Introduction to Communicable Disease Surveillance and Investigation in North Carolina
Practice of Communicable Disease Surveillance in North Carolina

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Learning Objectives

1. Describe the network of surveillance partnerships for communicable disease in North Carolina

2. Interpret reported data as an indicator of disease incidence within the community

3. List 4 public health uses of surveillance data
Public Health Partners in N.C.

- 85 Local Health Departments
- Clinicians and laboratories
- 9 Hospital-based Public Health Epidemiologists
- 8 Regional Immunization Consultants
- Regional Disease Intervention Specialists
- 4 Preparedness and Response Field Offices
Other Partners

Centers for Disease Control and Prevention

Within state government:

• In the Epidemiology Section: Occupational and Environmental Epidemiology Branch, and Office of Preparedness and Response
• State Laboratory of Public Health
• Office of the Chief Medical Examiner
North Carolina Electronic Disease Surveillance System, NC EDSS

Diagram showing connections between CDC (National), LHD (Local), NC EDSS, CD (State), PHRST (Region), Laboratories, and MDs.
Influenza Surveillance

- Hospitalization
- Outpatient
- Not medically attended
- Subclinical
“Traditional” Surveillance Lacks Sensitivity and Provides Delayed Information

Completeness of case identification, reporting, and investigation of shigellosis

- % of Patients
  - Infected: 100%
  - Symptomatic: 76%
  - Consulted Physician: 28%
  - Culture Obtained: 9%
  - Culture Positive: 7%
  - Report to Local Health Department: 6%
  - Report to CDC: 5%
  - Patient Contacted: 5%
  - Negative Follow-up Cultures Obtained: 2%

Cumulative Days Elapsed from Onset of Symptoms: 7, 10, 11, 29, 39
Uses of Surveillance Data

- Count Cases and Measure Trends
- Identify Risk Factors
- Verify Efficacy of Control Measures
- Allocate Resources
Influenza-Like Illness Surveillance in North Carolina, 2009-2010

Week Ending Date

% of visits due toILI

start of 09-10 season

ED (NC DETECT)  Sentinel Provider Network (ILINet)
Analysis

• Changes in reported number of cases or incidence rate
  - Unexpected vs. expected or caused by artifacts
  - Trend

• Analyze in epidemiologic terms:
  - Time
  - Place
  - Persons
Interpretation

Taking into account:
- Population changes
- Changes in reporting procedure
- Changes in personnel
- Scientific progress: diagnostic techniques, control measures
- Changes in disease patterns
Outbreak Patterns

FIG. 3. Reported isolations of salmonellae from humans in the United States, 1968–1987. (Courtesy of Centers for Disease Control, Enteric Diseases Branch, Division of Bacterial Diseases, Atlanta, GA).
More Cases Observed Than Expected

FIGURE 1. Expected and observed number of tuberculosis cases — United States, 1980–1992
U.S. TB Resurgence
1986 - 1992

Reported TB Cases
United States, 1982–2012*

20% increase
Monitoring effect of intervention

Cases of *H. influenza* invasive disease reported in NC, 1987 - 1999
Hepatitis B, acute
Reported cases, North Carolina, 1991-2005
Hepatitis B, acute – North Carolina
1991-2005 - Incidence rate by Age Group

- 91% decline
- 75% decline
- NC - Infant vaccination (7/1/1994)
- 6th Graders
- 91% decline

Incidence Rate per 100,000

0-19 years old

20+ years old
HEPATITIS A, NC
1952-1995

CASES

YEAR

SOURCE: COMMUNICABLE DISEASE
CONTROL SECTION, NCDEHNR
Hepatitis A – N.C., 1987-2005
(N=3,958)
Hepatitis A – N.C., 1987-2005
(N=3,958)
Hepatitis A - by gender and age group

- Hepatitis A transmission:
  - Foodborne
  - Person-to-person
- Gender distribution: Male > Female (60%-40%)
- Age/Gender distribution: Young Males, 20-39 years old
- MSM high risk for hepatitis A in these years

NC, 1987-2003; N=3,767 (2,243 M, 1,524 F)
Salmonella enteritidis

Salmonella enteritidis
JUNE–AUGUST 2001 Collection dates
Source: NC–SLPH
(N = 103)
North Carolina
Confirmed and Probable LaCrosse Encephalitis Cases
1998 - 2011

N = 212
Rocky Mountain Spotted Fever Reported Cases, NC, 2003-2007
by Month of Onset (N = 2931)
Reported Cases N.C., 1988-1994 by age group
Acute Hepatitis B

HEPATITIS B ACUTE
REPORTED CASES, NC, 1988-1994
BY AGE GROUP

CASES

AGEGRP

00-04 05-14 15-19 20-34 35-64 >65 UNKN

3170
2853
2536
2219
1902
1585
1268
951
634
317
0

- A Vaccine Preventable Disease
- A Childhood Disease
- Background Rate: ~ 0
- 1989 Outbreak:
  - Atypical age:
    - 19% aged < 10 y.o.
    - 76% aged 10-24 y.o.
- Use: Policy Changes

N=318 Reported Cases - NC 1987-2003
Measles in N.C., 2013

Number of Measles Cases by Date of Rash Onset (n=23)

- Males: 14 (61%)
- Females: 9 (39%)
- Median age: 14 yrs
- Range: 1 yr - 59 yrs

4/14: Public Health Notified

3/26: Source Case Returns From India
4/13: Community Festival
4/23: Pediatric Practice Exposure

Stokes County Cases (13)
Orange County Cases (8)
Out of State Case (1)
Forsyth County Case (1)
Pertussis Reported Cases
N.C. 2006-2012

2006: 332
2007: 330
2008: 94
2009: 220
2010: 343
2011: 198
2012: 566
Surveillance: Recent Trend

• Electronic reporting
• Reporting of events providing earlier warning
• Healthcare-Associated Infection
Syndromic/Electronic Surveillance

Traditional vs. Indicator Surveillance in Outbreak Detection

**Syndromic Surveillance**

- Probability of Disease Detection
- Incubation Period (Hours)
- Time (days)
- Number Dead
- Sensor, Animal, or Human Indicators

**Traditional Disease Detection**

- Gain of 2 days
- Effective Treatment Period
- Military & Civilian Fatalities With Traditional Alerting
- Fatalities With Early Warning

Source: Johns Hopkins University / DoD Global Emerging Infections System
NC DETECT: real-time surveillance during an event of public health significance

ED
98% of NC hospitals
~ 4.5 million visits / year

CPC
120,000+ calls / year

Pilot data
- Veterinary lab
- Urgent care
- School Absentee

ILINet
(Aggregate ILI data)

EMS (PreMIS)
~ 800,000+ total encounters / year

Distribute
(ED ILI data)

BioSense / CDC
(ED Data only)

NC DETECT
ETL, data repository, analytic components, Web portal
Emergency Departments Reporting to NC DETECT
by General Bed Capacity
As of August 13th, 2013, 122 EDs reporting
Hospital EDs Contributing to BioSense (Non-DoD facilities)
BioSense 2 reporting hospitals (Non-DoD facilities), Feb. 2014
NC Public Health Information Network (NC PHIN)

Early Detection: Suspected Cases

EMS
Vet Lab
Hospital Emergency Departments (EDs)

Wildlife
Poison Center

Health Alert Network

Alerting & Paging
Confirmed Cases
NC EDSS

Immunization Registry
Lab Results

Physician Reported Cases

“Traditional surveillance”