

- d. Because of the ease of choosing shoppers right in their own store, this is convenience sampling. In this case, convenience sampling is a viable method for gaining a representative sample since the store would be interested in knowing the thoughts of their customers.
 - e. Cluster sampling was used here because the counties are the natural clusters and all of the households in some of the counties received the surveys.
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Skill Check Answers

1. Answers will vary. For example: size of engine, manufacturer, make, safety rating, number of doors.
 2. No, since cluster sampling is an “all from one group” method, comparing mpg from cars in only certain price ranges would not produce a representative sample.
 3. The location of the entrance ramp might lend itself to having cars only on one end of the price scale depending on the businesses located in the area.
 4. No, although students in a given class represent a variety of different backgrounds, it is unlikely that everyone would drive a wide range of different types of cars, which would be representative of the population of cars driven in the United States.
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9.1 EXERCISES

✓ CONCEPT CHECK

Fill in each blank with the correct term.

1. A _____ involves gathering data from every member of a population.
2. A subset of a population is called a _____. _____ are numerical descriptors of characteristics of this subset.
3. A _____ is a particular group of interest in a statistical study. _____ describe numerical characteristics of this entire group.
4. A _____ does not favor one subgroup over another from a population.

 PRACTICE

Decide if each numerical value from a statistical study is a population parameter or sample statistic.

5. After the presentation by the United Way representative, 67 of the night's 300+ attendees were interviewed about their reaction. Of the 67 people interviewed, 79% said they were motivated to donate more of their time and/or money to helping nonprofit organizations.
6. The Nashville Country Music Marathon reported an average finish time of 4:46:28 for the 4082 finishers.
7. A medical study showed that the heart-rate profile during exercise and recovery is a predictor of sudden death. Of the 5713 men studied, the mean maximum heart rate during exercise (expressed as the percentage of the predicted maximum heart rate) was found to be 96% in subjects who died suddenly from cardiac causes during the 23 years of the follow-up period of the study.¹
8. An estimated 65% of drivers in rural or town areas view traffic conditions in a good light versus 39% of drivers in the city or suburbs based on a recent news report that aired nationally.

In each scenario, identify the population, the sample, and any population parameters or sample statistics that are given.

9. A medical study followed 675 cancer patients who received either the new drug *Lafent* or a standard chemotherapy drug. 76% of those who received *Lafent* were still living after eight months, compared to only 63% of those who received the standard chemotherapy drug.
10. US realtors across the country are encouraged by the latest reports on the real estate market. Taking into account seasonal factors, sales rose by nearly 9% in the West, 3.5% in the South, 3.4% in the Northeast, and 1% in the Midwest.
11. The online version of *Health* magazine, Health.com, reported the following: "Data from the Women's Health Study . . . examined the medical records of more than 36,000 women who had no history of depression at the start of the study. Roughly 18% of the women were experiencing some form of migraine or had suffered from the headaches in the past. Over the next 14 years, 11% of the study participants received a depression diagnosis." One of the conclusions of the study was that middle-aged women who experience migraines are 40% more likely to become depressed.²
12. In a recent study, US graduates of for-profit higher education institutions were between 4.8 and 6.7 percentage points more likely to be unemployed than graduates of nonprofit institutions and community colleges.³

¹ Xavier Jouven et al., "Heart-Rate Profile During Exercise as a Predictor of Sudden Death."

² Matt McMillen, *Health*, <http://www.health.com>

³ Dan Berrett, *The Chronicle of Higher Education*, <http://www.chronicle.com>

Identify the sampling technique used in each scenario.

13. To ensure the quality of its product, a company tests every 15th item off the assembly line.
14. A student committee in the biology department was formed by randomly choosing three biology majors from every level of student, that is, 1st year, 2nd year, etc.
15. In order to choose the winners of free tickets to the campus concert, student housing printed out all 60 pages of student IDs and then chose three of the pages randomly.
16. A candidate for the local school board surveyed parents picking up their children from the public school on three school days in the last month.
17. Surveying moviegoers as they exited the late movie, researchers determined that only young adults under the age of 22 see movies in the theater anymore.
18. In order to sample the production yield of milk from the farm's herd of cows, random samples are taken from each of the five different types of cows.
19. Using Excel to generate an arbitrary list of customers, the marketing department sent promotional materials to the top 250 names on the list.

APPLICATIONS

Determine an appropriate sampling method for each scenario. Give your reasons for choosing the method. Describe any potential biases that the researcher might need to consider.

20. A state senator wishes to survey his constituents on issues in the upcoming legislature session.
21. A pharmaceutical company wishing to test the outcomes of a new drug for a particular skin disease finds 1200 patients willing to participate in the study. They can only choose 100 of them for the actual study.
22. Medical scientists wish to evaluate the effects of vitamin E and low-dose aspirin in primary prevention of cardiovascular disease and cancer in apparently healthy women.
23. Researchers wish to study the effects of watching too much television at a young age for children diagnosed with autism.

WRITING & THINKING

24. Explain how cluster sampling is different from stratified sampling.

25. *Self-selected* samples are a type of convenience sampling in which the participants volunteer to participate in the study rather than being chosen by the researcher. One issue with this type of sampling is that people who “self-select” to be in a survey often either have very strong opinions about an issue or desire monetary rewards for their participation. For instance, consider online polls regarding political views that are conducted by popular news outlets. Describe some of the potential responses from those who take the time to log on and respond. Is it reasonable to generalize the results from a study like this to include all of the American public? Why?
26. Consider how you would collect data for a study of illegal immigrants working in the United States. How would you go about collecting the data? Is it possible to conduct a census on this population of people? How reliable do you think your results would be? Discuss any issues you might encounter.
27. Often words like “best” and “worst” are used in reporting data. However, descriptive words like these are hard to measure in a concrete way. Consider how you could measure small towns to compile a list of “America’s 50 Best Small Towns to Live In.” Name at least five distinct measurements.
28. Researchers try to eliminate as many biases in studies as they can in order to get a true picture of the population they are studying. Describe as many potential sources of bias as you can if you were asked to study the effects of alcohol on college campuses.