It is made available under a [CC-BY-NC-ND 4.0 International license](http://creativecommons.org/licenses/by-nc-nd/4.0/) . **(which was not certified by peer review)** is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. medRxiv preprint doi: [https://doi.org/10.1101/2020.08.07.20170456.](https://doi.org/10.1101/2020.08.07.20170456)this version posted August 11, 2020. The copyright holder for this preprint

124 Supplementary Material

¹²⁵ Model Equations

¹²⁶ We model the dynamics of SARS-CoV-2 using a set of deterministic ordinary differential equations,

 127 with susceptible individuals S, exposed individuals E, infected individuals I, and recovered indi-

128 viduals R. Subscripts c and sc refer to clinical and subclinical infections. Subscript v denotes those

¹²⁹ that are vaccinated. Population size N is constant.

¹³⁰ β represents the transmission rate (infectiousness), $\frac{1}{\sigma}$ represents the average latent period, ν repre-¹³¹ sents the proportion of exposed individuals who develop clinical symptoms, $\frac{1}{\gamma}$ represents the average 132 infectious period, and ρ_c represents the probability of death due to clinical infections.

¹³³ Vaccine 1: reduces risk of clinical infection to 30% of the original value and transmission rate to ¹³⁴ 70% of the original value:

135 $\nu_v = 0.3\nu, \beta_v = 0.7\beta$

¹³⁶ Vaccine 2: reduces risk of clinical infection to 70% of the original value and transmission rate to

¹³⁷ 30% of the original value:

138 $\nu_v = 0.7\nu, \beta_v = 0.3\beta$

139

$$
\frac{dS}{dt} = -\beta \frac{S}{N} (I_c + I_{sc}) - \beta_v \frac{S}{N} (I_{c,v} + I_{sc,v})
$$
\n
$$
\frac{dS_v}{dt} = -\beta \frac{S_v}{N} (I_c + I_{sc}) - \beta_v \frac{S_v}{N} (I_{c,v} + I_{sc,v})
$$
\n
$$
\frac{dE}{dt} = \beta \frac{S}{N} (I_c + I_{sc}) + \beta_v \frac{S}{N} (I_{c,v} + I_{sc,v}) - \sigma E
$$
\n
$$
\frac{dE_v}{dt} = \beta \frac{S_v}{N} (I_c + I_{sc}) + \beta_v \frac{S_v}{N} (I_{c,v} + I_{sc,v}) - \sigma E_v
$$
\n
$$
\frac{dI_c}{dt} = \nu \sigma E - \gamma I_c
$$
\n
$$
\frac{dI_{c,v}}{dt} = \nu_v \sigma E_v - \gamma I_{c,v}
$$
\n
$$
\frac{dI_{sc}}{dt} = (1 - \nu) \sigma E - \gamma I_{sc}
$$
\n
$$
\frac{dI_{sc,v}}{dt} = (1 - \nu_v) \sigma E_v - \gamma I_{sc,v}
$$
\n
$$
\frac{dR}{dt} = \gamma (I_c + I_{c,v} + I_{sc} + I_{sc,v})
$$
\n(1)

It is made available under a [CC-BY-NC-ND 4.0 International license](http://creativecommons.org/licenses/by-nc-nd/4.0/) . **(which was not certified by peer review)** is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. medRxiv preprint doi: [https://doi.org/10.1101/2020.08.07.20170456.](https://doi.org/10.1101/2020.08.07.20170456)this version posted August 11, 2020. The copyright holder for this preprint

¹⁴⁰ Conditions and Parameter Values

141 Total population size for the simulations was fixed at $N = 100k$ and we assume 20% of the population 142 is already in the 'recovered' class R. The initial size of the exposed class E was set to 200 individuals, $_{143}$ and values for the I_c and I_{sc} classes were calculated under a fast dynamics assumption:

$$
I_c = \frac{\nu \sigma E}{\gamma} = 140
$$

$$
I_{sc} = \frac{(1 - \nu)\sigma E}{\gamma} = 260
$$

144 The initial size of the susceptible class $S = 0.8(1 - f)N$ and the initial susceptible vaccinated ¹⁴⁵ class $S_v = 0.8fN$, where f is the vaccination coverage level. All other vaccinated classes $(E_v, I_{sc,v})$ $I_{c,v}$ are initially set to 0, and simulations were run for one year.

¹⁴⁷ We set the average latent period $(1/\sigma)$ to 4.6 days and the average infectious period $(1/\gamma)$ to 5 ¹⁴⁸ days [18]. We set the transmission rate β to 0.5 per day, resulting in a basic reproduction number ¹⁴⁹ of $R_0 = 2.5$ [19]. We set the risk of an unvaccinated individual developing a clinical infection at ¹⁵⁰ $\nu = 0.14$ [20], and the risk of dying from a clinical infection at $\rho_c = 0.02$ [21, 22].