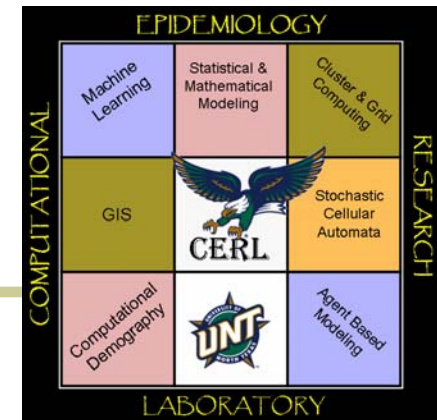


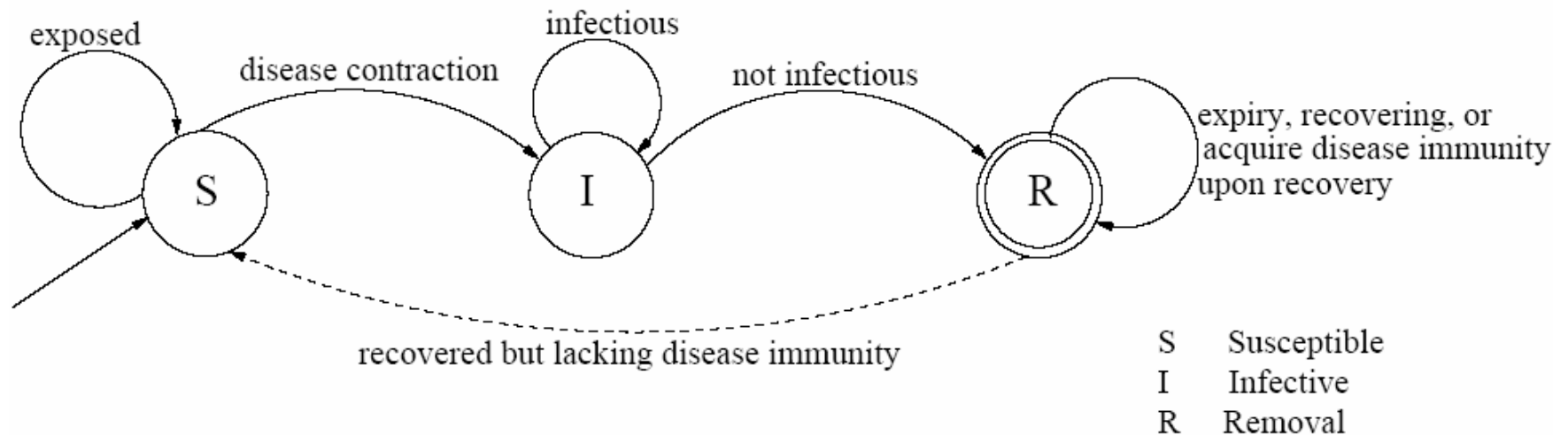
# *Temporal Analysis of Infectious Diseases: Influenza*

