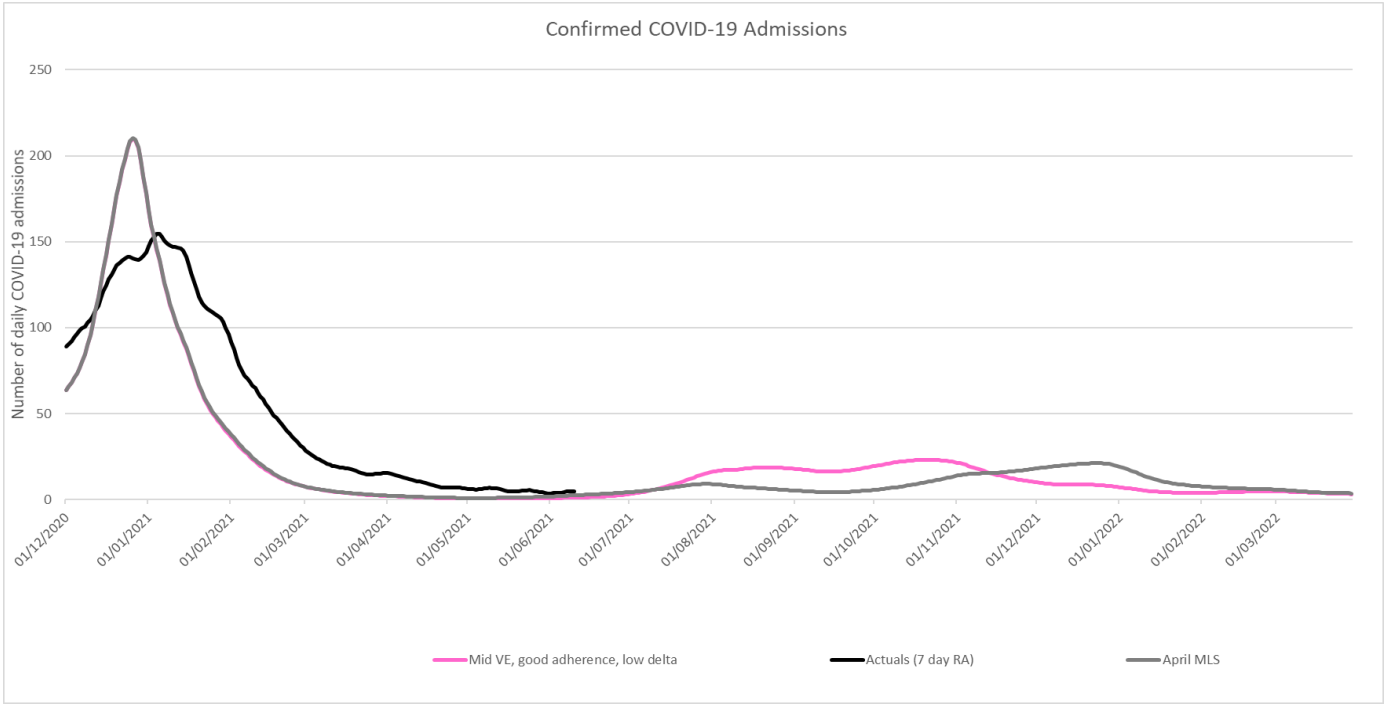
