**Exercise 8.1**

The mean weight loss for Diet B is 3.71kg, while the mean weight loss for Diet A is 5.341kg. This means that Diet B produced less weight loss on average than Diet A. Despite this, both diets were almost identical in effectiveness for participants as the sample standard deviations were almost equal (2.536kg for Diet A, and 2.769kg for Diet B). Both caused participants to lose weight.

**Exercise 8.2**

The IQR for Diet A was 3.285kg, and the IQR for Diet B was 3.451kg. This suggests that both diets produced consistent weight loss for the sample groups, when compared to each other- there isn’t a large variance and outliers do not affect this measurement. However, the findings for Diet A are relatively right-skewed, as its first and third quartiles are higher than Diet B (3.748kg and 7.033kg, vs 1.953kg and 5.404kg respectively), which implies that Diet A produced a higher quality of weight loss than Diet B.

**Exercise 8.3**

In Area 1, the majority of respondents preferred some other breakfast cereal compared to brands A and B. In Area 2, the opposite was seen- the majority of respondents preferred brands A and B (21.1% and 33.3% of responses respectively), and the minority (45.6%) preferred some other breakfast cereal.

**Exercise 8.4**

Based on the context provided in the annexe, it can be said that the aim of this analysis is to measure the differences between the agents, thus the two-tail data is used for drawing conclusions since differences could be positive or negative.

The t value is -2.636 with a two-tail p-value of 0.027, which is less than the standard significance level of 0.05. This means that the result findings are statistically significant and that the research groups are different from each other.

Bearing this in mind, the means for Agent 1 and Agent 2 were 8.15 and 8.54 respectively, meaning that using Agent 1 resulted in less impurities appearing in the product.

**Exercise 8.5**

If a one-tailed test was conducted instead of a two tailed test, it could still be concluded that Agent 1 filters out more impurities than Agent 2, especially because the one-tailed test displays a much lower p-value (0.009). This means that this finding is statistically significant to a high degree.

**Exercise 8.6**

Since the sample populations are different to each other (i.e., divided by the cardholder’s sex), using methods for testing independent samples is appropriate.

Due to the difference in sample populations, it is necessary to first determine if the variance between the two populations are equal. This is done by completing an F-test and is a prerequisite for evaluating differences between the means.

The observed F value is 1.2258 and the two-tailed p-value is 0.4365. This means that the F value is statistically significant, and this means that there may be significant underlying differences in the variance between the populations selected. This means that a t test assuming equal variances cannot be carried out.

There are a few possible options:

* Conduct a t test assuming unequal variances. The downside of this approach is that it becomes harder to draw conclusions between means because the research assumption of equal population variances no longer holds (BMJ, 2022).
* Try obtaining data from a different sample group
* Perform a data transformation (BMJ, 2022; Graphpad, n.d.)

Taking the approach of conducting a t test assuming unequal variances, the two-tail p value is 0.001, implying a high degree of confidence, which makes it possible to compare means. The difference between means is 8.68, but it cannot be concluded that men with a superplus diamond card have a higher income than women with a superplus diamond card.

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