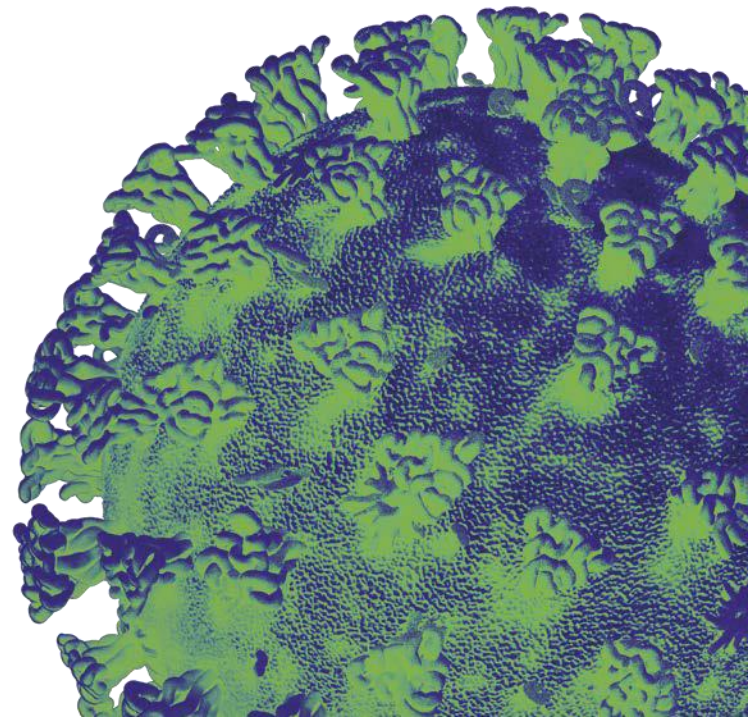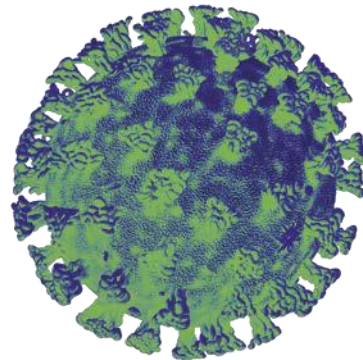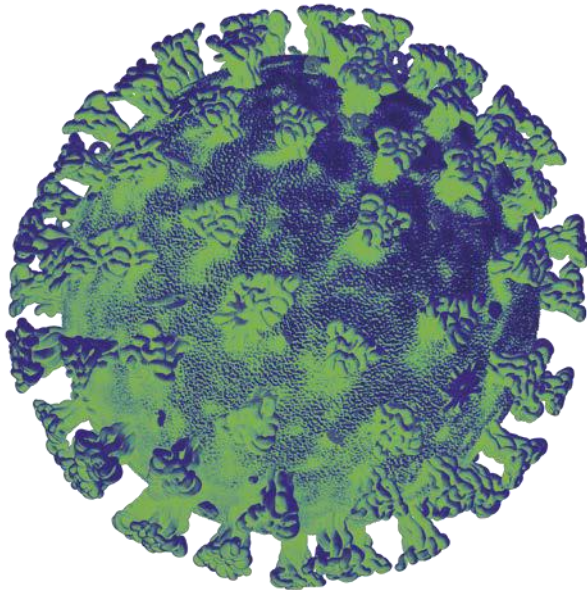Llywodraeth Cymru
Welsh Government

Technical Advisory Group

Advice for 15th July Restriction Review

2 July 2021

Changes to the Alert Level Control Plan Indicators
TAC Modelling Sub Cell
July 2021

Background

- The [Revised Alert level Coronavirus Plan](#), published in March 2021, sets out how decisions on COVID-19 restrictions in Wales are made. There are a number of factors taken into account when considering whether and when to move from one COVID-19 alert level to another. Information is collected from three main areas as shown by figure 1 below:

Figure 1 Triangulating information to inform decisions
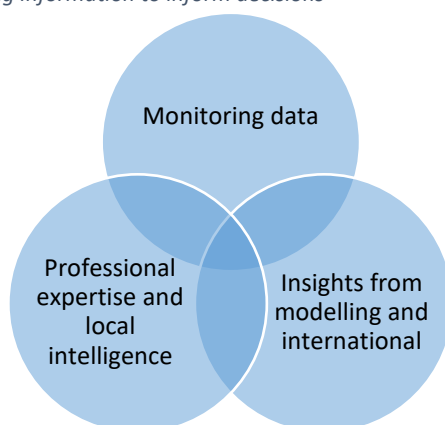
- A large part of the evidence provided for the alert level review decisions includes reviewing a basket of COVID-19 indicators. These indicators were updated in Appendix A of the [Revised Alert level Coronavirus Plan](#). They were updated to take into account the impact of vaccinations and the Alpha Variant of Concern (VOC). Since then, the Delta variant has become dominant. Latest evidence suggests the Delta variant is between 40% and 80%[1] more transmissible than the previously dominant Alpha variant. In addition, COVID-19 restrictions have also been gradually eased since May 2021: Wales moved to alert level 2 on 17 May 2021 and started a transition to alert level 1 on 7 June 2021. Throughout June, cases increased from around 8 cases per 100,000 of the population to around 100 cases per 100,000.

