INTRODUCTION TO PUBLIC HEALTH

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Disclosure
Select either a or b and make applicable according to your completed Disclosure form.

DR Anil T. Mangla., MS., PhD., MPH., FRSPH has no relationships with commercial companies to disclose.

Learning Objectives
At the end of this presentation the participant will be able to:
1. List the tenants of Epidemiology
2. Compare the difference between Public Health and Clinical Health
3. Develop analytical skills to interpret data
   (e.g., discuss, define, list, characterize, relate, compare, distinguish, demonstrate, diagnose, treat, manage, develop, educate, improve, refer, etc., etc.)
Course Topics

Introduction to Epidemiology
1. A Public Health Approach
2. What Is Epidemiology?
3. Key Concepts and Terms
4. Calculating Rates
5. Approach and Methodology
6. Data Sources and Study Design
7. Investigating an Outbreak

Learning Objectives

After this course, you will be able to
- define epidemiology
- describe basic terminology and concepts of epidemiology
- identify types of data sources
- identify basic methods of data collection and interpretation
- describe a public health problem in terms of time, place, and person
- identify the key components of a descriptive epidemiology outbreak investigation

A Public Health Approach

Surveillance Risk Factor Identification Intervention Evaluation Implementation
What is the problem? What is the cause? What works? How do you do it?

Problem Response

Public Health Core Sciences

Epidemiology — Defined

Study of the distribution and determinants of health-related states among specified populations and the application of that study to the control of health problems

Epidemiology Purposes in Public Health Practice

- Discover the agent, host, and environmental factors that affect health
- Determine the relative importance of causes of illness, disability, and death
- Identify those segments of the population that have the greatest risk from specific causes of ill health
- Evaluate the effectiveness of health programs and services in improving population health

Solving Health Problems

1. Data collection
2. Assessment
3. Hypothesis testing
4. Action

Knowledge Check

All of the following illustrate the purpose of epidemiology in public health, except

A. identifying populations who are at risk for certain diseases.
B. assessing the effectiveness of interventions.
C. providing treatment for patients in clinical settings. ✔️
D. determining the importance of causes of illness
Epidemiologists use a model for studying infectious disease and its spread that involves the microbe that causes the disease, the organism that harbors the disease, and the external factors that cause or allow disease transmission. This is also known as:

A. host, vector, and transmission.
B. transmission, host, and environment.
C. host, agent, and environment.  
D. organism, transmission, and environment.

**Knowledge Check**

**Epidemiology Key Terms**

- **Epidemic or outbreak**: disease occurrence among a population that is in excess of what is expected in a given time and place.
- **Cluster**: group of cases in a specific time and place that might be more than expected.
- **Endemic**: disease or condition present among a population at all times.
- **Pandemic**: a disease or condition that spreads across regions.
- **Rate**: number of cases occurring during a specific period; always dependent on the size of the population during that period.
Rates help us compare health problems among different populations that include two or more groups who differ by a selected characteristic.

To calculate a rate, we first need to determine the frequency of disease, which includes:

- the number of cases of the illness or condition
- the size of the population at risk
- the period during which we are calculating the rate

Rate formula:
\[ \text{Rate} = \frac{\text{number of cases}}{\text{population at risk}} \times 100 \]

Epidemiology Study Types:
- Experimental
- Descriptive
- Observational
- Analytic
Descriptive and Analytic Epidemiology

<table>
<thead>
<tr>
<th>Descriptive epidemiology</th>
<th>Analytic epidemiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>When was the population affected?</td>
<td>How was the population affected?</td>
</tr>
<tr>
<td>Where was the population affected?</td>
<td>Why was the population affected?</td>
</tr>
<tr>
<td>Who was affected?</td>
<td></td>
</tr>
</tbody>
</table>

Fatalities Associated with Farm Tractors

In 1982, the number of farm tractor-associated deaths was described in terms of time, place, and person by using records from an existing surveillance system.


Pediatric Grand Rounds
Fatalities Associated with Farm Tractors

Epidemiology Data Sources and Study Design

<table>
<thead>
<tr>
<th>Source</th>
<th>Method</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual persons</td>
<td>Questionnaire, Survey</td>
<td>Foodborne illness outbreak, CDC’s National Health and Nutrition Examination Survey, Health data on U.S. residents</td>
</tr>
<tr>
<td>Environment</td>
<td>Samples from the environment (river water, soil), Sensors for environmental changes</td>
<td>Collection of water from area streams — check for chemical pollutants, Air-quality ratings</td>
</tr>
<tr>
<td>Health care providers</td>
<td>Notifications to health department if cases of certain diseases are observed</td>
<td>Report cases of meningitis to health department</td>
</tr>
<tr>
<td>Nonhealth-related sources</td>
<td>Sales records, Court records</td>
<td>Cigarette sales, Intoxicated driver arrests</td>
</tr>
</tbody>
</table>

Conducting Studies

Studies are conducted in an attempt to discover associations between an exposure or risk factor and a health outcome.
Study Design — Cross-Sectional Study

Subjects are selected because they are members of a certain population subset at a certain time.

Study Design — Cohort Study

Subjects are categorized on the basis of their exposure to one or more risk factors.

Study Design Type — Case-Control Study

Subjects identified as having a disease or condition are compared with subjects without the same disease or condition.

