Essentials of Statistics 7th edition Triola Solutions Manual

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Chapter 1: Introduction to Statistics

Section 1-1: Statistical and Critical Thinking

1. The respondents are a voluntary response sample or a self-selected sample. Because those with strong interests in the topic are more likely to respond, it is very possible that their responses do not reflect the opinions or behavior of the general population.
2. a. The sample consists of the 1046 adults who were surveyed. The population consists of all adults.
   b. When asked, respondents might be inclined to avoid the shame of the unhealthy habit of not washing their hands, so the reported rate of 70% might well be much higher than it is in reality. It is generally better to observe or measure human behavior than to ask subjects about it.
3. Statistical significance is indicated when methods of statistics are used to reach a conclusion that a treatment is effective, but common sense might suggest that the treatment does not make enough of a difference to justify its use or to be practical. Yes, it is possible for a study to have statistical significance, but not practical significance.
4. No. Correlation does not imply causation. The example illustrates a correlation that is clearly not the result of any interaction or cause effect relationship between per capita consumption of margarine and the divorce rate in Maine.
5. Yes, there does appear to be a potential to create a bias.
6. No, there does not appear to be a potential to create a bias.
7. No, there does not appear to be a potential to create a bias.
8. Yes, there does appear to be a potential to create a bias.
9. The sample is a voluntary response sample and has strong potential to be flawed.
10. The samples are voluntary response samples and have potential for being flawed, but this approach might be necessary due to ethical considerations involved in randomly selecting subjects and somehow imposing treatments on them.
11. The sampling method appears to be sound.
12. The sampling method appears to be sound.
13. The Ornish weight loss program has statistical significance, because the results are so unlikely (3 chances in 1000) to occur by chance. It does not have practical significance because the amount of lost weight (3.3 lb) is so small.
14. Because there is only one chance in a thousand of getting such success rates by chance, the difference does appear to have statistical significance. The 92% success rate for surgery appears to be substantially better than the 72% success rate for splints, so the difference does appear to have practical significance.
15. The difference between Mendel's 25% rate and the result of 26% is not statistically significant. According to Mendel's theory, 145 of the 580 peas would have yellow pods, but the results consisted of 152 peas with yellow pods. The difference of 7 peas with yellow pods among the 580 offspring does not appear to be statistically significant. The difference does not appear to have practical significance.
16. Because there is a 25% chance of getting such results with a program that has no effect, the program does not appear to have statistical significance. Because the average increase is only 3 IQ points, the program does not appear to have practical significance.
17. With 40 out of 41 ballots having the Democrat first, it appears that the result is statistically significant. Because of the great advantage enjoyed by Democrats, the results also have practical significance.
18. Because it is so unlikely (0.3%) to get these results by chance, the results have statistical significance. With about 57% (from 235/414) of the coin toss winners going on to win the game, the result appears to have practical significance.
19. There appears to be statistical significance given the large discrepancy between 79.1% and 39%. Because the results are so far from yielding a jury of peers, it appears that the results have practical significance.
20. With only a 0.0000006% chance of getting such results, it appears that the results are statistically significant. The discrepancy between the 61% rate for voters who actually did vote and the 70% rate of those who said that they voted is a fairly large discrepancy, and the results appear to have practical significance.

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21. Yes. Each column of 8 AM and 12 AM temperatures is recorded from the same subject, so each pair is matched.
22. No. The source is from university researchers who do not appear to gain from distorting the data.
23. The data can be used to address the issue of whether there is a correlation between body temperatures at 8 AM and at 12 AM. Also, the data can be used to determine whether there are differences between body temperatures at 8 AM and at 12 AM.
24. Because the differences could easily occur by chance (with a 64% chance), the differences do not appear to have statistical significance.
25. No. The lemon imports are weights in metric tons and the crash fatality rates are fatalities per 100,000 population, so their differences are meaningless.
26. The issue that can be addressed is whether there is a correlation, or association, between lemon imports and crash fatality rates.
27. No. The author of an article for the *Journal of Chemical Information and Modeling* has no reason to collect or present the data in a way that is biased.
28. No. Correlation does not imply causation, so a statistical correlation between lemon imports and crash fatality rates should not be used to conclude that lemon imports are the cause of fatal crashes.
29. It is questionable that the sponsor is the Idaho Potato Commission and the favorite vegetable is potatoes.
30. The sample is a voluntary response sample, so there is a good chance that the results do not reflect the larger population of people who have a water preference.
31. The correlation, or association, between two variables does not mean that one of the variables is the cause of the other. Correlation does not imply causation. Clearly, sour cream consumption is not directly related in any way to motorcycle fatalities.
32. The sponsor of the poll is an electronic cigarette maker, so the sponsor does have an interest in the poll results. The source is questionable.
33. The correlation, or association, between two variables does not mean that one of the variables is the cause of the other. Correlation does not imply causation.
34. The correlation, or association, between two variables does not mean that one of the variables is the cause of the other. Correlation does not imply causation.
35. The sample is a voluntary response sample, so there is a good chance that the results do not accurately reflect the larger population.
36. Because the nutritionists are paid such large amounts of money, they might be more inclined to find favorable results. It is very possible that the results represent desired outcomes instead of actual outcomes.
37. a. 700 adults
    b. 55%
38. a. 253.31 subjects
    b. No. Because the result is a count of people among the 347 who were surveyed, the result must be a whole number.
    c. 253 subjects
    d. 32%
39. a. 559.2 respondents
    b. No. Because the result is a count of respondents among the 1165 engaged or married women who were surveyed, the result must be a whole number.
    c. 559 respondents
    d. 8%
40. a. 847.56 drivers
    b. No. Because the result is a count of respondents saying that they text while driving, the result must be a whole number.
    c. 848 drivers
    d. Given that texting while driving is extremely dangerous, the result of 42% of drivers who text while driving is far too high. The result suggests that steps should be taken to substantially lower that rate.

