

-
1. For each of the following situations involving sampling, identify—as precisely as possible—the population that the sample represents.
- (a) A business school researcher wants to know what factors affect the survival and success of small businesses. She selects a sample of 150 eating-and-drinking establishments from those listed in the telephone directory for a large city.
- (b) A member of Congress wants to know whether his constituents support proposed legislation on health care. His staff reports that 228 letters have been received on the subject, of which 193 oppose the legislation.
2. A local radio talk-show host asks viewers to call in and vote for or against a proposed plan to raise the prices charged by municipal parking meters in a downtown shopping district. 75% of the respondents are opposed to the increase. Describe one possible source of error or bias that might arise in this poll and indicate the direction in which the estimate might be biased. What is the name for this kind of bias?
3. Two different organizations conduct polls in a city whose mayor has been accused of taking bribes. One poll asks a SRS of city residents, “Do you think the mayor should resign because of accusations of his criminal activity?” The other asks, “Do you think the mayor should resign?” The first poll concluded that the majority of city residents think the mayor should resign. The second poll drew exactly the opposite conclusion. Explain why their results might be so different.

4. Your school will send a delegation of 35 seniors to a student life convention. 200 girls and 150 boys are eligible to be chosen. If a sample of 20 girls and separate sample 15 boys are each selected randomly, it gives each senior the same chance to be chosen to attend the convention.

(a) Is it an SRS? Explain.

(b) Explain clearly how you would use your calculator to choose a sample of 20 girls for this study.

(c) Beginning at line 108 in the random digits table, reproduced below, select the first three senior girls to be in the sample. Explain your procedures clearly.

108	60940	72024	17868	24943	61790	90656	87964	18883
109	36009	19365	15412	39638	85453	46816	83485	41979
110	38448	48789	18338	24697	39364	42006	76688	08708

-
5. A family restaurant chain wants to test the market for a new menu item: a grilled chicken sandwich with chipotle salsa. They are interested in both how to market the item and the right price to charge for it. They decide to offer the sandwich at 60 different restaurants in the chain, using two different descriptions on the menu. Half the restaurants' menus will emphasize "healthy eating" and half will emphasize "value." These two groups of restaurants will be further divided in three groups, each charging either a High, Medium, or Low price for the sandwich. After a month, they will measure what proportion of customers order the new sandwich.
- (a) Suppose the company plans to conduct a completely randomized design. List the experimental units, factors, and treatments in this experimental design.
- (b) Suppose that 30 of the restaurants in the study are free-standing buildings and the other 30 are located inside malls. The company suspects that the different building types may have impact on how people respond to the advertising campaign and the price. How might they alter the design of this experiment to take this into account?
6. A college fitness center offers an exercise program for staff members who choose to participate. The program assesses each participant's fitness using a treadmill test, and also administers a personality questionnaire. There is a moderately strong positive correlation between fitness score and score for self-confidence. Explain why it would not be possible to conclude from this study that the exercise program increases one's self-confidence.

7. A medical study of heart surgery investigates the effect of a drug called a beta-blocker on the pulse rate of the patient during surgery. The pulse rate will be measured at a specific point during the operation. The investigators will use 20 patients facing heart surgery as subjects. Describe the design of a completely randomized, controlled experiment to test the effect of beta-blockers on pulse rate during surgery. Your answer should address all four basic principles of experimental design.

-
8. For each study described below, comment on the extent to which inferences can be drawn about a larger population and whether cause and effect can be established.
- (a) A football coach thinks lessons in yoga will improve the flexibility of his players and thereby reduce injuries. To test his theory, he randomly divides the players on the team into two groups. One group has 45 minutes of yoga training each day. The players in the other group do the standard stretching routine the team has used in the past. He compares flexibility in the two groups at the end of the experiment.
- (b) Does lack of sleep affect your academic performance? A student explores this question by asking everyone in his statistics class to write down on a piece of paper his or her score on a recent test and total number of hours of sleep he or she got on the last three nights before taking the test.
- (c) Does “Cold-Cut,” a popular over-the-counter cold remedy that claims to reduce the length and severity of colds really work? A consumer advocacy group addresses this question by asking a random sample of 400 adults how many colds they’d had in the last six months, how long each cold lasted, and if they took “Cold-Cut” to treat the cold.
9. Preliminary observational studies have linked consumption of caffeine during pregnancy to a higher incidence of miscarriages. It would be unethical to run a controlled experiment to establish cause and effect in this situation. Describe two ways in which researchers can seek to establish cause and effect that do not involve experiments.