Supplementary Material for Vaccination of Front-Line Workers with the AstraZeneca COVID-19 Vaccine: Benefits in the Face of Increased Risk for Prothrombotic Thrombocytopenia

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Calculations for expected number of death

Assuming that BC allocates all 246,700 doses to front-line workers, we can estimate the expected number of deaths due to VIPIT, $E(death)_{VIPIT}$, as shown below. To err on the side of caution, we assume that each dose of the vaccine is independently associated with the risk for VIPIT and that the risk of VIPIT is uniform across all age groups. We also assume that there is enough uptake that BC is able to administer all these doses.

$$E(\text{death})_{\text{VIPIT}} = d \times P(\text{VIPIT}|\text{vaccine}) \times P(\text{death}|\text{VIPIT})$$

where d is the number of doses administered, $P(\text{VIPIT}|\text{vaccine})$ is the risk of VIPIT after receiving each dose, and $P(\text{death}|\text{VIPIT})$ is the case fatality for VIPIT.

According to the most recent data from UK and EU submitted to EudraVigilance (as of April 4th, 2021):

$$\begin{aligned} E(\text{death})_{\text{VIPIT}} &= d \times \frac{1}{153,000} \times \frac{21}{100} \\ &= 246,700 \times \frac{2.1}{1,530,000} \\ &\approx 0.338 \end{aligned}$$

Considering both doses of the vaccine, we will have:

$$\begin{aligned} E(\text{death})_{\text{VIPIT}} &= d \times \frac{1}{153,000} \times \frac{21}{100} \\ &= 2 \times 246,700 \times \frac{2.1}{1,530,000} \\ &\approx 0.677 \end{aligned}$$

NACI had based its analysis on the more pessimistic estimates of a chance of 1 in 100,000 for VIPIT, and a mortality probability of 40%. In this worst-case scenario analysis, the expected number of deaths in BC would be 1:

$$\begin{aligned} E(\text{death})_{\text{VIPIT-Worst Case}} &= d \times \frac{1}{100,000} \times \frac{40}{100} \\ &= 246,700 \times \frac{4}{1,000,000} \\ &\approx 1 \end{aligned}$$

Considering both doses of the vaccine, the expected number of deaths in BC would be 2.

