Evaluation of Outbreak Detection: Issues in Developing Test Data

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The Importance of Test Data

- Validity of evaluation depends on test data
- Test data contain 'marked-up' outbreaks
  - Start and stop
  - Point of successful detection
  - (Type of outbreak)
- Three general types of test data
  - Wholly authentic
  - Wholly simulated
  - Authentic background, simulated outbreaks

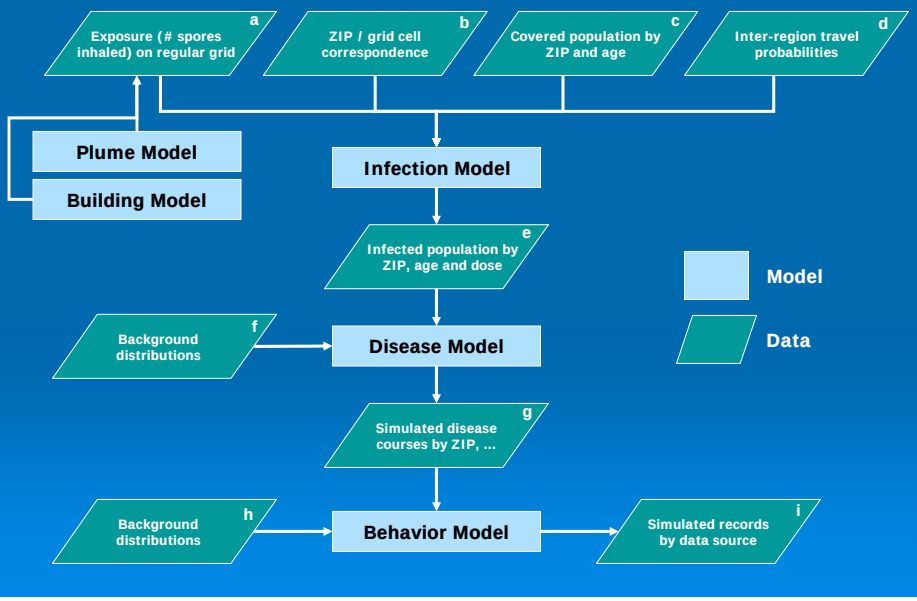
Comparison of Test Data Types

Type	Advantages	Disadvantages
Wholly authentic	• Face validity	• Resources for defining outbreaks • Validity and reliability of definition • Limited number / variety of outbreaks
Wholly simulated	• Ability to specify outbreak • Large number / variety of outbreaks • Sensitivity analyses	• Need to simulate background data • Need to simulate outbreak • Validity of simulation questionable as complexity increases
Authentic background, simulated outbreak	• Retains realism of authentic data • Retains most advantages of wholly simulated approach	• Need to simulate outbreak • Need to 'fit' outbreak to background • Validity of simulation questionable as complexity increases

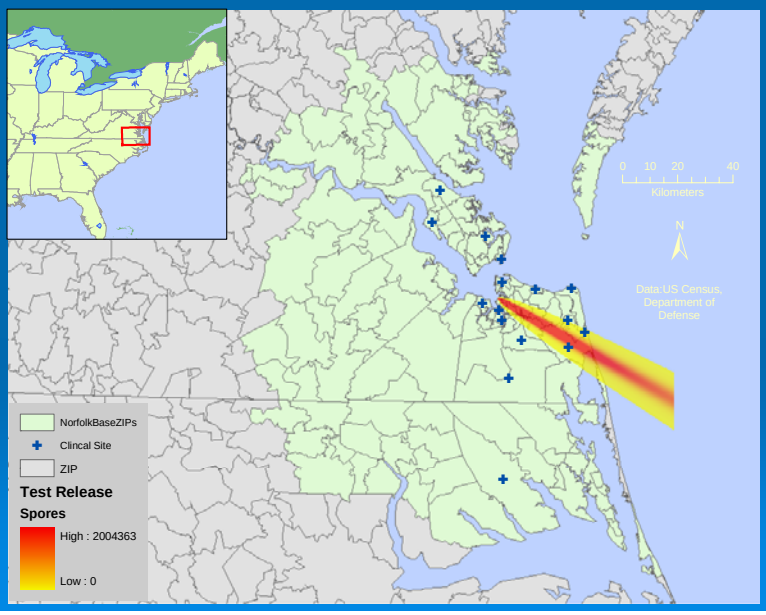
A Modeling Framework for the "Injection" Approach

- Exposure process
  - Introduction of the disease agent into the population
  - Transmission of the disease agent if communicable
- Infectious process
- Disease process
  - Progression of infected individuals through disease
  - Linkage of disease states to illness behavior
- Illness and diagnostic behaviors
  - Behavior of ill individuals
  - Behavior of health care system

