

## ACTIVITY 1: Worksheet Answers

### Example 1

Read the quote from the Boston Globe and answer the questions that follow.

**‘It’s impossible to ignore this anymore’: CTE study details devastating toll on football players.**

*Boston researchers who studied the brains of 202 deceased football players published the most detailed portrait to date Tuesday of the devastation wrought by a degenerative brain disease linked to repeated blows to the head, a grim tally they hoped removes any final doubts of the severity and long-lasting damages it causes.*

*In Tuesday’s Journal of American Medical Association, a team from the Boston University School of Medicine and VA Boston Healthcare System documented the troubling behavior, disturbed moods, and impaired thinking in people who had chronic traumatic encephalopathy, or CTE.*

*Among the 111 National Football League players whose brains were donated for the study, all but one was found to have the disease.<sup>1</sup>*

### Questions:

- a) What do you think is the intended population of this study based on the article? Why?

The article mentions that researchers studied the brains of 202 deceased football players but does not specify how these brains were selected. Therefore, based on the information provided in the article, it appears that the intended population for the study is all football players.

- b) Does it alarm you that out of 111 brains of National Football League players, all but one was diseased? Explain your answer.

The numbers do appear quite alarming. According to The Boston Globe, the implications of CTE linked to repeated blows to the head paint a grim picture. They highlight a particularly alarming statistic: 'All but one of the 111 brains donated by National Football League players for the study were found to have the disease.'

- c) Based on this article, do you know whether the 111 brains are a representative sample of brains from all football players? Explain your answer.

The article states that the brains of deceased football players were donated for the study. Other than that, no other information is given.

1) Staff, Felice J. Freyer Globe, et al. “It’s Impossible to Ignore This Anymore”: CTE Study Details Devastating Toll on Football Players - the Boston Globe.” *BostonGlobe.com*, <https://www.bostonglobe.com/metro/2017/07/25/boston-study-takes-deep-look-brain-disease-toll-football-players/nblZoCfstF4FNwfslnwCPI/story.html>.

### **Example 1 (cont.)**

**READ THE FOLLOWING STATEMENT BEFORE ANSWERING THE QUESTIONS BELOW.**

According to the article, “Biased Survey Samples in CTE Study of NFL Brains – Lessons for Surveying”<sup>2</sup>, it was found that the population of the original CTE study only included the brains of people who displayed neurological symptoms while alive.

Note: In this context, “survey sampling” refers to the process of selecting units/individuals and recording data about those units/individuals.

#### **Questions:**

- d)** What was the actual population for the original CTE study and how does it differ from the population inferred by the Boston Globe article?  
The actual population of brains only included people with symptoms whereas the Boston article made it appear as if the actual population was all NFL players or even all football players. They were throwing a lot of numbers around.
- e)** Based on the additional information, are you less alarmed by the study? Explain your answer.  
It makes me a lot less alarmed because only the brains of NFL players who had experienced symptoms while alive were part of the study. If the brains came from a representative sample of football players, the game should probably be banned.
- f)** The researchers of the original study clearly stated how the brains were selected. Do you think the news article implied the results extended beyond the intended population? Explain your answer.  
Yes. They implied the results extended beyond the intended population. They did this by omitting the information on which brains were analyzed. The fact that the brains came from individuals who had experienced neurological symptoms while alive is important information for correctly understanding the study.
- g)** From this example, what needs to be clear when you read an article that contains statistics?  
It is very important that the population from which the data was selected is clearly stated in the study. You also need to know how they selected the sample from that population to know whether it is representative.

As part of the class-wide discussion, it is recommended that the instructor initiates a list of critical components for accurate research. From the CTE example, the class should learn the significance of a representative sample and understand that a representative sample closely mirrors the characteristics of the entire population. To find a representative sample, it is important to have a well-defined population.

2) “Biased Survey Samples in CTE Study of NFL Brains -- Lessons for Surveying.” *Great Brook Consulting*, 22 Sept. 2017, <https://greatbrook.com/biased-survey-samples/>.