- In March 2021, the approach set out in the [Revised Alert level Coronavirus Plan](#) was to keep cases as low as possible. Since then, phase 1 of the vaccine programme was completed[2] and phase 2 is due to be completed by the end of July 2021. This will provide the adult population of Wales with extra protection against COVID-19 infection and severe disease[3]. Therefore it may

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[1] SPI-M-O: [Summary of further modelling of easing restrictions – Roadmap Step 4](#) Dated 9th June 2021
[2] [COVID-19 vaccination strategy update June 2021](#)
[3] See the [Annex](#) for the latest data on vaccine efficacy.

not be optimal to have an overarching aim of keeping cases low at the expense of other harms.

Why high numbers of COVID-19 cases may be less of a concern than in previous waves

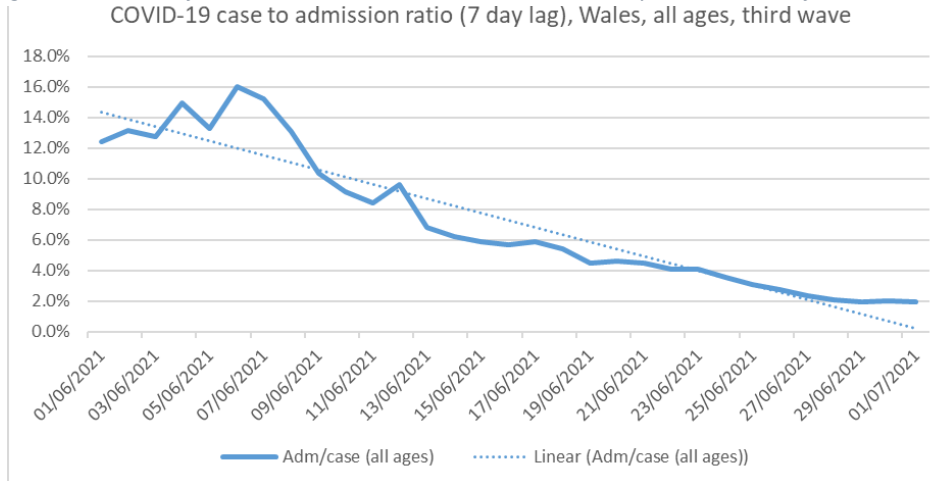## Ratios of COVID-19 cases to admissions and deaths, Wales

- The percentage of confirmed COVID-19 cases resulting in hospitalisation has decreased from around 10% in December 2020, before the introduction of COVID-19 vaccines, to 2% on 1 July 2021. However, the trend line in figure 2 below shows that the downwards trend over this period shows a gradual decrease. When considering the third wave alone, which began at the start of June 2021, when cases started to increase, the decrease in the case to admissions ratio is much more pronounced (see figure 3 below). This could be due the effects of the highly transmissible delta variant taking hold, particularly in the younger, unvaccinated individuals who are likely mixing more following easing of restrictions. This would lead to an increase in cases that are unlikely to lead to many hospitalisations. It could also be due to vaccinated adults being protected against COVID-19 hospitalisations. However, previous waves have started in young people and moved gradually moved into older age groups so this needs to be monitored.

Figure 2: The ratio of COVID-19 cases to COVID-19 admissions 7 days later in Wales from 1st October 2020 to 1st July 2021
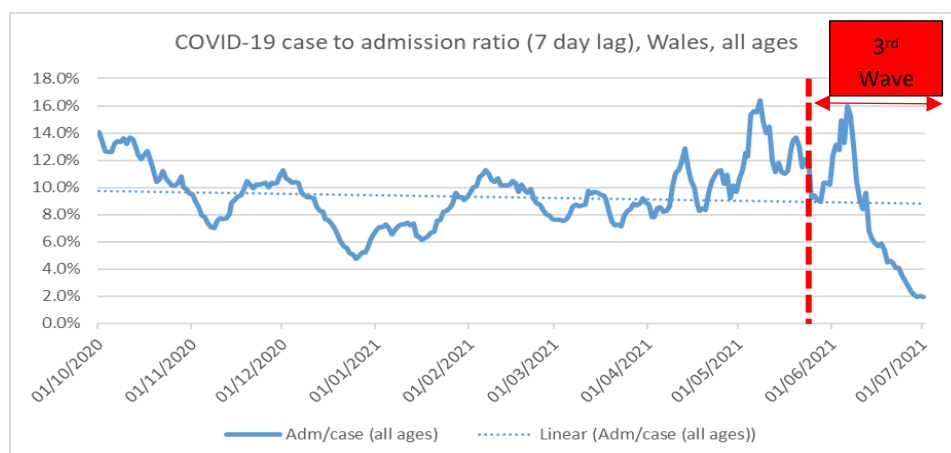
Source: PHW ICNet. Ratios are calculated using 7 day rolling averages of cases and admissions and applying lags.