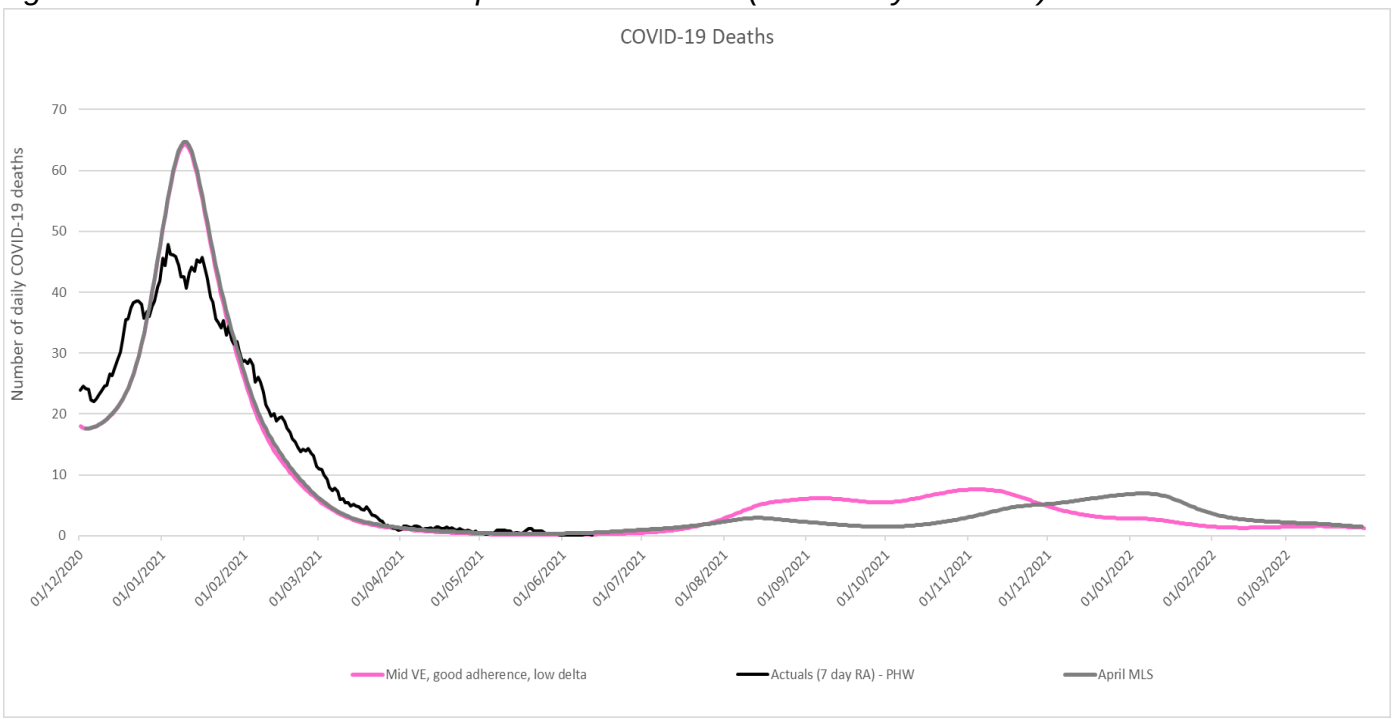
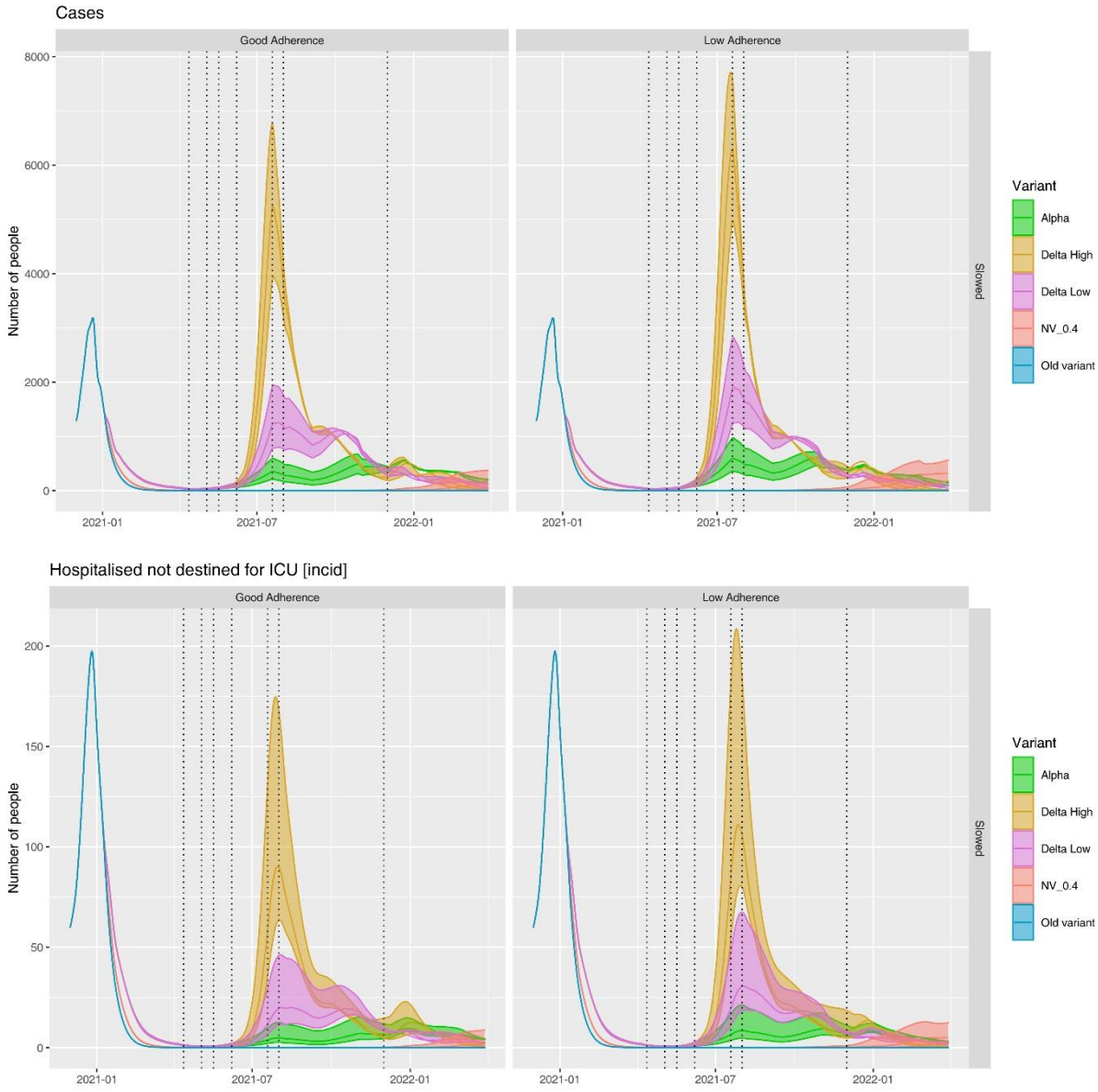


