



OVERVIEW

BIG IDEA

Epidemiologists study health outcomes and try to determine the causative and correlated exposures or risk factors.

OBJECTIVE

9.1: Identify epidemiological questions by identifying outcomes and possible exposures.

AGENDA

1. Facebook & Cognitive Function
2. Steps to Descriptive Studies
3. What about Exposures?
4. Practice

HOMEWORK

Propose an epidemiological study on a health topic of interest to you, following the steps outlined in this lesson.

LESSON 9.7

Exposures & Outcomes

SUMMARY:

This lesson provides students with a simple, step-wise process for studying a health issue. Students will begin with an example about Facebook & cognitive function in seniors, then they will launch into the steps for outlining a basic descriptive study focused on an outcome. After this, they will take the next step to begin thinking about links between the outcomes and possible exposures (risk factors). Finally, students will practice identifying the steps of this process with a sample data set.

STANDARDS:

NHES 2.12.9: Analyze how some health risk behaviors can influence the likelihood of engaging in unhealthy behaviors.



MODULE 9: EPIDEMIOLOGY LESSON 9.7

Exposures & Outcomes

Obj. 9.7: Identify epidemiological questions by identifying outcomes and possible exposures.

DO NOW Facebook as an Exposure

Suppose you read a study titled, "Does Facebook Prevent Alzheimer's? The Relationship Between Online Social Networking and Cognitive Function in Senior Citizens." Use your inferences about this study to answer the questions below.

1. What two primary variables are being researched in this study?
2. Do you think there is a causal relationship or a correlation between these variables? Why?
3. If you wanted to change the title to prevent misinterpretation of the research findings, how might you do so?

DISCUSS Cognitive Function as an Outcome

Using cognitive function in senior citizens as an outcome, work with a partner to list as many possible exposures (or risk factors) that might be related to the outcome in the box below:

NEW INFO Steps to Conducting a Descriptive Epidemiological Study

As a budding epidemiologist, you are ready to study health issues! Follow the example below which walks through FOUR steps for outlining a descriptive study.

1) Choose the **OUTCOME**.

a. Epidemiologists ask, "Does _____ (risk factor/exposure) affect _____ (outcome)?"

DO NOW: Answers:

1. Facebook use & cognitive function
2. Most likely a correlation. Answers to "why" will vary.
3. "Is Facebook Correlated with Higher Cognitive Function Among Seniors?"

DISCUSS: A few possible exposures: Social connectivity, age at retirement, hobbies, amount of television watched, sedentary vs. activity, amount of reading, other chronic conditions, diet, genetic predisposition, etc.



b. We can think about THREE types of outcomes:

- 1. **Medical conditions:**
 - Infectious: H1N1
 - Noncommunicable: Asthma
 - Chronic: Lung cancer
 - Acute: Ear infection
- 2. **Behaviors:**
 - Protective: Exercise
 - Harmful: Smoking
- 3. **Event-related:**
 - Injuries: Workplace
 - Disasters: 9/11, House Fire
 - Psychological: Stress

2) Define the OUTCOME.

- Clearly define the outcome.
- How do you define what constitutes a specific occurrence of your outcome?
- You must agree on a clearly defined "case" of your outcome to conduct a study!

Example: How would you define...

Fire-Related Injuries:

Any person who was transported by emergency services or admitted to the hospital for a burn or smoke inhalation or died of fire-related injuries

3) Identify the POPULATION.

- List facts to define the population the study focuses on.
- Keep in mind that you want to balance the population so that it is representative, but also diverse when possible. If the population all shares particular characteristics the results may be useful for those in the population but may not be able to be generalized to a larger population.

Example: What population will you sample?

5,500 residents of Dallas, TX from 1991 - 1997
Urban environment (vs. Rural)
Age: 30-65
Gender: male & female
Racial/Ethnic Make-up: 25% white, 30% Latino/a, 20% Black, etc.
Housing: High-rise apartments
Organizational Membership: N/A
Occupations: Construction, Financial Sector, etc.
Income: Working class 30-50K per family

4) DESCRIBE the Outcome Numerically

- Describe the problem with rates (in a descriptive study - 2 Types)

NEW INFO:

Ask students, "What other types of outcomes might there be?"

