Customer Ratings Analysis

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1 Introduction

Our primary objective is to compare and rank the four types of businesses (BBQ, Burgers, Pizza, Sandwiches) from unpaid customer ratings. A customer provides ratings from 1-5 for every type of business and each set of business ratings by a customer is designated an elite or non-elite status. It is also possible that a customer contributes ratings as both an elite and non-elite. We are also interested in whether elite customers give higher ratings than non-elite customers.

Using the tall/long version of data, there are 3 non-numeric fields, 1 numeric field and 262 observations.

2 Methods

Since each customer rates all food types but only some are designated both elite statuses, food types is a within factor and elite status is a between factor. Thus, we use a repeated measures one-way ANOVA to compare the means of ratings by food types and a separate one-way ANOVA for elite status to test the two following sets of hypotheses:

Hypotheses for the effect of food type:

H_0: There is no difference in mean customer rating for any food type.

H_a: There is a difference in mean customer rating by food type.

Hypotheses for the effect of elite status:

H_0: There is no difference in mean customer rating for any elite status.

H_a: There is a difference in mean customer rating by elite status.

3 Results

3.1 Summary statistics

We start by computing the mean customer ratings of the four food types split by elite vs non-elite status and for each elite status as well in Table 1.

	FALSE	TRUE
BBQ	3.065000	3.371719
Burgers	3.749702	3.841094
Pizza	3.211567	3.747109
Sandwiches	3.966045	4.001953
Elite	3.498078	3.740469

Table 1: Mean customer ratings by food types and elite status

On average, the customers rated the food types in the order of Sandwiches being the highest, followed by Burgers, Pizza and then BBQ with the lowest average rating. Elite customers have a higher average rating than non-elite customers by 0.242 points.
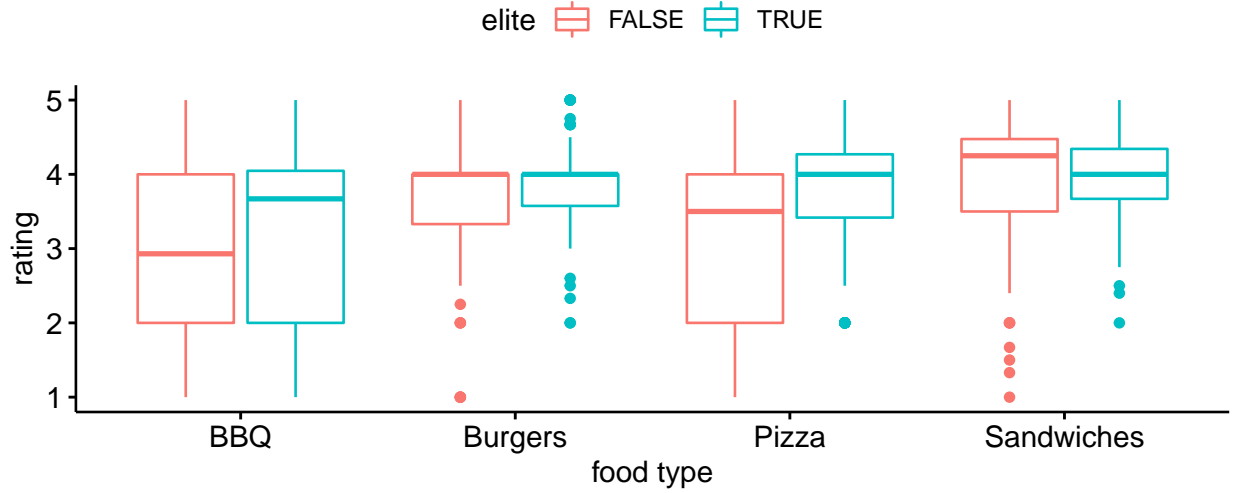

Figure 1: Box plot of mean customer ratings by food type and elite status

Figure 1 shows the distribution of customer ratings for each population of food types separated by elite status.