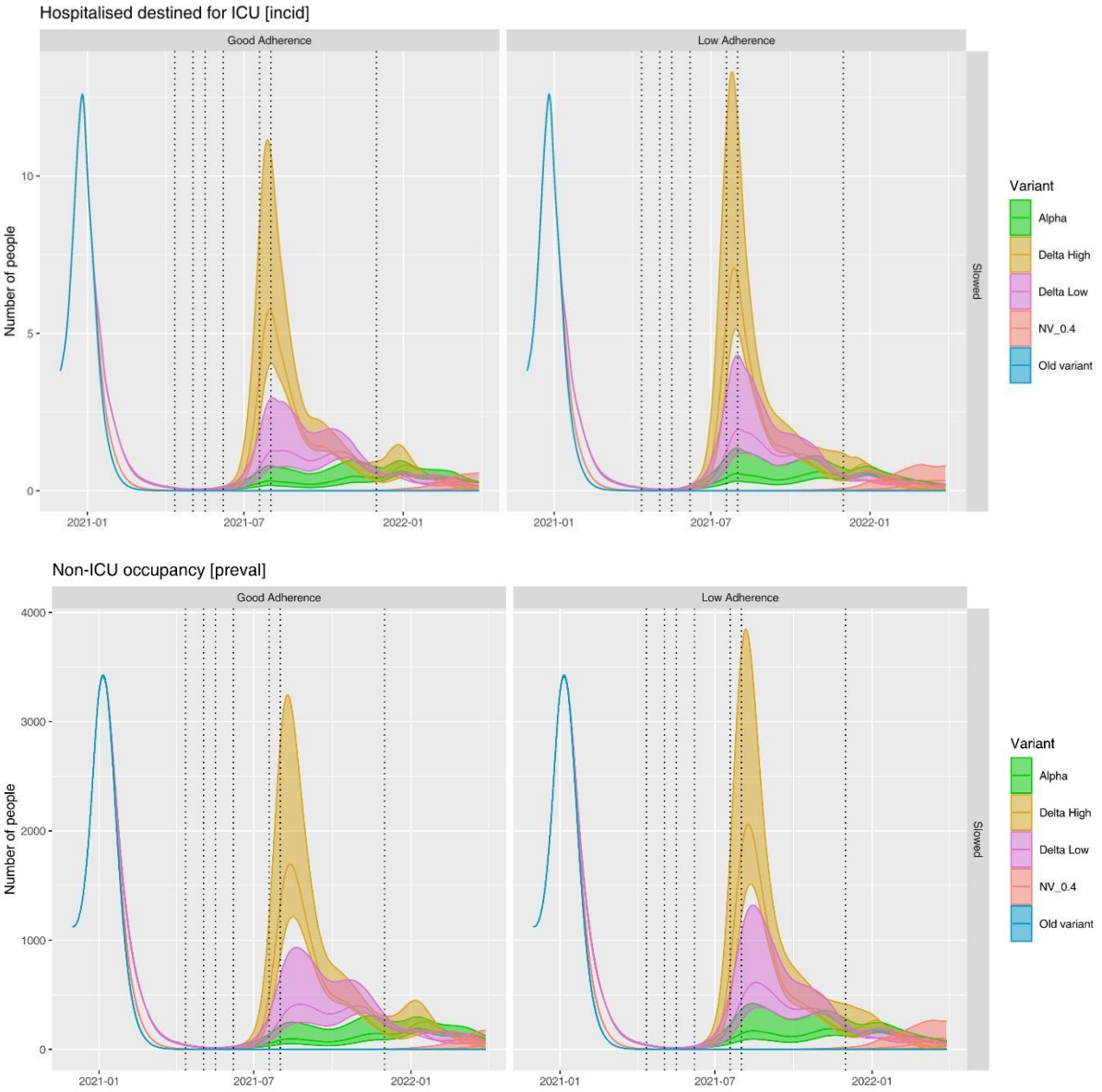
Figure 8 COVID-19 deaths under potential new MLS (most likely scenario).