Kaja Abbas, Armin R.  
Mikler, Robert Gatti  
*University of North Texas*



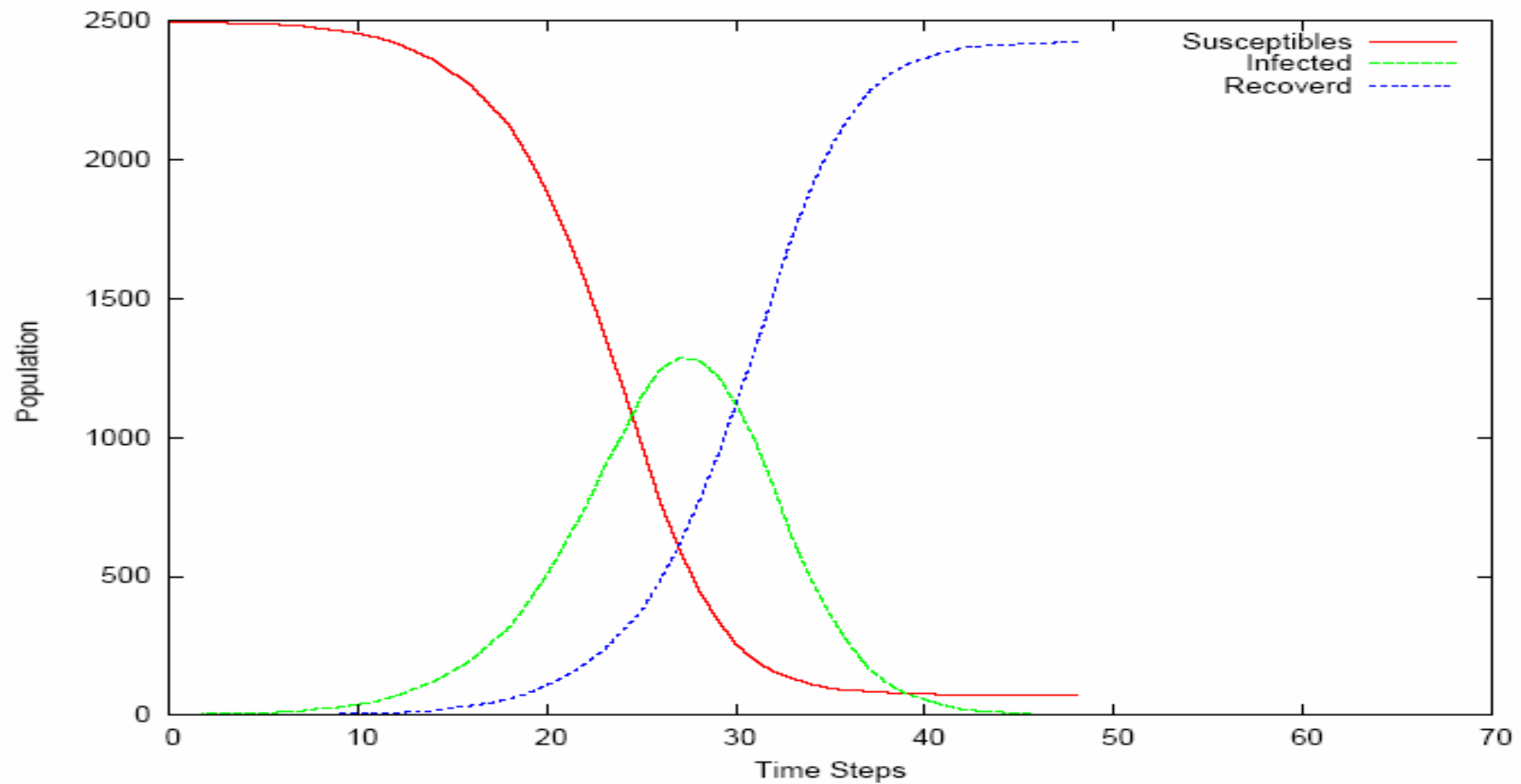
# Mathematical Epidemiology

## Susceptibles Infectives Removals (SIR) model



SIR State Diagram

# SIR Epidemic Curve



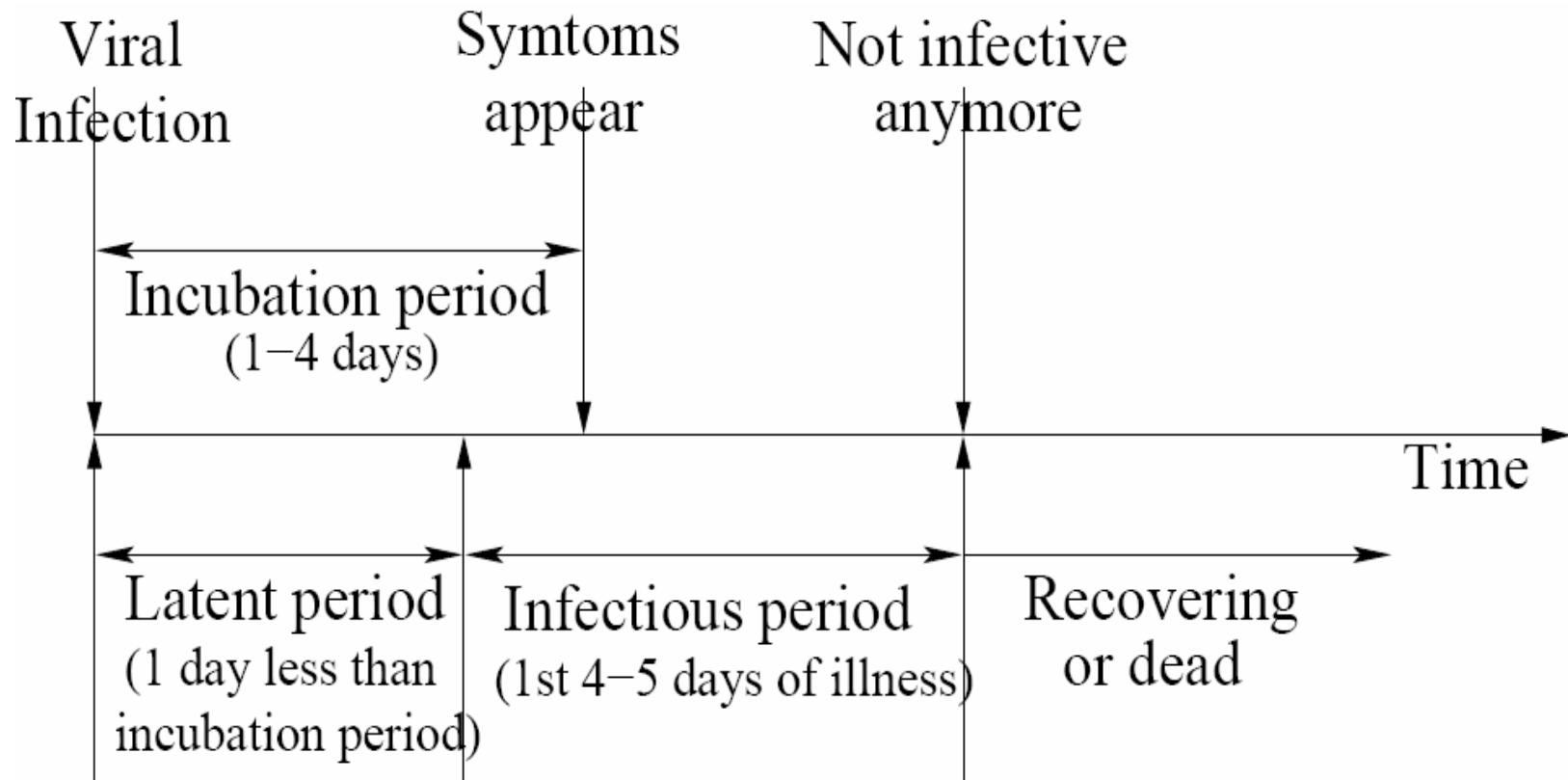