Figure 3. The ratio of COVID-19 cases to COVID-19 admissions 7 days later in Wales from 1st June 2021

Source: PHW ICNet. Ratios are calculated using 7 day rolling averages of cases and admissions, and applying lags.

- Overall, the ratio of cases to deaths in all ages has decreased following the introduction of COVID-19 vaccines from 3.5% in December 2020 to 0.2% on 1st July 2021. This is mostly driven by the over 70s who show a large reduction in the percentage of COVID-19 deaths produced on average from COVID-19 cases. The ratio of cases to deaths in this group has reduced from 24% in December 2020 to 2% on 1st July 2021. This is likely due to the effects of the COVID-19 vaccines.

Figure 4: COVID-19 Case to death ratio with a 20 day lag, Wales, all ages
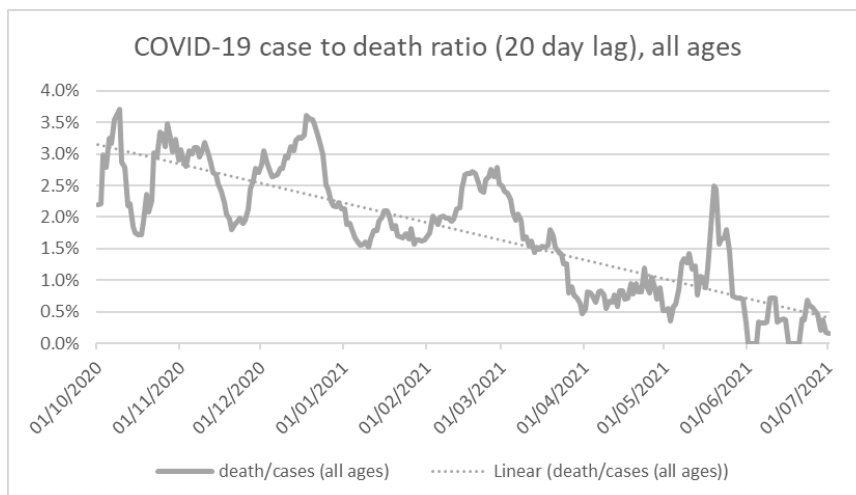
Source: PHW ICNet. Cases by specimen date and deaths by date of death are used. Ratios are calculated using 7 day rolling averages of cases, admissions and deaths and applying lags.

Figure 5: COVID-19 Case to confirmed hospital admissions ratio with a 20 day lag, Wales, individuals aged 70 and over
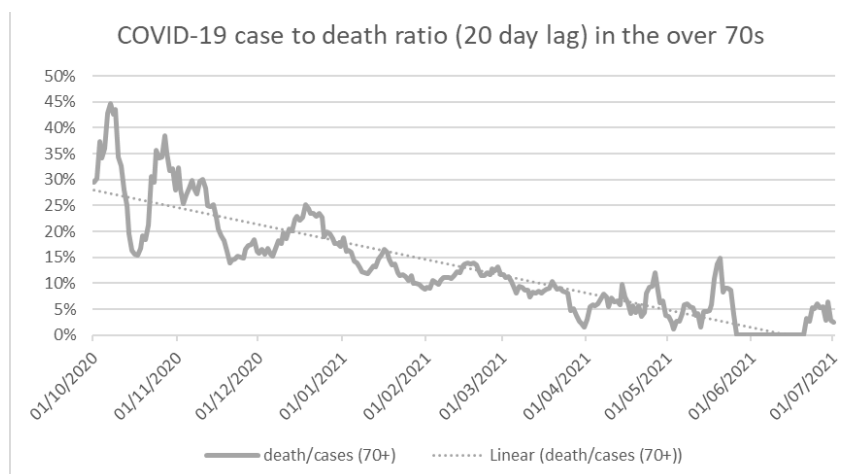
Source: PHW ICNet. Cases by specimen date and deaths by date of death are used. Ratios are calculated using 7 day rolling averages of cases, admissions and deaths and applying lags

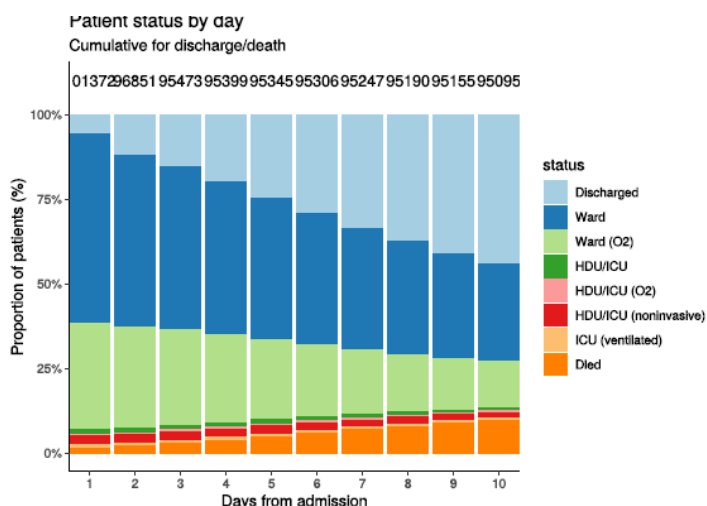- Using matched up data, linking cases to hospitalisations and deaths, may allow us to improve these estimates. There are potential biases with comparing cases to admissions and cases to deaths over time; if vaccines move individuals down a ladder of severity, then some symptomatic cases may move a step down the ladder and become asymptomatic or not detected; so the ratios may not be comparing the same type of cases over time. Using measures like ONS infection survey may negate some of these issues as it picks up all infections, although the numbers of infections in the survey are currently quite low and subject to uncertainties, especially when splitting by age group.

