8.4 Sampling

SWBAT identify and apply methods of data collection for the purpose of statistical analysis.

For an event to be random, there is no predetermined pattern or bias toward any particular outcome.

Example 1: A class of 25 students wants to choose 3 students at random to bring food for a class party. Any set of 3 students would have an equal chance of being chosen. Which of the following strategies will result in a fair decision? Are these scenarios random? If not, explain.

a. The students line up alphabetically, and each one in succession flips a fair coin. The first three students to flip heads bring the food.

Not fair! This method favors students in the beginning of the alphabet to be chosen to bring treats.

b. Each student draws a card from a well-shuffled deck of 52 cards. The teacher shuffles a second deck of cards, spreads them out, and draws cards one by one until he matches the cards of the three students.

Random because every student has the same probability of being chosen

Example 2: A random number table contains randomly-generated digits from 0 to 9. You can use these numbers to model randomness for sampling purposes.

Random Digits						
87494	39707	20525	95704	48361	27556	34599
14164	15888	24997	82392	08525	47551	37304
61249	08241	16243	18371	03349	91759	53613
67868	56747	73521	05975	40411	49493	70904

A coach wants to select 3 of her 15 basketball players at random to lead warm-ups before practice each week. The coach assigns each player a number 01 to 15. How can the coach use the random number table to fairly choose the three players?

starting at the beginning, select two digits at a time, ignoring 16-99 and 00 until you have selected 3 players (07, 04, 12)

Simulations and Probability Models

You can use a simulation to assign probabilities to outcomes of a chance process.

Example 3: Suppose that you are playing a board game for which you must roll a 6 on a number cube before you are able to move your game piece from start. Describe a simulation you can use to predict the number of times you would expect to have to roll the number cube before you can move from start.

1/6 chance, at most should take you 6 tries.

Sampling Methods

Convenience Sample: Select any members of the population who are conveniently and readily available

Voluntary Response Sample: Select only members of the population who volunteer for the sample

Systematic Sample: Order the population and then select from it at regular intervals

Random Sample: All members of the population are equally likely to be chosen

Types of Studies

Observational: Members are observed or measured in such a way that they are not affected by the study.

Controlled Experiment: The sample is divided into two groups.

- A "treatment" is imposed on one group, but not on the control group.
- The effect of the "treatment" on the treatment is then compared to the control group.

Survey: Every member of the sample set is asked a set of questions

Bias: systematic error introduced by the sampling method.
EX: Only surveying a certain age group or excluding certain people with specific opinions

Example 4: What type of sampling method is used in each scenario? Is there any bias in each sample?

a. A service surveys every 25th listing in a local directory.

systematic sample bias: not every # in town may be listed

b. A reporter interviews people on the street in a large city.

Convenience sample bias: time of day can change who is on street

c. A radio station allows people to call in to give their answers to a survey.

Voluntary response sample bias: people who call may over/under represent views

Survey Questions

To create unbiased survey questions, avoid:

- Combining two or more issues, using double negatives, overlapping answer choices, words that cause strong reaction, leading the subject to an answer.

Example 5: Are the following questions bias? If they are, explain why.

a. Do you think that the food and beverages being served in the cafeteria taste good?

Bias → question discusses two topics → food & drink

b. Don't you agree that school days should be shorter?

Bias → leading question

c. Do you prefer watching exciting movies or reading dull books?

Bias → it uses words that cause a strong reaction (exciting & dull)