

Using Different Sampling Methods

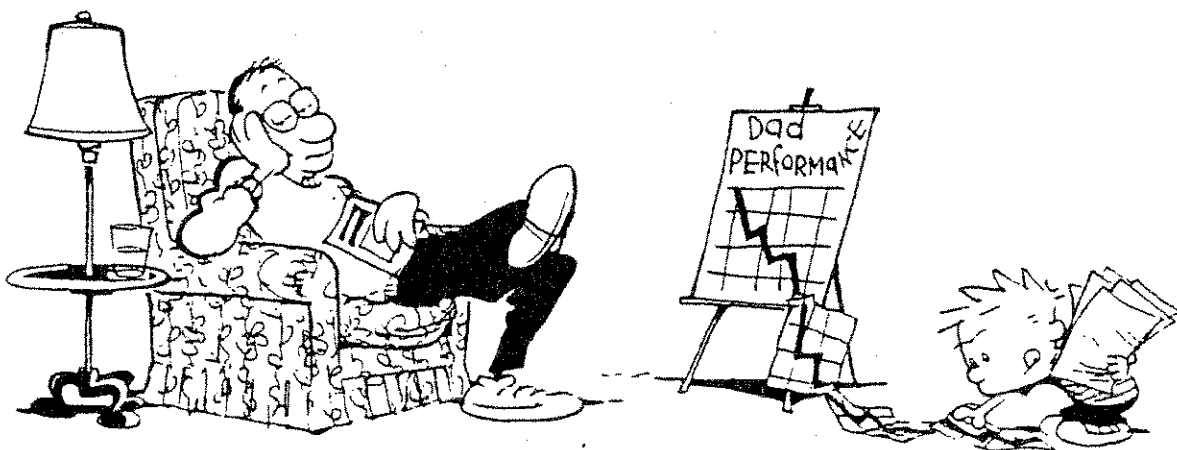
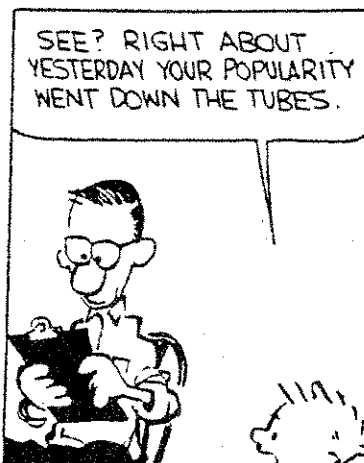
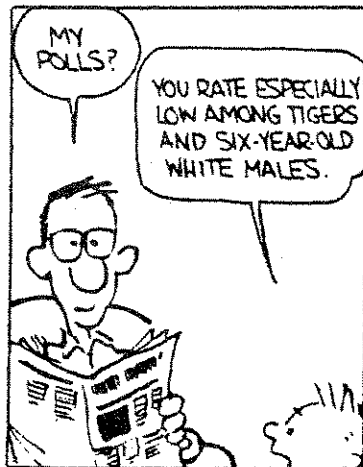
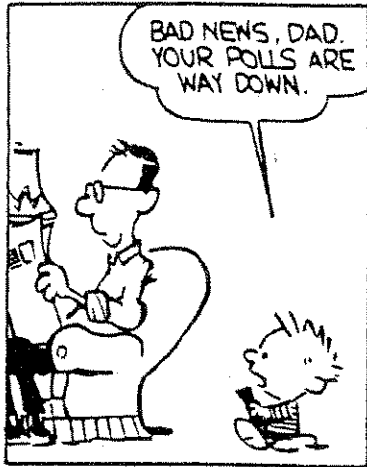
1. Describe how you would select a sample of 30 juniors from your school using the following methods.
 - a. random sampling
 - b. convenience sampling
 - c. sampling by self-selection
 - d. stratified random sampling
 - e. systematic sampling
 - f. cluster sampling
2. Retailers at the local shopping mall want to survey their Saturday customers about their satisfaction with the eating facilities within the mall. One merchant went to business school and learned about the importance of statistics, so he wants to obtain a random sample. He proposes the following method: Interviewers should stand at the center of the mall and select the first 100 people who walk by after 11:00 a.m. He believes this approach will provide a random sample because the interviewers will not exercise any decision over whether or not to include specific individuals in the sample.
 - a. What kind of sample would the merchant really get?
 - b. In what way might this sampling method be biased?
 - c. Describe how the merchant could modify this approach to use a version of systematic sampling.
 - d. If the retailer were to use stratified random sampling, what strata would you recommend that he choose?
 - e. How would you improve the merchant's sampling procedure?
3. The Educational Testing Service (ETS) needed a representative sample of college students. ETS first divided all colleges into groups of similar ones (such as public colleges with more than 25,000 students, small private schools, and so on). Then they used their judgment to choose one representative school from each group, thus obtaining the sample of schools. Each school in turn picked a sample of students (Freedman, Pisani, and Purves, *Statistics*).
 - a. ETS divided the colleges into strata but did not perform stratified random sampling. Explain.
 - b. Suggest ways to improve this sampling scheme.
4. Researchers wanted a representative sample of Japanese-Americans living in San Francisco. The procedure was as follows. After consultation with representative figures in the Japanese community, the four most representative blocks in the Japanese area of the city were chosen; all persons resident in those four blocks were taken for the sample. However, a comparison with Census data shows that the

sample did not include a high-enough proportion of Japanese with college degrees" (Freedman et al.).

