Chapter 10: Comparing Two Groups

Statistics: The Art and Science of Learning from Data
Second Edition
by Agresti/Franklin
10.1.1) Do people who drink caffeinated beverages have a higher occurrence of heart disease than people who do not drink caffeinated beverages? Two hundred caffeinated beverage drinkers and non-caffeinated beverage drinkers are followed for 20 years and the occurrences of heart disease is recorded. To answer this question would you use proportions or means AND dependent or independent samples?

a) Two proportions from independent samples.
b) Two proportions from dependent samples.
c) Two means from independent samples.
d) Two means from dependent samples.
10.1.1) Do people who drink caffeinated beverages have a higher occurrence of heart disease than people who do not drink caffeinated beverages? Two hundred caffeinated beverage drinkers and non-caffeinated beverage drinkers are followed for 20 years and the occurrences of heart disease is recorded. To answer this question would you use proportions or means AND dependent or independent samples?

a) Two proportions from independent samples.
b) Two proportions from dependent samples.
c) Two means from independent samples.
d) Two means from dependent samples.
10.1.3) Has there been a significant change in the proportion of Americans that believe that we are spending too little on improving the education system? Data were collected by the GSS in 1988 (group 1) and in 2004 (group 2) that resulted in the following 95% confidence interval for \( p_1 - p_2 \) is (-0.11, -0.03)? Interpret.

a) There is statistically significant evidence that the population proportion is higher for 1988 than 2004.

b) There is statistically significant evidence that the population proportion is lower for 1988 than 2004.

c) There is no statistically significant evidence that the population proportion is different for 1988 and for 2004.
10.1.3) Has there been a significant change in the proportion of Americans that believe that we are spending too little on improving the education system? Data was collected by the GSS in 1988 (group 1) and in 2004 (group 2) that resulted in the following 95% confidence interval for $p_1 - p_2$ is (-0.11, -0.03)? Interpret.

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10.1.4) Do more women (w) get greater satisfaction from their family life than men (m)? One year the GSS asked 234 men and 270 women if they got a “very great deal of satisfaction” from their family life. What is the correct alternative hypothesis?

a) $H_a : p_m - p_w > 0$

b) $H_a : p_m - p_w < 0$

c) $H_a : p_m - p_w \neq 0$

d) $H_a : p_m - p_w = 0$
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10.1.5) Do more women \((w)\) get greater satisfaction from their family life than men \((m)\)? The GSS asked men and women if they got a “very great deal of satisfaction” from their family life. For the output below \((p_m - p_w)\), what is the correct conclusion?

Test for difference = 0 (vs < 0) : \(Z = -3.50\) : \(p\)-Value = 0.000

a) We have strong evidence that more women than men get very great satisfaction from family life.

b) We have strong evidence that more men than women get very great satisfaction from family life.

c) We do not have statistically significant evidence of a difference between men and women.
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10.1.6) What type of problem would be used to test the following alternative hypothesis?

“Europeans on average walk more miles per day than Americans.”

a) Comparing two proportions from independent samples.
b) Comparing two proportions from dependent samples.
c) Comparing two means from independent samples.
d) Comparing two means from dependent samples.
10.1.6) What type of problem would be used to test the following alternative hypothesis?

“Europeans on average walk more miles per day than Americans.”

a) Comparing two proportions from independent samples.
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10.2.1) Do people who run at least 5 miles a week have a higher resting heart rate than people who ride their bike at least 5 miles a week? People were allowed to participate in only one sport. The resting heart rate of 200 runners and 200 bikers who cover more than 5 miles were recorded. To answer this question would you use proportions or means AND dependent or independent samples?

a) Two proportions from independent samples
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a) Two proportions from independent samples
b) Two proportions from dependent samples
c) Two means from independent samples
d) Two means from dependent samples
10.2.2) In 2004, two groups of college age students were asked how many drinks they had on a day in which they were drinking. Group A was above the legal drinking age and Group B was below the legal drinking age. The below drinking age group had a sample mean of 1.2 and the above drinking age group had a sample mean of 2.17. What is the point estimate of $\mu_b - \mu_a$?

a) 0  
b) -0.97  
c) 1.96  
d) 1.69  
e) Unknown
10.2.2) In 2004, two groups of college age students were asked how many drinks they had on a day in which they were drinking. Group A was above the legal drinking age and Group B was below the legal drinking age. The below drinking age group had a sample mean of 1.2 and the above drinking age group had a sample mean of 2.17. What is the point estimate of $\mu_b - \mu_a$?