## Disease Prevalence

# Influenza

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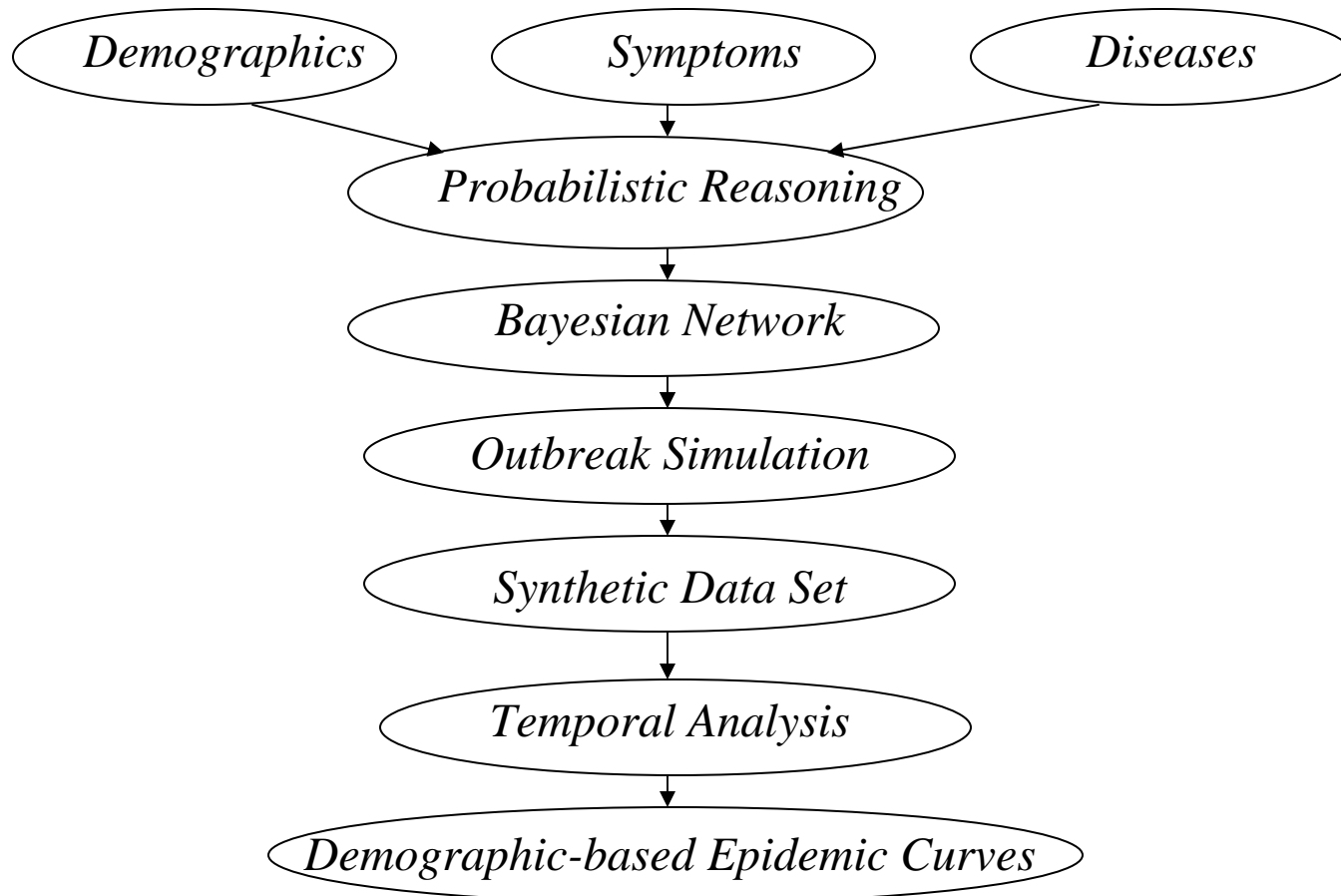
- Infectious disease
- Symptoms
  - Fever, respiratory symptoms, nasal discharges, cough, headache, sore throat
- Annual influenza epidemics
- Pandemics
  - 1977 – mild
  - 1968, 1990 – moderate
  - 1889, 1957 – severe
  - 1918 – etched in history !