3.2 ANOVA models

Effect	DFn	DFd	F	p	p<.05	ges
food_type	3	877	37.839	0	*	0.115

Table 2: Repeated measures one-way ANOVA for food type factor

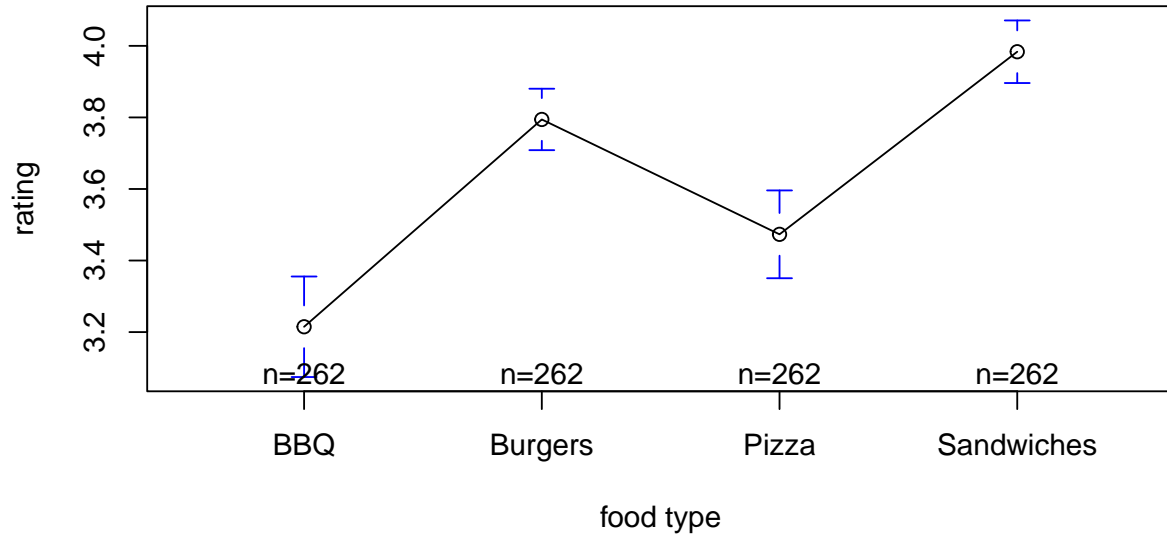|	Df	Sum Sq	Mean Sq	F value	Pr(>F)
elite	1	15.38524	15.3852398	16.86	4.34e-05
Residuals	1046	954.50521	0.9125289	NA	NA

Table 3: One-way ANOVA for elite status factor

Figure 2: Plot of means and confidence intervals for food type ratings

Table 2 shows the results of the repeated measures one-way ANOVA for food types. Differences among customer ratings for different food types are statistically significant (as indicated by the *) thus we reject the null hypothesis and conduct Bonferroni correction post-hocs for paired data. The results for pairwise comparisons of food types using paired t tests and Bonferroni correction is statistically significant for all comparisons.

Table 3 shows the results of the one-way ANOVA for elite or non-elite status. Differences among average elite and non-elite customer ratings are significant so we reject the null hypothesis.

Figure 2 shows the mean customer rating for each food type. Sandwiches rank highest, followed by Burgers, Pizza and lastly, BBQ.

4 Conclusion

The ranking of food types according to average customer ratings are as follows:

(highest)Sandwiches > Burgers > Pizza > BBQ(lowest)

From the repeated measures one-way ANOVA test as seen in Table 2 and Bonferroni correction test results, these differences in mean customer ratings for food types are statistically significant for all comparisons.

As for elite and non-elite customers, yes a customer with Elite = TRUE gives, on average, a higher rating than a customer with Elite = FALSE. From the one-way ANOVA for elite and non-elite status conducted in Table 3, elite customer ratings are 0.242 points higher than non-elite customer ratings and this difference is statistically significant.