Using GIS in the Response to an Infectious Disease Outbreak

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Background: Syphilis - A Quick Review

- Syphilis is a systemic disease caused by the spirochete, *Treponema pallidum*
- Disease manifests in stages
  - Primary
  - Secondary
  - Latent
  - Tertiary
Background: Transmission

- Primary mode of transmission is by sexual contact
  - Greatest infectivity during primary stage
  - Infection may also be passed during secondary and early latent stages
  - Transmission probability per partner is approximately 30%
- Next most common is transfer across the placenta from mother to fetus
- Penicillin effective for treatment
Syphilis Epidemiology
P & S Syphilis by Gender - United States, 1989 - 2008

Rate (per 100,000 population)

- Male Rate
- Female Rate
- Total Rate
- Male-to-Female Rate Ratio

Rate Ratio (log scale)

Source: CDC
Syphilis Epidemiology

Source: CDC
P & S Syphilis by Region - Michigan, 1986-2008

Source: MDCH
P&S Syphilis 2006-2009 By Month
Genesee County, MI
Challenges

• First time Genesee County has experienced a syphilis outbreak
  - No other areas of Michigan experiencing similar increases in syphilis

• Challenging disease
  - Complexity of disease
  - An estimated 20% of syphilis cases are never diagnosed or reported, i.e. no common source
  - Sensitive subject matter

• Hard to reach population
  - Syphilis outbreaks occur when a population has changes in behaviors
  - High risk behaviors
  - Access to care
Syphilis Outbreak Response

- Enhanced surveillance and outbreak planning
  - Michigan Department of Community Health
  - Cross-divisional teamwork
  - Use of data to drive decisions
- Rapid response
  - Increasing awareness among the health care community
  - Targeted testing of at risk populations
  - Public Information Campaign
- Increased community involvement
  - Working with community organizations and businesses to offer testing of at risk populations
  - Assisting with alerting those at risk of becoming infected with syphilis
Syphilis Outbreak Response

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Use of Surveillance Data to Guide Interventions & Assess Progress

- Aggregate epidemiological data
- Individual case information
- Geographical analysis
Epidemiological Data of 82 Cases

- Race: 72 (87.8%) African American, 10 (12.2%) White
- Gender: 47 (57.3%) Male, 35 (42.7%) Female
- Age
  - Average: 33.3 years
  - Range: 15-61 years
  - Males Average: 36.6 years
  - Females Average: 28.9 years
- Location: 67 (81.7%) Flint
- Provider:
  - 32 (39%) Emergency Departments
  - 24 (29.3%) Public (GCHD Adult Clinic)
  - 23 (28.0%) Private
  - 3 (3.7%) Jail
Risk Factors

• 46.3% admit to substance use
• 31.7% admit to anonymous partners
• Trading sex for drugs or money
• Multiple partners
• 7 (8.5%) MSM
• 4 HIV positive
Geographic Analysis of Syphilis Cases (n=82)
Geographic Analysis of Syphilis Cases
Targeting Areas of Highest Risk

- Targeted testing
  - Rates of Sexually Transmitted Diseases
  - Linked Cases
Outbreak Response: Health Care Community

- Hospitals
  - Genesee County Emergency Departments
  - Infection Control Practitioners
  - OB-GYN Departments
- Laboratories
- Community Heath Clinics
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Testing of At Risk Populations

- Jail
- Field testing
  - High risk populations such as commercial sex workers
  - Apartment complexes in high risk areas
  - Adult Entertainment
  - Bars/Nightclubs
- Community Organizations and Events
  - Churches
  - Health Fairs
Targeting Areas of Highest Risk

- Education and outreach
  - Employment
  - Poverty Status
  - Education
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Public Information Campaign

- Press releases
- Newsletters
- Flyers
- Billboard campaign
- Radio Campaign
Targeting Areas of Highest Risk

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Flyers

- Individualized flyers, posters, and bulletins for community partners
  - Community Mental Health
  - Churches
  - Community Organizations
  - Bars and Nightclubs
  - Schools/Universities

- GCHD Adult/Teen Clinic Information handouts
Billboard and Bus Campaign

- October ’08 - February ’09
- Various City of Flint locations
Targeting Areas of Highest Risk

- Billboard Campaign
Conclusions

• In 2009 cases decreases >75%
• Use of GIS was critical in management of this outbreak
  - Targeted interventions such as testing
  - Targeted education
• Limitations
  - No spatial analysis
  - Temporal analysis
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Thank You!