OVERVIEW OF EPIDEMIOLOGY & DISASTER EPIDEMIOLOGY 101

GREATER NASHUA PUBLIC HEALTH
Define what epidemiology is and the core epidemiological functions.

Define disaster epidemiology and the role it plays in pre-disaster, during a disaster, and in the recovery phase.

Demonstrate examples of how disaster epidemiology methods have been applied in recent disasters, such as Hurricane Sandy.

Explain disaster epidemiology tools.
WHAT IS EPIDEMIOLOGY?

Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

Principles of Epidemiology in Public Health Practice, 3rd Edition
## SUB-SPECIALTIES

- Infectious Diseases
- Chronic Diseases
- Injury
- Nutritional
- Occupational
- Environmental
- Behavioral
- Forensic
- Health care
- Disaster
- Public Policy
- Genomics
HISTORY OF EPIDEMIOLOGY

- 400 BC: Hippocrates tries to explain disease occurrence
- 1662: John Graunt (London) published a paper on mortality data; saw disparities in infant mortality
- 1854: John Snow (aka. Father of Epidemiology) studied cholera outbreaks
  - Discovered the cause of disease and how to prevent the spread of disease
JOHN SNOW AND THE PUMP HANDLE

- Cholera outbreak, 1854
- London, England
- Increase # of cases on Aug 31
- 79 deaths on Sept 1st and 2nd
EPIDEMIC CURVE FOR CHOLERA OUTBREAK

http://sph.bu.edu/otlt/MPH-Modules/PH/PublicHealthHistory/PublicHealthHistory4.html
Figure 1.1 Spot map of deaths from cholera in Golden Square area, London, 1854 (redrawn from original)

"There is a Brewery in Broad Street, near to the pump, and on perceiving that no brewery men were registered as having died of cholera, I called on Mr. Huggins, the proprietor. He informed me that there were above seventy workmen employed in the brewery, and that none of them had suffered from cholera...The men are allowed a certain quantity of malt liquor, and Mr. Huggins believe they do not drink water at all...". – John Snow
69 out of 79 deaths lived closer to the Broad Street pump than any other pump.

Workhouse on Poland Street only had 5 cholera deaths; the inmates did not use the Broad Street pump.

Brought his evidence to the Board of Guardians and the pump handle was removed – the cases stopped.
CORE EPIDEMIOLOGICAL FUNCTIONS

- Public Health Surveillance
- Field Investigation
- Analytical Studies
- Evaluation
- Linkages
- Policy Development
KEY ELEMENTS IN EPIDEMIOLOGY

- **Frequency**
  - Number of health events and the relationship of that number to the size of the population.

- **Pattern**
  - Occurrence of health-related events by time, place, person (Descriptive Epidemiology).

- **Determinants**
  - Any factor that brings about a change in a health condition or other characteristic
  - Provide the why and how of events (Analytical Epidemiology)
Explains What, Who, When, Where
Helps identify populations at higher risk for the health problem
Provides information for the allocation of resources
Provides a method for characterizing a problem
DESCRIPTIVE EPIDEMIOLOGY

- **Person**
  - May be characterized by age, race, sex, education, occupation, or other personal characteristics

- **Place**
  - May include information on home, workplace, school, circumstances of exposure

- **Time**
  - May look at time of illness onset, when exposure to risk factors occurred, duration of illnesses
DISASTERS IN NH
HAZARDS

- Floods
- Blizzards, Ice storms
- Tornadoes
- Radiological (near power plants)
- Man-made incidents
- Bioterrorism
- Pandemics
All emergencies are local emergencies

Every town in NH has an emergency management director

Towns have a Local Emergency Operations Plan and can open a Local Emergency Operations Center during an emergency

Organizations, especially those with a fragile population, should have an emergency response plan and a continuity of operations plan
NH Resource Support for All Other Emergencies

