MATH 1.1 – Comparison Investigation Exemplar

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Problem Statement

This report investigates whether Students who get their money for their phone plan from their parents tend to have a higher Monthly Phone Plan ($ NZD) than Students who get their money for their phone plan from their pocket money based on a dataset from NZ Census at School of High School Students in 2020.

Background: Most students have a cell phone, and those cell phones require a phone plan. The more expensive a plan, the more data, texts, and calls you can make. Not all students have their own money to pay for a phone plan so the payment may come from other places such as parents paying or pocket money. We wonder if the types of plans students buy is affected by how they are paying that phone plan.

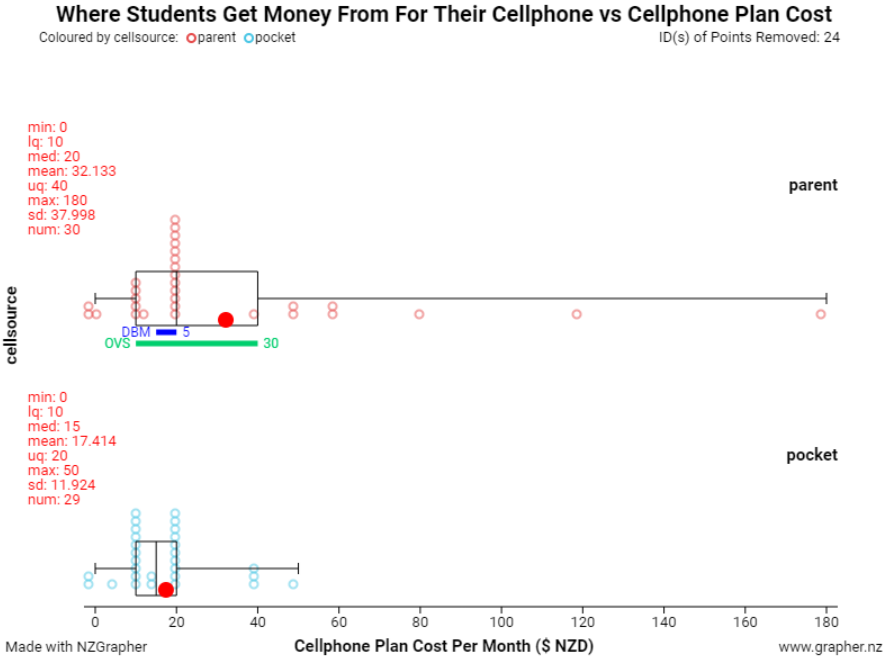
Hypothesis: I think when parents pay for the student's phone plan, they will pay more because those who pay with pocket money will be more conscious of being able to spend that on other things and those whose parents pay may be wealthier on average.

Plan

High School students recorded data including who paid for their phone plan and how much money their phone plan cost per month in a website called NZ Census at School. We took a sample of 30 students whose parents paid for their phone plan (Parent Group) and 30 students who paid for their phone plan with pocket money (Pocket Group), the minimum required for a comparison investigation. We put these data into NZ Grapher and made a Dot Plot and Box and Whisker Plot of the Parent Group and Pocket Group comparing the Phone Plan Cost Per Month ($ NZD) along with a Difference Between Medians (DBM) and Overall Visible Spread (OVS).

Sources of Variation: When the data was recorded there would have been certain phone plan deals available. We could have improved this by looking over a longer period than just 2020.
Also, there may be bias towards the Parent Group paying more in phone bills per month due to these whānau being wealthier on average. This could have been controlled by ensuring the sample we chose had the same median household income.

Data



Analysis

Centre: The median phone plan cost is $5 NZD higher for those students whose parents paid than those students who used their own pocket money. The mean phone plan cost is $15 NZD higher for those students whose parents paid than those students who used their own pocket money.
Spread: The IQR for the parent group is $30 while for the pocket money group it is just $10, $20 less.
Shape: The pocket group shows only slight right skew with the mean $2.40 more than the median. The parents group shows greater right skew with the mean $12 more than the median.
Shift/Overlap: The UQ for the pocket group is the same as the median for the parent group, at $20. This means 3/4 of those in the pocket group spend below or the same as 1/2 of those in the parent group.
Clusters: There appears to be clustering around the $10 and $20 marks in both groups. This may be due to common phone plans being available for $10 and $20 per month from Vodaphone and 2Degrees.
Unusual Points: One student in the parent pays group reported spending $180 per month on their phone plan. This is more than $40 above the next student, indicating an outlier. This may be because the student is on a family plan.

DBM / OVS: The DBM in our graph is $5 per month while the OVS is $30 per month. For a sample of 30, to make the call we investigate if the DBM is greater than 1/3 of the OVS. 1/3 of the OVS is $10. This means the DBM ($5) is smaller than 1/3 of the OVS ($10).

Conclusion

This report concludes that because the DBM is not greater than 1/3 of the OVS, we cannot make the call that Students who get their money for their phone plan from their parents tend to have a higher Monthly Phone Plan ($ NZD) than Students who get their money for their phone plan from their pocket money based on a dataset from NZ Census At School of High School Students in 2020.

Enough Data / Reliable Data: We can assume our conclusion is reliable because there is enough data for each group (30 in each) and the data comes from NZ Census at School who are a trustworthy source of data for schools conducting statistical experiments.

Other Improvements: If I were to do this experiment again, I would check that the median wealth of the groups was similar and include data over a longer period.