Sensitivity Analysis

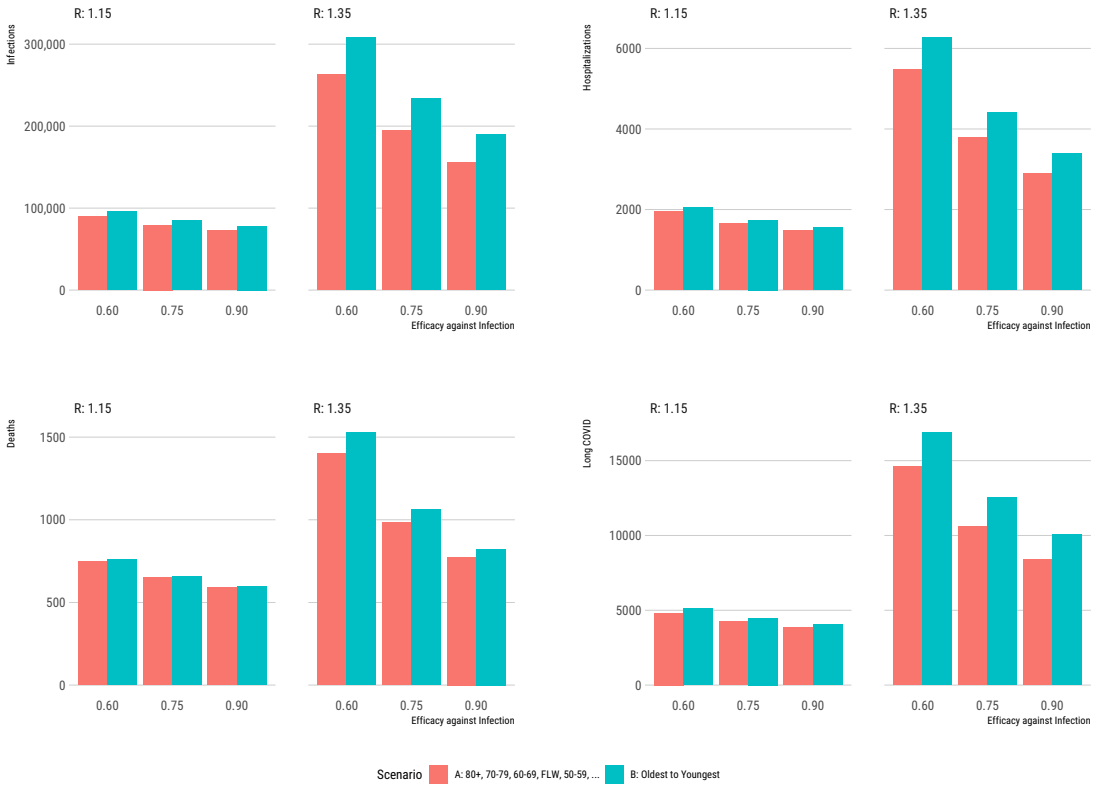

Figure 1: COVID-19 outcomes under different vaccination scenarios for different age groups and front-line workers (FLW) when $v_p = 0.80$

Figure 1 summarizes projected COVID-19 case counts, hospitalizations, and deaths, for a wider range of values for R_0 and the effectiveness of the vaccine against transmission, v_e. Sensitivity analysis on vaccine effectiveness against severe disease, v_p, lead to similar results and conclusions with a slight variation in number of outcomes. As v_p increased, both the overall number of deaths and the number of deaths prevented decreased. Specifically, under $v_p = 0.90$, Scenario A led to 46779 fewer cases of COVID-19, 730 fewer hospitalizations, 102 fewer deaths, and 2137 fewer cases of Long COVID, assuming R_0= 1.35. Figures 2 to 5 summarize main results when $v_p = 0.90$.

Under $v_p = 0.60$, Scenario A led to 43706 fewer cases of COVID-19, 910 fewer hospitalizations, 179 fewer deaths, and 2553 fewer cases of Long COVID, assuming R 0 = 1.35. Figures 6 to 9 summarize main results when $v_p = 0.60$.

