Public Health Part II: Epidemiology

Course
World Health Research

Unit V
Public Health & Epidemiology

Essential Question
How does the science of epidemiology promote critical thinking skills?

TEKS
130.209 (c)
3A, 4B

Prior Student Learning
Public Health Part I & knowledge of microorganisms

Estimated time
3 to 4 – 55 min. classes to complete lecture and activities

Rationale
Traditionally, epidemiology courses were taught to public health students at the graduate school level. The Centers for Disease Control and Prevention (CDC) took the lead in introducing and integrating epidemiology to K-12 in order to promote critical thinking and problem solving skills and make students aware of the important role and contributions of epidemiologists.

Objectives
Upon completion of this lesson, the student will be able to:

- Define epidemiology
- Explain the basic steps epidemiologists take when investigating an outbreak
- Define and give examples of emerging and re-emerging infectious diseases
- Identify the variety of evidence that epidemiologists must collect to determine the origin, infectious agent, and route of transmission o an infectious disease
- Explain how environmental changes can result in the emergence of infectious diseases
- Write an epidemiological report

Engage
"We do not have a smoking cow at this point"
This statement by Kevin Reilly from the California Department of Health Services was in connection with reports that epidemiologists had traced and matched the e-coli strain responsible for the US 2006 spinach outbreak to cattle feces on one of the four implicated ranches, but not the other three. Finding the exact "source cow" if there is only one, would be quite a feat of medical detective work!
http://www.epimonitor.net/epimonday/previousissues/06-12-17.htm

Key Points

I. What is epidemiology?
   A. The study of how and why diseases are distributed in the population (i.e. why some populations get sick and others don't).

II. Epidemiologists
   A. public health professionals who study the occurrence of disease and other health-related events in populations of people for purpose of preventing or controlling health problems
   B. sometimes called "disease detectives" because they are the Sherlock Holmes of the germ world

Epidemiologists are a lot like the detectives who investigate crimes:

Crime Detectives	Disease Detectives (Epidemiologists)
Investigate crimes	Investigate diseases
Look for clues at crime scenes	Look for disease clues in community
Judge quality of evidence	Judge quality of evidence
Form hypotheses	Form hypotheses
Identify suspected perpetrators	Identify suspected causes (pathogens, genetics, environment, accident-related origins)
Present evidence in court	Present evidence in scientific journals and at scientific meetings
Help control crime	Help control disease and health events

III. Epidemiologists often travel around the world in order to investigate outbreaks

IV. Basic steps of an epidemiological outbreak investigation:
   A. Gather information and confirm existence of an outbreak
   B. Confirm the diagnosis
   C. Establish a case definition (a standard set of criteria for identifying who has the disease)
   D. Perform descriptive studies
   E. Develop and test hypotheses
   F. Implement control and prevention
   G. Report findings

V. Where epidemiologists work
   A. local or state health departments
   B. research settings in hospitals or universities
   C. federal government
      1. National Institute of Health (NIH)
      2. Center for Disease Control and Prevention (CDC)
   D. private corporations specializing in health care research

Activity

I. Deadly Diseases Among Us – Students view National Institutes of Health video over past and present infectious diseases. http://science.education.nih.gov/supplements/nih1/diseases/guide/guide_manual_toc.htm

II. Disease Detectives – Students assume the roles of epidemiologists to investigate the cause of a mystery disease. This activity from the National Institutes of Health (NIH) includes instructions and videos. http://science.education.nih.gov/supplements/nih1/diseases/guide/masters.htm

A note to the teachers: The activities for this unit take considerable teacher preparation (downloading and coping handouts, familiarization with the content, etc.) Be prepared to spend several hours the first time you use these activities in your classroom, but know that they are awesome additions to your curriculum and worth every minute of your time.

Assessment
Successful completion of NIH activity epidemiological reports.

Materials
Teacher's Manual for Student Activities (download Activity 1 and 2; the other activities can be used at a later time when covering the Unit on Infectious Diseases)
http://science.education.nih.gov/supplements/nih1/diseases/guide/guide_manual_toc.htm

Activity Handouts and Transparencies (these can be downloaded as a PDF file)
http://science.education.nih.gov/supplements/nih1/diseases/guide/masters.htm

Student Activity Video: *Deadly Diseases Among Us*
http://science.education.nih.gov/supplements/nih1/diseases/activities/activity1.htm

Student Activity Video: *Disease Detectives*
http://science.education.nih.gov/supplements/nih1/diseases/activities/activity2_videos.htm

Student computers to view NIH's online videos

Accommodations for Learning Differences
For reinforcement, the student will view *Is Epidemiology In Your Future* video (8 minutes) or watch the movie *Outbreak* (127 min).
http://www.rwjf.org/pr/product.jsp?id=26931

Teachers, you may want to consider starting a Young Epidemiology Scholars (YES) program on your campus. Students can compete in epidemiological research for college scholarships.
http://yes.collegeboard.org/

National and State Education Standards
National Health Science Cluster Standards
HLC01.01
Health care workers will know the academic subject matter required (in

addition to state high school graduation requirements) for proficiency within their area. They will use this knowledge as needed in their role.

HLC02.01
Health care workers will know the various methods of giving and obtaining information. They will communicate effectively, both orally and in writing.

HLC06.01
Health care workers will understand the existing and potential hazards to clients, co-workers, and self. They will prevent injury or illness through safe work practices and follow health and safety policies and procedures.

HLC07.01
Health care workers will understand the roles and responsibilities of individual members as part of the health care team, including their ability to promote the delivery of quality health care.

TEKS
130.209 (c) 3A describe technologies that support the prevention and treatment of infectious diseases;
130.209 (c) 4B define and calculate a sample size.

Texas College and Career Readiness Standards
English Language Arts
II. B. Understand new vocabulary and concepts and use them accurately in reading writing and speaking.
III. B. Develop effective speaking styles for both group and one on one situations.
IV. A. Apply listening skills as an individual and as a member of a group in a variety of settings.

Science
I. A. 1. Utilize skepticism, logic and professional ethics in science
I. C. 2. Understand and apply safe procedures in the laboratory and field, including chemical, electrical, and fire safety and safe handling of live or preserved organisms.

Social Studies
I.A.2. Analyze the interaction between human communities and the environment.

Cross-Disciplinary
I.A.1. Engage in scholarly inquiry and dialogue.
I.C.1. Analyze a situation to identify a problem to be solved
I.C.2. Develop and apply multiple strategies to solving a problem.
I.C.3. Collect evidence and data systematically and directly relate to solving

a problem.
I.E.1. Work independently.
I.E.2. Work collaboratively.
II.B.1. Write clearly and coherently using standard writing conventions.
II.D.1. Identify patterns or departures from patterns among data.

Information from:
CDC: http://www.cdc.gov/excite/classroom/outbreak/objectives.htm
Montclair State University: http://www.montclair.edu/Detectives/index.html
NIH: http://science.education.nih.gov/supplements/nih1/diseases/default.htm
Young Epidemiology Scholars: http://www.collegeboard.com/yes/index.html