Description of the Global Model of influenza transmission
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1. Introduction

The Global Model can be used to model the transmission of a new strain of influenza around the globe.

2. Requirements

The model is written in Python and requires the numpy library (http://numpy.scipy.org) to be installed.

3. Quick start

The source file "global_model8.py" contains all of the model code. The default settings assume that there is a directory "DataFiles" that contains information about the cities in the model, the influenza season of these cities, and the passenger travel volume among these cities. We recommend using the defaults: population_321_age.txt, seasonality_321.csv, and travel_321.txt.

To run the model in Python, create a globalModel object. For example, to initialize a global model with normal seasonality and an maximum R0 of 1.5:

```
  > import global_model as globalmodel
  > Erth = globalmodel.season_globalModel(name='R0 = 1.5', R0=1.5, lowR0=0.8,
popFile = 'DataFiles/population_321_age.txt',travelFile =
'DataFiles/travel_321.txt', sympTratio=0.25, exchangeArrayList=True,
randomSeed=1)
```

To run the model, use the global_epidemic method. To start an epidemic in Mexico City with 100 infected individuals on January 1, using the model initialized as above:

```
  > Erth.global_epidemic(starttime=1, imprtList=[("Mexico_City", 100)])
```

The model can take about 15-20 minutes to run.

After the model is done, the results are stored in the globalModel object. you can output the results to text files using the write_global method of the global_csv object, which is defined in the global_csv.py file. If you call:

```
  > global_csv.write_global(Erth, "out")
```

you will get the following output files:

- out-args.csv, which summarizes the parameters for the model run.
- out-r.csv, which outputs the number of susceptible people each day in each city.
- out-i.csv, which outputs the number of infected people each day in each city.
- out-r.csv, which outputs the number of recovered people each day in each city.
- out-r4.csv, which outputs the number of recovered people each day in each city by subpopulation and risk group.
- out-exchange.csv, which outputs the number of infected people who travel between each pair of cities each day. This file can only be output when the globalModel object has its exchangeArrayList member variable set to True.

4. Class list

epiList - Influenza transmission model for a single city.

globalModel - Base class for all global models. Creates and manages an array of epiLists.

step_globalModel - The influenza season of all cities north of the Tropic of Cancer is from October 1 to March 31, all cities south of the Tropic of Capricorn is from April 1 to September 30, and all cities between the two tropics is always in-season. Transmissibility is high in-season and low out-of-season.

linear_globalModel - same as step_globalModel except that there is a 30-day transition when transmissibility changes at the beginning and at the end of influenza season in the temperate areas.

season_globalModel - uses a seasonality data file to determine the transmissibility of influenza for each city and each day of the year.

prevac_globalModel - same as season_global_model, but prevaccinates a fraction of the population.

vacfile_globalModel - same as season_global_model, but vaccinates individuals based on the contents of an input file, which specifies the timing and the fraction of the population of each city to vaccinate

5. License

6. Version history

October 2010: Version 1.0
This version was used to produce the results in the manuscript "The global transmission and control of influenza".