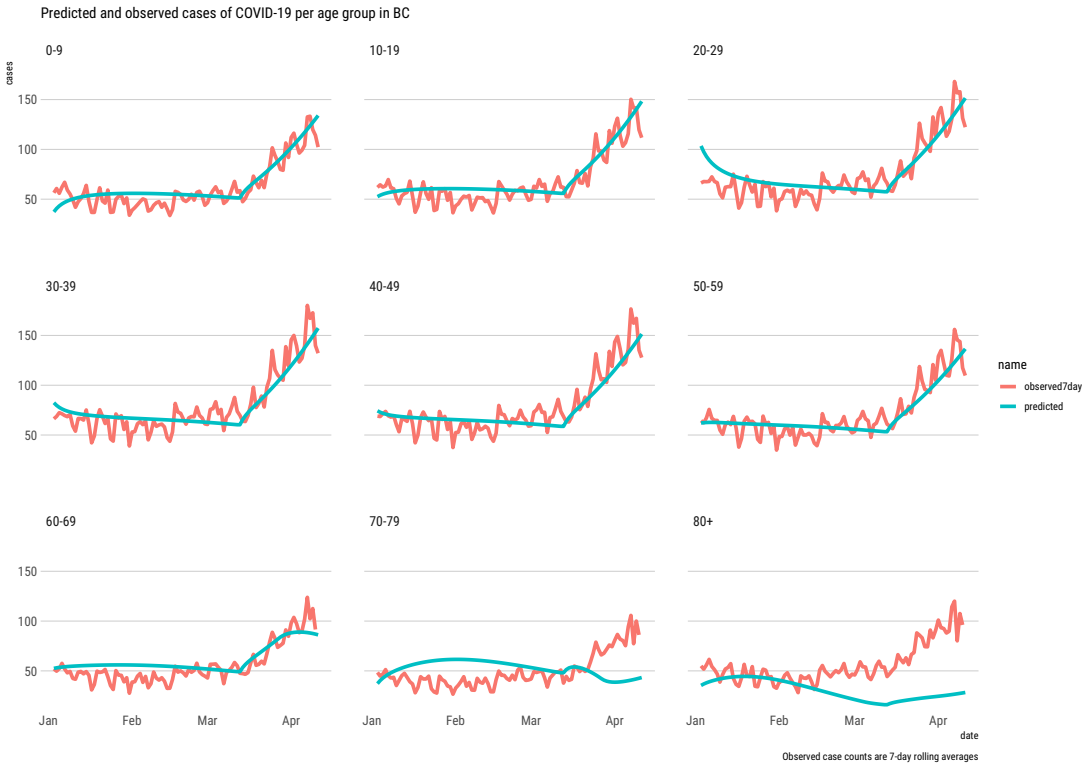

Figure 2: Observed and predicted case counts for different age groups when $v_p = 0.90$

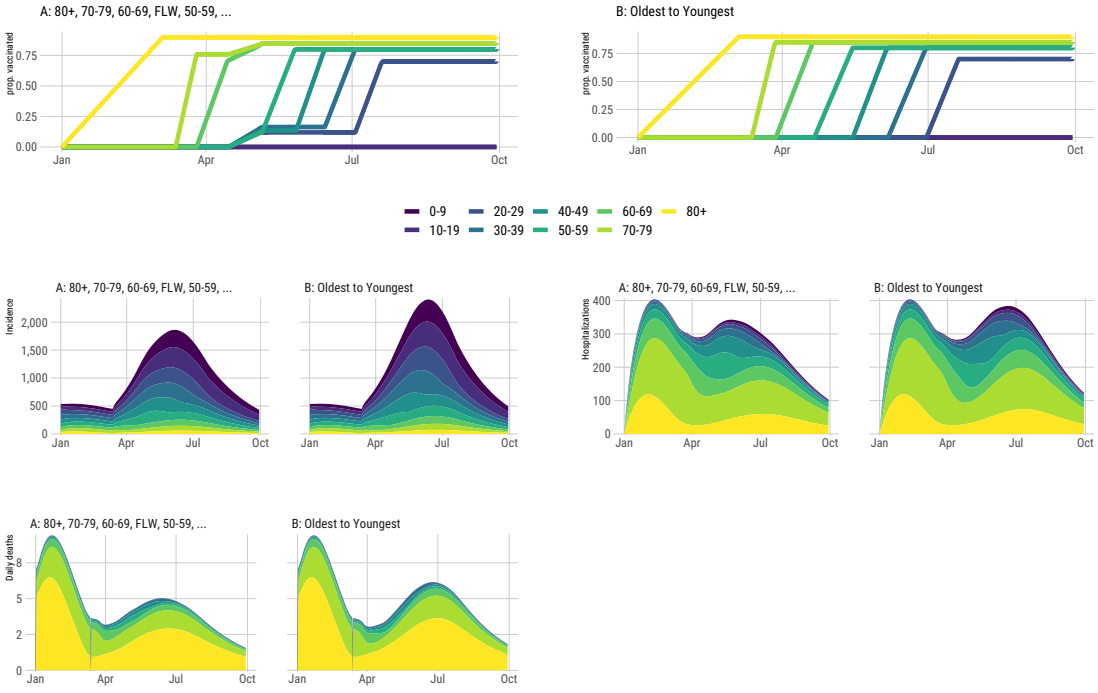

Figure 3: Top Panel: Projection of the progression of the vaccination for different age groups and front-line workers (FLW). Bottom Panel: Projection of COVID-19 cases, hospitalizations, and deaths from January 1st to October 1st, 2021 for $v_p = 0.90$