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a) $H_a : \mu_b - \mu_a > 0$

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10.2.4) An administrator wondered if upperclassmen spent a different amount of money on rent than underclassmen. The output below is the result of her study. What would be your conclusion?

\[
\text{Difference} = \mu(\text{under}) - \mu(\text{upper})
\]

95% CI for difference: (-209.800, -17.700)

a) There is statistically significant evidence that the population mean rent is higher for underclassmen than upperclassmen.
b) There is statistically significant evidence that the population mean rent is higher for upperclassmen than underclassmen.
c) There is no statistically significant evidence that the population mean rent is different for upperclassmen and underclassmen.
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10.2.5) An administrator wondered if upperclassmen spent a different amount of money on rent than underclassmen. The output below is the result of her study. What would be your $p$-value for a two sided test based on the confidence interval below?

Difference = $\mu$ (under) - $\mu$ (upper)
95% CI for difference: (-209.800, -17.700)

a) The $p$-value would be greater than 0.05.
b) The $p$-value would be less than 0.05.
c) It cannot be determined.
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c) It cannot be determined.
10.3.1) A medical researcher was testing to see if a new prescription anti-inflammatory drug helped reduce swelling after knee surgery. One group was given the new drug and another group was given a placebo. A week after surgery the amount of swelling was scored on a 1 to 20 point scale. Assuming that the population standard deviations are the same in both cases, what is the pooled standard deviation?

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<tr>
<th></th>
<th>New Drug</th>
<th>Placebo</th>
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<tr>
<td>Mean</td>
<td>8.8</td>
<td>10.7</td>
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<td>Stan. Dev.</td>
<td>2.3</td>
<td>3.1</td>
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a) 1.66  b) 2.70  c) 2.78  d) 7.70  e) None of the above
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a) 19  
b) 24  
c) 43  
d) 44  
e) None of the above

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a) 19  

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10.3.3) A medical researcher was testing to see if a new prescription anti-inflammatory drug helped more than a placebo to reduce swelling after knee surgery. A week after surgery, the amount of swelling was scored on a 1 to 20 point scale. A “20” is considered high amount of pain. Assuming that the population standard deviations are the same in both cases, what would be the conclusion for this test at $\alpha = 0.05$?

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a) Reject $H_0$
b) Fail to Reject $H_0$
c) Reject $H_a$
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a) Reject $H_0$
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10.3.4) A research study took a sample of car accidents on I-95 in Florida. It recorded that 75 out of 100 car accidents were fatal when the driver was talking on a cell phone (1), whereas 60 out of 200 car accidents were fatal when the driver was not talking on a cell phone (2). What is the relative risk?

a) 0  
b) 0.80  
c) 1.25  
d) 2.5  
e) None of the above
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10.3.5) In 2000 the GSS asked men and women how many hours a week they spent using a home computer to pay bills, shop online or do other household tasks. Assuming that the population standard deviations are equal, what would be the p-value for the test of the alternative hypothesis $H_a: \mu_1 - \mu_2 \neq 0$?

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<tr>
<td>Mean</td>
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<tr>
<td>Std. Dev</td>
<td>1.43</td>
<td>0.98</td>
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<td>Sample Size</td>
<td>149</td>
<td>161</td>
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a) 0.022  
b) 0.044  
c) 0.230  
d) 0.460
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10.4.1) Are people equally footed? Can they stand on their “right leg only” for a longer period of time than they can stand on their “left leg only”? Twenty people were timed standing on their “right leg only” and “left leg only”. This an example of…

a) Comparing proportions from independent samples.

b) Comparing proportions from dependent samples.

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a) Comparing proportions from independent samples.
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10.4.2) Do people drive faster if they listen to loud music? Three people drove to work one day with no music and another day with loud music. Their speed was recorded on an open space of road and the data is listed below. Find the test statistic. (Use Loud Music– No Music)

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a) 0.67  
b) -0.67  
c) 0.225  
d) 0.075  
e) None of the above
10.4.2) Do people drive faster if they listen to loud music? Three people drove to work one day with no music and another day with loud music. Their speed was recorded on an open space of road and the data is listed below. Find the test statistic. (Use Loud Music– No Music)

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a) 1.96  
b) 2.576  
c) 3.182  
d) 4.303  
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b) 2.576  
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10.4.4) Does a new diet plan help people lose weight? Twenty people were weighed before starting a 3 month diet program and again after they completed the program. If the test statistic was 3.45 what is the correct conclusion?

a) We have strong statistically significant evidence to show that the population mean weight loss was greater than zero.

b) We have moderate statistically significant evidence to show that the population mean weight loss was greater than zero.

c) We do not have statistically significant evidence that the population mean weight loss was less than zero.
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