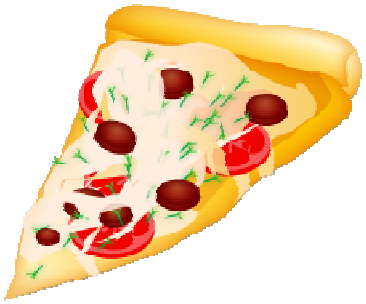
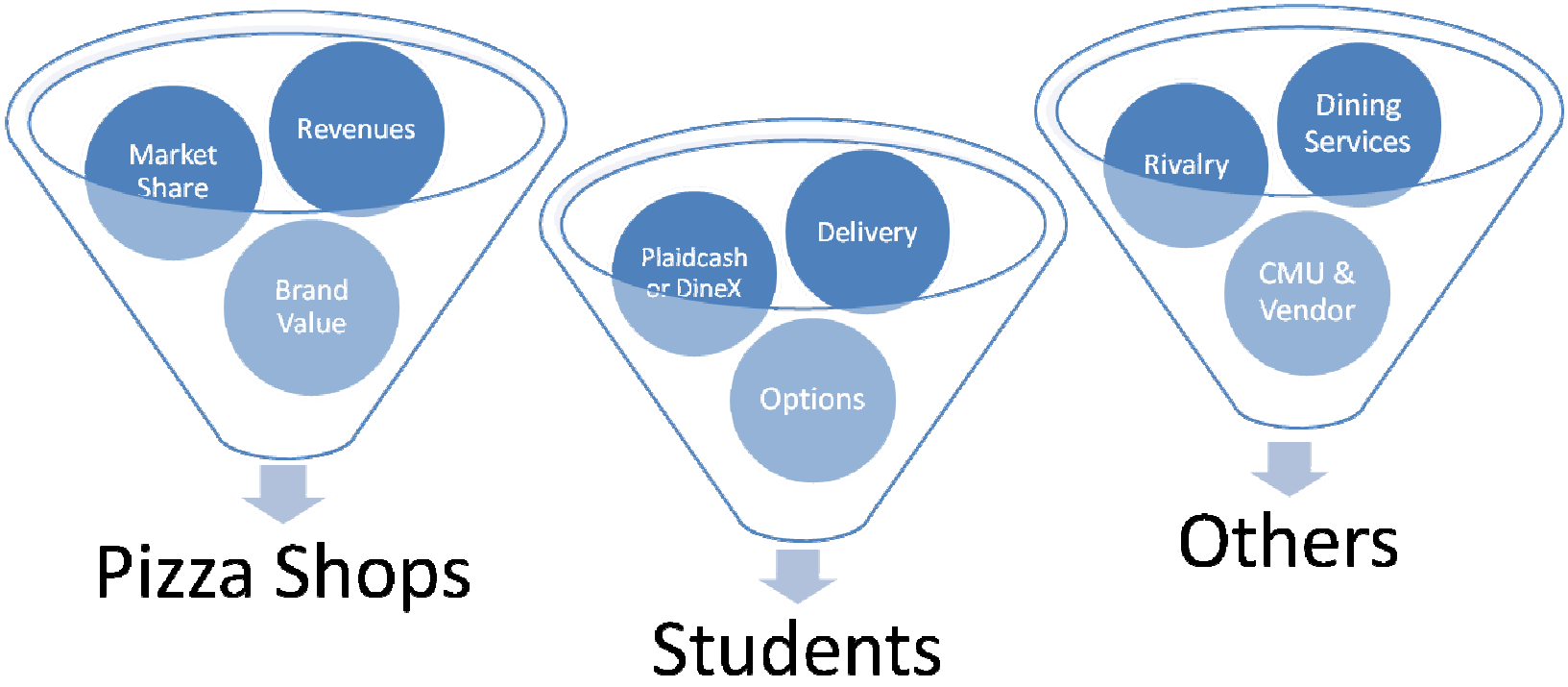
Group H



Atishe Chordia | Henry Wu | Tony Poor
Jacob Park | Stafford Brunk

Everybody loves pizza!

- What characteristics of pizzas and pizza shops appeal to the undergraduate students enrolled in the Pittsburgh campus of Carnegie Mellon University?



Questionnaire

Questions we propose to study include:

- Determine how often people eat pizza and order for delivery, and where their favorite pizza place is
- Compare the quality of pizza in chains to that of smaller, local places and what gives rise to this difference in quality
- Examine each aspect of a pizza shop (pizza quality, non-pizza products, cost, business hours, delivery) and the influence of each on where one chooses to order from

Question:

What time of day do you typically order pizza? Mark all that apply.

- □ 4:00 a.m. – 10:00 a.m.
- □ 10:00 a.m. – 2:00 p.m.
- □ 2:00 p.m. – 6:00 p.m.
- □ 6:00 p.m. – 11:00 p.m.
- □ 11:00 p.m. – 4:00 a.m.

Question:

How many times per week do you eat food from a campus dining restaurant (Entropy, trucks, hot dog stand, all other dining locations included)?

