Behavior Modeling Workshop

A Overview of FRED: The Framework for Reconstructing Epidemiologic Dynamics

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FRED Core

Synthetic Population

Health Conditions

Behavior Model

Policies & Resources

Initial Conditions

FRED SIMS
Simulation Information Management System

Request Queue

FRED Simulation Engine

Analysis and Visualization Tools

Results DB

Request DB

FRED Web Service

FRED Opioid Web Ap
Census-matched Synthetic Population

US Census Data
LandScan Satellite Data
DoE School Data
BLS Business Data

Person = Agent
Each agent is assigned to household, school and workplaces with other agents

U.S. Population (112,595,578 households with 289,390,247 people)

Extract Any Location

PHDL
Synthetic Population Matches Real Demographics
Location and size of each school

Location and size of each workplace

Household size, ethnicity, ages, income
Location and size of each school

Location and size of each workplace

Household size, ethnicity, ages, income
Location and size of each school

Location and size of each workplace

Household size, ethnicity, ages, income
FRED Measles

- Prompted by the recent publicity of the resurgence of measles in the public media
- Calibrated FRED (built for influenza) to the disease characteristics for Measles
  - More infectious
  - Infection spreads by close contact
- Created an app that can describe the expected number of cases when an infected person is placed in a county
https://fred.publichealth.pitt.edu/proj/measles/
"... Sen. Marty Block, a San Diego Democrat, said he was convinced to vote “yes” after Pan showed him a computer modeling program [from the University of Pittsburgh that simulates how quickly a measles outbreak could spread depending on a community's vaccination rate."

PHDL
But – this would never happen

- People would respond to what they saw
  - Keep children home from school
  - Vaccinate their children
  - Change group behaviors
Should I go to work?

Household size, ethnicity, income

Should we vaccinate our children?

Location and size of each school

Location and size of each workplace
Behavior matters.....

- Simulations of real-world events need to include simulation of peoples' responses to events
  - Staying home from work if sick
  - Health seeking behavior given conditions around you
  - Adhering to prescribed treatments
  - A huge list
Purpose of Workshop

- FRED has the tools and capabilities to represent behaviors in its agents
- Behaviors can be dependent upon:
  - Characteristics of the agent
  - Characteristics of agents in the same vicinity
  - Characteristics of the environment
  - What has already happened in the simulation
- We hope you will become able to instantiate behaviors into FRED models
Thank you

more information at: www.phdl.pitt.edu