Sources

(1) www.ncbi.nlm.nih.gov

(2) https://www.cdc.gov/mmwr/volumes/70/wr/mm7032e3.htm

(3) COVID-19 Hospital Data - In-hospital mortality among confirmed COVID-19 encounters by week (cdc.gov)

According to the CDC, the Pfizer vaccination prevented COVID-19 hospitalizations by 96% among those 65 and older.**(2)** Since this is the most at-risk population, we can assume the efficacy towards the rest of the population is at least this high. Mortality of the hospitalized infected is close to a fixed 10%, regardless of the at-the-time hospitalization counts.**(3)** If the hospitalizations are reduced by 96%, and we assume almost all fatalities occur in hospitals, then mortality can also be reduced by 96%.

According to the National Library of Medicine, in a 2009 study, masks were proven to be at least 80% effective against influenza-like diseases.**(1)** Since COVID-19 is an influenza-like disease, we can safely assume there will be an 80% reduction in the COVID-19 infection rate with masking mandates in place, making them another effective measure against the disease.

We can incorporate these values into a new fit, named 'Y_fit_new' in our MATLAB file. Using 'Y_fit_new', we realistically adjust the function's case and death rates based on these masking and vaccination effects. It is within reason to say that on day 0 of the outbreak masks can immediately affect the spread, so we can augment our infection rate to be 20% of the initial value. Vaccine development, however, can't be so quickly implemented. A reasonable guess for when a vaccine could be developed and administered to the bulk of the population is around one year(with the assumption that the world has been exposed to coronavirus strains before,) and for our data we assumed the unvaccinated population to be small enough to ignore(though we know this isn't the case in many regions/countries worldwide.) Our death rate post-vaccination was reduced by the same 96% cited above. So, our case rate was only affected by the mask mandate, but our death rate was affected by both. In Figure 3, we plotted the actual cases against the previously and newly modeled cases, and in Figure 4 we did the same for deaths, where the vaccine-induced mortality reduction is delayed 365 days. We got remarkably positive results, showing how effective these policies can be with ideal implementation.