# Influenza Infection Timeline

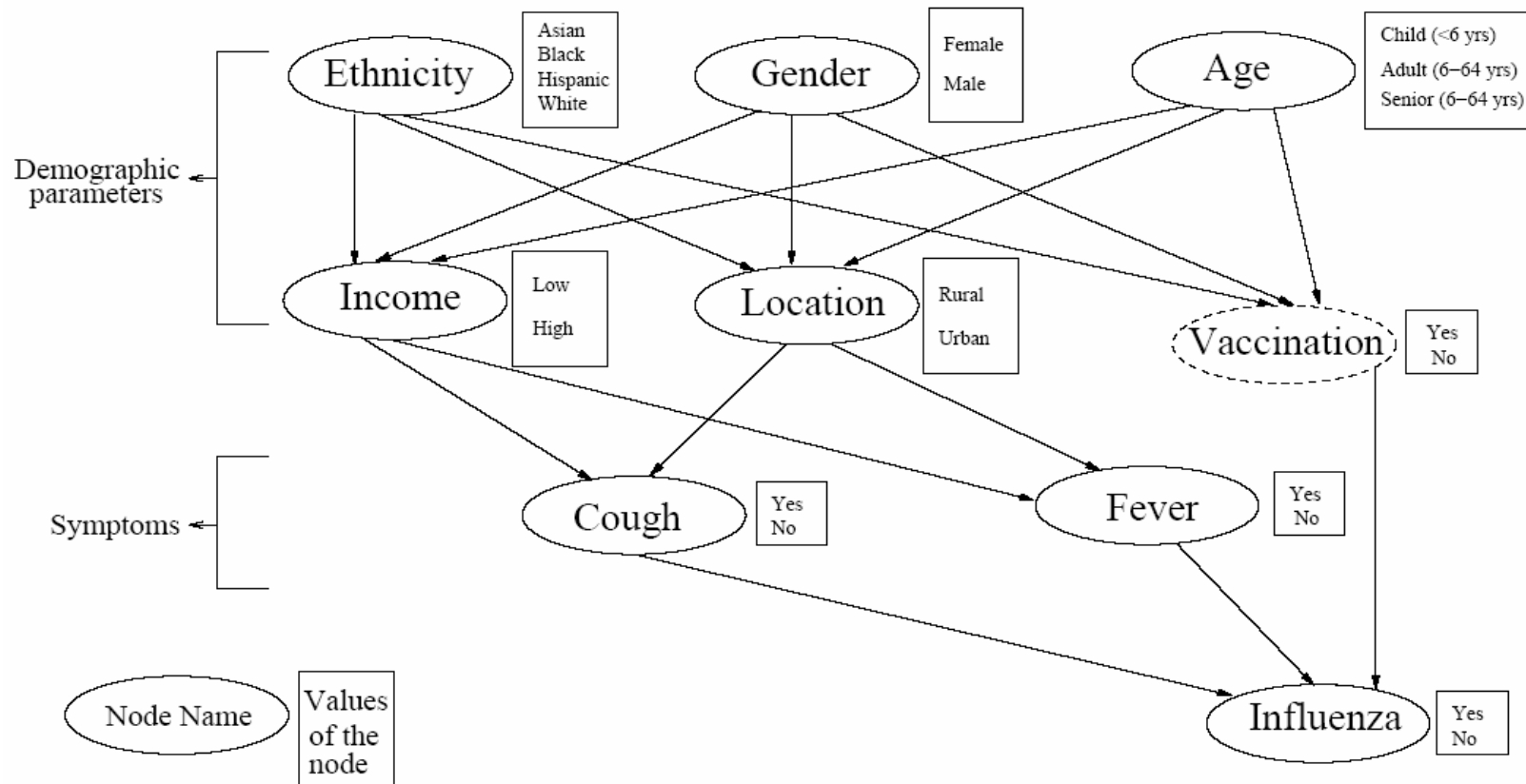


# Simulation Model

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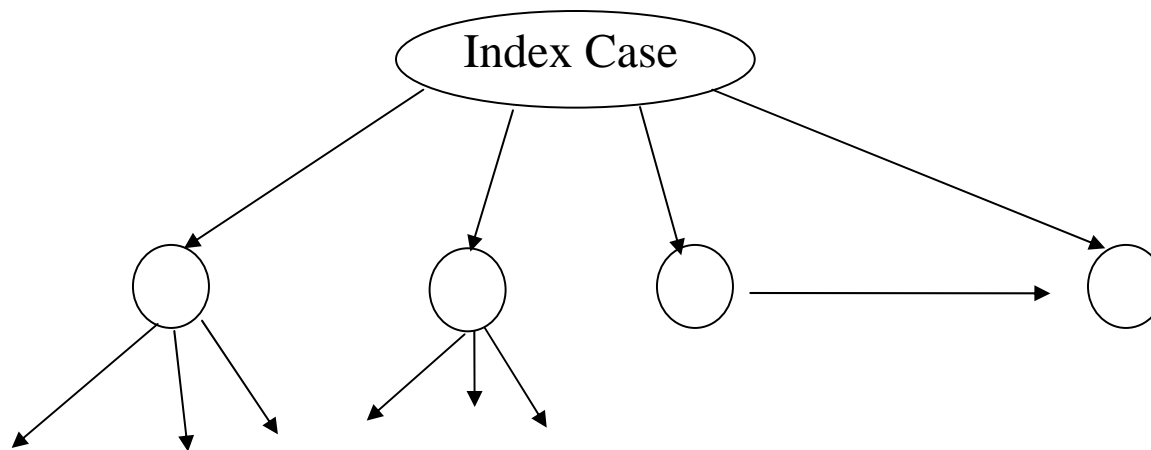
# Bayesian Network



