

Topic 3.1: Introducing Statistics

Do the Data We Collected Tell the Truth?

Video Follow-Along Worksheet

Learning Objective (VAR-1.E): Identify questions to be answered about data collection methods.

Essential Knowledge: Methods for data collection that do not rely on chance result in untrustworthy conclusions.

Key Vocabulary

Population	The entire group of individuals we want information about
Sample	A subset of the population from which we actually collect data
Bias	When certain responses or individuals are systematically favored over others
Survivorship Bias	A type of bias that occurs when we only analyze data from subjects that “survived” or made it through some selection process

Part 1: Introduction & Learning Goals

[0:00–0:30]

According to the video, what three questions will we explore in this lesson?

1. What _____ may arise when we collect samples?
2. How does the way we _____ inform our analysis of that data?
3. What should we be _____ of as we collect data?

Part 2: Abraham Wald—A Statistical Hero

[0:30–2:05]

4. Abraham Wald worked for the _____, a group of mathematicians and statisticians who helped the _____ forces during World War II.
5. Wald was a _____ Jew who immigrated to the United States in _____ to escape persecution in Europe.
6. Many of Wald's own family members were sent to _____.

Name: _____

Period: _____

7. *Reflection:* Why does the narrator mention Wald's personal background and motivations? How might this context matter when we think about his statistical work?

Part 3: The Airplane Problem

[2:05–3:04]

8. The British military had a problem: they were sending _____ over Nazi Germany, and many were being _____.
9. They wanted to add heavy, bullet-resistant _____ to reinforce the planes, but they could only put it in _____ place because adding too much would make the plane less _____.
10. To decide where to put the armor, soldiers made _____ for the planes that _____ from bombing missions.

Part 4: Pause and Think

[3:04–3:32]

The video shows bullet hole patterns on planes that returned from missions.
Look at the diagram—the blue dots show where bullet holes were found.

11. Based on what you see in the diagram, where do most of the bullet holes appear?
12. Where are there *very few* bullet holes?
13. **Your initial instinct:** Where would YOU put the extra armor, and why?

Part 5: Wald's Key Insight

[3:32–4:31]

14. The critical insight Wald had was about the _____ in which the data was collected.
15. The planes in the sample were only the ones that _____ from their bombing missions.
16. The bullet holes we see mark places where planes can take hits and still _____!
17. So where should the armor actually go? In the places where we _____ see bullet holes—because those might be the _____ spots.
18. The planes that are NOT in our sample are the ones that were _____. We can't see their data because they never made it back.

The Logic of Survivorship Bias

What We See	What It Means	What We Should Do
Bullet holes on wings and body	These areas can survive damage	Don't add armor here—planes survive hits here
No bullet holes on engines/cockpit	Planes hit here didn't return	Do add armor here—these are vulnerable spots

Part 6: Key Takeaways

[4:49–5:12]

Complete the three main takeaways from the video:

19. A proper analysis of data must take into account _____.
20. Sometimes, our samples may not be _____ of the whole _____ we're looking at.
21. The narrator's motto for statisticians: "Be _____, Be _____, Be _____. And of course, avoid _____ (_____)."

Part 7: Post-Video Reflection

22. **Connecting to the Big Idea:** In your own words, explain why the method of data collection matters when analyzing data.
23. **Identifying the Bias:** The Wald airplane problem is an example of *survivorship bias*. In this case:
- What was the **population** of interest? _____
 - What was the actual **sample**? _____
 - Who/what was **missing** from the sample? _____
24. **Real-World Application:** Can you think of another situation where survivorship bias might occur? Describe a scenario where only looking at “survivors” would lead to incorrect conclusions.
(Hint: Think about successful companies, college graduates, famous musicians, etc.)
25. **Looking Ahead:** Unit 3 is all about *collecting data*. Based on this video, what questions should we always ask ourselves when we see statistical data or research findings?

Exit Ticket

In one or two sentences, explain the main lesson from the Wald airplane problem: