



Analyzing Data Using Inferential Statistics

A 2008 study reported that teens who are heavy cell phone users (those who make more than five calls or text messages per day) had a harder time getting up in the morning, woke up more often during the night, spent more time tossing and turning before falling asleep, and drank more caffeinated soft drinks.

A 2007 national survey of 1,000 16-and 17-year-old drivers reported that 29 percent of those surveyed admitted to sending text messages with their cell phones while driving.

The Insurance Institute for Highway Safety studied North Carolina's law, passed in 2006, which fines drivers 18 and under who use a cell phone while driving. Researchers found that 11 percent of teen drivers leaving 25 high schools during the two months prior to the ban taking effect were using their cell phones. About five months following the ban, during the spring of 2007, nearly 12 percent were observed using cell phones.

Suppose you want to investigate cell phone usage amongst teens in Howard County to compare their behaviors to those found in previous studies. You randomly sample 50 students and record the following information:

- Average number of times student uses cell phone while driving
- Average number of times student sends a text message while driving
- Average number of times per day student uses his/her cell phone to make calls
- Average number of times per day student uses his/her cell phone to send text messages (then *you* categorize responses as never, rarely, sometimes, often, very often)
- Average number of times student wakes up during the night
- Average time spent tossing and turning before falling asleep (then *you* categorize responses as never, rarely, sometimes, often, always)
- Average amount of caffeinated beverages (in ounces) consumed per day

Read each of the following situations and determine which type of significance test would be most appropriate.

1. You want to know if teens in Howard County use their cell phones more than 5 times per day.
2. You find that 18 out of 50 students admit to sending text messages while driving, and you want to compare that to the national reported average of 29 percent.
3. You want to know whether students use their cells phones for sending text messages more often than they use their cell phones for making calls.
4. You randomly sample 50 young-adults (age20-25), and compare the difficulty they have falling asleep to the sample of teens.
5. You want to know if females are more likely to send text messages while driving.

6. You want to compare the average number of times male teens, female teens, male young-adults, and female young-adults use their cell phones while driving.
7. You want to know whether males or females send a greater number of text messages, on average.
8. You want to know if there is an association between the frequency of cell phone usage and the number of times a student wakes up per night.
9. You want to know whether males and females have the same difficulty falling asleep.
10. You want to know if the proportion of students falling into each category of text messaging frequency (never, rarely, sometimes, often, very often) is the same.

ANSWER KEY:

1. **One-sample t-test**

Null hypothesis: Teens in Howard County use their cell phones an average of 5 times per day.

Alternative hypotheses: Teens in Howard County use their cell phones more than an average of 5 times per day.

2. **One-proportion z-test**

Null hypothesis: Twenty-nine percent of teens in Howard County send text messages while driving.

Alternative hypothesis: The proportion of teens in Howard County who send text messages while driving is not equal to 29 percent.

3. **Paired t-test**

Null hypothesis: There is no difference between the average number of times teens in Howard County use their cell phones for text messaging and the average number of times they use it for making calls.

Alternative hypothesis: The average number of times teens in Howard County use their cell phones for text messaging is greater than the average number of times they use it for making calls.

4. **Chi-square test for homogeneity**

Null hypothesis: There is no difference in the distribution of sleeping behaviors of teens and young-adults in Howard County.

Alternative hypothesis: There is a difference in the distribution of sleeping behaviors of teens and young-adults in Howard County.

5. **Two-proportion z-test**

Null hypothesis: There is no difference in the proportion of males and females in Howard County who send text messages while driving.

Alternative hypothesis: There is a difference in the proportion of males and females in Howard County who send text messages while driving.

6. **One-way ANOVA**

Null hypothesis: There is no difference in the average number of times cell phones are used while driving for male and female teens and young-adults.

Alternative hypothesis: There is a difference in the average number of times cell phones are used while driving for male and female teens and young-adults.

7. **Two-sample t-test**

Null hypothesis: There is no difference in the average number of text messages sent by males and females.

Alternative hypothesis: Females send a greater average number of text messages than males.



8. **Linear regression t-test**

Null hypothesis: There is no association between the frequency of cell phone usage and the average number of times a teen wakes up during the night.

Alternative hypothesis: There is an association between the frequency of cell phone usage and the average number of times a teen wakes up during the night.

9. **Chi-square test for independence**

Null hypothesis: There is no difference in the distribution of sleeping behaviors of male and female teens in Howard County.

Alternative hypothesis: There is a difference in the distribution of sleeping behaviors of male and female teens in Howard County.

10. **Chi-square goodness-of-fit test**

Null hypothesis: The frequency of text messaging is evenly distributed (20% in each category).

Alternative hypothesis: The frequency of text messaging is not evenly distributed.