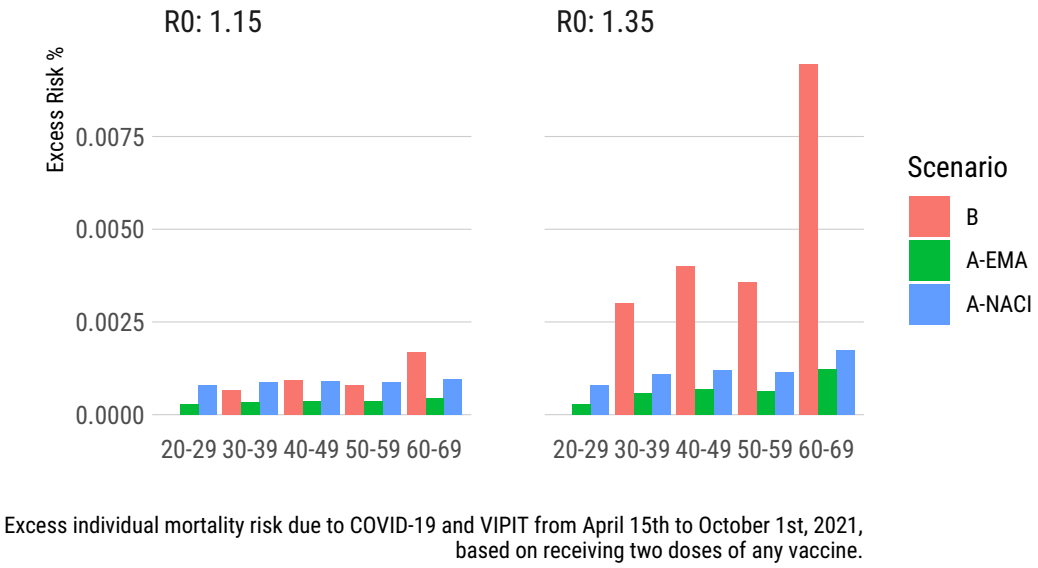

Figure 4: Comparison of excess mortality risk for different age groups based on the COVID-19 risk caused by delayed vaccination (B) and estimated residual COVID-19 and VIPIT risk (A) by the EMA and NACI when $v_p = 0.90$

