AP Statistics   **Surveys and Sampling Methods**

1. Various claims are often made for surveys. Why is each of the following claims not correct?
a) It is always better to take a census than to draw a sample.
b) Stopping students on their way out of the cafeteria is a good way to sample if we want to know about the quality of the food there.
c) We drew a sample of 100 from the 3000 students in a school. To get the same level of precision for a town of 30,000 residents, we will need a sample of 1000.
d) A poll taken at our favorite Web site (www.statsisfun,org) garnered 12,357 responses. The majority said they enjoy doing statistics homework. With a sample size that large, we can be pretty sure that most Statistics students feel this way, too.
e) The true percentage of all Statistics students who enjoy the homework is called a "population statistic."

2. We need to survey a random sample of the 300 passengers on a flight from San Francisco to Tokyo. Name each sampling method described below.
a) Pick every 10th passenger as people board the plane.
b) From the boarding list, randomly select 5 people flying first class and 25 other passengers.
c) Randomly generate 30 seat numbers and survey the passengers who sit there.
d) Randomly select a seat position (right window, right center, right aisle, etc.) and survey all the passengers sitting in those seats.

For the following reports (3 - 5) about statistical studies, identify the following items (if possible). If you cannot tell, then say so—this often happens when we read about a survey.
a) The population
b) The sampling frame
c) The sample
d) The sampling method, including whether or not randomization was employed.
e) Any potential bias you can detect and any problems you see in generalizing to the population of interest.

3. Consumers Union asked all subscribers whether they had used alternative medical treatments and if so, whether they had benefited from them. For almost all of the treatments, approximately 20% of those responding reported cures or substantial improvement in their condition.

4. The Environmental Protection Agency (EPA) took soil samples at 16 locations near a former industrial waste dump and checked each for evidence of toxic chemicals. They found no elevated levels of harmful substances.

5. A company packaging snack foods maintains quality control by randomly selecting 10 cases from each day's production and weighing the bags. Then they open one bag from each case and inspect the contents.

6. In a large city school system with 20 elementary schools, the school board is considering the adoption of a new policy that would require elementary students to pass a test in order to be promoted to the next grade. The PTA wants to find out whether parents agree with this plan. Listed below are some of the ideas proposed for gathering data. For each, indicate what kind of sampling strategy is involved and what (if any) biases might result.
a) Put a big ad in the newspaper asking people to log their opinions on the PTA Web site.
b) Randomly select one of the elementary schools and contact every parent by phone.
c) Send a survey home with every student, and ask parents to fill it out and return it the next day.
d) Randomly select 20 parents from each elementary school. Send them a survey, and follow up with a phone call if they do not return the survey within a week.

7. An amusement park has opened a new roller coaster. It is so popular that people are waiting for up to 3 hours for a 2-minute ride. Concerned about how patrons (who paid a large amount to

enter the park) feel about this, they survey every 10th person on the line for the roller coaster, starting from a randomly selected individual.
a) What kind of sample is this?
b) Is it likely to be representative?
c) What is the sampling frame?

8. Two members of the PTA committee in question #6 have proposed different questions to ask in seeking parents' opinions.
Question 1: Should elementary school-aged children have to pass high stakes tests in order to remain with their classmates?
Question 2: Should schools and students be held accountable for meeting yearly learning goals by testing students before they advance to the next grade?

a) Do you think responses to these two questions might differ? How? What kind of bias is this?
b) Propose a question with more neutral wording that might better assess parental opinion.

9. Anytime we conduct a survey we must take care to avoid undercoverage. Suppose we plan to select 500 names from a city phone book, call their homes between noon and 4 p.m., and interview whoever answers, anticipating contacts with at least 200 people.
a) Why is it difficult to use a simple random sample here?
b) Describe a more convenient, but still random, sampling strategy.
c) What kinds of households are likely to be included in the eventual sample of opinion? Who will be excluded?
d) Suppose, instead, that we continue calling each number, perhaps in the morning or evening, until an adult is contacted and interviewed. How does this improve the sampling design?
e) Random digit dialing machines can generate the phone call for us. How would this improve our design? Is anyone still excluded?

10. Sammy's Salsa, a small local company, produces 20 cases of salsa a day. Each case contains 12 jars and is imprinted with a code indicating the date and batch number. To help maintain consistency, at the end of each day Sammy selects three bottles of salsa, weighs the contents, and tastes the product. Help Sammy select the sample jars. Today's cases are coded 07N61 through 07N80.
a) Carefully explain your sampling strategy.
b) Show how to use random numbers to pick three jars for testing.
c) Did you use a simple random sample? Explain.

11. Consider each of these situations. Do you think the proposed sampling method is appropriate?
a) We want to know what percentage of local doctors accept Medicaid patients. We call the offices of 50 doctors randomly selected from the local Yellow Page listings.
b) We want to what percentage of local businesses anticipate hiring additional employees in the upcoming month. We randomly select a page in the Yellow Pages, and call every business listed there.
c) We want to know if there is neighborhood support to turn a vacant lot into a playground. We spend a Saturday afternoon going door-to-door in the neighborhood, asking people to sign a petition.
d) A college wants to know if students at their school are satisfied with the selection of food available on campus. We go to the largest cafeteria and interview every 10th person in line.