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 scoring a point or ultimately winning a set.

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**1. What would an appropriate research question be, based on the previous information?**

Does calling a timeout at a specific time in a game significantly increase the probability of winning a set?

**2. Suppose you are interested in finding out the probability of winning a set if your team was losing before the final timeout of the set.**

1. **In words identify the observations.**

Observations in this data would be each timeout in a set. It would include information about the score, and the timeout number within the set.

1. **Identify the variable of interest.**

The losing team and weather they win the set

1. **If it is categorical, identify the levels. If it is numerical, identify the units.**

There would be a categorical variable of interest, which would be the outcome of the set after the last timeout was called. You would have 2 levels, losing the game or winning the game.

**3. Identify a population from which this sample is representative.**

This is representative of division three volleyball

**4. Suppose that you are looking at the percentage of times a team wins a set after calling a timeout. Would this quantity be a statistic or parameter? Explain.**

This is a statistic because it is calculated from a sample of data (2013-2022 seasons).

**5. Based on this statistic, what is a possible parameter that we can infer?**

The proportion of all volleyball sets in NCAA Division 3 Liberty League matches where the losing team wins the set after the last timeout. This is a parameter because it represents the characteristic of the entire population of volleyball sets.

**6. Now, assume that it is reported that in 214 sets out of 2718 total sets, the losing team won the set after the last timeout was called. Given this data, what is our estimate of the losing team winning a set after the last timeout is called?**

p^= 214/2718 = 0.0787

About 7.87% chance that the losing team wins a set after the last timeout of the set is called.

**7. If we were to take another sample of matches (e.g., look at a different conference), would we necessarily get the same estimate?**

No, since each sample may vary due to different teams, situations, and strategies during matches. However, with a sufficiently large and random sample, we expect our estimate to be close to the true parameter.

**8. Construct a 95% confidence interval for the proportion of losing teams winning a set after the final timeout.**

We know p^ = 0.0787

Standard Error = = 0.005164915

z = 1.96

Margin of Error = 1.96\*0.005164915 = 0.0101

95% CI = (0.0686, 0.0888)

**9. Provide an interpretation for the resulting interval.**

With 95% confidence, the probability that the losing NCAA women’s volleyball team will win the set after the final timeout is called is between 0.0686 (6.86%) and 0.0888 (8.88%).

**10. Why would a team call a timeout if the chances of the losing team winning the game after the last timeout are so low?**

Even though the chances of winning are low, calling a timeout may allow for a higher chance of winning the game than if no timeout were called and teams may be able to better plan and score after a timeout is called.

**11. When looking at only the first timeout of the set, we see that the losing team before the timeout has a significantly higher chance of winning the game than they would have after the last timeout (about an 18% +/- 0.956% chance of winning the game). Why do you think that calling a timeout earlier in a game increases the chances of winning?**

Calling an earlier timeout allows teams to have more time to make back the points they lost, so it makes sense that the chances of winning would increase if you call timeouts earlier in the game rather than later.