Ask students, "What would happen if scientists did not determine and agree upon definitions of outcomes prior to conducting studies?"

Ask students, "Why is selecting a study population a difficult step? What factors should influence the study population chosen?"

Ask students, "Can you think of a way to remember the difference between prevalence and incidence?"



Prevalence - tells how widespread cases are
(A "snapshot" of the problem)
Calc. — (#cases/total population)
Example: 17% of students at UICCP have the flu

Incidence - tells the risk of new cases occurring in a set period of time
(Good for less common problems)
Calc. — [(# new cases/total population)/time]
Example: 25 flu cases occur in every 200 students per month



What About Exposure?

Although epidemiology is sometimes viewed as a collection of statistical tools used to elucidate the associations of exposures to health outcomes, a deeper understanding of this science is that of discovering *causal* relationships.

Review:

"Correlation does not imply causation" is a common theme for much of the epidemiological literature. For epidemiologists, the key is in the term inference. Epidemiologists use gathered data and a broad range of biomedical and psychosocial theories in an iterative way to generate or expand theory, to test hypotheses, and to make educated, informed assertions about which relationships are causal, and about exactly how they are causal.

Exposures (Possible Causes):

Epidemiologists Rothman and Greenland emphasize that the "**one cause – one effect**" understanding is a simplistic mis-belief. Most outcomes, whether disease or death, are caused by a chain or web consisting of many component causes. Causes can be distinguished as necessary, sufficient or probabilistic conditions. If a necessary condition can be identified and controlled (e.g., antibodies to a disease agent), the harmful outcome can be avoided.

Source: Epidemiology on Wikipedia http://en.wikipedia.org/wiki/Epidemiology#As_causal_inference



Practice!

Over the course of 4-years, teachers at a local high school have been collecting data on the senior class as they move from freshman year through to senior year. The physical education instructor, with a keen interest in health data collected over an extended period of time, decided an analysis of the senior class' performance would make an excellent epidemiological study. Therefore, he decided to analyze performance on a mandatory fitness test for 92 senior girls at the high school.

READ: Review the types of epidemiological studies (descriptive vs. analytical) focused on in Lesson 9.5. Exposures are not a focus of descriptive studies, but are required when the study is seeking to determine relationships between variables.



Table 1

Year	New Students Passing Fitness Test	Students Still Failing
1	25	67
2	32	35
3	12	23
4	19	4

1. What is the health outcome? _____
What type of health outcome is it? _____
2. How would you define the "case" in this situation?
3. What population was used in this study?

What other characteristics of the population (not given) might be important to consider?
4. Describe the extent of the problem using **prevalence** and **incidence** rates.
(Hint: Assume year 4 was just evaluated (2011) for calculating the current prevalence rate. For incidence rates, you must choose the time frame you will use.)
5. List five possible exposures that could have had an effect on the outcome in this study.



Define:

Outcome:

Prevalence:

Exposure:

THINK:

Answers:

1. Performance on fitness test; Behavior
2. Passing (for girls): ½ mi time < 6 min; Sit-ups > 25 in 1 min Push-ups > 6 in 1min
3. 92 seniors; other answers will vary
4. Prevalence: current-day snapshot of passing!
(total passing today: (25+32+12+19) = 88;
total population: 92
Calc: [(25+32+12+19)/92] = 88/92 = ~0.96 = 96
Prevalence is 96% of students pass after 4 years

Incidence: must choose time frame (try 1st 4 years)
new cases: (25+32+12+19) = 88
total population: 92
time frame: 4 years
Calc: [(88/92)/4] = ~0.24 = 24%
Average incidence for passing is 24 students per 100 students per year OR 24% per year



Propose An Epidemiological Study

Using the table below, plan an epidemiological study on any health topic of interest.

Step:	Your Plan:
1) Choose the OUTCOME.	
2) Define the OUTCOME.	
3) Identify the POPULATION.	
4) DESCRIBE the Outcome Numerically	

Now select at least 5 possible exposures that you predict may have a relationship with your outcome of interest.

EXPOSURES (RISK FACTORS):

HOMEWORK:

The purpose of this homework assignment is to get students engaged in the health issues they are passionate about or curious about in the context of conducting epidemiological studies. This will prime them for their team case study by giving them a chance to get their feet wet.