Epidemiology 6000

Dr. H. Stockwell

Epidemiology

- What is epidemiology?

Definitions of Epidemiology

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

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 **groups** not predicting which specific individual will become ill
- How do we define populations?

Epidemiology

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

Basic assumptions of epidemiology

- Human disease does **not** occur at **random**
- Causal and preventive factors can be identified through **systematic investigation** of **different populations** or subgroups of individuals in a population in **different places or times**
Epidemiology’s Unique Contribution

Essential components
- Population
- Distribution
- Frequency
- Determinants of disease
- Control
- Studies in 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 into two major components:
  - Descriptive Epidemiology
  - Analytic Epidemiology (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**

<table>
<thead>
<tr>
<th>POPULATIONS</th>
<th>INDIVIDUALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define health problems</td>
<td>Diagnosis</td>
</tr>
<tr>
<td>Distributions of diseases</td>
<td>Treatment</td>
</tr>
<tr>
<td>Study associations</td>
<td>Caring</td>
</tr>
<tr>
<td>Assess causation</td>
<td>Curing</td>
</tr>
<tr>
<td>Prevention</td>
<td></td>
</tr>
</tbody>
</table>

---

**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

Epidemiology

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


First Vaccination
- 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 1855–1854</th>
<th>Deaths per 100,000 living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southwark and Vauxhall</td>
<td>167,834</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>20</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>40,346</td>
<td>1263</td>
<td>515</td>
</tr>
<tr>
<td>Lambeth</td>
<td>28,167</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](http://www.ted.com/talks/steven_johnson_tours_the_ghost_map.html)