Federal

FEMA Region 1 ROC

Federal ESF’s

State

State EOC

ESF’s

No Regional EOC/MACE

234 Local EOC’s

Requests For:
1. Information
2. Goods
3. Services
4. Problem Solving
5. Comm/Control
New Hampshire Regional Public Health Networks July 1, 2013

<table>
<thead>
<tr>
<th>Region</th>
<th>2010 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Country</td>
<td>52,899</td>
</tr>
<tr>
<td>Upper Valley</td>
<td>44,020</td>
</tr>
<tr>
<td>Central NH</td>
<td>30,603</td>
</tr>
<tr>
<td>Carroll County</td>
<td>47,818</td>
</tr>
<tr>
<td>Greater Sullivan</td>
<td>46,934</td>
</tr>
<tr>
<td>Winnipesaukee</td>
<td>75,647</td>
</tr>
<tr>
<td>Greater Monadnock</td>
<td>101,401</td>
</tr>
<tr>
<td>Capital Area</td>
<td>130,067</td>
</tr>
<tr>
<td>Strafford County</td>
<td>123,143</td>
</tr>
<tr>
<td>Greater Manchester</td>
<td>180,333</td>
</tr>
<tr>
<td>Greater Nashua</td>
<td>205,765</td>
</tr>
<tr>
<td>Greater Derry</td>
<td>137,630</td>
</tr>
<tr>
<td>Seacoast</td>
<td>140,210</td>
</tr>
</tbody>
</table>

These regions are used for public health planning and the delivery of select public health services.
NH Emergency Management Framework for a Large-Scale *Public Health Emergency*

Federal
- Centers for Disease Control
- FEMA Region 1 Federal ESF-8
- FEMA Region 1 ROC

State
- DHHS ICC
- STATE EOC ESF-8

Regional
- Multi-Agency Coord Entity (MACE)

Local
- POD
- Hospital
- Neighborhood Emergency Help Center
- ACS
- LEOC

Approved by DHHS & DOS 1/27/11
PUBLIC HEALTH EMERGENCY PREPAREDNESS RESPONSE PLANS

- Public Information and Warning
- Isolation and Quarantine
- Multi-Agency Coordinating Entity
- Medical Surge
- Mass Fatality
- Volunteer Management
- Points of Dispensing (PODs)
DISASTER EPIDEMIOLOGY
The application of epidemiology in disasters.
The application of DE provides **reliable and actionable information** to incident commanders, planners, and **decision-makers** to make decisions and allocate resources.

- **Origin in 1980s; term “Disaster Epidemiology” (DE) became common in 2010**
- **DE has become a core capability under “Emergency Services Function – 8 public health planning and response”**
Public Health Emergency Preparedness Capabilities and DE:

- Capability 1: Community Preparedness
- Capability 2: Community Recovery
- Capability 5: Fatality Management
- Capability 7: Mass Care
- Capability 10: Medical Surge
- Capability 13: PH Surveillance and Epidemiological Investigations
- Capability 14: Responder Safety and Health
DE executed in large scale emergencies encompasses:

- Rapid needs assessment, Surveillance, Tracking, Research and Evaluation, and Registries

- Goal is prevention
INTEGRATING THE ACROSS DISCIPLINES AND AGENCIES

- Public Health
  - Federal, State, County, Local, Tribal
- Hospitals
- Academic Partners
- Industrial hygiene and safety professionals
- Emergency managers
- Responders
- Regulators
- Business community
Provides a framework for how epidemiology can be integrated into the disaster management cycle
Disaster Epidemiology Activities

The Disaster-Management Cycle

Humanitarian Action ◄▬▬► Sustainable development

Tracking Registries
- Surveillance
  - Affected communities
  - Responders
- Rapid needs assessments

Rehabilitation
- Recovery
- Response

Epidemiologic studies
- Prevention/Mitigation
- Preparedness

Evaluation studies
- Relief programs
- Other interventions

Studies to compare efficacy of control strategies and interventions

Disaster Impact

Surveillance
- Relief programs
- Other interventions
Depicts how disaster epidemiology can assist health departments with achieving the 15 capabilities