Length of Stay in Hospital due to COVID-19

- There are differences between the length of stay in hospital between the second wave and third wave of COVID-19 in Wales. Figures 6 and 7[4] show that, at a UK level, less than 50% of admissions were discharged from hospital by day 10 of their admission, whereas during the 3rd wave (so far), around 75% of patients are discharged by day 10. Note that we are only at the start of the third wave so it may be that the picture changes over time.

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[4] COVID-19 Clinical Information Network (CO-CIN) data collated and analysed by the ISARIC Coronavirus Clinical Characterisation Consortium (ISARIC4C.net) funded by NIHR and MRC.

Figure 7: COVID-19 patient status per day, 2nd wave   *Figure 6: COVID-19 patient status per day, 3rd wave*
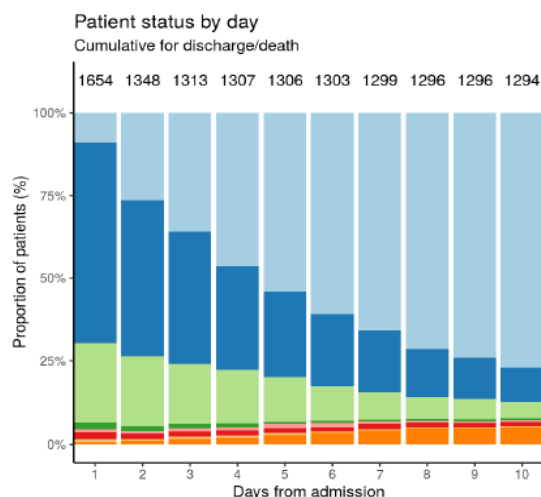
- With COVID-19 patients staying less time in hospital, beds and resources are freed up to treat other patients, COVID-19 and non COVID-19 specific.
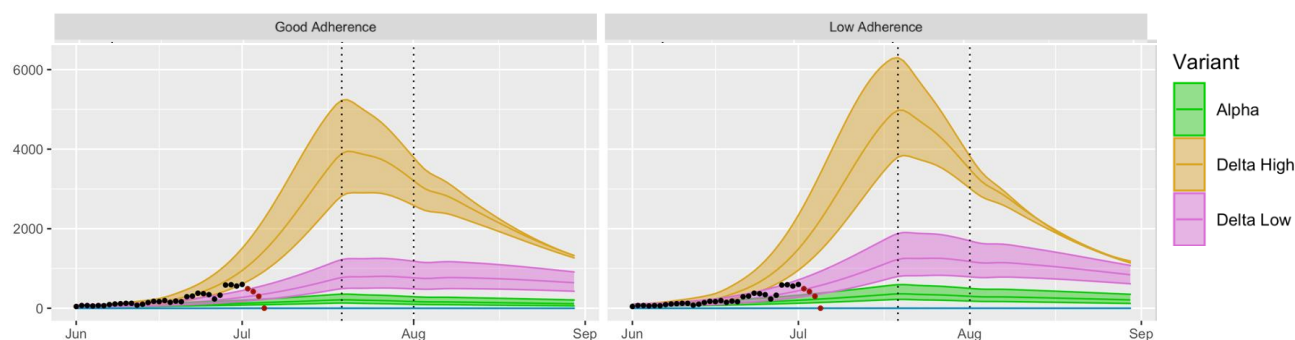
Swansea University modelling Scenarios

- The latest COVID-19 modelling from Swansea University takes into account the vaccines administered and the Delta variant[5]. The model assumes we will reach Alert level one fully on 19 July. Although there is potential for cases to reach a higher peak during this third wave than the previous wave, the worst case estimations for the hospitals and deaths third wave peak do not exceed the previous wave's peak. This also shows the models estimate a reduction in the number of admissions and deaths produced on average from COVID-19 cases.

- There are a number of modelling scenarios shown in figure 8.[6] The "Alpha" scenario estimates the number of symptomatic COVID-19 cases that may have arisen between June 2020 and September 2020 if the Alpha variant was still the dominant one in Wales. Given that we know Delta is more transmissible, we now focus on the "Delta Low" and the "Delta High" scenario which represent the scenario where Delta is 30% and 80% more transmissible than Alpha respectively.

