

Study Guide — BI Problem 5: Public Health Issue (Mid-Unit Test)

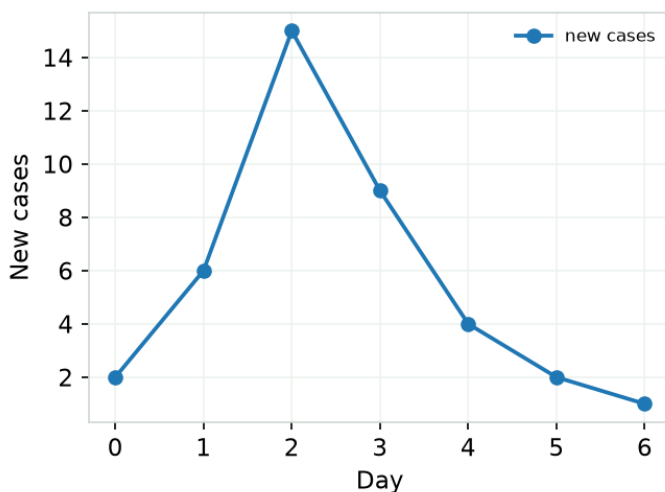
Biomedical Innovations · Problem 5 — Public Health Issue · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Incidence	The number of NEW cases of a condition that develop in a population over a time period.
Prevalence	The number or proportion of ALL existing cases (new and old) at a given point in time.
Point-source outbreak	An outbreak where people are exposed to a single common source at about the same time, producing a single peak.
Case-control study	An observational study that starts with cases (diseased) and controls (non-diseased) and looks backward at exposures.
Cohort study	An observational study that groups people by exposure and follows them forward in time to see who develops the disease.
Randomization	Randomly assigning participants to groups so that confounding factors are balanced between them.
Pre-analytical error	A mistake made before testing, such as mislabeling, wrong tube, or improper storage or transport of a specimen.
Chain of identity	Labeling and tracking a specimen so it is never confused with another patient's sample.
Centrifugation	Spinning a sample at high speed so denser components (cells) separate from the liquid (plasma or serum).
Confounding variable	A factor linked to both the exposure and the outcome that can create a misleading association.
Hypothesis	A testable, falsifiable prediction about the relationship between measurable variables.
Storage temperature	The protocol-specified temperature (room, 2-8 C, or frozen) at which a specimen must be kept to stay valid.

Worked examples (follow the reasoning)

Example 1. Read the epidemic curve and decide what kind of outbreak it shows.



- Look at the overall shape: cases rise quickly to one peak, then fall off.
- A single peak suggests everyone was exposed at about the same time from one source.
- Compare with a propagated outbreak, which would show repeated waves of rising peaks.
- Conclude the single-peak shape indicates a common point source.

Answer: A point-source outbreak (single common exposure).

Example 2. Decide whether a study is a case-control or a cohort design: Researchers identify 200 children with asthma and 200 without asthma, then ask their parents about past exposure to mold.

- Identify how participants were selected: by disease status (asthma vs. no asthma).
- Selecting by OUTCOME first and then looking backward at exposure is the case-control approach.
- A cohort study would instead select by exposure (mold vs. no mold) and follow forward.
- Because grouping was by disease status with a backward look at exposure, it is case-control.

Answer: Case-control study.

Practice questions (with reasoning)

1. Prevalence differs from incidence because prevalence counts

- A. only new cases over a period
- B. all existing cases at a point in time
- C. only deaths
- D. only people who tested negative

Answer: B. Prevalence is all existing cases at a moment; incidence is only new cases over a span of time.

2. A specimen tube is labeled at the nurses' station 20 minutes after the draw, after three other patients were seen. The biggest risk introduced is

- A. the tube will be too cold
- B. a labeling mix-up that misidentifies the patient
- C. the centrifuge will spin too fast
- D. the hypothesis will be falsified

Answer: B. Delayed, away-from-patient labeling is a classic pre-analytical error that can attach the wrong identity to a sample.

3. Randomly assigning subjects to groups is valuable mainly because it helps

- A. guarantee a large effect
- B. balance both known and unknown confounders across groups
- C. eliminate the control group
- D. make the sample size smaller

Answer: B. Randomization distributes confounding factors evenly, strengthening the fairness of the comparison.