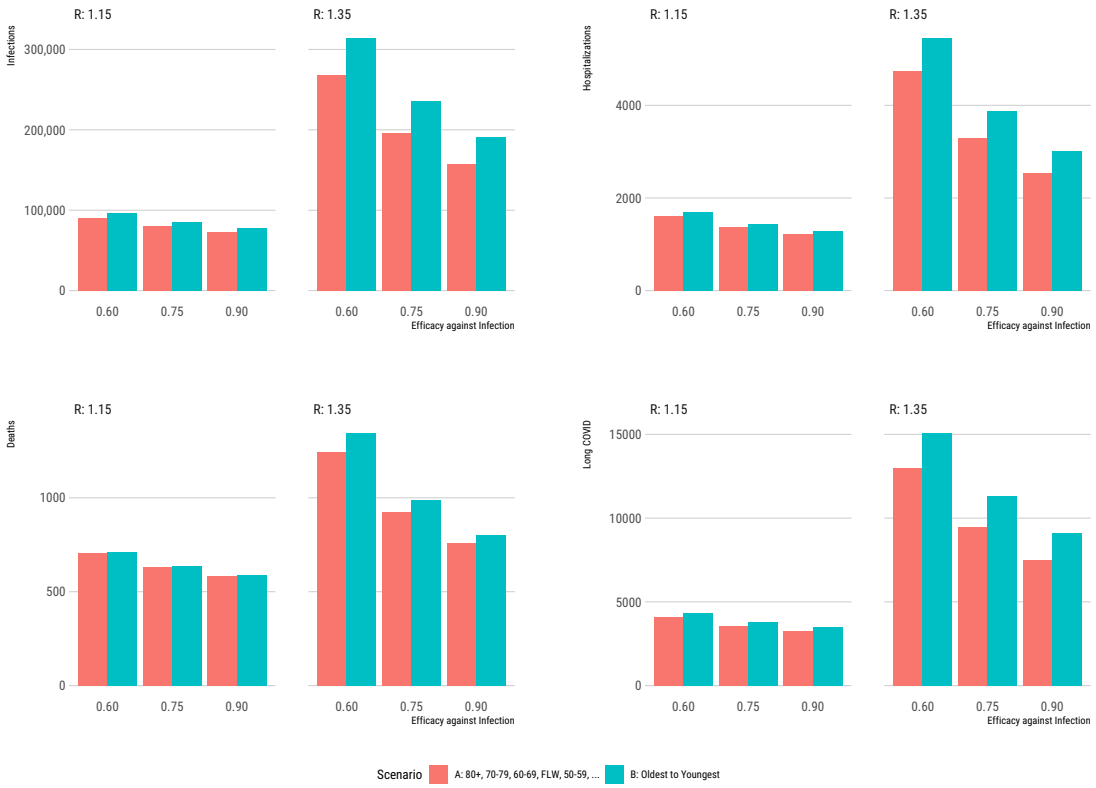

Figure 5: COVID-19 outcomes under different vaccination scenarios for different age groups and front-line workers (FLW) when $v_p = 0.90$

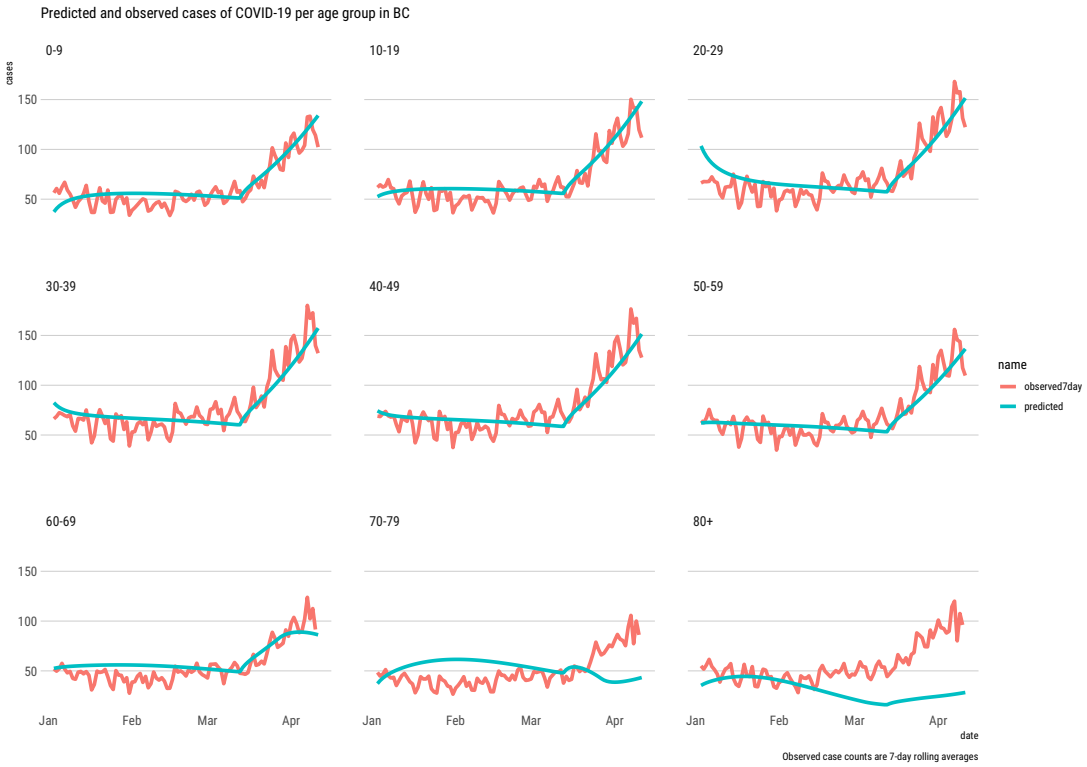

Figure 6: Observed and predicted case counts for different age groups when $v_p = 0.60$

