

Using epidemic simulators for monitoring an ongoing epidemic

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Supplementary material

Modelling equations

E, I, R : Fraction of population that are exposed, undetected infections or recoveries, *no unit*.

E_q, I_q, R_q : Corresponding fraction of populations that are quarantined, *no unit*.

D : Fatalities from the undetected population(as a fraction of total population), but they may be detected close to death or post-mortem, *no unit*.

D_q : Fatalities from quarantined infections(as a fraction of total population), *no unit*.

a : Fraction of Infected that acquired it by direct contact with another infected, *no unit*.

c : Fraction of exposed or contact infected individuals that are detected, *no unit*.

q : Fraction of community infected that are detected by self reporting or random testing, *no unit*.

δ : Fraction of infected that succumb to the disease, *no unit*.

γ : Inverse of the mean time of infection, day^{-1} .

k : Inverse of mean latency time, day^{-1} .

β : Transmission rate given by product of contact rate and probability of infecting a contact, day^{-1} .

ϕ : Rate of influx in persons / day (normalised by total population), day^{-1} .

p_I : Probability that an incomer is infected or exposed, *no unit*.

$$\frac{dS}{dt} = -\beta SI + \phi(1 - p_I)$$

$$\frac{dE}{dt} = \beta SI (1 - c) - kE + \frac{\phi p_I}{2}$$

$$\frac{dI}{dt} = kE \{a(1 - c) + (1 - a)(1 - q)\} - \gamma I + \frac{\phi p_I}{2}$$

$$\frac{dR}{dt} = \gamma (1 - \delta) I$$

$$\frac{dD}{dt} = \gamma \delta I$$

$$\frac{dE_q}{dt} = \beta SI c - kE_q$$

$$\frac{dI_q}{dt} = kE\{ac + (1-a)q\} + kE_q - \gamma I_q$$

$$\frac{dR_q}{dt} = \gamma (1 - \delta) I_q$$

$$\frac{dD_q}{dt} = \gamma \delta I_q$$

Model parameters for states

State	Fatality rate	Parameters at t=0								Parameters at other time points		
		Beta	c	q	Lag of recovery	Population	Influx population (in_phi)	p (influx infected)	Pre-start	Time point	Parameter	New value
MH	7%	5.7/9	0.50	0.10	8	114200000	100	0.10	7	8-Mar-2020	c	0.1
										20-Mar-2020	in_phi	0
										30-Mar-2020	c	0.25
										14-Apr-2020	c	0.1
GJ	7%	4/9	0.50	0.20	8	62700000	0	0.10	0	18-Mar-2020	in_phi	180
										22-Mar-2020	in_phi	0
										4-Apr-2020	beta	8.4/9
										4-Apr-2020	in_phi	410
										4-Apr-2020	c	0.25
DL	4%	4/9	0.10	0.30	8	21800000	5	0.10	15	14-Apr-2020	in_phi	0
										27-Feb-2020	in_phi	40
										15-Mar-2020	c	0.45
										18-Mar-2020	in_phi	0
										27-Mar-2020	in_phi	450
KA	5%	5/9	0.10	0.10	8	64100000	5	0.01	20	29-Mar-2020	c	0.75
										9-Apr-2020	in_phi	0
										24-Feb-2020	c	0.4
										15-Mar-2020	in_phi	150
RJ	2%	4.5/9	0.20	0.10	8	68900000	0	0.10	4	29-Mar-2020	in_phi	0
										15-Apr-2020	c	0.95
										9-Mar-2020	c	0.5
										13-Mar-2020	in_phi	48
TN	1.50%	4/9	0.50	0.40	7	67900000	0	0.10	-1	25-Mar-2020	beta	8/9
										30-Mar-2020	in_phi	0
										10-Apr-2020	c	75
										20-Mar-2020	in_phi	50
										27-Mar-2020	in_phi	1200
MP	8%	8.55/9	0.10	0.10	8	73300000	0	0.10	5	29-Mar-2020	beta	2/9
										29-Mar-2020	c	0.8
										5-Apr-2020	in_phi	0
										9-Mar-2020	in_phi	25
KL	1%	3.06/9	0.20	0.30	6	34800000	100	0.10	10	19-Mar-2020	in_phi	1
										25-Mar-2020	in_phi	1
										25-Mar-2020	beta	43839
										25-Mar-2020	c	0.6
WB	7%	5.3/9	0.20	0.30	8	90300000	0	0.10	0	15-Mar-2020	in_phi	40
										20-Mar-2020	in_phi	0
TG	4%	4.5/9	0.30	0.30	8	35200000	5	0.10	4	14-Mar-2020	in_phi	80
										24-Mar-2020	in_phi	0
										31-Mar-2020	in_phi	450
										31-Mar-2020	c	0.7
PB	8%	4/9	0.00	0.10	8	28000000	0	0.10	2	4-Apr-2020	in_phi	0
										12-Mar-2020	in_phi	40
										19-Mar-2020	c	0.7
										20-Mar-2020	in_phi	0
UP	3%	4.6/9	0.10	0.10	5	204200000	0	0.10	18	4-Apr-2020	in_phi	190
										10-Apr-2020	in_phi	0
UP	3%	4.6/9	0.10	0.10	5	204200000	0	0.10	18	10-Mar-2020	c	0.2

Table 1. (supplementary) Model parameters for various states: The values of all the model parameters used along with temporal variations are listed.