- We do not know which projection we are tracking yet but data of actual confirmed COVID-19 cases in figure 8 shows an early indication that we may be tracking the higher estimate of the "Delta Low" scenario if adherence to restrictions is low, or the lower estimate of the "Delta High" scenario if we have good adherence to restrictions in Wales. The higher and lower estimates of each variant scenario represent the lower and higher vaccine efficacy assumptions respectively.

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[5] Policy modelling update published on 28th June 2021
[6] Charts in figure 8 use the assumptions set out in the Policy modelling update with the exception of the vaccine efficacy assumption which has been updated to reflect latest data. See Annex for further details.

Figure 8: Number of daily COVID-19 (symptomatic) cases in Wales estimated by the Swansea University Modelling

Source: Projections – Swansea University Models, Black dots represent actuals – PHW confirmed COVID-19 Cases, red dots represent actuals – incomplete data of PHW confirmed COVID-19 cases.

- 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.

Vaccine Efficacy and Vaccine Uptake

- The vaccine uptake rate across Wales since the start of the vaccine rollout in December 2020 has been high. As at 7 July 2021, 2.27m individuals have received their 1st doses of a COVID-19 vaccine, and 1.78m individuals have been fully vaccinated (2 doses).[7]

- In addition, the latest vaccine efficacy estimates show a high effectiveness against infection, hospitalisation and deaths for the available COVID-19 vaccines. The latest estimates used in the Swansea University modelling scenarios described above use the latest data available and can be found in the Annex.

- The high vaccine uptake rates combined with the high vaccine efficacy will help build up the level of immunity in the population of Wales and increase the chances of reaching the threshold for population immunity.

Population Immunity Levels

- We may be getting nearer to levels of population immunity, meaning COVID-19 won't be able to spread as easily throughout the population due to a high enough number of individuals having being vaccinated or previously infected. The ONS COVID Infection Survey estimates that 91.8% of the adult population of Wales aged 16 and over have COVID-19 antibodies in the week ending 20 June 2021[8]. This may mean that most of the adult population of

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[7] COVID-19 Situation Report
[8] ONS Coronavirus (COVID-19) Infections survey

Wales currently have immunity and that the increasing cases may plateau soon. Note that the presence of antibodies does not guarantee immunity in an individual, but it is a useful proxy.

- Our analysis estimates that around 69% of the population of Wales (including those aged 16 and under) have immunity against COVID-19 infection on 1 July 2021.[9] The Delta variant is so much more transmissible than the previously-dominant Alpha variant, that it's likely around 90% immunity is required, spread evenly across Wales, for population immunity effects to be observed. Vaccinations are not currently being offered to children which may make it difficult to see population immunity effects.

Sources: COVID-19 cases – PHW, Projections – Swansea University, Vaccine date – PHW

Figure 9: COVID-19 Immunity estimates of individuals , all ages, Wales
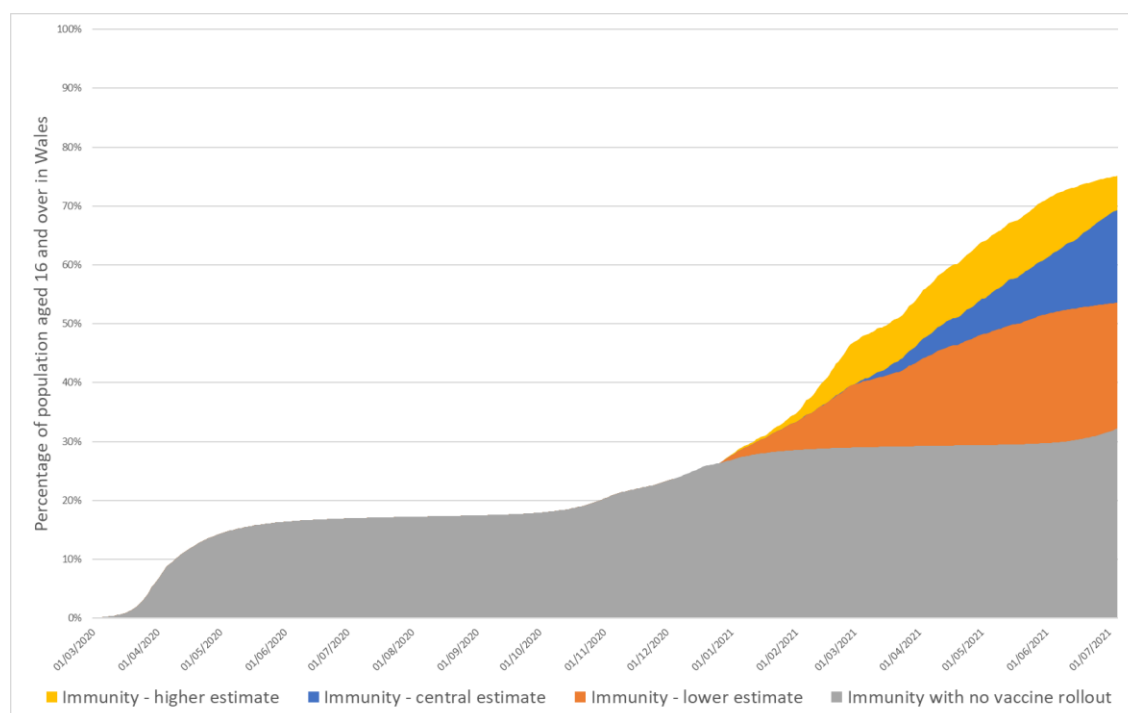
- It's important to note that these estimations do not take waning immunity or infection escape into account so caution should be taken in interpreting population immunity estimations. However, to keep immunity at high levels, booster vaccines are due to be offered to priority groups 1 to 9 during Phase 3 of the Vaccine Programme in Wales from September 2021[10].

