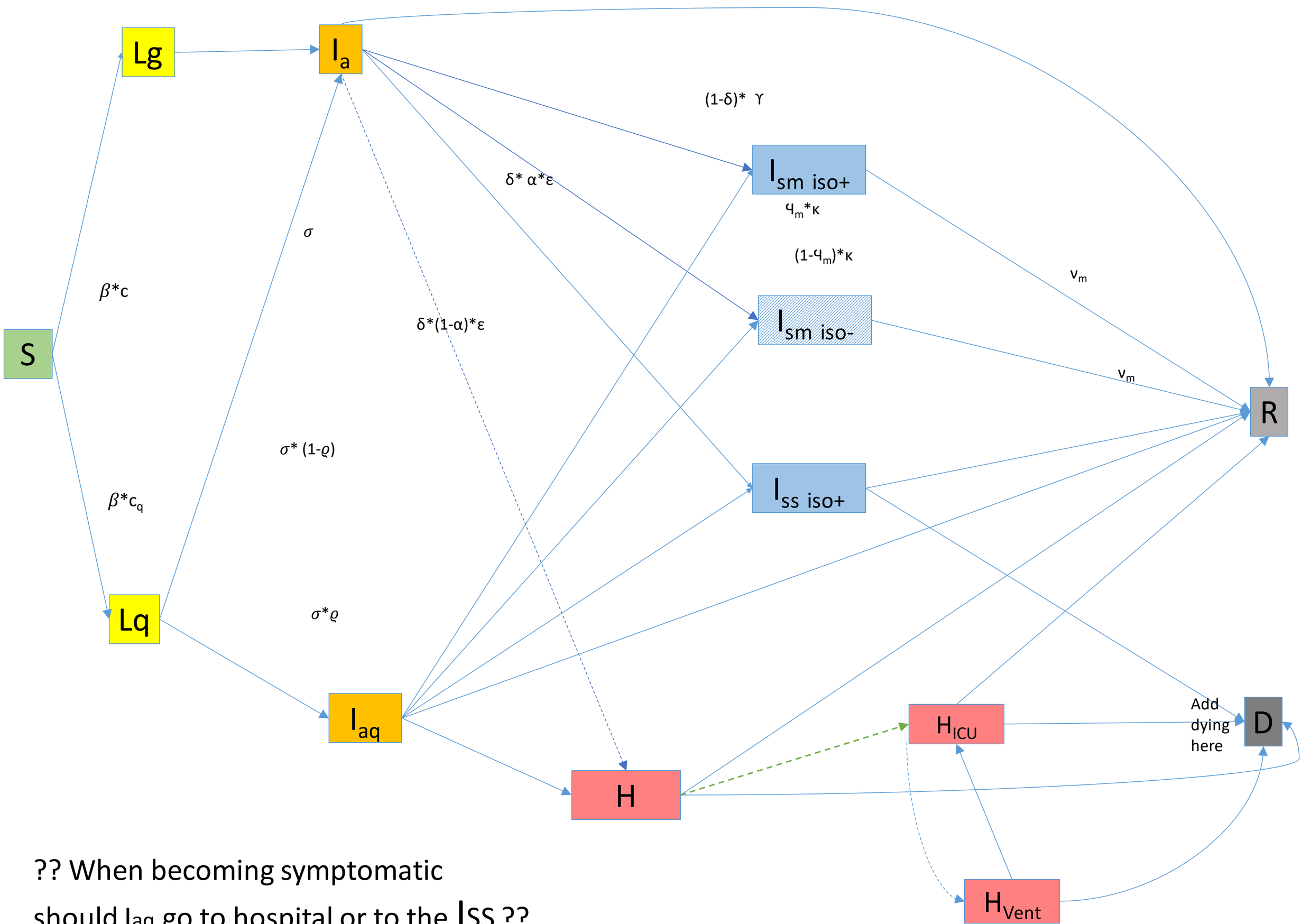
PHRS SEIR Model - With quarantine 3.0 – with parameters



?? When becoming symptomatic

should I_{aq} go to hospital or to the I_{SS} ??

dS = -beta * c*r1*(Σ infected non-isolated + r2* Σ infected isolated)