## Example 2

Ann Landers asked her readers in 1975 whether they would still have children if they could start their marriages over. To her surprise, 70% responded by saying they would not. She received responses from at least 10,000 readers.

When Good Housekeeping asked readers to respond to Ann Lander's survey results, 95% of their readers said they still would have had children.<sup>3</sup>

### Questions:

- a) Do you think that both Ann Landers and Good Housekeeping posed the question in the same way? Explain your answer.

*It is highly unlikely that they phrased the question in the same way, given the very different results.*

- b) Ann Lander's readers were responding to a letter that read:

*"My husband and I have been married for a year and are undecided as to whether or not we should have children. Do people in their 50s, 60s, and 70s regret not having had children when they were young? ... I've heard some couples say they wish they had never had children — that their lives were beautiful until the kids came along and ruined everything."*

How do you think the letter above impacted who responded to Ann Lander's appeal?

*The statement "I've heard some couples say they wish they had never had children", will most likely solicit responses from likeminded couples who want to vent. Therefore, those who hold negative views about parenthood are more likely to respond.*

- c) The Good Housekeeping article included the following when soliciting responses.

*"To (Landers') horror, seventy percent said that if they had known then what they know now, they would not have children."*

How do you think the wording of Good Housekeeping's article impacted who responded?

*The statement "To (Landers') horror,...." will dissuade those who feel negatively to respond. As a result, it is more likely that those who are "horrified" by the statistics will respond to this survey.*

3) Schlueter, Roger. "If You had it to do over Again, would you have kids?" *Answer Man*, Belleville News-Democrat, 6 Apr. 2006, <http://www.bnd.com/living/liv-columns-blogs/answer-man/article75646392.html>. Accessed 12 June 2024.

- d) Use Google to figure out how the readership might be different for Ann Lander's column versus the Good Housekeeping article. Do you think this might impact the responses? Why or why not?

Because Ann Landers was an advice columnist, her readers consisted primarily of people seeking help. Consequently, they most likely were struggling with parenting and would thus feel negative about it.

Good Housekeeping most likely had a readership of more women who had the time to focus on being homemakers and raising their children.

- e) Both surveys are considered voluntary response surveys, meaning that people can choose whether they respond. People with what type of opinions will generally respond to such surveys?

Typically people with strong opinions are more likely to respond, voluntary response surveys provide them with an outlet to express and vent their feelings.

- f) In a national survey based on a random sample of 1,373 respondents, 91% said they would have children if they had it to do over again.<sup>3</sup> Do you think the results of this study are more accurate? Do you think that we can fully trust this number? Why?

I would still be somewhat skeptical as many people do not respond to those types of surveys. It would be important to know if there was potentially a difference between those who responded and those who did not. Furthermore, in a nationwide survey, it is possible to randomly select more people of one view as opposed to another just due to random chance.

- g) What have you learned from this example in terms of the information you need to know when reading statistics?

When surveying people, it is important to know whether the questions were neutral or solicited a certain response. Furthermore, how the sample was selected is of vital importance.

In the class-wide discussion, the instructor needs to mention the importance of neutrally worded surveys, as well as the use of randomization as opposed to a convenience sample when selecting samples.

**Random sampling** is a sampling method that allows for the randomization of sample selection and can prevent bias.

It should also be emphasized that with random sampling, one can still get inaccurate results if the sample selected favors one side of the population over the other due to chance. This however is not considered bias, but sampling error which will be discussed more in a later lesson.

3) Schlueter, Roger. "If You had it to do over Again, would you have kids?" *Answer Man*, Belleville News-Democrat, 6 Apr. 2006, <http://www.bnd.com/living/liv-columns-blogs/answer-man/article75646392.html>. Accessed 12 June 2024.

### **Example 3**

Read the paragraph below and answer the following questions.