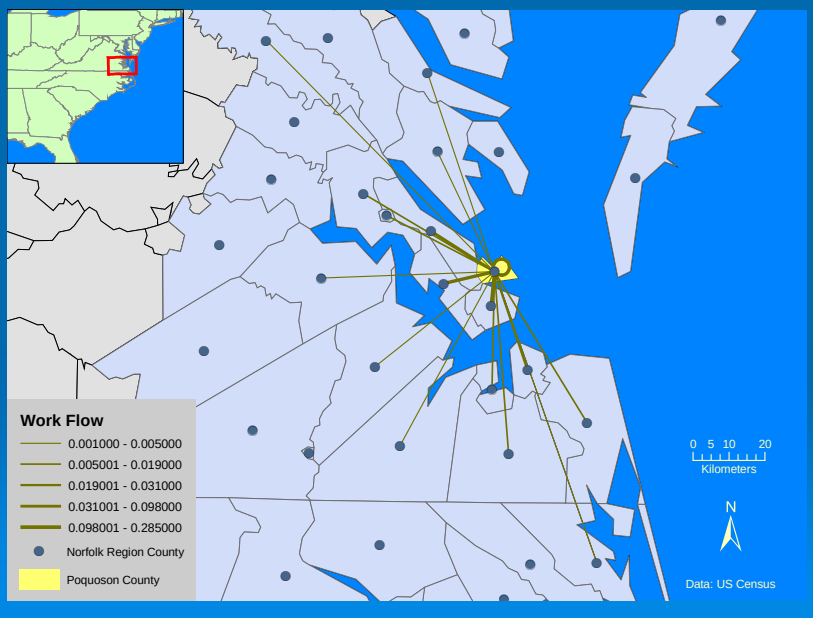
Relationship of Components



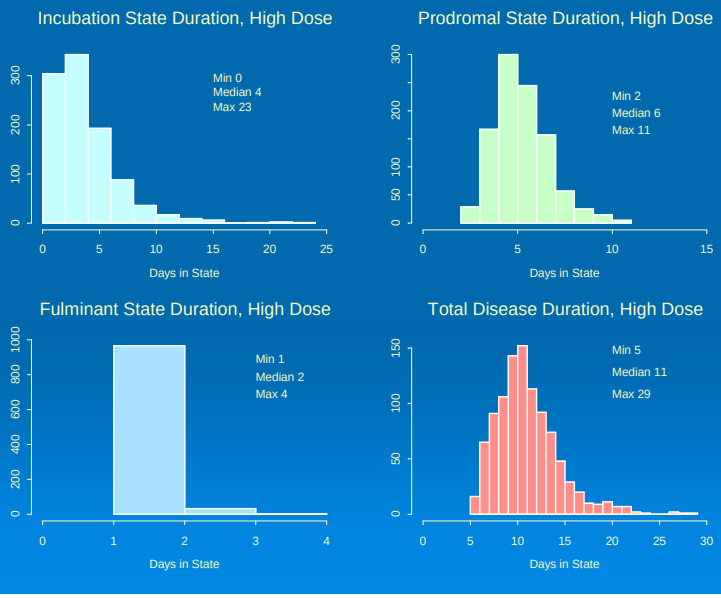
Exposure Process



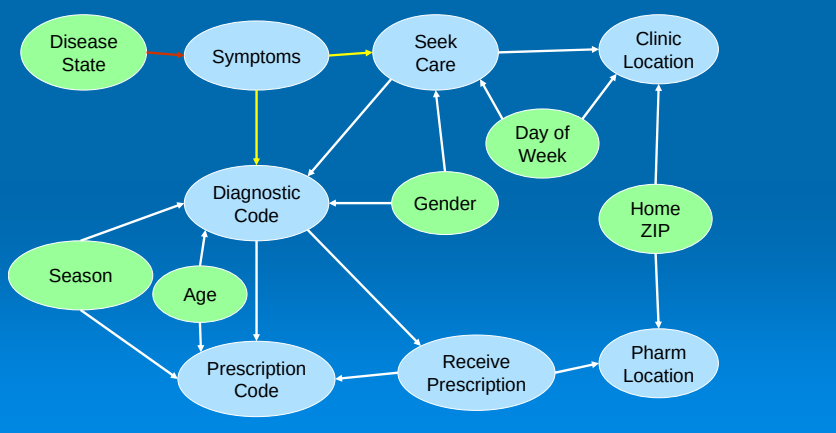
Impact of Mobility on Exposure



Disease Process



Example Bayesian Network Structure for Illness and Diagnostic Behavior



Algorithms and Evaluation Goals Drive Test Data Requirements

- Algorithms
  - Space, individual-level covariates
  - Most ‘complex’ algorithm sets requirements
- Evaluation goals
  - Algorithm development
  - Surveillance system development
  - Disease control policy