- a. What kind of sampling did this study use?
 - b. Why do you suppose the sample did not have enough college graduates?
 - c. Can you think of a way to improve this sampling scheme? Can you think of a reasonable way to use random sampling to obtain the sample?
5. The headline on page 1 of an Illinois newspaper stated, "More people using drugs at work, survey reports." The article gave the following information: "The survey questioned 227 people who called the national [cocaine] helpline, chosen at random, during a six-week period in February and March Ninety-two percent of the callers said they sometimes worked while under the influence of drugs" (*Rockford Register Star*, March 25, 1985).
- a. What kind of sampling was used?
 - b. What population would you say this sample is drawn from?
 - c. Describe why this survey does not justify the claim made in the headline.
6. A newspaper article began, "Almost half of the USA's secretaries would rather work for a man than a woman, even though a male boss is more likely to ask them to clean the coffeepot, says a *Working Woman* survey" (*USA Today*, April 23, 1986). This is the result of a "poll of 1,100 readers in the magazine's May issue." Of these readers, 46% prefer to work for a man, 5% for a woman, and 49% say it doesn't matter.
- a. What kind of sampling do you think was used?
 - b. What population do the results apply to, according to the newspaper?
 - c. In what way might the sampling method be biased? (*Hint: What kind of secretaries would not read Working Woman?*)

ANSWERS 19

1. Answers will vary, but here are some possibilities:
 - a. Get a list of all juniors from the office, and number them from 1 to N. Use a random number table to get 30 values from 1 to N, and then select these students for the sample.
 - b. Go to a class or two that contains only juniors, such as certain English classes, and choose 30 students from them.
 - c. Go to the cafeteria and ask for 30 juniors to volunteer.
 - d. Use the list of all juniors from part a and modify the method used in part a to obtain 15 boys and 15 girls.
 - e. Use the list of all juniors from part a and N. If the list includes, say, 220 students, then we need a 1-in-7 sample. Choose a random digit from 1 to 7 and put that student in the sample. Then put every 7th subsequent student on the list in the sample until you have 30 juniors in the sample.
 - f. Suppose all juniors are enrolled in one of 12 English classes. Using a random number table, choose 5 of the 12 classes at random. Then randomly choose 6 students from each of these classes.
2.
 - a. Convenience sample
 - b. It might include more "wanderers" and fewer customers of the eating facilities. It would not include those who shop in the afternoon or at night.
 - c. The interviewers could stand at the entrances to the mall and select every, say, 25th person who enters. They should do this all day on several Saturdays.
 - d. Age of customer/sex of customer/income of customer
 - e. Answers will vary but could include the ideas suggested in parts c and d.
3.
 - a. ETS's sampling method was judgment sampling because it required using judgment. This method does not allow generalization to the population of students.
 - b. Use a random number table to choose a school in each group. Then have each school select a random sample of its students, with the sample size proportional to its number of students.
4.
 - a. ~~judgment sampling~~ cluster
 - b. Those with college degrees might live away from the "Japanese area."
 - c. This problem is difficult because it is unlikely that a list of all Japanese-American people exists. One possibility is to use census information to draw a simple random sample from the whole population in San Francisco and then keep only those who are Japanese-American in the sample.
5.
 - a. Convenience sampling (a self-selected sample)
 - b. Cocaine users
 - c. It is not a random sample of the population of workers, and the article provides no information about a similar study in the past to justify the claim of increased drug use. Moreover, a study of only cocaine users, such as this one, cannot possibly tell whether cocaine usage in the general population is increasing or decreasing.
6.
 - a. The article does not give enough information to determine the sampling method, but it implies that the sample was self-selected.
 - b. All U.S. secretaries
 - c. The survey is not likely to include male secretaries.



Homework 29.2: 5 – 8

5.
 - a. If the stereotype of fraternities (that excessive drinking is widespread) is true, this sample would be biased.
 - b. Stratified (random) sampling. The sample should be unbiased unless the samples from each group are not selected in some unbiased way (e.g., randomly).
 - c. If the two groups have about the same number of people, this sample should be all right. If not, the larger group would be underrepresented.
 - d. Although a stratified random sample, the choice of religious groups could bias the results about alcohol abuse. There is also the likelihood that the religious groups are of quite different sizes, so a quite small group would be overrepresented and a quite large group, underrepresented.
 - e. Convenience sampling. There could be a bias for several reasons: Do students patronize the student center because alcohol is served there? What time of day would the polling be done? What if, say, the sample is drawn right after a large class populated mostly by a group likely to include alcohol abusers?
6.
 - a. Stratified sampling. If the same number is selected from each of the three groups, teachers would be overrepresented and so there would be some bias if all questionnaires are put together as one sample.
 - b. Convenience sampling. Which door is used, one by an information booth already there, or one not close to an information booth? The time the sample is collected could possibly give a bias, if it is known that shoppers already familiar with the mall come mostly at that time.
 - c. This is an example of systematic sampling that is also self-selected. One source of bias is that questionnaires are more likely to be completed by unsatisfied students than by satisfied students. (6abc Instructor only)
7.
 - a. If an important decision that affects only a few people is to be made, all of the people should be polled. For example, a family is deciding on a vacation locale. Or, a new drug has been tried on only 12 people.
 - b. Any assembly-line product, or particularly troublesome parts of an assembly line.
 - c. If you want to know how people in a 15 block neighborhood feel about a new mall being planned for the neighborhood, you could randomly select three of the 15 blocks and then interview all of the residents of those blocks. The information gathered in this way should not be biased in any particular way.