*“In 2007, Colgate was ordered by the Advertising Standards Authority (ASA) of the U.K. to abandon their claim: ‘More than 80% of Dentists recommend Colgate.’ The slogan in question was positioned on an advertising billboard in the U.K. and was deemed to be in breach of U.K. advertising rules.”<sup>4</sup>*

#### **Questions:**

- a) When you read the advertisement, does it give you the impression that 80% of Dentists recommend Colgate over other brands of toothpaste? Why?

Yes. One automatically assumes that dentists could recommend only one toothpaste.

- b) The original survey allowed dentists to select one or more toothpaste brands. Does this change how you interpret the advertisement? Why or why not?

Yes. It is less impressive. In fact, 90% of dentists could recommend Crest, 100% Sensodyne, etc. It could mean that only 80% of dentists recommend toothpaste in general.

- c) Do you think it was correct of the U.K. to order Colgate to abandon their claim even though they did not technically lie? Why or why not?

I think that the U.K. was correct in ordering Colgate to abandon its claims. Most people will automatically assume that 80% of dentists recommend Colgate over other brands of toothpaste because no context was given to the claim in the advertisement.

- d) From this example, what do you think you need to pay attention to when you read articles that contain statistics?

It is important to understand the context of the claim and how the survey was conducted and worded.

During the class-wide discussion, the instructor should emphasize the need to understand the context in which the data was collected. In this case, the dentists could choose more than one toothpaste which was not clear in the statistics presented.

Moreover, the importance of wording should be emphasized. The instructor will also introduce the word bias.

**Bias** occurs when the data collected systematically distorts the truth.

Students will be told that different types of bias will be presented in the next lesson.

4) Calzon, Bernardita. “Misleading Statistics – Real Life Examples of Data Misuse.” *BI Blog | Data Visualization & Analytics Blog | Datapine*, 6 Jan. 2023, <https://www.datapine.com/blog/misleading-statistics-and-data/>.

#### **Example 4**

Faulty Polling – The way questions are phrased can have a huge impact on the way they will be answered.

#### **Questions:**

- a) Do you think that the following questions concerning government assistance will have a persuasive effect on those responding? Explain your answer.
- “Do you believe that you should be taxed so other citizens don’t have to work?”<sup>4</sup>  
This wording implies that people choose not to work out of laziness, or because they will be supported by the government. This could influence voters to oppose taxes supporting unemployment benefits.
  - “Do you think that the government should help those people who cannot find work?”<sup>4</sup>  
This wording evokes feelings of empathy towards those who are unable to find employment, potentially influencing voters to support taxes that fund unemployment benefits.
- b) What would be a more neutral question to replace the two above?  
Do you think the government should provide unemployment benefits to its constituents?

In the class-wide discussion, the importance of wording should again be emphasized.

4) Calzon, Bernardita. “Misleading Statistics – Real Life Examples of Data Misuse.” *BI Blog | Data Visualization & Analytics Blog | Datapine*, 6 Jan. 2023, <https://www.datapine.com/blog/misleading-statistics-and-data/>.

### Example 5



- a) The statement “Up to 100% leakproof gap-free fit” is circled on the Pampers above. Why do you think the “up to” part is in smaller print than the 100% leakproof? They are hoping you will just notice the 100% leakproof part and be extremely impressed by the diapers.
- b) What does “up to 100%” mean? It means that it could be 100% leakproof, but it could mean that for some babies, the diaper will only be 10% leakproof, which would be extremely frustrating.
- c) What can you learn from this? Always read the fine print before you believe something and make sure you understand what the numbers are really saying as opposed to going with your first impression.
- d) Have you seen similar advertisements or signs that use this tactic? If so, where? Yes. In retail stores, they often say that clearance is “up to” a certain percentage off.

## **Overall Takeaways**

Based on these studies, what questions do you think you should ask yourself when reading statistics online?

1. What is the population they are extending the data to?
2. Is it clear how they selected the units/individuals from which the data was collected (sample)?
3. Is the sample representative of the entire population?
4. If people were surveyed, how were the questions asked? Were they clear and neutral?
5. Who did the study? Was it a neutral party or someone who has a vested interest in the results?