

1. The city council of a small town needs to determine if the town's residents will support the building of a new library. The council decides to conduct a survey of a sample of the town's residents. Which one of the following procedures would be most appropriate for obtaining a sample of the town's residents?

- ☐ A. Survey a random sample of librarians who live in the town.
- ☒ B. Survey a random sample of persons within each neighborhood of the town.
- ☐ C. Survey every 7th person who enters the old library on a given day.
- ☐ D. Survey 200 individuals who are randomly selected from a list of all people living in the state in which the town is located.

2. Define simple random sampling.

Choose the correct answer below.

- ☒ A. A sample of size n from a population of size N is obtained through simple random sampling if every possible sample of size n has an equally likely chance of occurring. The sample is then called a simple random sample.
- ☐ B. Simple random sampling is the process of using chance to select individuals from a population to be included in the sample. The sample is then called a simple random sample.
- ☐ C. Simple random sampling is the process of selecting individuals from a population using a convenient sample. The sample is then called a simple random sample.
- ☐ D. Simple random sampling is the process of obtaining a sample of size n from a population of the same size n . The sample is then called a simple random sample.

The most basic sample survey design is simple random sampling. A sample of size n from a population of size N is obtained through simple random sampling if every possible sample of size n has an equally likely chance of occurring. The sample is then called a simple random sample.

To obtain a simple random sample, typically, each individual in the population is assigned a unique number between 1 and N , where N is the size of the population. Then n distinct random numbers from this list are selected, where n represents the size of the sample. To number the individuals in the population, one needs a frame—a list of all the individuals within the population.

3. What does it mean when sampling is done without replacement?

Choose the correct answer below.

- ☐ A. Once a sample is taken, those individuals cannot be selected for any other samples.
- ☐ B. Once a sample is taken, those individuals are no longer considered part of the population.
- ☒ C. Once an individual is selected, the individual cannot be selected again.
- ☐ D. Once an individual is selected, the individual can be selected again.

The term "without replacement" refers to the current sample being taken and not future samples.

4. What does it mean when a part of the population is under-represented?

Choose the correct answer below.

- ☐ A. A part of the population is under-represented when it is proportionally smaller in its population than in a sample.
- ☒ B. A part of the population is under-represented when it is proportionally smaller in a sample than in its population.
- ☐ C. A part of the population is under-represented when their answers on a survey tend not to reflect their true feelings.
- ☐ D. A part of the population is under-represented when individuals selected to be in the sample who do not respond to the survey have different opinions from those who do.

When the answers on a survey tend not to reflect the true feelings of respondents, this is known as response bias.

5. Distinguish between nonsampling error and sampling error.

Choose the correct answer below.

- ☐ A. Nonsampling error is the error that results from the process of obtaining the data. Sampling error is the error that results from undercoverage, nonresponse bias, response bias, or data-entry errors.
- ☒ B. Nonsampling error is the error that results from undercoverage, nonresponse bias, response bias, or data-entry errors. Sampling error is the error that results because a sample is being used to estimate information about a population.
- ☐ C. Nonsampling error is the error that results from randomness. Sampling error is the error that results from using a sample to estimate information about a population.
- ☐ D. Nonsampling error is the error that results because a sample is being used to estimate information about a population. Sampling error is the error that results from undercoverage, nonresponse bias, response bias, or data-entry errors.

Nonsampling error is the error that results from the process of obtaining the data. Undercoverage, nonresponse bias, response bias, or data-entry errors are all types of nonsampling errors. Sampling error is the error that results because a sample is being used to estimate information about a population. This type of error occurs because a sample gives incomplete information about a population.

6. The manager of a shopping mall wishes to expand the number of shops available in the food court. She has a market researcher survey the first 100 customers who come into the food court during weekday afternoons to determine what types of food the shoppers would like to see added to the food court. Complete parts (a) and (b) below.

(a) The survey has bias. Determine whether the flaw is due to the sampling method or the survey itself. For biased surveys, identify the cause of the error.

What is the cause of the bias?

- ☒ A. Sampling bias
- ☐ B. Nonresponse
- ☐ C. Response bias

(b) Suggest a remedy to the problem.

Which of the following is the best way to remedy this problem?

- ☐ A. Reword the question so that it is balanced.
- ☒ B. Ask customers throughout the day on both weekdays and weekends.
- ☐ C. Increase the sample size so that more people respond to the question.

