

Bioinformatics and the investigation of cholera

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Bioinformatics and Research Computing



Major areas of BaRC work

- Provide lots of software (desktop, web, and Unix) and databases to all scientists
- Train people to use this software
- Teach classes in bioinformatics theory and practice
- Consult and collaborate with scientists on their specific research interests
- Create custom software and databases



Bioinformatics

- Using computers to organize and analyze biological information
- Common types of biological information
 - DNA, protein, and genomic sequences
 - Large-scale quantitative data: microarrays, protein-protein interactions
- Sometimes called “computational biology”



Learning bioinformatics

- Bioinformatics gets people from all directions and backgrounds
- Most helpful academic subjects:
 - Biology
 - Esp. molecular biology, genetics, biochemistry
 - Computer science, mathematics, and/or statistics
- Experience in a lab that does what you might like to do

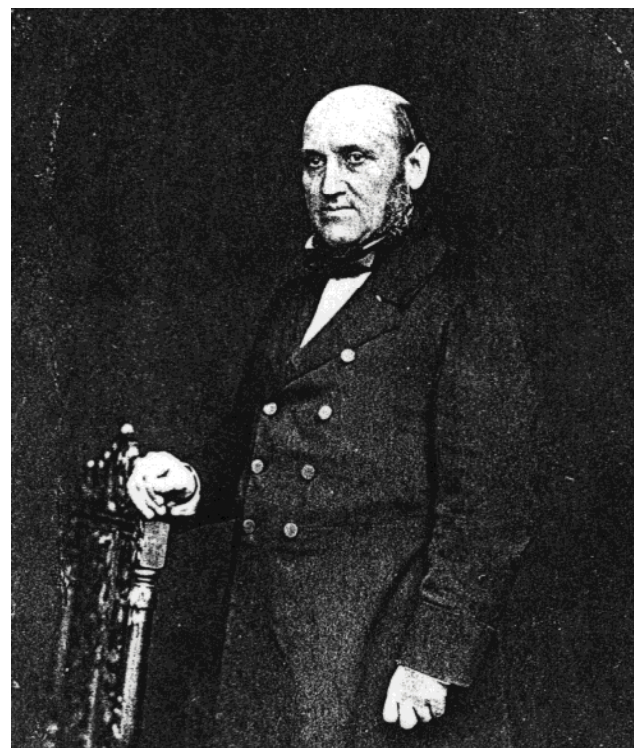


Cholera

- 1853: What is cholera? ...all is darkness and confusion, vague theory, vain speculation...
-- The Lancet
- “The symptoms are primarily seated in the alimentary canal, and all the after-symptoms of a general kind are the results of flux from the canal”
-- Richardson, “Snow on Cholera”
- Death in a few hours to a week



William Farr
1807-1883



Well-known
epidemiologist



London 1848-9 cholera epidemic: 1.9 million deaths

- Deaths per 10,000 people
- Elevation above the Thames
- Persons per acre
- Persons per house
- Average annual value of house
- Average annual value of house per person
- Poor rate
- Water supply