Why high numbers of COVID-19 cases may remain a cause for concern

- In contrast, although a rise in COVID-19 cases may not result in a large rise in hospitalisation and deaths, there are other consequences to consider. This

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[9] See the Annex for further detail on the population immunity analysis.

[10] COVID-19 vaccination strategy update - June 2021

included the creation on new variants of concern and the prevalence of Long COVID.

Antigenic Drift (Vaccine and Infection escape)

- RNA viruses such as the coronavirus tend to evolve gradually. The higher the number of COVID-19 cases that occur, the higher the likelihood of a new variant of concern (VOC) arising.

- In an individual with a weakened immune system, the virus could replicate for an extended period of time. This could be a concern when restrictions are removed and people mix with each other more, particularly as the shielded and older populations were vaccinated first and may have had some waning of their immunity occur already. Booster vaccines, due from around September 2021 may counteract this somewhat. Opening up international travel gives another route to VOCs entering the UK via travellers. It's also important to ensure we act responsibly and reduce spreading VOCs from Wales to other countries.

- Another potential scenario is one where new variants of concern are more easily able to escape vaccines as they evolve and adapt to the newly-vaccinated population of Wales. This can be counteracted by providing new generation vaccines each year, similar to the flu vaccine.

- Vaccination (whether by boosters or new future generation vaccines) may provide a level of protection against COVID-19. However, if we are unable to keep up with the rate of antigenic drift, it's important to consider the characteristics of the new variants of concern; i.e. whether the VOCs are more transmissible but less fatal, or more fatal but less transmissible. If the former, then a more transmissible variant may lead to a higher number of COVID-19 cases, but if this does not translate into such a great rise in hospitalisation and deaths, then it may be less of a concern. However, it's important to establish leading indicators to be able to pick this up as early as possible if the levels of hospitalisations are becoming too high for the NHS to cope with.

Long COVID[11]

- Updated estimates from ONS indicate that as of 6 June 2021, an estimated 1.4% of the Welsh population were experiencing self-reported long COVID (symptoms persisting for more than four weeks after the first suspected COVID-19 infection that were not explained by something else). This has reduced from an estimated 1.7% reported as at 2 May 2021. In Wales, an estimated 27.9% of people with self-reported long COVID indicated their ability to undertake day-to-day activities was 'limited a lot'.

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[11] There is no official internationally agreed definition for Long COVID but the National Institute for health Research (UK-based) have agreed upon a definition. Please see the Annex for further detail.

- Fatigue was the most common symptom reported as part of individuals' experience of Long COVID, followed by shortness of breath, muscle ache, and difficulty concentrating.

- As a proportion of the UK population, prevalence of self-reported Long COVID was greatest in people aged 35 to 69 years, females, people living in the most deprived areas, those working in health or social care, and those with another activity-limiting health condition or disability.

- As shown in the table below, the risk of Long COVID appears to be lower in younger people, with the percentage of people with self-reported Long COVID for at least 12 weeks in the UK population estimated at 0.16% for people aged 2 to 11 years, 0.51% for people aged 12 to 16 years and 1.21% for people aged between 17 and 24 years.

Table 1: Estimated percentage of people living in private households with self-reported long COVID of any duration, UK: four-week period ending 6 June 2021 (Source: ONS)

Domain	Group	Estimate	Lower 95% confidence limit	Upper 95% confidence limit
All people	All people	1.49	1.44	1.54
Age group	2 to 11 years	0.16	0.10	0.23
	12 to 16 years	0.51	0.39	0.63
	17 to 24 years	1.21	1.03	1.39
	25 to 34 years	1.55	1.38	1.72
	35 to 49 years	2.12	1.98	2.25
	50 to 69 years	2.19	2.09	2.29
	≥70 years	1.06	0.97	1.15

Large numbers of people Self-isolating

- High case rates may lead to high levels of people needing to self-isolate. This can have economic and social consequences and should be considered with the other harms.

