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quiz07

1.

First we compute the proportion of infected population with assumption $s_0 = 1$:

$$s(\infty) - s(0) = \frac{log(s(\infty))}{R_0}, s(0) = 1, R_0 = 3$$

$$s(\infty) = \frac{log(s(\infty))}{3} + 1$$

Then we have $S(\infty) = 0.05962$. Thus we have $r(\infty) = 1 - s(\infty) = 0.9404$Thus there are in total 2.8212×10^8 people being infected. By multiplying a death rate of 2% we know there are $5.64 * 10^6$ expected death cases.

2.

First we compute $i_m ax$:

$$i_m ax = 1 - \frac{1}{R_0} - \frac{log(R_0)}{R_0}$$

$$i_m ax = 1 - \frac{1}{3} - \frac{ln(3)}{3}$$

Then we have $i_m ax$ is approximately 0.3. Thus there are in total 9×10^7 patients at the peak. Since there are 1000000 hospitals beds and only 50% are available and only 20% of the patiences need a bed. There are in total $9 \times 10^7 * 0.2 - 10000000 \times 0.5 = 1.75 \times 10^7$ extra beds needed.

3.

We compute R_0 using:

$$R_0 = \frac{log(\frac{s(\infty)}{s(0)})}{s(\infty) - s(0)}$$

$$R_0 = \frac{log(\frac{0.9-0.4}{0.9})}{0.5 - 0.9}$$

Thus we get $R_0 \approx 1.469$.