Epidemiology 6000
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Definitions of Epidemiology
- The study of the distribution, determinants and deterrents of morbidity and mortality in human populations. (Oleckno)

Epidemiology is all around us......

Epidemiology
- Cornerstone of public health
- Basis for our understanding of disease including distribution, natural history, antecedents (risk factors) and prevention (protective factors)

Epidemiology
- Population based
- "denominators" important to understanding diseases and other events
Populations
- Concerned with disease in \textit{groups} not predicting which specific individual will become ill
- How do we define populations?

Epidemiology
- Translates qualitative impressions in numbers - quantifies
- \textit{Quantification} is key to the epidemiologic approach
- Count cases (\textit{numerators})
- Evaluate in terms of those at risk (\textit{denominators}) (populations)

Basic assumptions of epidemiology
- Human disease does \textbf{not} occur at random
- Causal and preventive factors can be identified through \textit{systematic investigation} of \textit{different populations} or subgroups of individuals in a population in \textit{different places or times}

Epidemiology’s Unique Contribution

Essential components
- Population
- Distribution
- Frequency
- \textbf{Determinants} of disease
- Control
- Studies in \textbf{human populations}

Applications of Epidemiology
- Epidemiology is a discipline
- Developed methods adopted by many disciplines
- draws on the knowledge and expertise of many disciplines to answer important health questions

Epidemiology
- Divided in to two major components:
  - Descriptive Epidemiology
  - Analytic Epidemiology (\textit{hypothesis testing})
- Both important to our understanding of disease
- Cannot ask relevant questions about disease etiology without a firm understanding of the descriptive epidemiology
Distribution of disease: Descriptive Epidemiology

- **Person**: age, sex, race/ethnicity, SES, occupation, lifestyle,
- **Place**: neighborhood, state, country, environment
- **Time**: date of exposure, date of diagnosis etc

Descriptive Epidemiology
- counts the occurrence of disease in a population
- Measures the frequency and prevalence of disease and describes the existing distribution of variables
- CANNOT TEST HYPOTHESES using descriptive studies - can generate hypotheses for analytic studies

Determinants of Disease: Analytic Epidemiology

- Identifying the **causes** of disease
- Testing hypotheses using epidemiologic studies
- Goal is to prevent disease (deterrents)

Epidemiology: Risk factors
- A behavior, environmental exposure, or inherent human characteristic that is associated with an important health related condition*
- Risk factors are associated with an increased probability of disease but may not always cause the diseases

*Last, J. Dictionary of Epidemiology

The distinction between epidemiology and clinical medicine

- **POPULATIONS**
  - Define health problems
  - Distributions of diseases
  - Study associations
  - Assess causation
  - Prevention

- **INDIVIDUALS**
  - Diagnosis
  - Treatment
  - Caring
  - Curing

Clinical epidemiology
- Evidence based medicine
- Offshoot of classical epidemiology
- Patient oriented
- Use epidemiology to assist in clinical decision making
- The application of epidemiologic knowledge and methods to clinical care
A brief history of epidemiology

460-377 BC: Hippocrates
Proposes that external and personal environment be considered to explain development of disease. Defines “epidemic” vs. “endemic”

1620-1674: John Graunt
Published *The Nature and Political Observations Made Upon The Bills of Mortality*, 1662. In each parish, he collected information on who died every week. Credited as being founder of medical stats. Tabulated births & deaths by season, year, parish and made inferences. - This was the beginning of vital statistics

First Clinical Trial
- James Lind – first planned trial – 1747
- Took 12 sailors with scurvy who were as similar as possible
- Had 6 possible treatments
- Gave two sailors each of 6 remedies
- Only the pair on oranges and lemons got better

Edward Jenner
- Edward Jenner interested in smallpox
- Noted that milkmaids didn’t develop smallpox
- Had a milder disease - cowpox
- Used material from cowpox pustule to vaccinate against smallpox - 1768

First medical statistics
- William Farr: Founder of modern epidemiology
  - In 1839 became responsible for medical statistics in Office of the Registrar General for England and Wales
  - Developed a system of routine compilation of number and causes of death and published annual reports using vital records. Used the data compiled by Graunt to answer questions
  - Developed the forerunner of ICD codes
  - Emphasized completeness and accuracy of records;
John Snow

- First epidemiologist to propose and test a hypothesis: cholera is transmitted by a contaminated water supply.

Snow and Cholera

- Snow's Data (Table 1.1)

<table>
<thead>
<tr>
<th>Water company</th>
<th>Population in 1851</th>
<th>Cholera deaths in 1853–1854</th>
<th>Deaths per 100,000 living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southwark and Vauxhall</td>
<td>167,654</td>
<td>192</td>
<td>114</td>
</tr>
<tr>
<td>Both companies</td>
<td>301,149</td>
<td>182</td>
<td>60</td>
</tr>
<tr>
<td>Lambeth</td>
<td>14,652</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


- Snow's Data (Table 1.2)

<table>
<thead>
<tr>
<th>Water company</th>
<th>Number of houses</th>
<th>Deaths from cholera</th>
<th>Deaths per 10,000 houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southwark and Vauxhall</td>
<td>40,046</td>
<td>1263</td>
<td>315</td>
</tr>
<tr>
<td>Lambeth</td>
<td>29,107</td>
<td>98</td>
<td>37</td>
</tr>
<tr>
<td>Rest of London</td>
<td>256,423</td>
<td>1422</td>
<td>59</td>
</tr>
</tbody>
</table>


More on John Snow

- Please view the TED lecture below for a slightly different story about cholera and John Snow

http://www.ted.com/talks/steven_johnson_tours_the_ghost_map.html