7. The survey has bias. (a) Determine the type of bias. (b) Suggest a remedy.

A polling organization conducts a study to estimate the percentage of households that have two incomes. It mails a questionnaire to 1243 randomly selected households across the country and asks the head of each household if he or she has two incomes. Of the 1243 households selected, 12 responded.

(a) Which of these best describes the bias in the survey?

- ☐ Response bias
- ☐ Sampling bias
- ☐ Undercoverage bias
- ☒ Nonresponse bias

(b) How can the bias be remedied?

- ☐ A. The polling organization should mail the questionnaire to a greater number of households.
- ☐ B. The polling organization should only select households in a single state.
- ☐ C. The polling organization should mail the questionnaire to each person in the households.
- ☒ D. The polling organization should try contacting households that do not respond by phone or face-to-face.

8. Suppose you are conducting a survey regarding empathy among children in a school district. You obtain a cluster sample of 19 schools within a school district and sample all sophomore students in the randomly selected schools. The survey is administered by the teachers.

(a) Which of these best describes the bias in the survey?

- ☐ Sampling bias
- ☐ Nonresponse bias
- ☐ Undercoverage bias
- ☒ Response bias

(b) How can the bias be remedied?

- ☒ A. The survey should be administered by an impartial party.
- ☐ B. The survey should include the teachers.
- ☐ C. The survey should include a greater number of schools.
- ☐ D. The survey should be administered to a random sample, not a cluster sample.

Sampling bias means that the technique used to obtain the sample's individuals tends to favor one part of the population over another.

Undercoverage bias occurs when the proportion of one segment of the population is lower in a sample than it is in the population.

Nonresponse bias exists when individuals selected to be in the sample who do not respond to the survey have different opinions than those who do.

Response bias exists when the answers on a survey do not reflect the true feelings of the respondent.

Does the sampling technique favor one part of the population over another?

9. Consider the two questions shown below.

- (a) What is the most important problem facing the nation?
- (b) Do you approve or disapprove of the way the president is handling his job?

Will the order in which the questions are asked affect the survey results? If so, what can the pollster do to alleviate this response bias?

Choose the correct answer below.

- ☒ A. Yes, question order will affect the survey results. The pollster should alternate the order of the questions given in the questionnaire so that different respondents receive questionnaires with the same questions but different question orderings.
- ☐ B. Yes, question order will affect the survey results. The pollster cannot do anything to alleviate this response bias.
- ☐ C. No, there is no obvious reason that question order would affect the survey results in this scenario.
- ☐ D. Yes, question order will affect the survey results. The pollster should try to make the questions more impartial.

Response bias exists when the answers on a survey do not reflect the true feelings of the respondent. In some cases, the order in which questions are asked affects the responses to those questions. Think about how the two given questions may be related and, if so, what the pollster can do so that responses are not affected by prior questions.

10. Suppose a surveyor wants to conduct a phone survey about a new song. He plans to take a simple random sample. However, some people have caller ID. Do you believe this can affect the ability of the surveyor to obtain accurate polling results? If so, how?

Choose the correct answer below.

- ☒ A. Yes, especially if the people who have caller ID have a trait that is not accurately represented by the remaining people in the sample.
- ☐ B. Yes, because it keeps the people who are less informed from introducing bias to the survey.
- ☐ C. Yes, because it allows the surveyor to better target his intended demographic.
- ☐ D. No, this does not affect the surveyor's ability to obtain accurate polling results.

For the results of a survey to be reliable, the characteristics of the individuals in the sample must be representative of the characteristics of the individuals in the population. If the results of the sample are not representative of the population, then the sample has bias.

11. Suppose that a newspaper predicted that Candidate A would defeat Candidate B in a certain election. They conducted a poll of automobile owners with a response rate of 24%. On the basis of the results, the newspaper predicted that Candidate A would win with 57% of the popular vote. However, Candidate B won the election with about 62% of the popular vote. At the time of this poll, most automobile owners belonged to the party of Candidate A. Name two biases that led to this incorrect prediction.

Choose the correct answer below.

- ☐ A. Nonresponse bias: The low response rate caused bias.
Response bias: The way the poll was administered showed bias.
- ☒ B. Sampling bias: Using an incorrect frame led to undercoverage.
Nonresponse bias: The low response rate caused bias.
- ☐ C. Sampling bias: Using an incorrect frame led to undercoverage.
Response bias: The way the poll was administered showed bias.