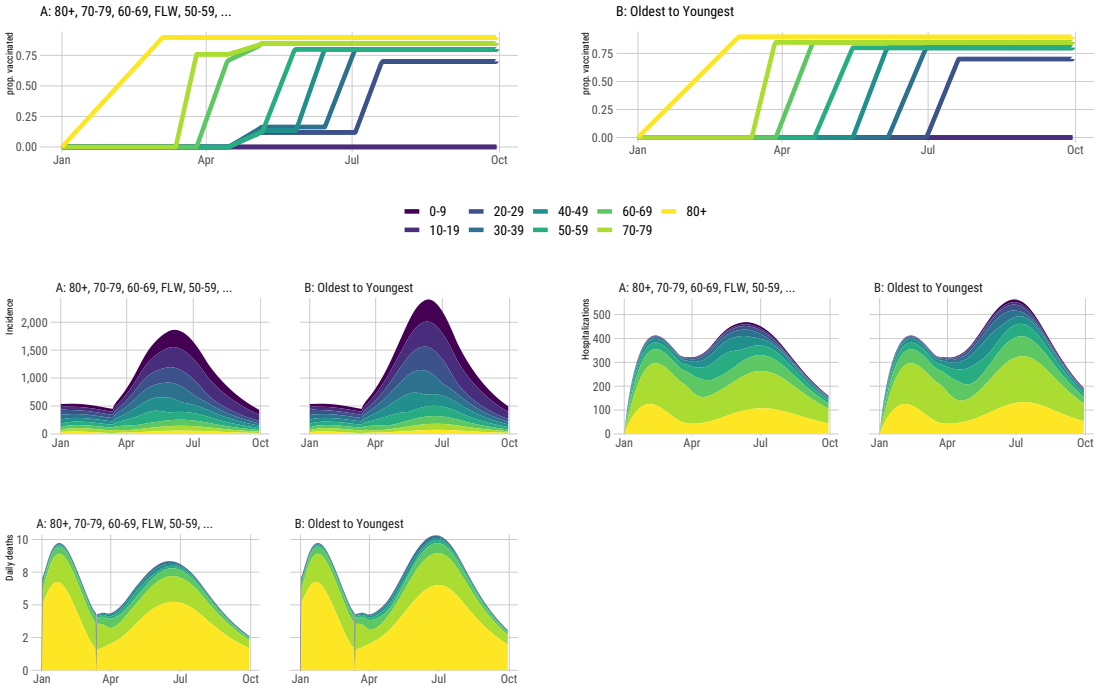

Figure 7: Top Panel: Projection of the progression of the vaccination for different age groups and front-line workers (FLW). Bottom Panel: Projection of COVID-19 cases, hospitalizations, and deaths from January 1st to October 1st, 2021 for $v_p = 0.60$

