Lesson Overview

- Finish Setting the Context
- Origins of human disease
- Evolution of humans and disease agents
- Some major milestones in the history of humans and “their” diseases

Disease & History

“In the course of many years of preoccupation with infectious diseases, . . ., we have become increasingly impressed with the importance – almost entirely neglected by historians and sociologists -- of the influence of these calamities upon the fate of nations, indeed on the rise and fall of civilizations.”

Hans Zinsser, 1935
In Rats, Lice & History
Population Hazards

Source: McMichael AJ. Planetary Overload, 1993

Early Humans

What diseases?
Where did they come from?

Disease

Acute vs. Chronic Disease
Infectious diseases evolved with human populations
  Infectivity
  Pathogenicity
  Virulence
Animal Husbandry

- Close relationship between humans and their animals
- Proximity to zoonotic (animal) diseases
- Modern Examples??

Zoonotic Diseases

<table>
<thead>
<tr>
<th>Human Disease</th>
<th>Animal with most closely related pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles</td>
<td>Cattle (Rinderpest)</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Cattle</td>
</tr>
<tr>
<td>Smallpox</td>
<td>Cattle (cowpox), Etc.</td>
</tr>
<tr>
<td>Influenza</td>
<td>Pigs and Ducks</td>
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<tr>
<td>Pertusis</td>
<td>Pigs and Dogs</td>
</tr>
<tr>
<td>Malaria (falciparum)</td>
<td>Birds (Chickens &amp; Ducks?)</td>
</tr>
</tbody>
</table>

Source: Diamond J. Guns, Germs and Steel, 1997

Zoonotic Diseases

Number of Diseases that Human Populations Share with Domesticated Animals

- Poultry: 26
- Rodents: 32
- Horse: 35
- Pig: 42
- Sheep/Goats: 46
- Cattle: 50
- Dog: 65

Source: McNeil WH. Plagues and People, 1977
A variety of factors, including population pressure, technological innovation, and climate change, prompted the shift to agriculture.

Similar factors are involved in the intensification of agriculture. Agro-ecosystems have effects on humans and the environment.

Hunting/Gathering vs. Agriculture:

- Daily caloric intake: 2,160 calories
- 3.5 hours per day spent “working” (Source: Sahlins 1972)
Agriculture

“If agriculture provides neither better diet, nor greater dietary reliability, nor greater ease, but conversely appears to provide a poorer diet, less reliably, with greater labor costs, why does anyone become a farmer?”
- Cohen 1977: 141

Values of crops and livestock

- More calories
  - more people
    - 1 acre farmland feeds 10-100x more than hunter-gatherer
- Domestic animals
  - Meat, milk, bone, fiber, fertilizer, work, warmth, transportation and disease!
- Plants
  - Food, fiber, containers

Extensive agriculture

- Typical features:
  - Productivity (yield/area) LOW
  - Fallow LONG (10-40 yrs). Requires large amt. land / capita
  - Efficiency (yield/labor time) HIGH
  - Population density LOW
  - Technology SIMPLE
  - Fertilizer LITTLE
  - Land tenure COMMUNAL
  - Economic system SUBSISTENCE
  - Sociopolitical complexity gen. LOW
Intensification

- Prehistoric
  - Identification difficult
  - Find by aerial photography, radar scanning
  - Ancient field systems and settlements rare
  - What survives in landscape? Marginal lands

- Later examples
  - Native North America (canals, wild rice)
  - Africa (flood systems of W. Africa)
  - Mexico (Chinampa fields)

From Smil 2000

Extensive agriculture

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  - Fertilizer LITTLE
  - Land tenure COMMUNAL
  - Economic system SUBSISTENCE
  - Sociopolitical complexity gen. LOW
Intensive Agriculture

- Typical features:
  - Productivity (yield/area) HIGH
  - Fallow SHORT (0-3 yrs)
  - Efficiency (yield/labor time) VARIABLE
  - Population density HIGH
  - Technology COMPLEX
  - Fertilizer HIGH
  - Land tenure INDIVIDUAL/FAMILY
  - Economic system MARKET
  - Sociopolitical complexity gen. HIGH

Population Pressure

Source: Smil 1993
Development of Cities

- New Problems with:
  - Food Supplies
  - Water Supplies
  - Wastewater disposal
  - Garbage disposal

Infectious Disease

- The Great Herbal
  (~3,000 BCE)
- Plagues
  - E.g., The Ten Plagues of Egypt (~1,500 BCE)

Plagues

- 1,141 BCE: Possibly first record of bubonic plague (1 Samuel 4)
- 900 BCE: The Great Pestilence
- 430 BCE: Typhus Outbreak in Greece
The Glory that was Rome

- 1st Century BCE: Malaria in the Campagna
- 54 CE: Major pestilence
- 79 CE: a bad year
  - Vesuvius erupts
  - Malaria assaults Rome
  - Huns invasion turned back by anthrax

The Roman Empire

- 100 CE: Hippocrates
- 125 CE: Locusts attack
- 165-169 CE: Smallpox?
- 189 CE: Reoccurrence
- 250 CE: Cyprian Pandemic

Roman Period (Continued)

- 444 CE: Britain - unknown pestilence
- 476 CE: Rome falls — finally
- 540 CE: Justinian Plague
Europe: The Middle Ages

- 1250: Little Ice Age
- 1320s: Bubonic plague emerges
- 1347 - 1352: "The Black Death"
- 1600s: Bubonic Plague pandemic

Medieval Medicine

- Miasmas
- Imbalance of humours
  - Blood
  - Black bile
  - Yellow bile
  - Phlegm

Elsewhere in the World

- 1331: China: Bubonic Plague
- 1492 - 1519: Smallpox conquers Mexico
- 1520: Malaria arrives in North America
- 1620: Pilgrims land Plymouth Rock
- 1630: Measles hits Massachusetts
- 1740: Smallpox arrives in the Pacific Northwest
Industrialization

- Machines save “labor”
- Machines save money
- Machines improve consistency and quality
- Machines free humans to engage in more rewarding activities

Urbanization

- Concentrates People
- Public Works
  - More people = More projects
  - Seasonal migration of workers
- Facilitates spread of pathogens

Population Health Hazards

- Vectorborne Diseases
- Nutritional Deficiencies
- Contagious (Crowd) Diseases
- Industrial Chemical Toxins
- Over-nutrition

Source: McMichael AJ. Planetary Overload, 1993

Homo sapiens appear
Towns & Cities appear
Industrial Revolution
**Lesson Summary**

- Humans and our environment have evolved together
  - i.e., disease has always been there
  - Change from acute to chronic diseases
  - Evolutionary adaptations have not had a chance to work with chronic diseases
  - Re-emergence of infectious disease
- Our understanding of disease has changed from time to time and place to place
- The effect of disease on human populations and the growth and development of civilizations has often been significant

**Questions**

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Urbanization & Health