

a.

	To Start	To No restrictions	To Tier 1	To Tier 2	To Tier 3	To Lockdown	To End
From Start	0	0.2125	0.2125	0.2125	0.2125	0.1	0.05
From No restrictions	0	0.4	0.2	0.117	0.117	0.117	0.05
From Tier 1	0	0.1	0.4	0.2	0.125	0.125	0.05
From Tier 2	0	0.125	0.1	0.4	0.2	0.125	0.05
From Tier 3	0	0.125	0.125	0.1	0.4	0.2	0.05
From Tier 4	0	0.15	0.15	0.15	0.1	0.4	0.05
From End	0	0	0	0	0	0	1

- b. To calculate the probability of being in policy T in week k, calculate the sum over all possible sequences of tiers from week 1 to week k-1. Multiply each of these by the probability of being in policy T given the policy in week k-1, multiplied by the probability of observing that range of case numbers given that you are in policy T. Then take the maximum of these as your estimate. For example:

$P(\text{No restriction in week 2}) = P(\text{No restriction in week 1}) * P(\text{No restriction in week 2} | \text{No restriction in week 1}) * P(0-99 \text{ cases given no restriction}) + P(\text{Tier 1 in week 1}) * P(\text{No restriction in week 2} | \text{Tier 1 in week 1}) * P(0-99 \text{ cases given no restriction}) + P(\text{Tier 2 in week 1}) * P(\text{No restriction in week 2} | \text{Tier 2 in week 1}) * P(0-99 \text{ cases given no restriction}) + P(\text{Tier 3 in week 1}) * P(\text{No restriction in week 2} | \text{Tier 3 in week 1}) * P(0-99 \text{ cases given no restriction}) + P(\text{Lockdown in week 1}) * P(\text{No restriction in week 2} | \text{Lockdown in week 1}) * P(0-99 \text{ cases given no restriction}) = 0.05 * 0.2 * (0.4 + 0.1 + 0.125 + 0.125 + 0.15) = 0.009$

Similarly,  $P(\text{Tier 1 in week 2}) = 0.1 * 0.2 * (0.2 + 0.4 + 0.1 + 0.125 + 0.15) = 0.0195$

And  $P(\text{Tier 2 in week 2}) = 0.2 * 0.2 * (0.117 + 0.2 + 0.4 + 0.1 + 0.15) = 0.03868$

And so on

- c. With the epidemic, the next policy is actually based more on the observation (the number of cases) than the previous policy. The model is not predictive, meaning that it is inadequate to predict the exact policies from an event which already occurred. The ranges for the observations are also too large to correctly model exponential growth