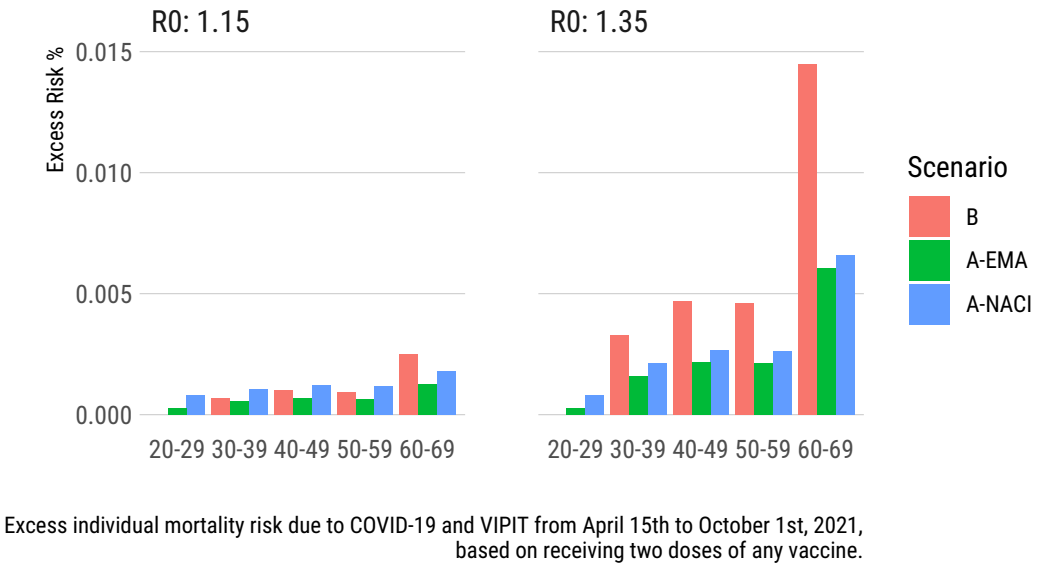

Figure 8: Comparison of excess mortality risk for different age groups based on the COVID-19 risk caused by delayed vaccination (B) and estimated residual COVID-19 and VIPIT risk (A) by the EMA and NACI when $v_p = 0.90$

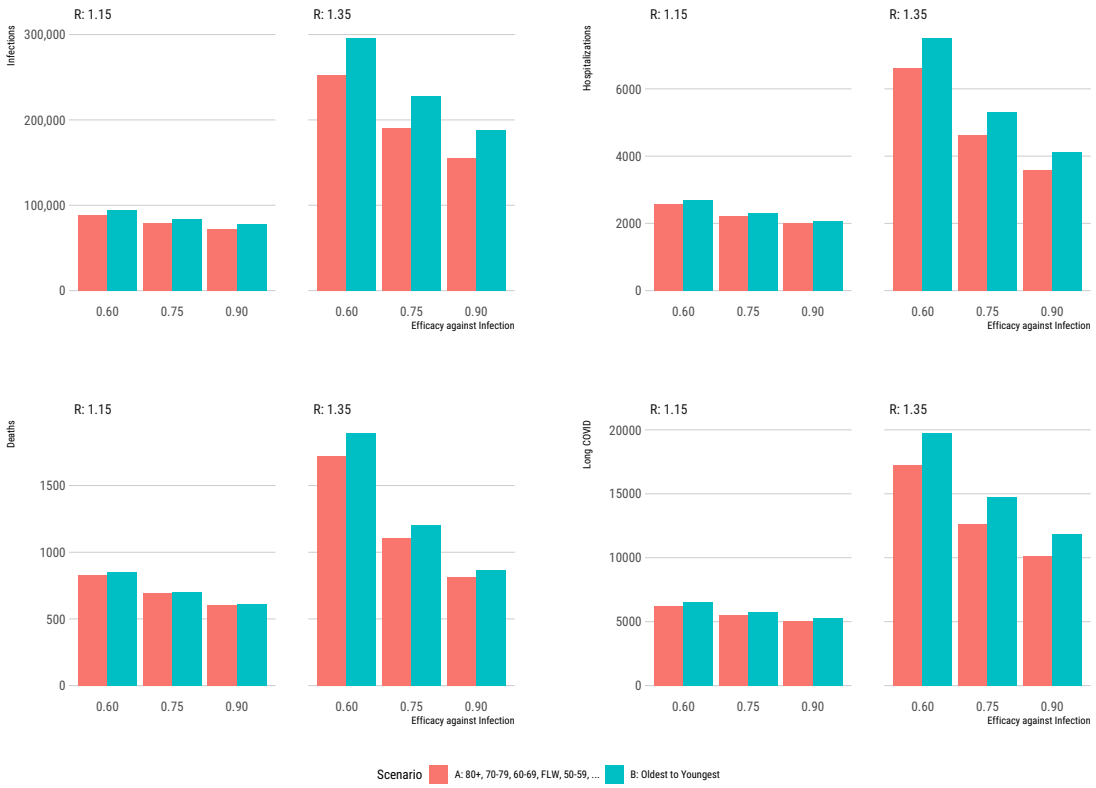

Figure 9: COVID-19 outcomes under different vaccination scenarios for different age groups and front-line workers (FLW) when $v_p = 0.90$