Topic 3.2: Introduction to Planning a Study

What conclusions can we draw from different types of studies?

Video Follow-Along Worksheet

Learning Objectives (DAT-2.A, DAT-2.B):

- Identify the type of a study (observational vs. experiment).
- Identify appropriate generalizations and conclusions based on study type.

Essential Knowledge: The way we collect data influences what we can and cannot say about a population. It is not possible to determine causal relationships from observational studies.

Key Vocabulary

Population	All items or subjects of interest in a study
Sample	A subset of the population that is measured or observed
Observational Study	A study where treatments are *not* imposed on subjects
Experiment	A study where treatments *are* imposed on subjects
Confounding Variable	A variable related to the explanatory variable that may create a false perception of association

Part 1: Introduction [0:00–0:27]

Today we will learn:

1. What is the difference between a _____ and a _____?
2. What is the difference between an _____ and an _____?
3. What types of _____ can we draw from different types of studies?

Part 2: Abraham Wald's Airplane Problem [0:27–3:17]

4. During World War II, Abraham Wald worked with the Statistical Research Group. Soldiers made bullet hole charts for the planes that came back and asked Wald where to put extra _____.
5. Wald's key insight: The planes they could chart were only the ones that _____.

Name: _____ Period: _____

6. These bullet holes show locations where planes can take hits and still _____. So armor should go where you see the _____ hits.

7. In this example:
   - The **population** was: _____
   - The **sample** was: _____

8. A sample is always a _____ of the population.

9. Were the sampled hit locations representative of the population? _____
   Why not? This was a _____ sample—only the planes that made it back safely were included.

Part 3: Generalization Rules [3:17–3:57]

10. It is only appropriate to make generalizations about a population based on samples that are:
    - _____ or otherwise representative
    - Selected from _____ population

11. Example: If we observe a representative sample of lima beans that grow quickly in humid climates, we _____ infer that black beans would also grow quickly, because our sample was not taken from the population of black beans.

Part 4: The Racial Income Gap [3:57–5:36]

12. Data from the 2018 Current Population Survey:
    - White households median income: $70,642
    - Black households median income: $58,665
    - Difference: _____ per year

13. Over 45 years (a typical career), this difference totals about _____.

14. Possible causes of the gap include:
    - **Social factors:** inequity of schools, _____
    - **Current, direct discrimination:** _____

15. These potential causes are called _____ variables. It's hard to determine which factor is truly responsible from observed data alone.

16. This survey is an _____ because it was taken *without imposing treatments* on individuals. Therefore, we _____ infer cause and effect.

Name: _____ Period: _____

Part 5: Types of Observational Studies [5:36–6:10]

17. A **retrospective** study examines _____ data on individuals.

18. A **prospective** study follows a sample of individuals _____.

19. The income gap study was _____ because it examined past/current data.

Part 6: The Résumé Experiment [6:10–7:47]

20. Researchers sent identical résumés to employers, _____ assigning either a commonly white name or a commonly Black name.

21. They measured the aggregate _____ for both groups.

22. This is an example of an _____ because different conditions (treatments) are _____ upon subjects.

23. In this study, the "treatment" was the _____ imposed on employers.

24. If this study is well designed and executed, it _____ determine a causal relationship.

Comparing Study Types

	Observational Study	**Experiment**
Treatments imposed?		
Can determine causation?		
Example from video		

Part 7: Key Takeaways [7:47–8:12]

Complete the main takeaways from the video:

25. A sample is a _____ of a population.

26. We cannot infer _____ relationships from observational studies.

27. We can generalize from samples that are _____ or otherwise representative of the population.

Name: _____ Period: _____

28. When analyzing data: Be critical, be cautious, be compassionate, and avoid BS—_____!

Part 8: Post-Video Reflection

29. **Connecting to the Big Idea:** In your own words, explain why we cannot determine cause and effect from an observational study. What would need to change to allow causal conclusions?

30. **Identifying Key Elements:** For the résumé experiment:
    - What were the **experimental units**? _____
    - What was the **treatment**? _____
    - What was the **response variable**? _____

31. **Real-World Application:** A news headline claims: "Study shows that drinking coffee leads to longer life." What questions would you ask to determine if this claim is justified?

32. **Looking Ahead:** The video mentions that random selection is important for generalization. What do you think *random assignment* is important for in experiments?

Exit Ticket

In 1–2 sentences, explain the key difference between an observational study and an experiment, and why that difference matters for the conclusions we can draw.

Name: _____ Period: _____