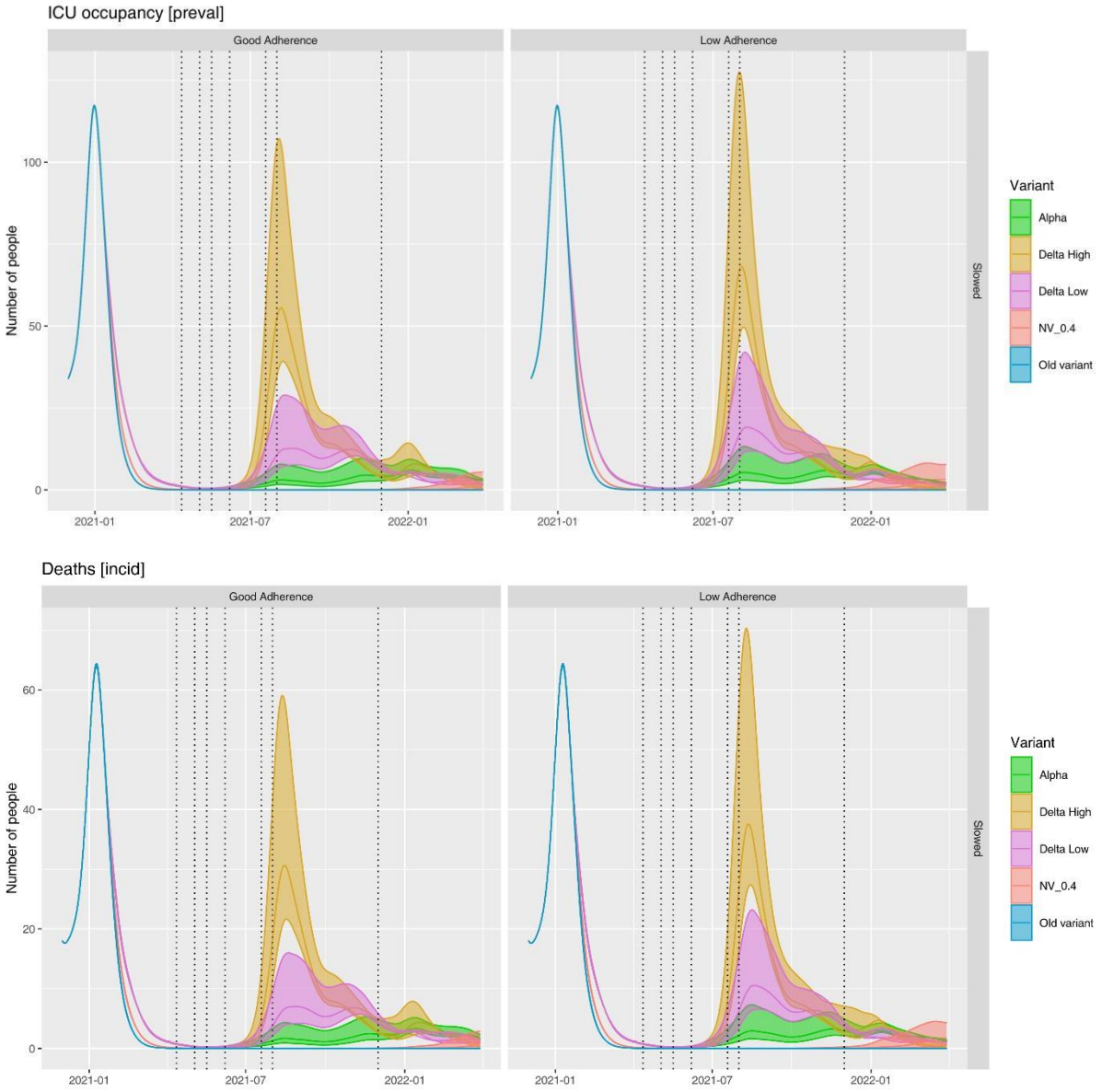


Appendix 1. Charts showing all scenarios

Note: on these charts the ribbon bands show a range from high, mid, low vaccine effectiveness.




Hospitalised destined for ICU [incid]
Good Adherence
Low Adherence
Slowed
Number of people
10
5
0
2021-01
2021-07
2022-01
Variant
Alpha
Delta High
Delta Low
NV_0.4
Old variant
Non-ICU occupancy [preval]
Good Adherence
Low Adherence
Slowed
Number of people
4000
3000
2000
1000
0
2021-01
2021-07
2022-01
Variant
Alpha
Delta High
Delta Low
NV_0.4
Old variant


ICU occupancy [preval]
Good Adherence
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2021-07
2022-01
Slowed
Variant
Alpha
Delta High
Delta Low
NV_0.4
Old variant
Deaths [incid]
Good Adherence
Low Adherence
Number of people
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2021-01
2021-07
2022-01
Slowed
Variant
Alpha
Delta High
Delta Low
NV_0.4
Old variant