*dS = -beta *((c*r1* Σ infected non-isolated) + (c*r2 Σ infected isolated))*

~~*dS = differentiate between the mild and severe non-isolated (based on one of the formula above)*~~

dL = +beta * c*r1*(Σ infected non-isolated + r2*(Σ infected isolated))*(1-lambda) – sigma*L *[depending on decision above]*

dL_q = + beta * c*r1*(sum infected non-isolated + r2*(sum infected isolated))*(lambda) – sigma*L_q

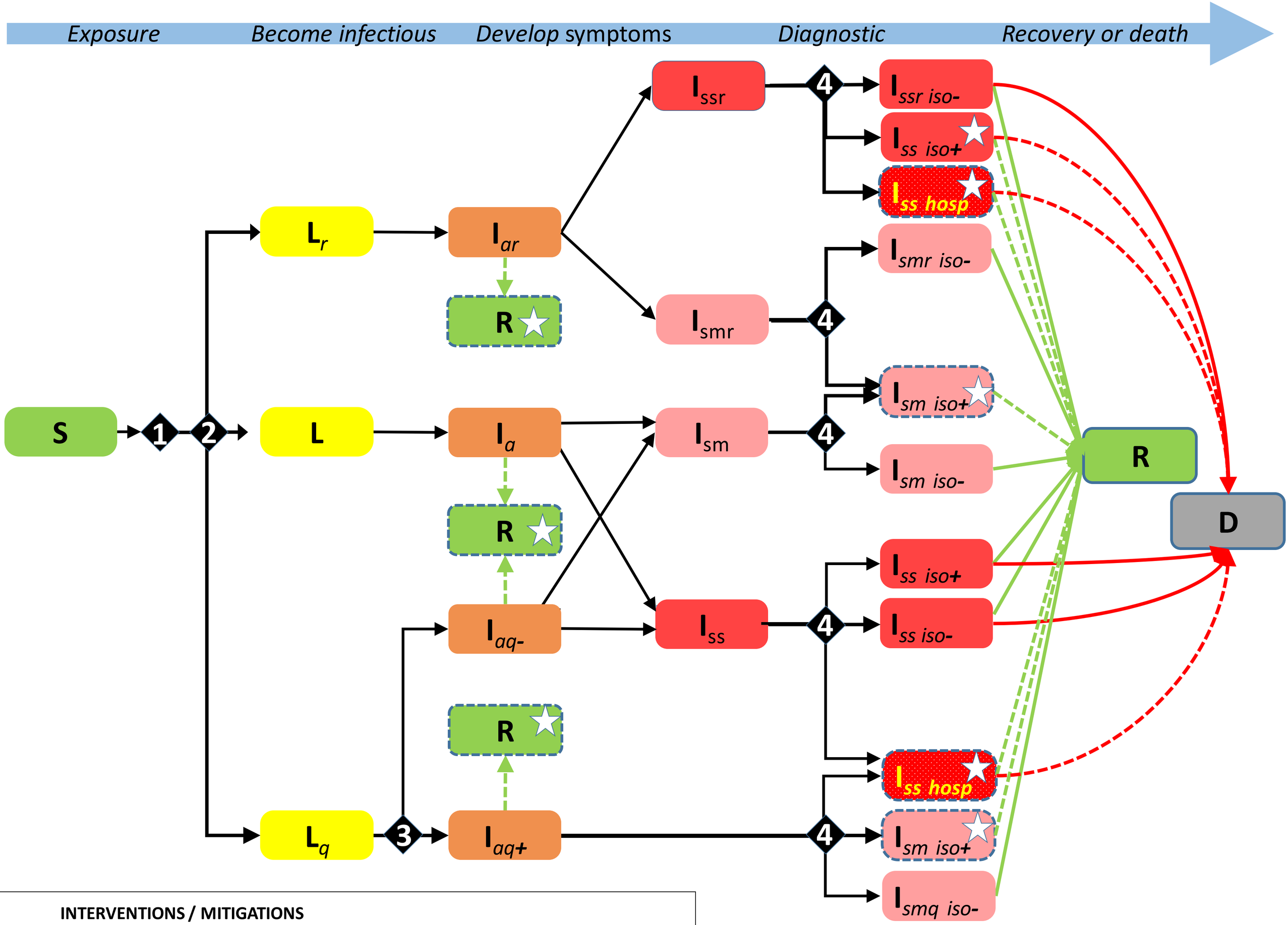
c= baseline contact rate
r1= reduction of contact rate because social distancing (60%)
r2=reduction of contact rate because infected are isolated or quarantined or in hospital

For age stratification model: c will be developped using the age strata contact matrix and will be cij

Questions?