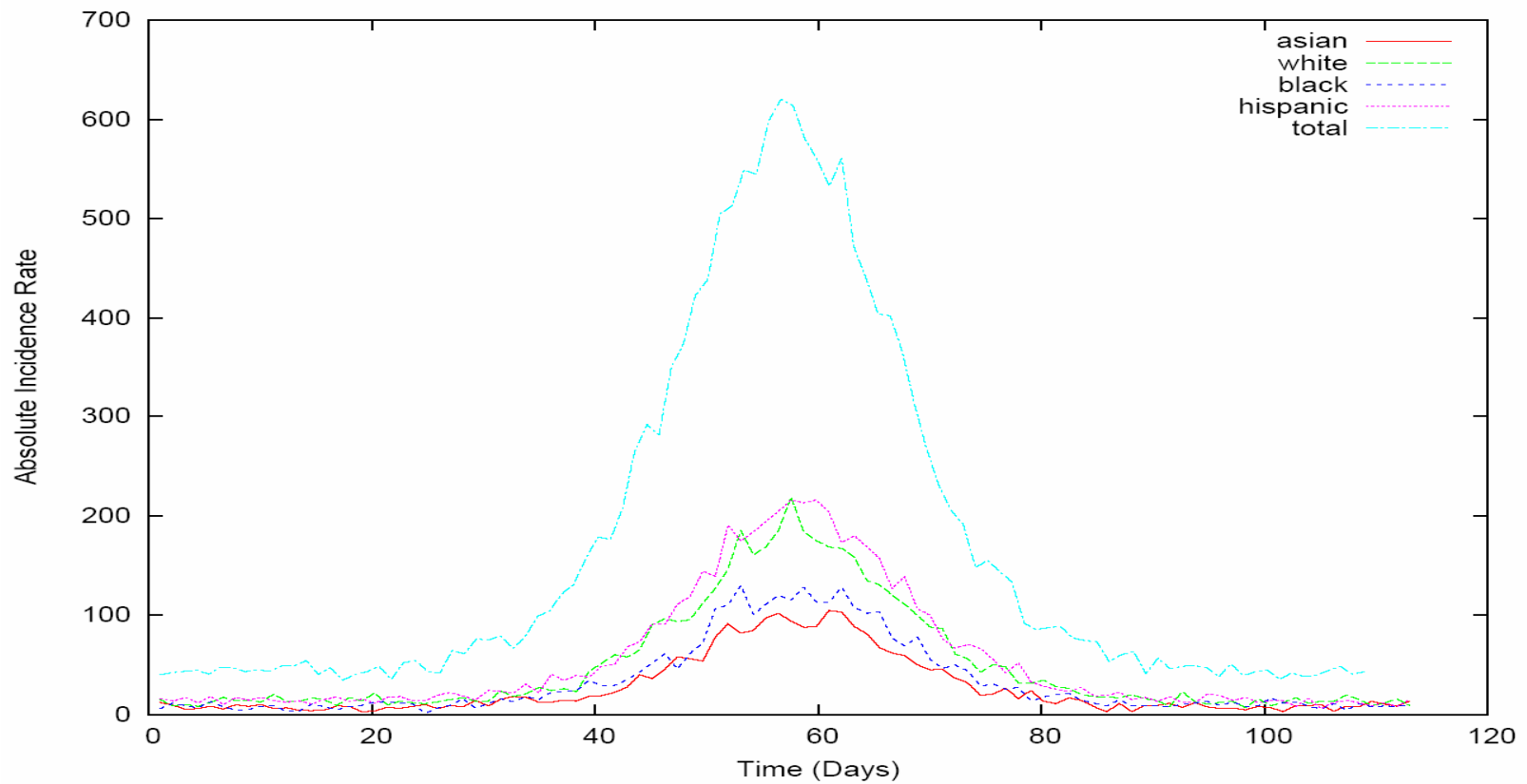
## Synthetic Data Set

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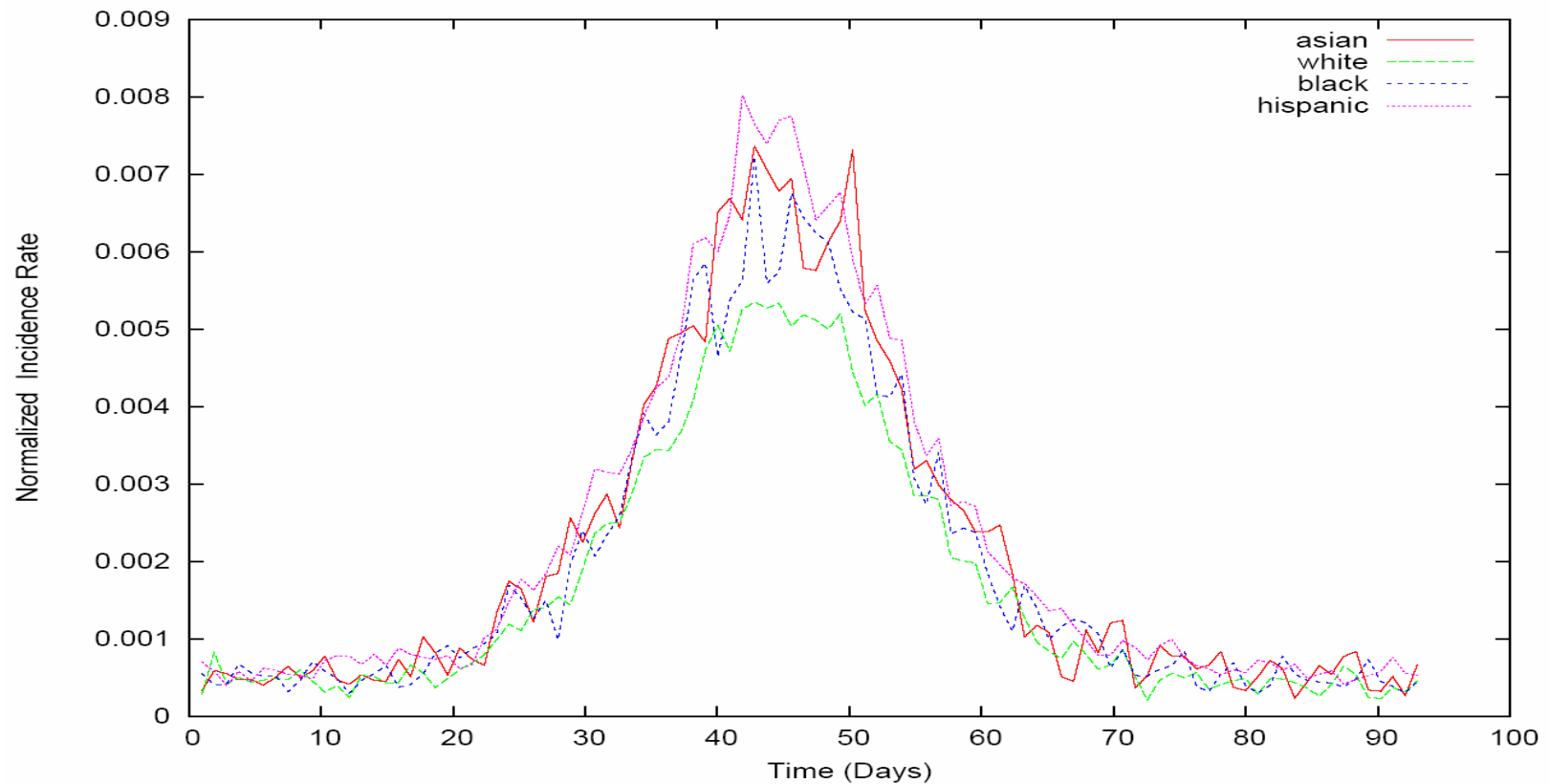
- Population Size: 100,000
- Influenza: Latent period:(0-3) days  
Infectious period: (0-4/5 days)
- Contact rate: 10