Topic 7
Investigating an Outbreak
Ten steps are involved in outbreak investigations, including:

- Establishing the existence of an outbreak
- Preparing for fieldwork
- Verifying the diagnosis
- Defining and identifying cases
- Using descriptive epidemiology
- Developing hypotheses
- Evaluating the hypotheses
- Refining the hypotheses
- Implementing control and prevention measures
- Communicating findings

Step 1 — Establishing the existence of an outbreak:
- Use data from data sources

Step 2 — Preparing for fieldwork:
- Research the disease
- Gather supplies and equipment
- Arrange travel

Step 3 — Verifying the diagnosis:
- Speak with patients
- Review laboratory findings and clinical test results

Step 4 — Defining and identifying cases:
- Establish a case definition by using a standard set of criteria

Step 5 — Using descriptive epidemiology:
- Describe and orient the data
Outbreak Investigation — Steps 6, 7, and 8

Step 6 — Develop a focused hypothesis
Step 7 — Evaluate the hypothesis for validity
Step 8 — Refine the hypothesis as needed

Outbreak Investigation — Steps 9 and 10

Step 9 — Implement control and prevention measures
- Control and prevent additional cases

Step 10 — Communicate findings
- Determine who needs to know
- Determine how information will be communicated
- Identify why the information needs to be communicated

Course Summary

During this course, you learned to:
- Define epidemiology
- Describe basic terminology and concepts of epidemiology
- Identify types of data sources
- Identify basic methods of data collection and interpretation
- Describe a public health problem in terms of time, place, and person
- Identify the key components of a descriptive epidemiology outbreak investigation

QUESTIONS?
Resources and Additional Reading


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The findings and conclusions in this course are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Congenital Syphilis in Texas

* 1 in 5 U.S. cases occurs in Texas (2013)

- 19.4 cases per 100,000 live births
- 8.7 cases per 100,000 live births

* No. 3 among 25 states reporting a congenital syphilis case in 2013

Source: CDC

Congenital Syphilis Cases and Rates In Texas’ Most Populated Counties, 2013

<table>
<thead>
<tr>
<th>County</th>
<th>2013 Cases</th>
<th>County</th>
<th>2013 Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harris</td>
<td>25</td>
<td>Bexar</td>
<td>64.7</td>
</tr>
<tr>
<td>Bexar</td>
<td>17</td>
<td>Harris</td>
<td>37.1</td>
</tr>
<tr>
<td>Tarrant</td>
<td>7</td>
<td>Tarrant</td>
<td>25.3</td>
</tr>
<tr>
<td>Dallas</td>
<td>6</td>
<td>Dallas</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Source: CDC
Primary and Secondary (P&S) Syphilis Rates for Bexar County, Texas and the United States, 2003 – 2013

Source: Data extracted from local STD*MIS database, Texas and CDC reports, using ACS population estimates

<table>
<thead>
<tr>
<th>Year</th>
<th>P&amp;S syphilis Bexar rate</th>
<th>P&amp;S syphilis Texas rate</th>
<th>P&amp;S syphilis US rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td>17.2</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td>16.0</td>
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<td>2005</td>
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<td>6.3</td>
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<td>2006</td>
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<td>5.4</td>
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<td>2007</td>
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<td>5.0</td>
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<tr>
<td>2008</td>
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<td>5.3</td>
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<td>2009</td>
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<td>5.3</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td>5.0</td>
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Congenital Syphilis (CS) Cases for Bexar County, 2003 – 2015*

Source: Data extracted from local STD*MIS database, Texas and CDC reports, using ACS population estimates

*Preliminary, as of April 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>CS cases Bexar</th>
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<tbody>
<tr>
<td>2003</td>
<td>1</td>
</tr>
<tr>
<td>2004</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>6</td>
</tr>
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<td>2006</td>
<td>7</td>
</tr>
<tr>
<td>2007</td>
<td>9</td>
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<td>2008</td>
<td>4</td>
</tr>
<tr>
<td>2009</td>
<td>8</td>
</tr>
<tr>
<td>2010</td>
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<tr>
<td>2014</td>
<td>11</td>
</tr>
<tr>
<td>2015*</td>
<td>2</td>
</tr>
</tbody>
</table>

Prenatal care visits, mothers of Bexar County infants with congenital syphilis, 2012-2014 (n = 44)

<table>
<thead>
<tr>
<th>Visits</th>
<th>Mothers</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 10</td>
<td>13</td>
</tr>
<tr>
<td>5 to 10</td>
<td>21</td>
</tr>
<tr>
<td>1 to 4</td>
<td>10</td>
</tr>
</tbody>
</table>

Syphilis Cases, Bexar County, 2013

Cases (all stages)
N = 1,069
17 to 27
10 to 14
5 to 9
3 to 4
1 to 2
Definition of Congenital Syphilis

- **Probable:** mother untreated or **inadequately treated**, regardless of infant’s condition; or evidence of syphilis in infant/child by exam, in serology or CSF
- **Confirmed:** *T. pallidum* directly sampled (lesions, placenta/cord, nasal discharge, autopsy material) via darkfield, fluorescent antibody, or other specific stains

* Inadequate treatment consists of any nonpenicillin therapy or penicillin administered <30 days before delivery.

3rd trimester screening

- Early third trimester (28-32 weeks)
- SB 1128 will mandate 3rd tri screen
- Ensures adequate treatment
- Makes sense because of syphilis latency period
- UHS at 92% (rest either had late care or care elsewhere)

Metro Health data by:
Anil Mangla, Assistant Director and chief epidemiologist
Cara Hausler, senior epidemiologist

References:


Thank you