Balance of Harms

- It is clear that there are positive and negative effects to the removal of restrictions. The benefits and consequences need to be balanced appropriately and proportionately to cause the least amount of overall harm in

terms of health, education, inequalities, and socioeconomic harms. There is a separate paper discussing the 5 harms in further detail, circulated to the Technical Advisory Group (TAG) on 8th July 2021. It's important to consider all harms when making decisions to ease, maintain or increase non-pharmaceuticals interventions.

Leading Indicators

- A basket of indicators should be used, along with further local intelligence and expertise to determine the point at which action needs to be taken. The leading indicators that could be used for assessing we have reached a worrying situation with regards to COVID-19 are as follows:

1. COVID-19 case rate (7 day rolling sum) – As discussed throughout this paper, there are reasons why a rise in COVID-19 cases may or may not be a cause for concern. This indicator would need to be considered in the context of further indicators:

2. The relationship between COVID-19 cases to admissions and deaths -The COVID-19 case to admissions ratio and COVID-19 case to deaths ratio could be used for this.

3. Vaccine efficacy and uptake of current COVID-19 vaccines offered

4. Population Immunity levels (including vaccine uptake and percentage of the population of Wales vaccinated). Focus on immunity levels by age bands and/or vaccine priority groups, particularly as children have not been offered vaccinations.

5. Outbreaks in care homes or other closed settings containing vulnerable individuals.

6. NHS hospital pressure – Length of stay in hospitals and hospital bed occupancy (including ICU) as well as the number of hospital and ICU admissions and NHS staff self-isolating.

7. COVID-19 case rates in the UK (Especially areas close to Welsh border. This has often been a driver, e.g. in north east Wales).

8. TTP performance metrics.

- Public Health Wales (PHW) also use a number of indicators in a "RAG" rating table to assess the COVID-19 risk and have a set of actions to take within Incidence Management Teams. The indicators for a high risk and a very high risk situation closely align to the leading indicators above.

- There are many further indicators which are also important to consider and are included in the Annex and were decided upon for the previous coronavirus alert level plan. However due to the changing nature of the COVID-19 situation with the Delta variant and the success of the vaccination programme, it is worth using these above leading indicators to quickly determine whether

COVID-19 is becoming risky enough that action may need to be considered to minimise the harms caused.

- The full basket of indicators we focus on is updated can be found in the [Annex](). The assessment of indicators is not a mechanistic process. To inform decision-making, we analyse and assess the data from the indicators, insights from modelling and the experience of other countries alongside professional expert advice and intelligence from local partners.

Conclusion

- It has been announced on 5 July 2021 that England will remove all remaining COVID-19 restrictions as planned on the 19 July 2021. This may have an impact on the spread of COVID-19 in Wales. The leading indicators are designed to be able to rapidly pick up when a situation is arising where action may need to be taken to reduce the spread further. The indicators form part of the decision making process and all available insight should be taken into account when deciding which alert level to move to and when.

Annex

Updated Vaccine Efficacy Assumptions used in the COVID-19 Swansea University Modelling:

Vaccine Efficacy (3 scenarios representing uncertainty in each variant ribbon plot)			
Scenario	Test positive	Hospital / ICU	Death
Low	70%	93% (VEclin = 0.77)	94% (VEclin = 0.8)
Mid	80%	97% (VEclin = 0.85)	98% (VEclin = 0.90)
High	90%	98% (VEclin = 0.80)	99% (VEclin = 0.90)

Long COVID

- There is not an internationally agreed definition, but the National Institute for Health Research (UK-based)[12] have agreed the following:

    - **Acute COVID-19**: signs and symptoms of COVID-19 for up to 4 weeks.
    - **Ongoing symptomatic COVID-19**: signs and symptoms of COVID-19 from 4 to 12 weeks.
    - **Post-COVID-19 syndrome**: signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis.

- In addition to the clinical case definitions, 'Long COVID' is commonly used to describe signs and symptoms that continue or develop after acute COVID-19. It includes both ongoing symptomatic COVID-19 and post-COVID-19 syndrome (described above).

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[12] Overview | COVID-19 rapid guideline: managing the long-term effects of COVID-19 | Guidance | NICE

Population Immunity Analysis

- In this analysis, we estimate the proportion of Wales' population that may have some immunity to COVID-19. Immunity can be acquired following a COVID-19 infection or an effective COVID-19 vaccination. The term "COVID-19 immunity" can mean protection from COVID-19 infection, protection from severe illness, and/or prevention/reduction of transmission of COVID-19 to others. In this analysis, immunity refers to individuals who are no longer able to be infected with COVID-19 (until an individual's immunity starts to wane over time).

- The estimates of immunity from natural infection before the vaccine programme was introduced were drawn from the Swansea University model, most likely scenario as at November 2020. These models factor in the effect of vaccines on infection and transmission. We also provide a counterfactual of the immunity level we may have reached had the COVID-19 vaccines not been deployed (with and without waning immunity).

- Those who have been infected with COVID-19 and survived are considered to be immune 2 weeks after infection. There is also a 2-week lag applied to the vaccinated total to account for the 14-day period between vaccine administration and consequential building of immunity.

