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Sampling

3.3

Name: S. Hutton

1. What are the three most important things to find in any study?

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Replication	Random Assignment	Effective Sampling

2. What are the three sampling methods that we care about in this class?

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Random Sampling	Convenience Sampling	Voluntary Sampling

For the following case studies, identify the items requested.

3. **Water testing:** The water testing board of Manitoba wanted to measure the amount of lead in the water in a Winnipeg Elm Park apartment building. On October 12, 2023, they went to every 4th apartment after starting in a random place and took a water sample from the kitchen (for a total of 25 apartments). The amount of lead in the water was below detection level in all but 2 apartments.

a) Identify the problem unit.	Water sample from Apartment in Winnipeg Elm Park
b) Identify the plan unit.	Kitchen water sample on October 12, 2023, in Apartment in Winnipeg Elm Park, Manitoba.
c) Identify a limitation in diversity. (6)	Water only from kitchen
d) Identify the sampling technique.	Random sampling
e) How much Replication?	25
f) Did randomization occur? If so, where?	No.

5. **Brain Development**: Scientists wanted to know the effect of experience on human brain development. In 1972, two researchers at Harvard, Cambridge Massachusetts, raised 16 sets of baby rats in two environments: (a) an impoverished environment - one baby rat alone in its cage with only water and food (b) an enriched environment - 3 baby rats living together with many playthings that were changed daily. In 14 out of the 16 sets of rats, the rats in the enriched environment had significantly more cerebral cortex than the impoverished rats. Scientists concluded that early exposure matters in the brain development of humans.

a) Identify the problem unit.	Human Child
b) Identify the plan unit. (6)	Baby rat, 1972, Harvard, Cambridge Massachusetts.
c) Identify a limitation in diversity.	Well, it turns out rats aren't humans.
d) Identify the sampling technique.	Convenience? Unclear.
e) How much Replication?	32 rats
f) Did randomization occur? If so, where?	Yes. Rats assigned to (1) enriched environments (2) impoverished environment

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6. **Question wording:** In 1989, a researcher from the University of Alabama wanted to see the effect of question wording on the answers that people selected. 200 People who walked by the researcher's table at the University Mall in Tuscaloosa were randomly asked one of two questions: (1) would they consider having surgery with a 90% success rate or (2) Would they consider surgery with a 10% failure rate. People were 5 times as likely to say yes to the 90% success rate than to the 10% failure rate.

a) Identify the problem unit.	Human
b) Identify the plan unit.	Mall goer at University of Alabama, 1989 in Tuscaloosa, Alabama
5 c) Identify a limitation in diversity.	only one place, Alabama.
d) Identify the sampling technique.	Convenience
e) How much Replication?	200

Law of Large Numbers

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- Small samples yield extreme results more often than ...large..... samples do.
- Large samples are more precise than ..Small... samples.

7. A town is served by two hospitals. In the larger hospitals about 45 babies are born each day, and in the smaller about 15 babies are born each day. As you know, about 50% of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50%, sometimes lower. For a period of 1 year, each hospital recorded the days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days? [circle the correct answer]

1 (a) The larger hospital (b) The smaller hospital (c) About the same (within 5% of each other)

8. Imagine an urn filled with balls, of which 2/3 are of one colour and 1/3 of another. Individual A has drawn 5 balls from the urn and found that 4 were red and 1 was white. Individual B has drawn 20 balls and found that 12 were red and 8 were white. Which of the two individuals should feel more confident that the urn contains 2/3 red balls and 1/3 white balls, rather than the opposite? ..(B)..... Explain why below:

2 .....B...has...sampled...20,....A...has...sampled...5.....
.....The...larger...sample....is...more...accurate.....
.....

9. A study of the incidence of kidney cancer in the 3,141 counties of the United States reveals a remarkable pattern. The counties in which the incidence of kidney cancer is lowest are mostly rural, sparsely populated and located in traditionally Republican states in the Midwest, the South and the West. Briefly explain this phenomenon using the Law of Large Numbers.

2 .....The...rural,..sparsely..populated..areas..have..lower.....
.....samples....Thus,...they...have...more...extreme...results...
.....and...appear...to...have...higher...incidence...of...cancer.....

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