

Study Guide — BI Problem 5: Public Health Issue (Pretest)

Biomedical Innovations · Problem 5 — Public Health Issue · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Epidemiology	The study of how diseases and health conditions are distributed in populations and what causes them.
Epidemic curve	A graph of new case counts over time used to show the size and pattern of an outbreak.
Rate	A measure of how often an event occurs in a population, expressed as cases divided by population at risk.
Independent variable	The factor the researcher changes or compares (the exposure).
Dependent variable	The outcome the researcher measures, which may respond to the independent variable.
Control group	The comparison group that does not receive the treatment, used as a baseline.
Confounding variable	An outside factor linked to both the exposure and the outcome that can distort the apparent relationship.
Correlation	A statistical relationship in which two variables tend to change together; it does not prove cause.
Causation	A relationship in which a change in one variable directly produces a change in another.
Sensitivity	The proportion of people who truly have the disease that a test correctly identifies as positive (true-positive).
Biohazard	Biological material, such as blood or body fluids, that may carry infectious agents and needs special handling.
Sharps container	A rigid, puncture-resistant, labeled container for safely discarding needles, lancets, and other sharp items.

Worked examples (follow the reasoning)

Example 1. A town has 50 new flu cases this week in a population of 10,000. Calculate the case rate per 1,000 people.

- Identify the numerator (new cases = 50) and denominator (population = 10,000).
- Divide cases by population: $50 / 10,000 = 0.005$.
- Multiply by 1,000 to express per 1,000 people: $0.005 \times 1,000 = 5$.

Answer: 5 cases per 1,000 people.

Example 2. A screening test is given to 100 people who are known to have a disease. The test comes back positive for 90 of them. What is the test's sensitivity?

- Sensitivity = true positives / all people who truly have the disease.
- True positives = 90; total diseased = 100.
- Compute $90 / 100 = 0.90$, or 90%.

Answer: Sensitivity = 90%.

Practice questions (with reasoning)

1. A graph showing the number of new measles cases each day during an outbreak is best described as a(n)

- A. pedigree
- B. epidemic curve
- C. standard curve
- D. karyotype

Answer: B. An epidemic curve plots new cases over time, which is exactly what the description states.

2. Researchers find that ice-cream sales and drowning deaths rise together each summer. The BEST explanation is that

- A. ice cream causes drowning
- B. a third factor (hot weather) drives both, so this is correlation, not causation
- C. drowning causes ice-cream sales
- D. the relationship must be a coincidence with no pattern

Answer: B. Hot weather is a confounder that increases both swimming (drowning risk) and ice-cream sales; correlation is not causation.

3. Which item should NOT be placed in a sharps container?

- A. A used needle
- B. A used lancet
- C. A blood-soaked gauze pad
- D. A broken glass capillary tube

Answer: C. Soft contaminated waste like gauze goes in a biohazard bag; the sharps container is reserved for puncturing objects.