In volleyball, timeouts are often called by teams when they are losing a set. By analyzing NCAA Division 3 Liberty League Conference Volleyball data from the 2013-2022 seasons, we can examine the impact of calling a timeout on winning a set. This data contains 2781 sets in which a time out was called.

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1. Suppose you are interested in finding out the chance of winning a set if your team was losing before the final timeout of the set.
2. Identify the information you would need from a set to address this question. (These would represent the observations and variables you would need from a data set.)
3. Based on the sample described in the first paragraph, identify a population from which this sample could be considered representative.
4. Suppose that you are interested in the percentage of times a team wins if they call the final timeout in a set (from the 2781 sets we have data on). Would this quantity be a statistic or parameter? Explain.
5. What is a possible parameter that we can learn about based on your answers to b) and c)?
6. In 222 out of 2781 sets, the team calling the final timeout ended up winning. Given this data, what is our estimate of the team winning a set after they call the last timeout of the match?
7. If we were to take another sample of 2781 sets in which a timeout was called (e.g., perhaps by looking at a different conference), would we necessarily get the same estimate? Briefly explain.
8. Now, construct a 95% confidence interval for the proportion of team that win a set after calling the final timeout.
9. Provide an interpretation for the resulting interval. Be sure to provide context that someone familiar with volleyball, but not statistics could understand.

**Discussion Questions**

1. Brainstorm some ideas as to why the chance of winning after calling the last timeout is so low.
2. When looking at only the first timeout of the set, we see that the team that called the (first) timeout has a substantially higher chance of winning the game than they would have after the last timeout. More specifically, the team that called the first time out won 532 of the 2781 sets. (This results in a 95% confidence interval of approximately (0.177, 0.206).) Why do you think that calling a timeout earlier in a game has a higher chance of winning?
3. Brainstorm several other research questions related to the impact of timeouts in volleyball that one might be able to address with point-by-point volleyball data.