- For non-isolated , severe and mild cases should have different contact rate
- Other cap process in the model?

Parameters	Definition	Values	References
c	Number of contact per day per person in a population that is not quarantined and follow social distancing measures	S1=6	Arbitrary scenario
c_r	Number of contact per day per person in a population that is not quarantined and doesn't follow social distancing measures	S1=11	Béraud, G., S. Kazmercziak, et al. (2015). "The French Connection: The First Large Population-Based Contact Survey in France Relevant for the Spread of Infectious Diseases." PLOS ONE 10(7): e0133203.
c_q	Number of contact per day per person in a population that is quarantined	S1=4	Arbitrary but would correspond to a family of 4
β	Beta – transmission rate when contact	0.05	Stilianakis, N. I. and Y. Drossinos (2010). "Dynamics of infectious disease transmission by inhalable respiratory droplets." Journal of the Royal Society, Interface 7(50): 1355-1366.
σ	sigma = 1 /latency period	0.27=1 /3.7 days	Wu, P., X. Hao, et al. (2020). "Real-time tentative assessment of the epidemiological characteristics of novel coronavirus infections in Wuhan, China, as at 22 January 2020." Eurosurveillance 25(3): 2000044. (not sure)
λ	Lambda = percentage of exposed (incubant) individuals identified through contact tracing and placed in quarantine	lambda1 =0; lambda2=80	SCENARIO
ϱ	Rho=quarantine compliency rate	Rho1=0.75; Rho2=0.95	SCenario
ε	Espilon = 1/pre-symptomatic infectious period	S1 = 1/2.5 days	See Vicky's model
εq	Espilon = 1/(pre-symptomatic infectious period +duration between onset of symptoms and diagnostic)	1/4.5	Kappa+epsilon
α	Alpha= percentage of infectious(symptomatic) that develop mild symptoms	0.86	Base on CIRID report March 30th 2020
δ	Delta = percentage of infectious pré-symptomatic who will develop symptoms	87%	Courriel LIsa
ϒ	Upsilon = 1/ duration of the asymptomatic period between pre-symptomatic period and recovery	1/15 days	CDC report (12.5 + 2.5)
ν_m	Nu $_m$= 1/duration of the symptomatic period for Mild cases before they recover	1/12.5 days	See Vicky
ν_s	Nu $_s$= 1/duration of the symptomatic period for Severe cases before they recover	1/12.5 days	See Vicky
ν_d	Nu $_d$= 1/duration of the symptomatic period for Severe cases before dying	1/12.5 days	See Vicky
κ	Kappa= 1/duration between onset of symptoms and diagnostic	1/2 days	Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. Pediatrics. 2020; doi: 10.1542/peds.2020-0702
ψ_m	Fei m= percentage of mild cases who go in isolation	100%; 80%	Scenario to be tested
ψ_{si}	Fei si= percentage of severe cases who go in isolation	0%	Scenario to be tested
ψ_{mr}	Fei si= percentage of severe cases who go in isolation	80%; 80%	Scenario to be tested
ψ_{mq}	Fei mq = percentage of mild cases **in quarantine** who go in isolation	100; 80%	Scenario to be tested
ψ_{sh}	Fei sh= percentage of severe cases who go in hospital	100%	Scenario to be tested . Note: $\psi_{si}+\psi_{sh}$ <=1
μ	Mu= percentage of severe case dying	12.4%	Wilson et al explored case fatality risk accounting for a 13 day lag time and report the most reasonable estimates should be considered between 0.25% - 3.0% (KS report March 16th)
τ	Tau = complience rate with social distancing measures	90%; 60%	Scenario to be tested
φ	Phi = parameter to adjust le level of participation of the quarantined to the transmission	0	



INTERVENTIONS / MITIGATIONS

- 1 Contact tracing efficiency
- 2 Compliance to social distancing (refractary: **r**)
- 3 Compliance of contacts quanrantined (compliance: subscript ***q+***, ***q-***)
- 4 Case isolation compliance (subscripts: ***iso+***, ***iso-***, ***hosp***)

☆ Compartments repeated for graphical purpose only. Check indices in name of compartment

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