

**Statistical Studies: Statistical Investigations**III.A Student Activity Sheet 3: Margin of Error

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Recall the study from Student Activity Sheet 1 (Question 19) that analyzed scalp hair samples from 22 participants with epilepsy and 23 participants without epilepsy, checking for differences in levels of copper, iron, zinc, magnesium, and calcium. The results are summarized in the table below.

	Copper	Iron	Zinc	Magnesium	Calcium
Males, epileptic	14	6	211	329	947
Males, nonepileptic	19	9	200	259	960
Females, epileptic	10	7	218	444	1,143
Females, nonepileptic	16	15	218	505	1,162

Average trace element concentrations ( $\mu\text{g/g}$ ) in scalp hair

1. If it were possible to measure the presence of copper in the hair of *all* males with epilepsy in the world, do you think the average would be exactly  $14 \mu\text{g/g}$ ? Explain your thinking.
2. The journal article that contains the results of the study actually reports that males with epilepsy have an average of  $14 \pm 9 \mu\text{g/g}$  of copper in their scalp hair. What do you think  $14 \pm 9$  means in this situation?
3. The  $\pm 9$  is called the *margin of error*. This wording, however, does not mean that someone messed up the research. It simply means that no sampling method can guarantee that the sample exactly matches the population, but that the sampling techniques (when used correctly) can be trusted to give results that are accurate within a certain range.

Since the males with epilepsy in the sample showed an average of  $14 \mu\text{g/g}$  of copper in their scalp hair, the researchers are fairly confident that the true average copper concentration for all males with epilepsy in the study is between 5 and  $23 \mu\text{g/g}$ .

Have you ever seen a news report that mentions *margin of error*? What was the report about?

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Politician Paul and Candidate Carl are running for governor, and the election is next week. The latest poll shows that Politician Paul has 46% of the vote, while Candidate Carl has 43% of the vote. The news report, however, states that this poll contains a 3% margin of error.

4. What does this mean for Politician Paul?
  
5. What does this mean for Candidate Carl?
  
6. What do these poll results tell you about the upcoming election?

Recall the study from Student Activity Sheet 1 (Question 19) that tested the effect of replacing rabbits' soybean diet with *Gliricidia sepium* Leaf Meal (GLM). The rabbits were randomly assigned to receive either 0%, 5%, 10%, 15%, or 20% GLM. The resulting effect on weight gain is summarized in the table below.

	0% GLM	5% GLM	10% GLM	15% GLM	20% GLM
Weight gain	958 ± 40	887 ± 59	992 ± 24	972 ± 33	919 ± 44

Increase in weight during an eight-week period, measured in grams

7. Fill in the interval of the true mean weight gain for each treatment. Based on these results alone, what do you recommend to the farmers in the area? Why?

GLM	True Mean Weight Gain
0%	
5%	
10%	
15%	
20%	

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8. **REFLECTION:** Remember that increasing the concentration of GLM in the rabbit food decreases the cost of the food. Does this change your recommendation? Why or why not?
9. **EXTENSION:** Review an article about not trusting pollsters' interpretations and the need to see the actual questions. Write a short summary of the article. The following is one such article:

Leo, J. (1999, October 10). Polls and poll-emics. *U.S. News and World Report*.  
from [www.usnews.com/usnews/opinion/articles/991018/archive\\_002116.htm](http://www.usnews.com/usnews/opinion/articles/991018/archive_002116.htm).