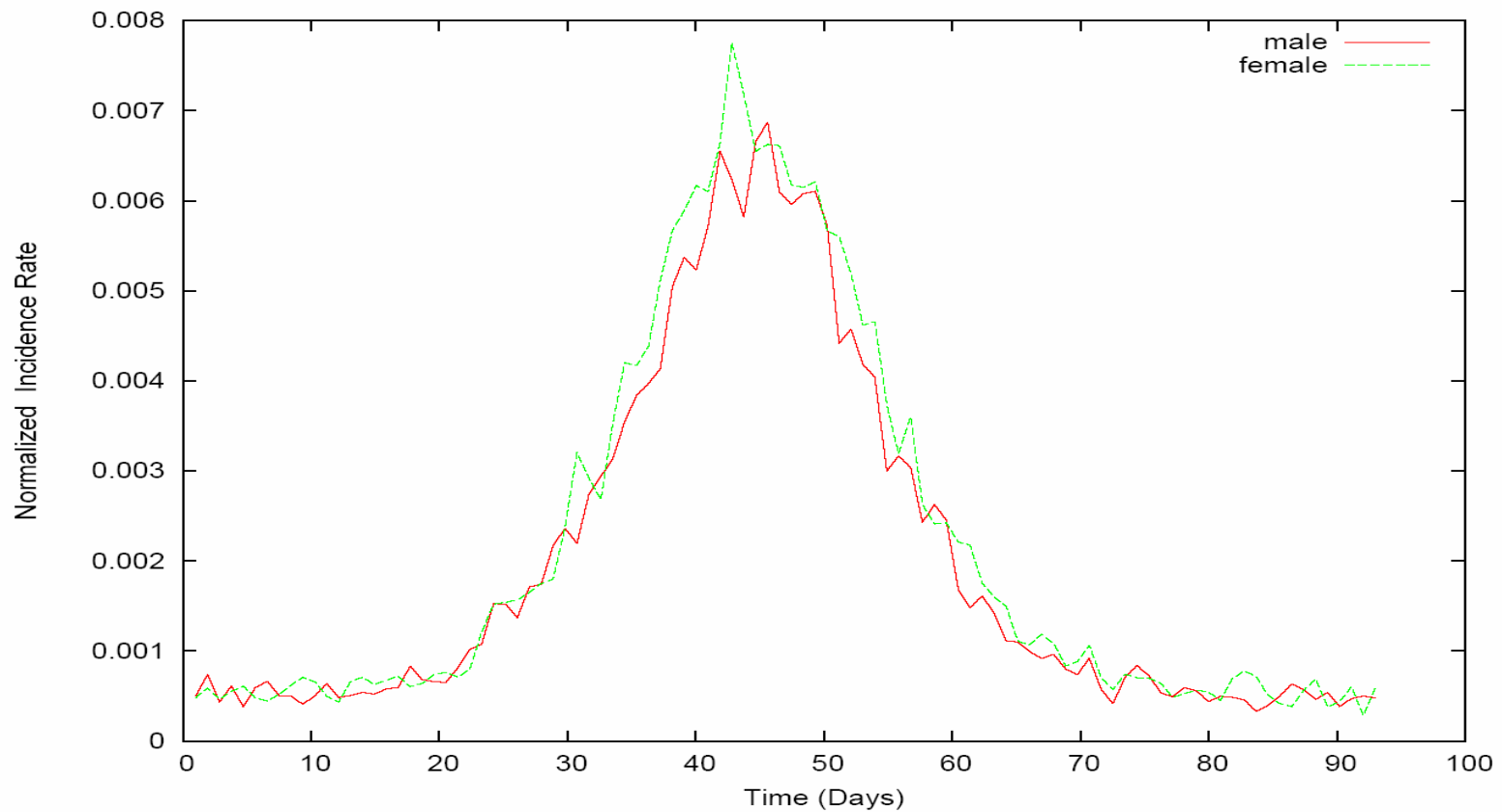
# Ethnicity-based Epidemic Curves



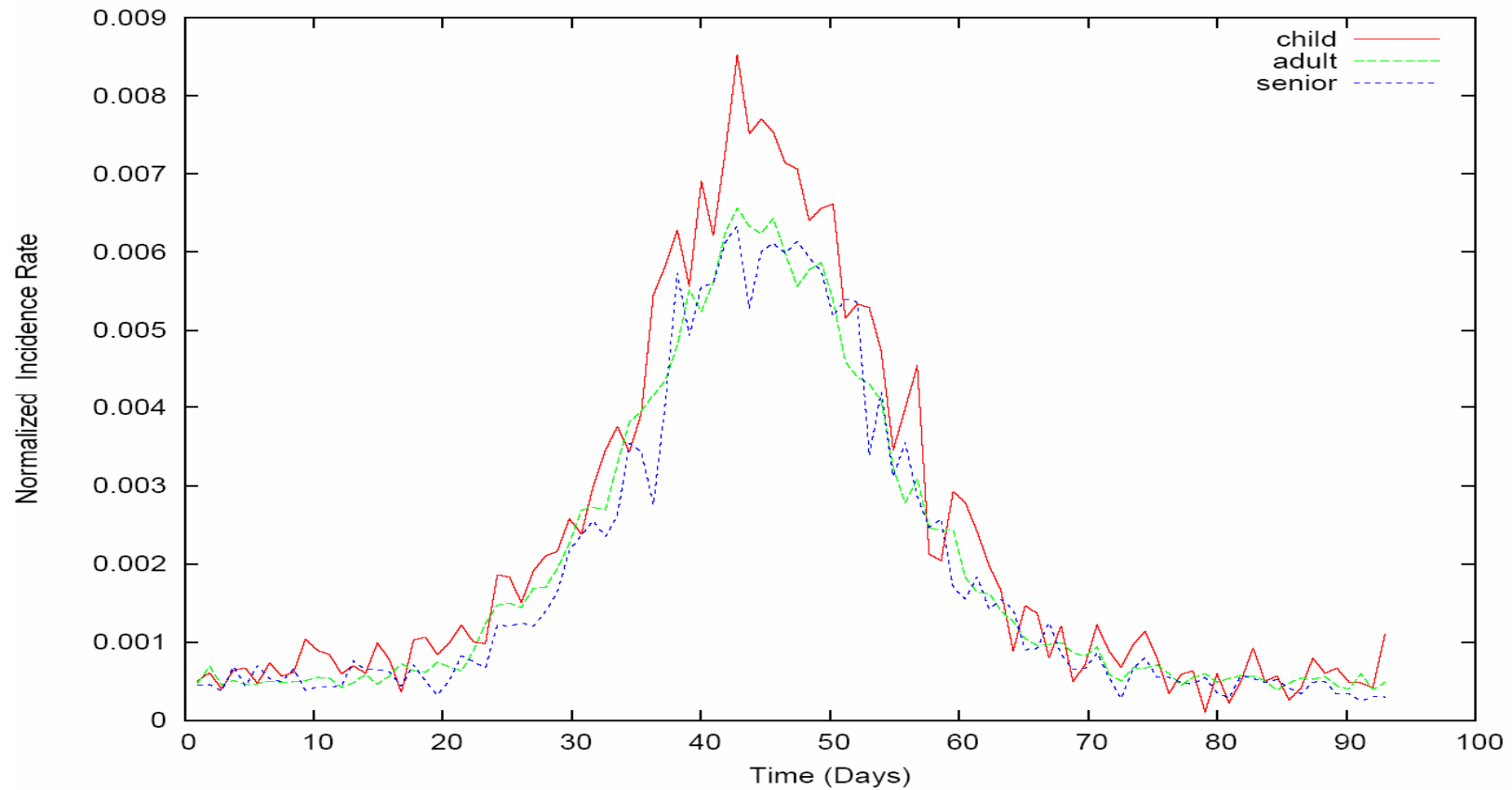
# Normalized Ethnicity Epidemic Curves



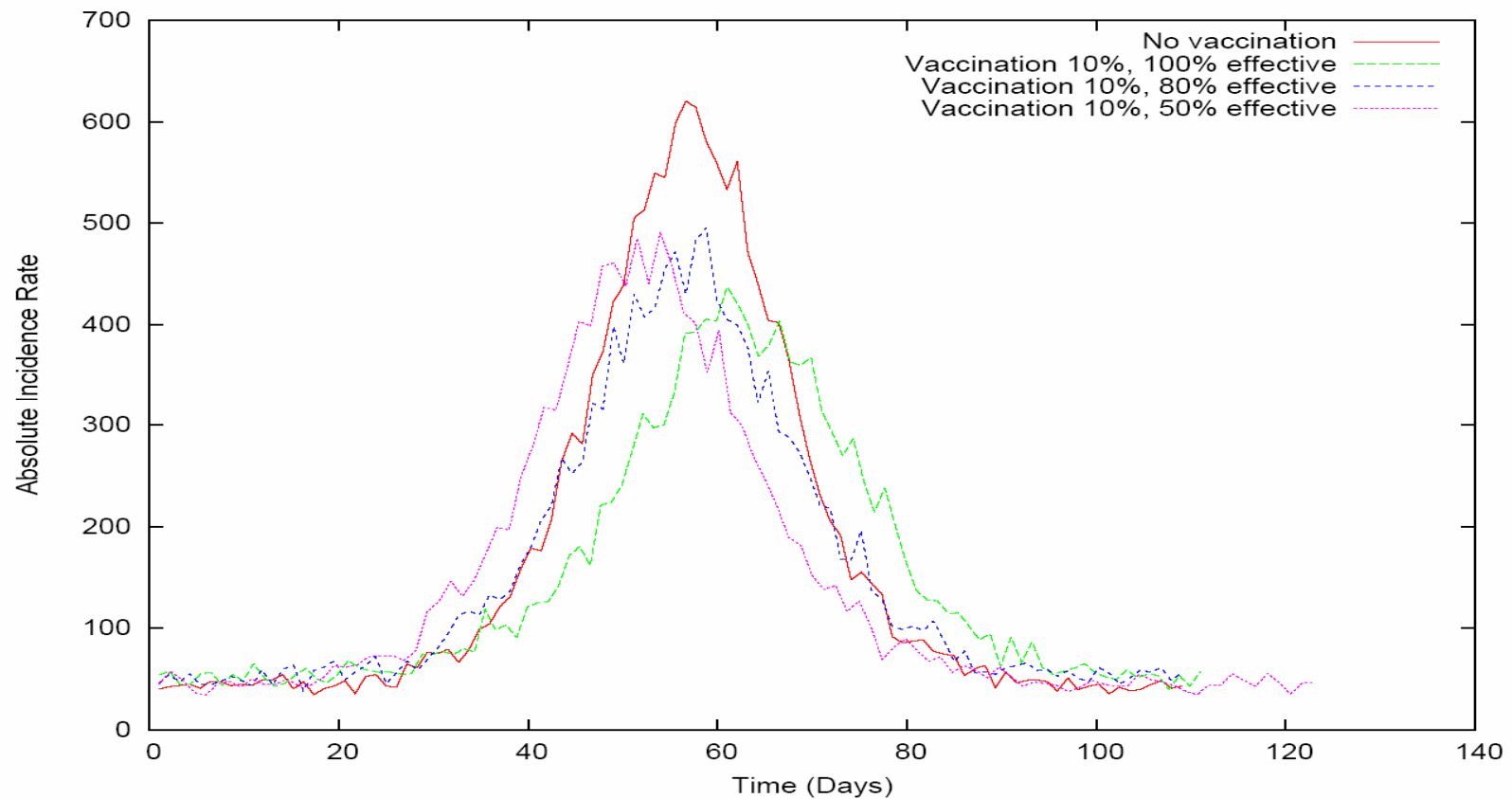
# Normalized Gender Epidemic Curves



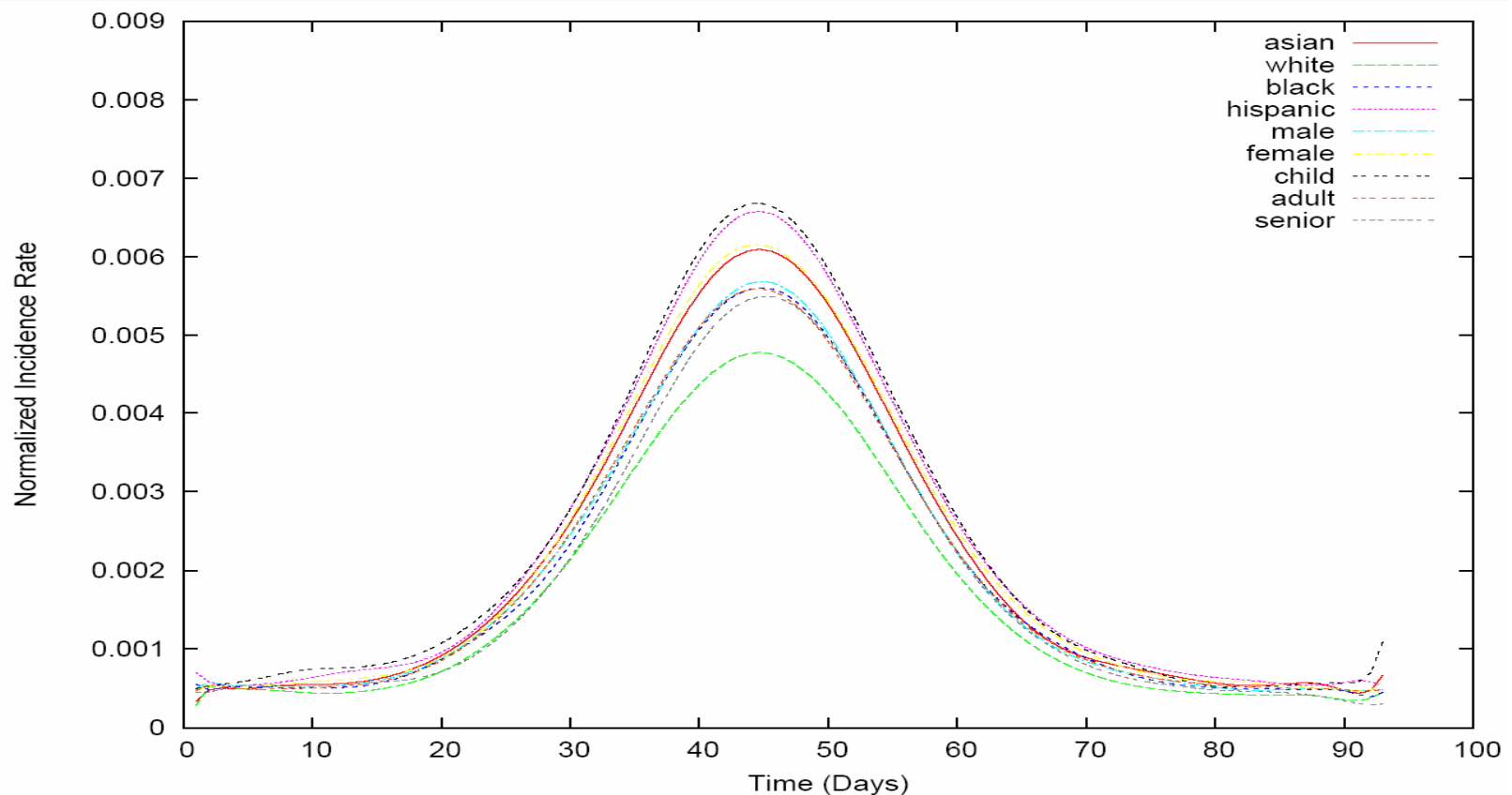
# Normalized Age Epidemic Curves



# Absolute Spread Vaccination Epidemic Curves (varied efficacy)

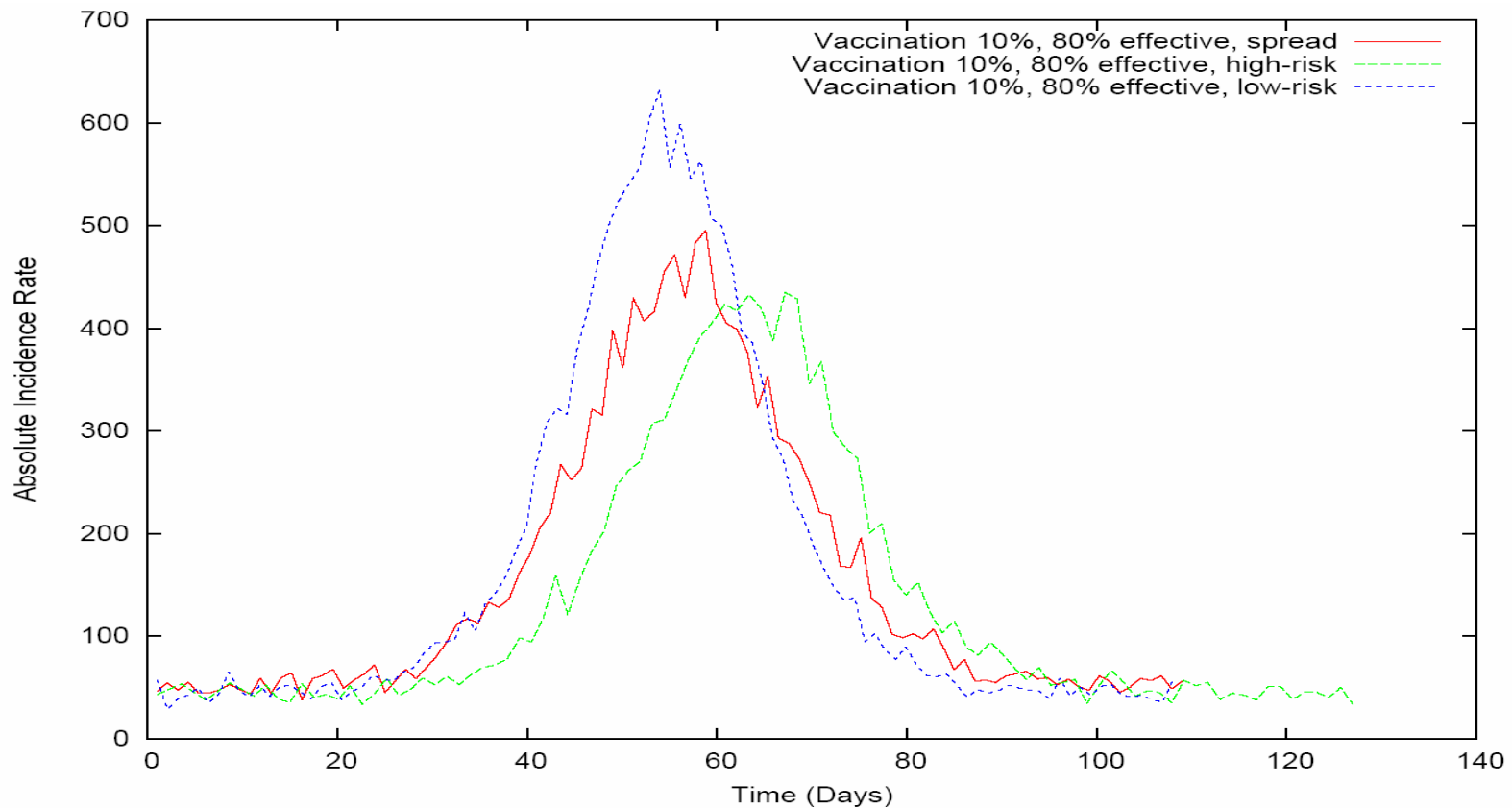


# Normalized (Bezier) Ethnicity, Gender, Age Epidemic Curves



Ordered list of demographic sub-groups  
{child, hispanic, asian, female, male, black, adult, senior, white}

# Absolute Vaccination (spread, high-risk, low-risk)



# Summary

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*Influenza Epidemics: 8 weeks*

*Bayesian Network*

*Synthetic Data Set*

*Temporal Analysis*

*Demographic Based Epidemic Curves*

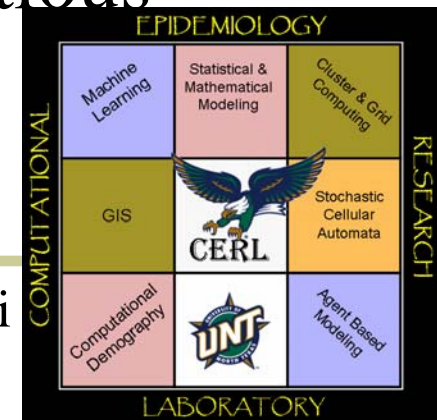
*Identify High-risk Groups*

*Vaccination & Primary Health Care Strategies*

*Curtail Epidemic at the earliest !*

# *Discussion, Questions & Comments*

## Temporal Analysis of Infectious Diseases: Influenza



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