Crime in Chicago - Statistical Data Analysis
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Question 1: Is there an association between the locations of pawnbrokers and burglary?

Null Hypothesis:
There is no relationship between the number of burglaries in an area and the number of pawnbrokers. (Pearson correlation $\rho = 0$)

Alternative Hypothesis:
There is a correlation between burglaries and the number of pawnbrokers.
Pearson correlation r ≠ 0

Test:
For each community area, we summed the number of pawnbrokers and summed the number of burglaries.

There is a low positive correlation between burglaries and pawnbrokers (Pearson correlation is r = 0.382) **This is a weak correlation.** However, a t-test indicates a very high statistical significance for this correlation ($p < 0.001$).

Conclusion:
The p-value is <0.001 so we reject the null hypothesis. This test shows **we can say with very high confidence that there is a relationship between the number of burglaries and pawnbrokers in an area, albeit a somewhat weak correlation.** Since the association is weak, it is not the type of result that recommends further study.

Question 2: Is there an association between the locations of taverns and battery?

Null Hypothesis:
There is no relationship between the incidence of battery in an area and the number of taverns.
Pearson correlation r = 0

Alternative Hypothesis:
There is a correlation between batteries and the number of taverns.
Pearson correlation r ≠ 0

Test:
For each community area, we summed the number of taverns and the number of batteries.

There is a very low correlation between batteries and taverns (Pearson correlation is r = 0.125) **This is essentially no correlation.** Furthermore, a t-test indicates a low statistical significance for this correlation (p = 0.280).

Conclusion:
The p-value is 0.280 so we cannot reject the null hypothesis. This test shows **there is essentially no correlation between the number of batteries and the number of taverns in an area.**

Question 3: Is there an association between poverty and violent crime?

Null Hypothesis:
There is no relationship between the percentage of households below the poverty line and the number of violent crimes per 1000 residents.
Pearson correlation r = 0

Alternative Hypothesis:
There is a correlation between the poverty rate and the violent crime rate.
Pearson correlation r ≠ 0

Test:
For each community area, we found the poverty rate, and calculated the violent crime rate by dividing the number of violent crimes reported by the population, then multiplied by 1000.

There is a high, positive correlation between poverty and the violent crime rate (Pearson correlation is r = 0.813). A t-test indicates a very high statistical significance for this correlation (p = 2.89e-19).

Conclusion:
The p-value is essentially zero so we confidently reject the null hypothesis. This test shows **there is strong, positive correlation between the percent of households in poverty and the number of violent crimes reported per 1000 people.**