

Topic 3.4: Potential Problems with Sampling

What can go wrong when we collect data?

Video Follow-Along Worksheet

Learning Objective (DAT-2.E): Identify potential sources of bias in sampling methods.

Essential Knowledge: Bias occurs when certain responses are systematically favored over others. Non-random sampling methods introduce potential for bias because they do not use chance to select individuals.

Key Vocabulary

Bias	A systematic tendency to favor certain responses over others
Undercoverage bias	When part of the population has a reduced chance of being included
Nonresponse bias	When individuals chosen for a sample do not respond, and they differ from respondents
Voluntary response bias	When volunteers who choose to participate differ from those who don't
Response bias	Problems in data gathering, including confusing/leading questions or self-reported responses

Part 1: Introduction

[0:00–0:29]

1. Today's video discusses potential sources of _____ in sampling methods.
2. We will learn how sampling methods can lead to _____ or _____.

Part 2: College “Success” Data Example

[0:30–2:21]

3. A college pamphlet claimed: “Based on a random sample of recent graduates, about _____% of our former students are working full time in the career of their choice!”
4. The key phrase to notice is that they sampled “recent _____”—they only included students who actually graduated!
5. Using IPEDS data, only _____% of incoming freshmen graduated within 6 years.
6. So 99.7% of that 40% had good outcomes. But the other _____% who didn't graduate were excluded entirely.

Part 3: Defining Bias and Undercoverage

[2:22–2:43]

7. **Bias** is a _____ tendency to favor certain responses over others.
8. **Undercoverage bias** occurs when part of the _____ has a reduced chance of being included in the sample.
9. In the college example, the students who didn't graduate were _____ from the sample.

Part 4: Nonresponse Bias Example

[2:43–3:27]

10. A university reported that 85% of students secured paid internships. They collected this data by randomly selecting students and sending them a _____.
11. Only _____% of those students actually responded to the survey.
12. **Nonresponse bias** occurs when individuals chosen for a sample don't _____, and these individuals _____ from those who did respond.

Part 5: Model Response Strategy for FRQs

[3:27–4:54]

When writing about bias on free-response questions, follow these three steps:

13. **Step 1:** Identify the _____ and the _____.
14. **Step 2:** Explain how sampled individuals might _____ the general population.
15. **Step 3:** Explain how this leads to an _____ or _____.

Applying the 3-Step Model: Internship Example

Step 1: Population: _____ Sample: _____

Step 2: Students without paid internships may be _____ and disproportionately choose not to respond.

Step 3: Because students without internships respond less often, 85% may be an _____ of the true percentage.

Part 6: Voluntary Response Bias

[4:54–5:42]

16. Voluntary response bias occurs when invitations are sent to _____ individuals, and those who choose to participate (_____) may differ from those who don't.
17. **Example:** You want to estimate the percentage of people who enjoy running. You post an ad for a “_____ study” and survey the people who respond.
18. This would likely _____ the true proportion who like running because volunteers are more likely to already enjoy running.

Part 7: Survey-Specific Bias

[6:11–6:56]

19. **Question wording bias** occurs when survey questions are _____ or _____.
20. **Self-reported response bias** occurs when individuals _____ report their own traits.
21. *Important advice:* If you're unsure which specific type of bias to name on an FRQ, just _____ how the bias arises and whether it leads to an over or underestimate.

Part 8: Key Takeaways

[6:56–7:23]

22. Bias arises when certain responses are _____ favored over others.
23. When describing bias, explain how the _____ may differ from the _____ and the resulting _____ of bias.
24. When analyzing data: Be _____. Be _____. Be _____.

Part 9: Post-Video Reflection

25. **Connecting to the Big Idea:** In your own words, explain why non-random sampling methods tend to produce biased results.
26. **Identifying Key Elements:** For the college “success” data example:
 - What was the **population** of interest? _____

- What was the **sample**? _____
- What **type of bias** was present? _____
- Did this lead to an over- or underestimate of success? _____

27. **Real-World Application:** Create your own example of a study that could have nonresponse bias. Identify the population, sample, and explain why certain people might not respond.

28. **Looking Ahead:** In experiments, researchers use random *assignment* rather than random *selection*. Why might random assignment help avoid confounding variables? (Topic 3.5!)

Exit Ticket

In 1–2 sentences, explain the most important thing to include when describing bias on an AP Statistics free-response question.