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41. Because a reduction of 100% would eliminate all of the size, it is not possible to reduce the size by 100% or more.
42. In an editorial criticizing the statement, the *New York Times* correctly interpreted the 100% improvement to mean that no baggage is being lost, which was not true.
43. Because a reduction of 100% would eliminate all plaque, it is not possible to reduce it by more than 100%.
44. Because a reduction of 100% would eliminate all car thefts, it is not possible to reduce it by more than 100%.
45. If one subgroup receives a 4% raise and another subgroup receives a 4% raise, the combined group will receive a 4% raise, not an 8% raise. The percentages should not be added in this case.
46. The wording of the question is biased and tends to encourage negative responses. The sample size of 20 is too small. Survey respondents are self-selected instead of being randomly selected by the newspaper. If 20 readers respond, the percentages should be multiples of 5, so 87% and 13% are not possible results.
47. All percentages of success should be multiples of 5. The given percentages cannot be correct.

Section 1-2: Types of Data

1. The population consists of all adults in the United States, and the sample is the 1001 adults who were surveyed. Because the value of 69% refers to the sample, it is a statistic.
2. a. quantitative
   b. categorical
   c. categorical
   d. quantitative
3. Only part (b) describes discrete data.
4. a. The sample is the 36,000 adults who were surveyed. The population is all adults in the United States.
   b. statistic
   c. ratio
   d. discrete
5. statistic
6. parameter
7. parameter
8. statistic
9. statistic
10. statistic
11. parameter
12. parameter
13. continuous
14. continuous
15. discrete
16. discrete
17. continuous
18. discrete
19. discrete
20. continuous
21. nominal
22. ordinal
23. ordinal
24. ratio
25. interval
26. nominal
27. ratio
28. interval
29. The numbers are not counts or measures of anything. They are at the nominal level of measurement, and it makes no sense to compute the average (mean) of them.
30. The digits are not counts or measures of anything. They are at the nominal level of measurement and it makes no sense to calculate their average (mean).
31. The temperatures are at the interval level of measurement. Because there is no natural starting point with 0°F representing "no heat," ratios such as "twice" make no sense, so it is wrong to say that it is twice as warm in Paris as it is in Anchorage.
32. The ranks are at the ordinal level of measurement. Differences between the universities cannot be determined, so there is no way to know whether the difference between Harvard and MIT is the same as the difference between Stanford and the University of California at Berkeley.
33. a. Continuous, because the number of possible values is infinite and not countable.
    b. Discrete, because the number of possible values is finite.
    c. Discrete, because the number of possible values is finite.
    d. Discrete, because the number of possible values is infinite and countable.

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34. Interval level of measurement. The direction of north represented by $0°$ is arbitrary, and $0°$ does not represent "no direction." Differences between degrees are meaningful; the difference between $30°$ and $60°$ is the same as the difference between $150°$ and $180°$. But ratios are not meaningful; the ratio of $60°$ to $30°$ does not result in twice some direction. (These degree measurements are directions, not amounts of rotation.)

