The **Variant_Mulitiplyer** allows you to estimate the infection load based on different virus variants and vaccine effectiveness. This enables entering values to show the range of conditions. We recommend the values in the table to represent the case with the Delta variant to show the range. Vaccination reduces the risk of infection and severe disease and hospitalization. Vaccine Effectiveness wanes for the risk of being infected and getting what is called a breakthrough infection. If infected both unvaccinated and vaccinated can spread it to others. For our scenario spreadsheet we recommend entering Variant_Multiplyer representative of the situation you which to quantify the risk of.

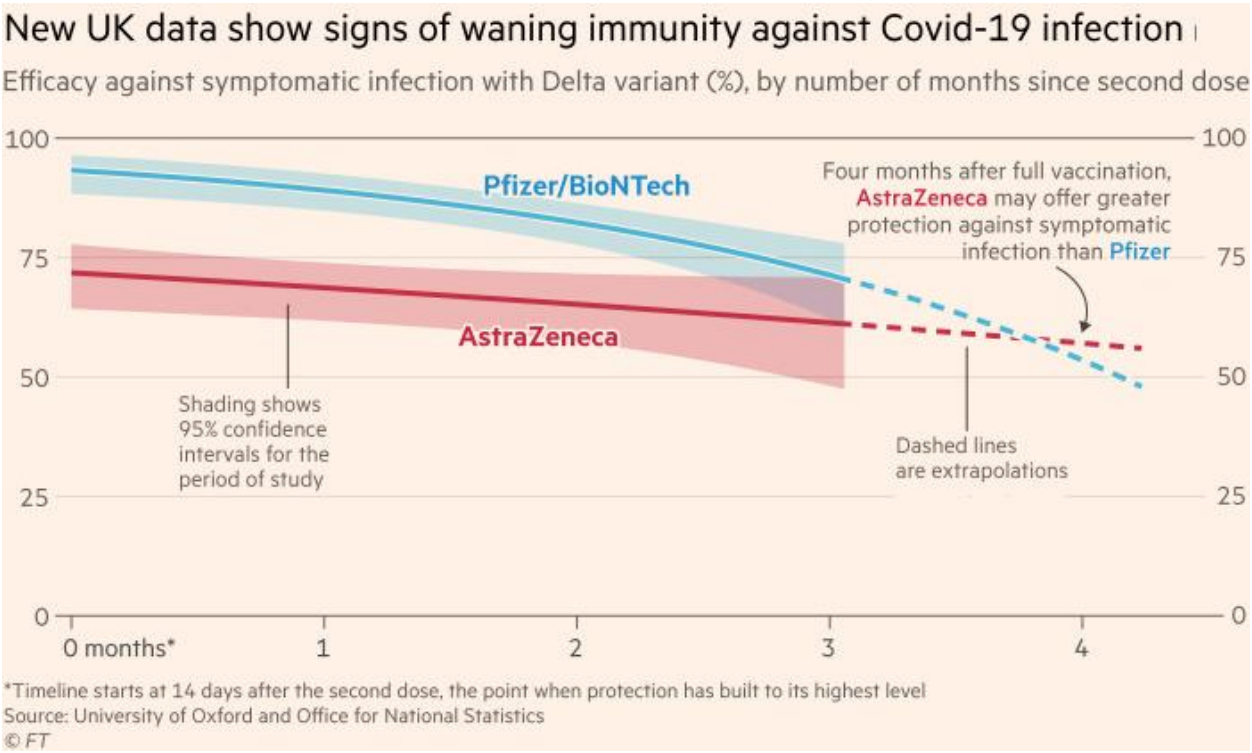
Condition seeking to model	Variant_Multiplyer
Unvaccinated Delta variant	3
Fully vaccinated one month after vaccination Pfizer or Moderna	0.3
Fully vaccinated one month after vaccination Johnson and Johnson	1.0
Data is still coming in (see figure below) but our current suggested projections	
Pfizer vaccinated six months ago	1.7
Pfizer with booster (initial data from Israel, UK and US) expected	0.3
Moderna at six months	0.7
Moderna with booster guestimate (insufficient data yet)	0.3
Johnson & Johnson one month after injection	1
Johnson & Johnson six months after no data guestimate (insufficient data yet)	1.5
Johnson & Johnson six months after booster (insufficient data yet)	1

The original variant in the Fall of 2020 has a Variant_Multiplyer value of 1. The Delta variant dominates in the world today and it is estimated to be 3 times more infectious than the original variant (3x R0 infection risk increase). We also note Delta and waning vaccine effectiveness (VE**)** changes the effective variant multiplier. VE for Pfizer is reported to drop to 30-40% at 6 months in vaccinated people in the Israeli data BBC report). The effect of VE is the risk of being relative risk of being infected as unvaccinated (1) minus the VE (e.g., if the VE is 40% at the sixth month post the second vaccination. Fracturing in VE the risk is now 1-VE times what is was without vaccination. (1-0.4 or 60%) For the Pfizer vaccinated at 6 months post second shot we estimate 40% VE at six months and Delta being 3X more transmissible, the projected infection rate for the vaccinated is now 1.8 times worse (((1-VE) x 3) than it was for the unvaccinated a year ago pre Delta and pre vaccination. For the unvaccinated it is now 3x worse than a September 2020. If you want to do calculations for all Pfizer vaccinated with 40% VE we suggest use a multiplier of 1.8, for unvaccinated 3.

The VE decline varies with the vaccine and month out from the second dose of the vaccine, age on other underlying conditions. The data on VE decline and booster shot restoration is still coming in but with booster for the Pfizer the effectiveness likely returns to above 90% protection of infection and hence with boosters the Variant_multiplyer would be ((1-0.9)x3) or 0.3 for the booster vaccinated or fully vaccinated just a month ago versus 3 for the unvaccinated with Delta. VE is differs by vaccine, times since last dose, age and medical condition.

Below is a figure from Covid protection for the fully vaccinated is waning, UK Oxford study finds. The shows the uncertainty and that the VE is not a constant but a function of time from

the vaccination.



A [Mayo clinic report] show VE against infection fell from 91% to 76% between February and July for the vaccine made by Moderna, and from 89% per cent to 42% per cent for the Pfizer vaccination. The Johnson & Johnson data the [CDC reports] initial VE 66% and in that range in the UK data. The VE decline has a low downward slope we projected it to be 50% based on the UK projection at 6 months. We assume that a booster would restore the Johnson & Johnson to 66%.

We will update our suggested values in the table above and more data is published.