- Charts showing the immunity levels in the adult population of Wales (age 16+), along with comparisons to the antibody levels (age 16+) from the ONS COVID-19 infection survey are also included in the COVID-19 situational report published weekly.

Further assumptions (applied to all ages)
- Population: We have used the ONS 2020 mid-year estimates for the population of Wales. We have assumed no change in the population sizes from 1 March 2020 where the analysis starts from, to 30 June 2020. This estimate is believed to be an underestimate of the true size of the population.
- Vaccines: This analysis considers people who have had at least one dose of a COVID-19 vaccine. We use the vaccine efficacies of the first and second doses to be a lower and higher estimate respectfully. The assumed vaccine effectiveness is 34% for AZ, Pfizer and Moderna for the first vaccine dose, and 71% for AZ and 73% for the Pfizer and Moderna second dose.
- The estimated number of infections are taken from the Swansea University Epidemiological models.[13]
- Waning immunity is not taken into account in this analysis in figure 9.
- We assume that the percentage of those vaccinated who have already been infected is the same as the current estimated percentage of cumulative infections to date (taken from the Swansea University Epidemiological model).
- "Outside Wales" data entries are excluded from the PHW ICNet and PHW vaccine data (cases, hospitalisations, deaths and vaccines).
- The models assume that an individual's immunity goes from no immunity to full immunity on their designated date for acquiring immunity.

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[13] https://gov.wales/technical-advisory-cell-modelling-update-12-february-2021

COVID alert level indicators

	Rapid surveillance and intelligence - for moving to higher alert levels.	Additional lagging and forward looking indicators - for moving down the alert levels.
Transmission, incidence and prevalence	***What is the rate of transmission in the community, workplaces, care homes, prisons and hospitals? Are rates increasing?***	***What is the rate of transmission in the community, workplaces, care homes, prisons, and hospitals?***
	Confirmed case rate per 100,000 people rolling seven-day sum (depends on testing, local outbreak control and degree of community transmission). The lower the case rate, the lower the risk of mutation of the virus due to competition of the vaccine.	ONS COVID Infection Survey - community prevalence estimates
	Confirmed case rates for all age groups or populations (e.g. student, homeless) and understanding of cases, incidents and outbreaks (see next question).	**What will the rate of transmission look like going forward?**
	Test positivity over seven days (this may be influenced by the testing strategy).	Forecasts of cases and incidence rates, to avoid significant rises.
	An estimate of the Reproduction number based on a COVID-19 positive tests or hospital admissions is less than one.	A consensus estimate (using multiple data sources) of the Reproduction number
		COVID-19 Wastewater sampling (in development)
	Are the clusters, incidents and outbreaks identified understood?	**Are the clusters, incidents and outbreaks identified are under control?**
	Evidence from local health professionals (including any from incident management teams or outbreak control teams).	Rapid surveillance and intelligence
	Evidence from local authorities or local partners.	
NHS Capacity	***Is current hospital and ICU occupancy at manageable levels?***	***Is current hospital and ICU occupancy at manageable levels?***

	Rapid surveillance and intelligence - for moving to higher alert levels.	Additional lagging and forward looking indicators - for moving down the alert levels.
	COVID-19 confirmed hospital occupancy	Rapid surveillance and intelligence
	Overall hospital occupancy	
	Hospital admissions	
	COVID-19 confirmed critical care bed occupancy	
	Overall critical care bed occupancy	
	NHS Staff absence due to illness	
	Intelligence on NHS staff wellbeing	
	PPE availability	
	Are admissions related to COVID-19 increasing quickly?	*Is there sufficient capacity within hospitals for future outbreaks?*
	COVID-19 admissions into hospital	Forecasts of hospital admissions and mortality over next two to six weeks.
	CRITCON assessment levels which define capacity of ICUs in a crisis situation	
Mortality	*Are mortality rates due to COVID-19 increasing?*	*Are mortality rates due to COVID-19 increasing?*
	Public Health Wales COVID-19 mortality estimates	Office for National Statistics mortality estimates
	Care Inspectorate Wales deaths notifications	Office for National Statistics Care Home mortality estimates

	Rapid surveillance and intelligence - for moving to higher alert levels.	Additional lagging and forward looking indicators - for moving down the alert levels.
Variants	***Which variants are currently in Wales and which Is there any evidence of variants that impact established vaccines?***	
	Evidence about variants present in Wales and their impact on transmission and health outcomes.	
	Consideration of whether any variants under investigation or variants of concern could impacts the effectiveness of the vaccine.	
	Percentage of variants that cannot be linked to travel (*in development*)	
Immunity and Vaccines	***How will the vaccine roll out impact transmission, hospitalisation and fatality?***	***What proportion of the population have some protection against COVID-19, either by previous infection or vaccination?***
	Number of people vaccinated: first, second and any booster doses	Estimated % of the population that have tested positive for antibodies
	Effectiveness of the vaccine in protecting individuals, including reinfection	Infection fatality ratio
	Vaccine coverage (take up)	

This will be supported by additional analysis considering the situation across the UK and internationally.