Section 1-3: Collecting Sample Data

1. The study is an experiment because subjects were given treatments.
2. The subjects in the study did not know whether they were given the magnet treatment or the sham treatment, and those who administered the treatments also did not know.
3. The group sample sizes are large enough so that the researchers could see the effects of the two treatments, but it would have been better to have larger samples.
4. The sample appears to be a convenience sample. Given that the subjects were all patients at a Veterans Affairs hospital, it is not likely that the sample is representative of the population, so it is questionable whether the results can be generalized for the population of subjects with chronic low back pain.
5. The sample appears to be a convenience sample. By e-mailing the survey to a readily available group of Internet users, it was easy to obtain results. Although there is a real potential for getting a sample group that is not representative of the population, indications of which ear is used for cell phone calls and which hand is dominant do not appear to be factors that would be distorted much by a sample bias.
6. The study is an observational study because the subjects were not given any treatment.
7. With 717 responses, the response rate is 14%, which does appear to be quite low. In general, a very low response rate creates a serious potential for getting a biased sample that consists of those with a special interest in the topic.
8. Answers vary, but the following are good possibilities.
   a. Obtain a printed copy of the class roster, assign consecutive numbers (integers), then use a computer to randomly generate six of those numbers.
   b. Select every third student leaving class until six students are chosen.
   c. Randomly select three males and three females.
   d. Randomly select a row, and then select the students in that row. (Use only the first six to meet the requirement of a sample of size six.)
   e. Select the first six students who enter the class.
9. systematic
10. convenience
11. random
12. stratified
13. cluster
14. random
15. stratified
16. systematic
17. random
18. cluster
19. convenience
20. systematic
21. Observational study. The sample is a convenience sample consisting of subjects who decided themselves to respond. Such voluntary response samples have a high chance of not being representative of the larger population, so the sample may well be biased. The question was posted in an electronic edition of a newspaper, so the sample is biased from the beginning.
22. Experiment. The sample subjects consist of male physicians only. It would have been better to include females. Also, it would be better to include male and females who are not physicians.
23. Experiment. This experiment would create an *extremely* dangerous and illegal situation that has a real potential to result in injury or death. It's difficult enough to drive in New York City while being completely sober.
24. Observational study. The sample of only three students is too small.
25. Experiment. The biased sample created by using a small sample of college students cannot be fixed by using a larger sample. The larger sample will still be a biased sample that is not representative of the population of all adults.
26. Experiment. Calling the subjects and asking them to report their weights has a high risk of getting results that do not reflect the actual weights. It would have been much better to somehow measure the weights instead of asking the subjects to report them.

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27. Observational study. Respondents who have been convicted of felonies are not likely to respond honestly to the second question. The survey will suffer from a "social desirability bias" because subjects will tend to respond in ways that will be viewed favorably by those conducting the survey.
28. Observational study. The number of responses is very small, and the response rate of only 1.52% is far too small. With such a low response rate, there is a real possibility that the sample of respondents is biased and consists only of those with special interests in the survey topic.
29. prospective study
30. retrospective study
31. cross-sectional study
32. prospective study
33. matched pairs design
34. randomized block design
35. completely randomized design
36. matched pairs design
37. a. Not a simple random sample, but it is a random sample.
    b. Simple random sample and also a random sample.
    c. Not a simple random sample and not a random sample.

Quick Quiz

1. No. The numbers do not measure or count anything.
2. nominal
3. continuous
4. quantitative data
5. ratio
6. statistic
7. no
8. observational study
9. The subjects did not know whether they were getting aspirin or the placebo.
10. simple random sample

Review Exercises

1. The respondents are a voluntary response sample or a self-selected sample. Because those with strong interests in the topic are more likely to respond, it is very possible that their responses do not reflect the opinions or behavior of the general population.
2. a. The sample is a voluntary response sample, so the results are questionable.
   b. statistic
   c. observational study
3. Randomized: Subjects were assigned to the different groups through a process of random selection, whereby they had the same chance of belonging to each group. Double-blind: The subjects did not know which of the three groups they were in, and the people who evaluated results did not know either.
4. No. Correlation does not imply causality.
5. a. systematic
   b. stratified
   c. simple random sample
   d. convenience
   e. cluster
6. Yes. The two questions give the false impression that they are addressing very different issues. Most people would be in favor of defending marriage, so the first question is likely to receive a substantial number of "yes" responses. The second question better describes the issue and subjects are much more likely to have varied responses.
7. a. discrete
   b. ratio
   c. The mailed responses would be a voluntary response sample, so those with strong opinions or greater interest in the topics are more likely to respond. It is very possible that the results do not reflect the true opinions of the population of all state residents.
   d. stratified
   e. cluster

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8. a. If they have no fat at all, they have 100% less than any other amount with fat, so the 125% figure cannot be correct.
   b. 686
   c. 28%
9. a. interval data; systematic sample
   b. nominal data; stratified sample
   c. ordinal data; convenience sample
10. Because there is less than a 1% chance of getting the results by chance, the method does appear to have statistical significance. The result of 239 boys in 291 births is a rate of 82% so it is above the 50% rate expected by chance, and it does appear to be high enough to have practical significance. The procedure appears to have both statistical significance and practical significance.

Cumulative Review Exercises

1. The mean is $\frac{135+149+145+129+118+119+115+133+107+188+127+131}{12} = 133.0$. The IQ score of 188 appears to be substantially higher than the other IQ scores.
2. $0.5^{13} = 0.000122$
3. $\frac{203-176}{6} = 4.5,$ which is an unusually high value.
4. $\frac{98.2-98.6}{\frac{0.62}{\sqrt{106}}} = -6.64$
5. $\frac{1.95996^2 \cdot 0.25}{0.03^2} = 1068$
6. $\frac{188-107}{4} = 20.25$
7. $\frac{(135-133.0)^2}{11} = 0.364$
8. $\sqrt{\frac{(98.4-98.6)^2+(98.6-98.6)^2+(98.8-98.6)^2}{3-1}} = \sqrt{0.04} = 0.20$
9. $0.3^6 = 0.000729$
10. $8^{12} = 68{,}719{,}476{,}736$ (or about 68,719,477,000)
11. $85^6 = 377{,}149{,}515{,}625$ (or about 377,149,520,000)
12. $0.2^{12} = 0.000000004096$

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