Students at Work

By April Boyd
Abstract

My research problem was testing the proportion of employed students working in retail or in food service. I chose this question because, as a retail employee and a full-time student, I was interested in looking into the amount of students balancing homework and minimum wage jobs just like me. According to the Bureau of Labor Statistics, about 44% of employed youth worked in the retail and food service industries in July 2016 (Employment). Since I already knew several employed students who worked in food service or retail, I hypothesized that the proportion of employed students working in these industries would be greater than 0.44.

To obtain a random sample of students, I calculated a sample size estimate and surveyed 450 Collin College students at the Spring Creek Campus. To ensure the sample of students was random, my helpers and I visited the campus on several weekdays in November at various times of the day. We found that of the 450 students we spoke to, 60% of them were employed, and about 35% of those employed students worked in food service while 43% worked in retail.

I concluded that a majority of employed students worked in the food service or retail industries, as only 22% held other jobs. Additionally, the proportion of students we surveyed that worked in food or retail totaled up to about 0.778, which is greater than the 0.44 estimate I used from the Bureau of Labor Statistics.

Introduction

On a daily trip to Starbucks or an annual Black Friday shopping spree, one might notice that a lot of the employees working in these industries are in their teens and twenties. As a retail sales associate for several months now, I can say that almost every associate I have worked with is a student between the ages of 16 and 24. Even outside of work, I found myself noticing just how many people in my age group were serving, hosting, and taking orders in restaurants. This
led me to wonder if a majority of students with jobs worked in the food service and retail industries, and I settled on this for my research question. This paper will detail prior research on the subject, my methods and data analysis, and the results and final conclusion of my research project.

Literature Review

Based on information from the Bureau of Labor Statistics, there were 20.5 million employed youth between the ages of 16 and 24 in July 2016. Of these, 5,213,000 were employed in leisure and hospitality (which includes food service), and 3,756,000 were employed in the retail industry. In total, about 44% of employed youth worked in these two industries. This analysis covers summertime, which has a higher youth employment rate than any other time of the year, so the total number of employed youth in the fall season may differ. Additionally, this analysis contains further information about other industries youths may be working in, such as childcare and education. It also gives employment ratios per gender, race, and ethnicity, as well as how these statistics have changed between July 2015 and July 2016 (Employment). My own analysis does not go into as much detail about demographics and other industries, because I was more interested in focusing on just the food service and retail industries and the amount of students working these jobs.

Methodology

For my null hypothesis, I chose \( p = 0.44 \) because that is the proportion of employed youth in food service and retail according to the Bureau of Labor Statistics (Employment). I decided to place my alternative hypothesis at \( p > 0.44 \) because I was curious about whether a majority of working students were employees of these two industries. To prove my hypothesis, I needed to seek out a random sample of students and administer a survey about their employment
status. I recruited two helpers and the three of us took turns sampling students at the Spring Creek Campus over the course of two weeks.

I had to settle on a sample size that would be large enough to yield significant results, but not so large that my helpers and I would be unable to sample enough people. Using the sample size estimate for proportions at a 95% confidence level with a 0.05 margin of error, I found that $n = 0.25(1.96/0.05)^2 = 384.16$, rounded up to 385. I estimated that if we surveyed 450 students, we should get about 385 who were employed, but after surveying 450, we ended up with only 270 employed students. I found that $n\hat{p}(\hat{q}) = 270(0.778)(1-0.778) = 46.67$ which is greater than 10, so my sample size was large enough to meet the requirements for testing a single proportion.

After obtaining my data, the first thing to do was check the rest of the requirements for proportions (Sullivan 484).

1. Simple random samples are being used.
   a. We surveyed Collin students at various times and campus locations on Monday -- Thursday to ensure randomness.

2. The setting is binomial. We know this because:
   a. There are only 2 outcomes possible for each trial.
      i. The outcomes are food service/retail or another job.
   b. There are a fixed number of trials in the experiment.
      i. We surveyed 450 people total but ended up with 270 who were employed.
      This means that our sample size was 270, which is our fixed number of trials.
   c. The trials were not independent; however, $n<0.05N$. 
i. The total number of students enrolled at the Collin College Spring Creek Campus in Fall 2016 is 29,858. We sampled a total of 450 students. 270 of these sample students were employed, showing that approximately 60% of Spring Creek students are employed. Based on this, I approximate that there were around 17,915 employed students at the Spring Creek campus in Fall 2016. Our sample size of employed students (270) is less than 5% of the predicted employed students on the campus (0.05 x 17,915), so the trials are independent.

d. The probability of success on a single trial remains constant.

i. We obtained 210 successes (food service or retail jobs). Using \( \frac{x}{n} \) \( (210/270) \), I estimate that the probability of success is about 0.778.

3. Since \( npq \geq 10 \), I used the normal distribution for the sample proportions.

a. \( npq \sim n(\hat{p})(\hat{q}) = 270(0.778)(1-0.778) = 46.67 \geq 10 \).

Results

After doing my data analysis, I found that my test statistic was about 11.18 and my P-value was \( 2.58 \times 10^{-29} \), which is extremely close to zero. Because I am using a 95% level of confidence, my significance level (\( \alpha \)) is at 0.05. Since my P-value is less than \( \alpha \), I can reject the null hypothesis that \( p = 0.44 \) and accept the alternative hypothesis, \( p > 0.44 \). There is sufficient evidence at the \( \alpha = 0.05 \) level to support the claim that \( p > 0.44 \). Since I am highly confident that the proportion is greater than 0.44, I also decided to estimate the value of \( p \). I calculated a 95% confidence interval using my sample size (270) and number of successes (210). I came up with a confidence interval of (0.72819, 0.82737). This means that I am 95% confident that the
proportion of employed Spring Creek students who work in retail or food service is between 0.72819 and 0.82737.

Discussion

So, what do these results really mean? A 95% confidence interval means that the interval includes the population parameter for 95% of all simple random samples of size 270. So, about 95% of sample statistics of this size should have an interval that includes the parameter, and 5% should have an interval that does not include the parameter. The proportions in my confidence interval are significantly higher than the proportion of young retail and food service employees according to the Bureau of Labor Statistics (*Employment*). Clearly, Spring Creek campus has a high proportion of students employed in these two industries, so if I had sampled students at multiple schools as well as young people who are employed but not in school, I might have obtained a confidence interval closer to 0.44. However, my results were bound to be somewhat different from the Bureau’s since my population is less diverse than the Bureau’s. This confirms my original belief that the Collin population of employed students would be different than the population from the Bureau’s research.

Conclusion

After estimating the proportion of employed Spring Creek students working in food service or retail, I was able to accept my alternative hypothesis and conclude that the percentage of Spring Creek students working in food service or retail is higher than 44%. I am 95% confident that the percentage is somewhere between about 73% and 83%. I think that in the future, my research could be expanded to include more colleges as well as young working people who are not in school. Further research could also obtain data for more job categories and keep track of race, gender, and ethnicity demographics for these employed students.