

HOMEWORK 12

Due: March 12

1. For the following reports identify (i) the population, (ii) the population parameter of interest, (iii) the sample, and (iv) the sample statistic.
 - a. A company packaging snack foods maintains quality control by randomly selecting 10 cases from each day's production and weighing the bags, and then inspecting the contents. The weight of a case should be 2 lbs. One day they found that the weight of the 10 cases was 20.5 lbs.
 - (i) The population: all the snack food cases from the day's production
 - (ii) The parameter of interest: the mean weight of all the snack bags, which should be 2 lbs.
 - (iii) The sample: the 10 cases
 - (iv) The sample statistic: the mean weight of the bags in the sample, which is 2.05lbs.
 - b. State police set up a roadblock to estimate the percentage of cars with up-to-date registration and insurance. They found problems with 10% of the cars they stopped.
 - (i) The population: all the cars in the state
 - (ii) The parameter of interest: the proportion of all cars in the state with up-to-date registration and insurance.
 - (iii) The sample: the cars they stopped at the roadblock
 - (iv) The sample statistic: the proportion of cars stopped at the roadblock with up-to-date registration and insurance.
 - c. The Environmental Protection Agency took soil samples at 20 locations near a former industrial waste dump and checked each for evidence of toxic chemicals. They found no elevated levels of any harmful substances.
 - (i) The population: the soil around the former industrial waste dump
 - (ii) The parameter of interest: the mean level of toxic chemicals in the soil
 - (iii) The sample: the 20 soil samples
 - (iv) The sample statistic: the mean level of toxic chemicals in the 20 soil samples
 - d. A magazine 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.
 - (i) The population: the subscribers
 - (ii) The parameter of interest: the proportion of subscribers who benefited from alternative medical treatments
 - (iii) The sample: those subscribers who responded
 - (iv) The sample statistic: the proportion of the subscribers who responded who benefited from alternative medical treatments, which is 20% in this case.

2. For each of the following indicate whether what is described is a *parameter* or a *statistic*:
- The fraction of all Americans who have never seen an ocean in person.
Parameter because it is the fraction of ALL Americans who never seen an ocean in person.
 - The mean number of spots in a sample of 100 ladybugs have.
Statistic because it is the mean number of spots in a SAMPLE of ladybugs.
 - The proportion of 100 randomly chosen single-family houses in Orange County with a swimming pool
Statistic because it is the proportion of a SAMPLE.
 - The percent of all defective iPods made by Apple.
Parameter because it is the proportion of ALL defective iPods.
 - The mean height of all kindergarten kids in California.
Parameter because it is the mean height of ALL kinderkids.
3. For each of the following, indicate whether what is described is a *parameter* or a *population*:
- All four-inch ham sandwiches sold at Quizno's.
Population.
 - The average weight in ounces of all four-inch ham sandwiches sold at Quizno's.
Parameter.
 - The proportion of registered drivers in California who had an accident in 2008.
Parameter.
 - All apartment units in New York that are larger than 2000 square feet.
Population.
 - The percentage of dogs and cats in Los Angeles that have been spayed or neutered.
Parameter.
 - All 100 members of the United States Senate.
Population.
3. A poll is administered to a random sample of 250 students at a certain university to determine the percentage that favor a new fee that will go towards enhancing the campus Recreation Center. Only 24% of those polled are in favor of the fee. The standard deviation of the sampling distribution for such polls is 2.7%.
- Give an interval estimate of the proportion of the entire student body that supports the fee.
$$24\% \pm 2(2.7\%) = 24\% \pm 5.4\% = (18.6\%, 29.4\%)$$

- b. What is the population here? What is the parameter?
Population: ALL students at the university
Parameter: the proportion of ALL students at the university who favor the new fee.
- c. Give the value of the statistic.
The statistic is the proportion of students in the SAMPLE who favor the new fee, which is 24%.
- d. Does the size of the university student population play a role in the accuracy of estimation?
No, the population size does not play any role in the accuracy of estimation, only the sample size.

4. Explain why sampling distributions are important in statistical inference.

Sampling distributions are important because they allow us to compare sample statistics from SINGLE samples with their relevant sampling distribution. More particularly, it allows us to determine where the statistic from one sample fits on the distribution of that statistic. If our statistic does not look like it fits in with the sampling distribution, we conclude that the sampling distribution is incorrect, and therefore the parameter we hypothesized in order to create the sampling distribution is also incorrect. Thus, sampling distributions are the foundation of inference, as they allow us to make conclusions about the unknown population parameter.

5. A simple random sample of 1000 Americans found that 61% were satisfied with the service provided by the dealer from whom they bought their car. A simple random sample of 1000 Canadians found that 58% were satisfied with the service provided by the dealer from whom they bought their car. The sampling variability associated with these statistics:

- a. is about the same
- b. is smaller for the sample of Canadians since the population of Canada is smaller than that of the United States, hence the sample is a larger proportion of the population
- c. is smaller for the sample of Canadians since the percentage satisfied was smaller than that for the Americans
- d. is larger for the Canadians, since Canadian citizens are more widely dispersed throughout the country than in the United States, hence have more variable views

6. Suppose that studies were made to estimate the mean number of televisions owned by families in various California cities. Indicate which of the following would be likely to give the most accurate estimate of the city's mean, and which would probably give the least accurate estimate:

- a. A random sample of 500 families from Bakersfield (population 330,000)
- b. A random sample of 500 families from San Diego (population 1,350,000)

- c. A survey form distributed in various locations (shopping malls, libraries, post offices, etc.) of Santa Barbara (population 95,000), with 7,285 responses received

Part c) would give the least accurate estimate of the population parameter because the data did not come from a random sample.

Parts a) and b) both give the same accurate estimate of the population parameter because the population size doesn't matter, only the sample sizes. Since the samples sizes are the same, the accuracy of the estimate will be the same.