Readings on the papers

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1 What I need to do?

To create a SIR model of two cities with different R_0's connected by a transport and figure out the R_0 of the new connected system.

From readings of paper I, Day I
The calculations of individual city R_0 depends on the SIR model of the paticular city, ie, It does not account for the transportation term or the city is considered to be a closed system.

Intrinsic R_0
But the R_0 depends only on the parameters α and β which are dependent only on the disease. So, How come the two cities can have different R_0 for the same disease.

Todo: Figure out R_0 is defined and how do we calculate it for a model.
R_0 definition is the number of secondary infections caused a single infected individual. Since we have two cities the R_0 depends only on γ , $\beta_{1)}$,β_2 and N the total size of the population.

2 Modeling the Worldwide Spread of Pandemic Influenza: Baseline Case and Containment Interventions

Meta population stochastic epidemic model
This also considers the airline flow travel.

Network Vertices are Cities and weighted edges represent the rate of passenger flow. Each vertice with a weight representing the population.

The Model
We use **SLIR** model.

The Stochastic transport operator
ω acts as a coupling term between the equations.To read about

Langevin formulation Todo

Discrete nature of Individuals
They have used a special type of calculation to account for the discreteness of the Individuals.To see Text S1 and figure out

Since R_0 is function of the disease parameters, technically the R_0's of all the cities must be the same. Since R_0 doesn't depend on ω. Here in this paper we have different R_0's due to seasonality changes.ie, their transmission coefficient β is different due to seasons.Should we also consider giving different β values to different cities to create cities with different $_0$'s?

Yes, techincally we should consider different β values for different cities since it denotes the rate of contacts inside the city and connectivity of the poeple may be different in different cities. But the γ value of the cities must be the same. Since it doesnot depend the location or the spatial distribution of the poeple. Hence we get different R_0

3 Devolopments

The initial exponential rise in propotion of susceptible who are infected $p(t)$ depends on the rate of which new infections are being produced at the rate λ

$$P(t) = P(0)e^{\lambda t}$$

$$\lambda = \frac{R_0 - 1}{\gamma}$$

We use $R_0 = \frac{\beta N}{\gamma}$ as the theoritical value for the cities considering simple SIR model.

fitting the slope Different types of fitting(see note)