ENVIR 202: Lesson No. 4

History & Disease

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Lesson Overview

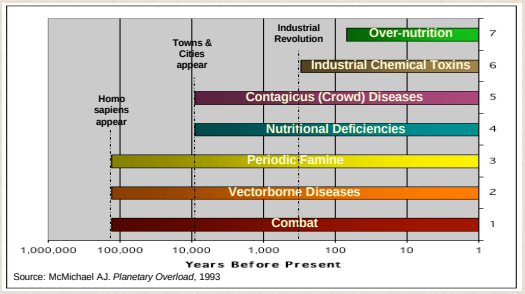
- Finish Setting the Context
- Origins of human disease
- Evolution of humans and disease agents
- Some major milestones in the history of humans and "their" diseases

Disease & History

"In the course of many years of pre-occupation 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."

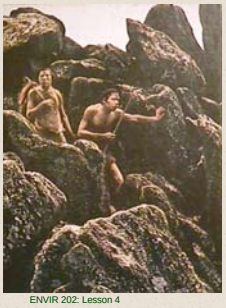
Hans Zinsser, 1935
In *Rats, Lice & History*

Population Hazards



Source: McMichael AJ. *Planetary Overload*, 1993

Early Humans



- What diseases?
- Where did they come from?

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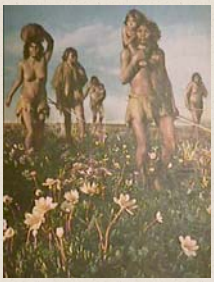
Disease



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

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Animal Husbandry

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

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Zoonotic Diseases

Human Disease	Animal with most closely related pathogen
Measles	Cattle (Rinderpest)
Tuberculosis	Cattle
Smallpox	Cattle (cowpox), Etc.
Influenza	Pigs and Ducks
Pertusis	Pigs and Dogs
Malaria (falciparum)	Birds (Chickens & Ducks?)

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

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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

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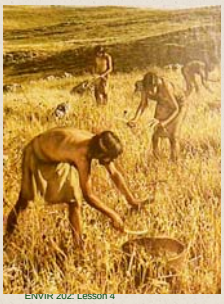
Agriculture



- A variety of factors, including population pressure, technological innovation, and climate change, prompted the shift to agriculture

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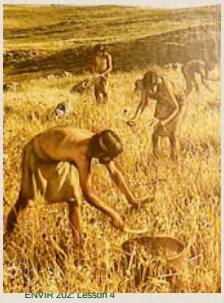
Agriculture



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

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Hunting/Gathering vs. Agriculture:

- Daily caloric intake: 2,160 calories
- 3.5 hours per day spent "working"

(Source: Sahlins 1972)

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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

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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

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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

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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)**

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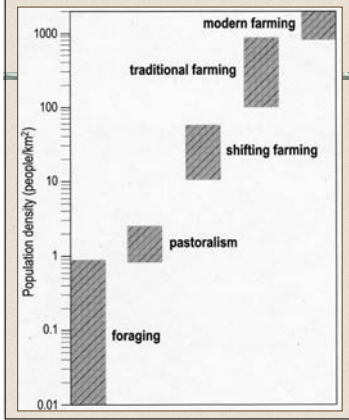

From Smil 2000

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Extensive agriculture

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  - **Efficiency (yield/labor time) HIGH**
  - **Population density LOW**
  - **Technology SIMPLE**
  - **Fertilizer LITTLE**
  - **Land tenure COMMUNAL**
  - **Economic system SUBSISTENCE**
  - **Sociopolitical complexity gen. LOW**

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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

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Intensive Agriculture

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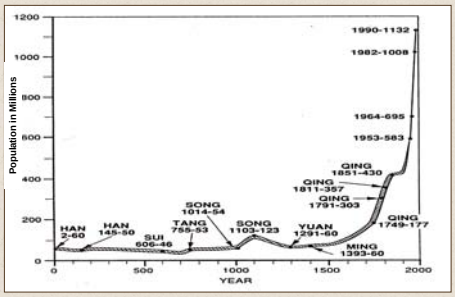
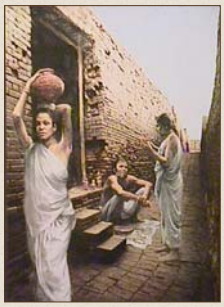
Population Pressure



ENVIR 202: Lesson 4 Source: Smil 1993 21

Development of Cities



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

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Infectious Disease

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

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Plagues

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

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The Glory that was Rome

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

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The Roman Empire

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

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Roman Period (Continued)

- 444 CE: Britain - unknown pestilence
- 476 CE: Rome falls — finally
- 540 CE: Justinian Plague

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Europe: The Middle Ages

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

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Medieval Medicine

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

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Elsewhere in the World

- 1331: China: Bubonic Plague
- ~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

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Industrialization

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

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Urbanization

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

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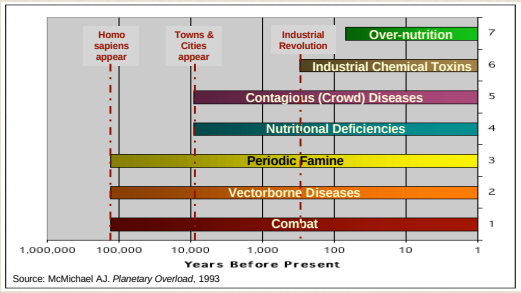
Population Health Hazards



Source: McMichael A.J. *Planetary Overload*, 1993

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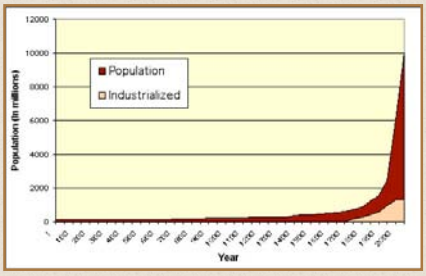
World Population



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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

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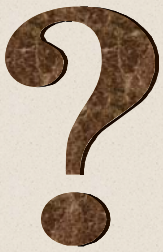
Questions



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Next Lesson

Urbanization & Health

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