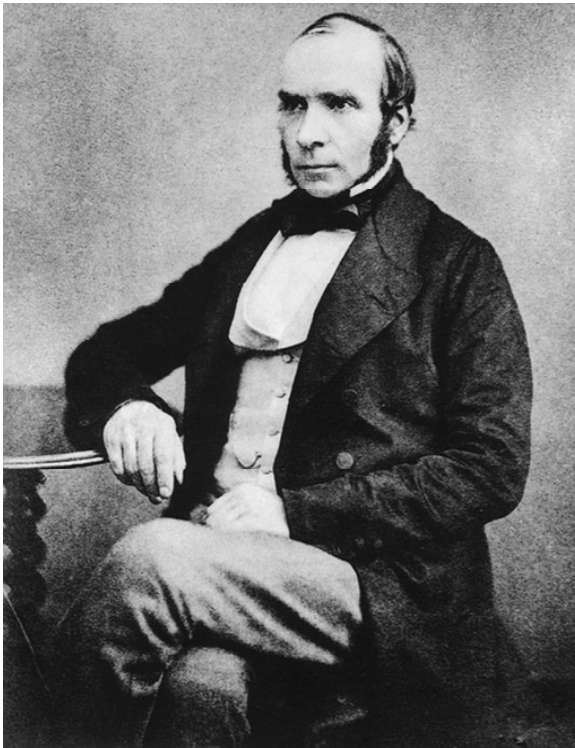
Summary of Farr's analysis

The elevation of the soil in London has a more constant relation with mortality than any other known element

- Note: He was wrong



John Snow
1813-1858



Up-and-coming
doctor

London 1854 cholera epidemic

- Since this was an intestinal disease, Snow already felt confident it was due to something that was eaten or drunk.
- While the epidemic was in progress, he mapped all deaths to London locations.



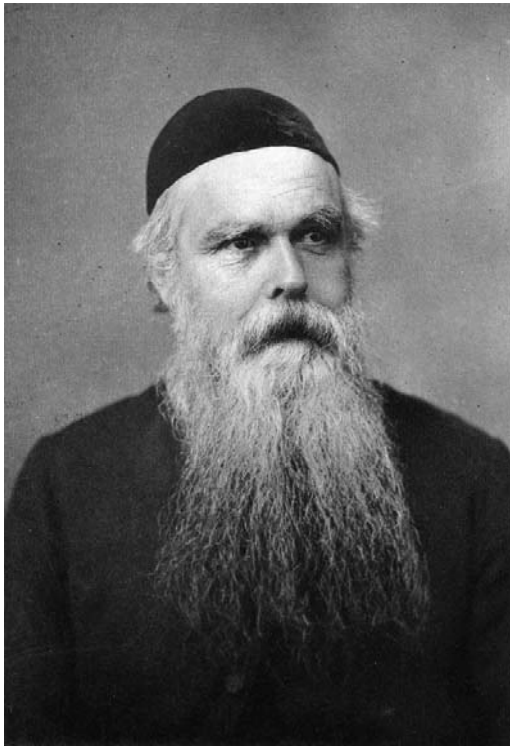


The Broad Street pump

- Hypothesis: The pump was the origin of the cholera outbreak
- People listened to Snow but weren't convinced.
- What experiment could be designed to test this hypothesis?
- Note: He was right



Henry Whitehead
1825-1896



minister

Whitehead's interviews

- Set out to disprove Snow's ideas
- The source of the outbreak was a mother washing an infected baby's diapers on August 24, 1854
- Also explained unexpected observations
- Came to accept Snow's ideas



Robert Koch
1843 - 1910



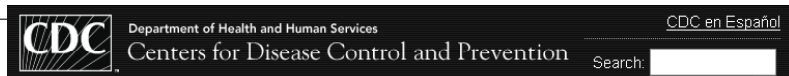
Official
discoverer
of
*Vibrio
cholerae*

Benefits of modern biology

- Genome sequences
- Protein sequences
- Many protein structures
- Physiology of cholera infections



Escherichia coli



E. coli Outbreak Investigations

Note: the updates below have not been revised since their original release, and the content they contain may no longer be up to date.

Escherichia coli O157:h7 (Topp's Ground Beef Patties)

- [October 26, 2007](#)

Escherichia coli O157:h7 (Taco Bell)

- [December 14, 2006](#)
- [December 13, 2006](#)
- [December 12, 2006](#)
- [December 11, 2006](#)
- [December 10, 2006](#)
- [December 9, 2006](#)
- [December 8, 2006](#)
- [December 7, 2006](#)
- [December 6, 2006](#)

Escherichia coli O157:h7 (Fresh Spinach)

- [October 6, 2006](#)

Protein structure demo

- Goal: Analyze the structure and function of the cholera and *E. coli* toxins