Provides recommendations for the Council of State and Territorial Epidemiologists, health departments and the CDC
Rapid Needs Assessment

- Community Assessment for Public Health Emergency Response (CASPER) – tool developed by CDC
- Two-staged cluster sampling
- Door-to-door survey with 7 interview teams in 30 clusters for 210 surveys

http://www.cdc.gov/nceh/hsb/disaster/casper.htm
Assess potential mental health issues

2 CASPERs performed – 1 in 2010 following the incident and a second in 2011

In 2011, 8%-15% of individuals reported depressive symptoms compared to 15%-24% of individuals in 2010

Respondents with decreased income as a results of the spill were more likely to report mental health symptoms

http://www.adph.org/CEP/assets/CASPER_report.pdf
SURVEILLANCE OF HEALTH-RELATED OUTCOMES

- Describes the health burden of an affected community
  - Quantifying mortality and morbidity in affected communities and first responders and residents
- Characterize pressures on health care service system
A health monitoring and surveillance framework for protecting responders through all phases of a response

http://www.cdc.gov/niosh/topics/erhms/
COMPONENTS OF ERHMS

- **Pre—deployment**
  - Assessment for fitness and ability to safely deploy
  - Train for anticipated hazards and protective measures

- **Deployment**
  - Approaches for centralized tracking and rostering
  - Surveillance and monitoring for exposures and health effects

- **Post-deployment**
  - Out-processing assessments
  - Follow-up or long-term surveillance for delayed adverse effects
REGISTRIES

- Track affected people for medium to long-term health consequences
- Informs needs for continuing medical/behavioral care or establishing public health measures
- Follow exposed population for conditions that may have delayed symptom onsets
- Provides a basis for health education and disease prevention
Voluntary enrollment of individuals that worked, went to school or responded to the event

Results will help determine to what extent physical and mental health conditions have persisted

Example: Of 30,000 enrollees, in 2014, 15% had PTSD 10 years after 9/11

May be applied at different phases of disaster management cycle to assess response actions or interventions.

Often provides information about efficient, efficacious, and cost-effective actions during response and recovery.

Example: Generators
Think about how your organization will collect data and information about your staff and employees:
  ▪ Health and well-being
  ▪ Injuries

Volunteer if a CASPER is needed in our region

Utilize some of the concepts and components of ERHMS

Keep up to date on evaluation studies that could impact your target audience or organization
RESOURCES

- Epidemiology in the Classroom
  http://www.cdc.gov/excite/classroom/index.htm

- North Carolina Center for Public Health Preparedness, UNC
  http://cphp.sph.unc.edu/training/index.php

  http://www.cdc.gov/osels/scientific_edu/SS1978/

- CDC Epidemiologic Case Studies
  http://www.cdc.gov/epicasestudies/index.html

- Epidemic Intelligence Service Case Studies
  http://www.cdc.gov/eis/casestudies/casestudy-list.htm
RESOURCES

- Council of State and Territorial Epidemiologists Disaster Epidemiology Website
  http://www.cste.org/group/DisasterEpi

- Public Health Assessment After a Disaster
  http://emergency.cdc.gov/disasters/surveillance/

- IS-930: Emergency Responder Health Monitoring and Surveillance (ERHMS) System: Leadership Training (1 hr. CEU)

- WB2254: Emergency Responder Health Monitoring and Surveillance (ERHMS): (3.0 hr. CEU)
  http://cdc.train.org/DesktopModules/eLearning/CourseDetails/CourseDetailsForm.aspx?courseId=1045755
Ashley Conley, MS, CPH
Epidemiologist

City of Nashua, Division of Public Health & Community Services

Office: 603-589-4552
colleya@nashuanh.gov
An invisible sneeze droplet can contain 200 million germs!

Our hand sanitizer kills 99.99% of germs!

20,000,000 x 0.01% =

Ew.