- ○ 0
- ○ 1-2
- ○ 3-5
- ○ 6-10
- ○ 10-15
- ○ 15+

Sampling

- Used a custom Ruby script to download the Andrew IDs for all CMU Pittsburgh undergrads
- Used population list to sample 800 undergrads
- Each person's e-mail address was encoded using the SHA-1 hash algorithm
- E-mails were sent using another custom Ruby script

Survey

- Conducted using Google Docs
- The unique ID for each person allows for re-contact as well as filtering double responders
- All communication done in software so the researchers never know what SHA-1 corresponds to which e-mail address in results

Gotchas

- CMU's directory service allows my script to accidentally import alumni
- Google Docs encodes number ranges (eg 10-15) as dates (10/15/2010)

Response Rate

Responses were amazing.

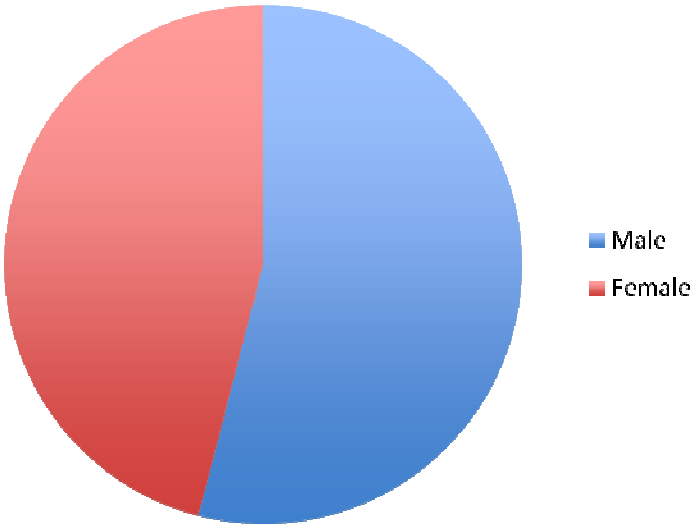
30+% with two emails (244 respondents).

29.25% after eliminating respondents.

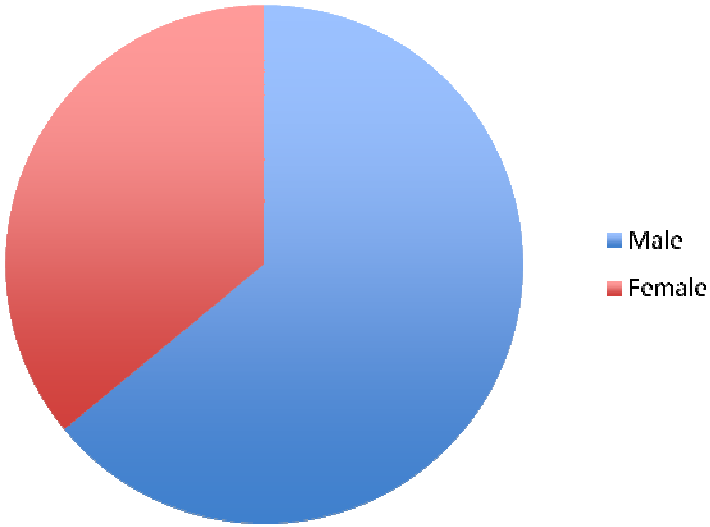
Response Demographics

Far more **female respondents.**

Response Gender



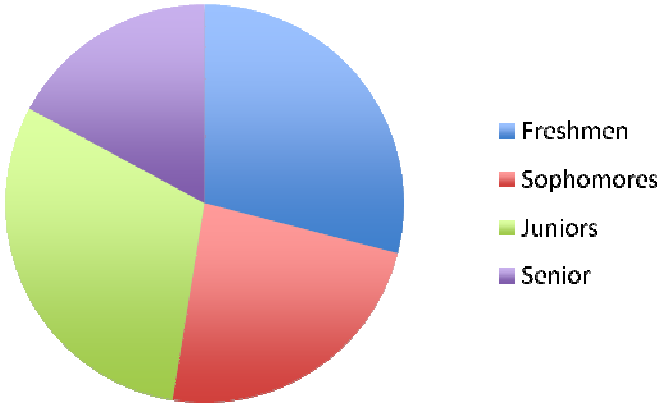
Population Gender



Response Demographics

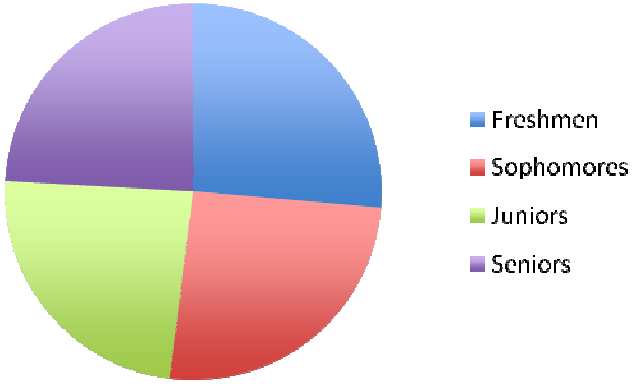
Response Schools

Response Years



Population Schools

Population Years

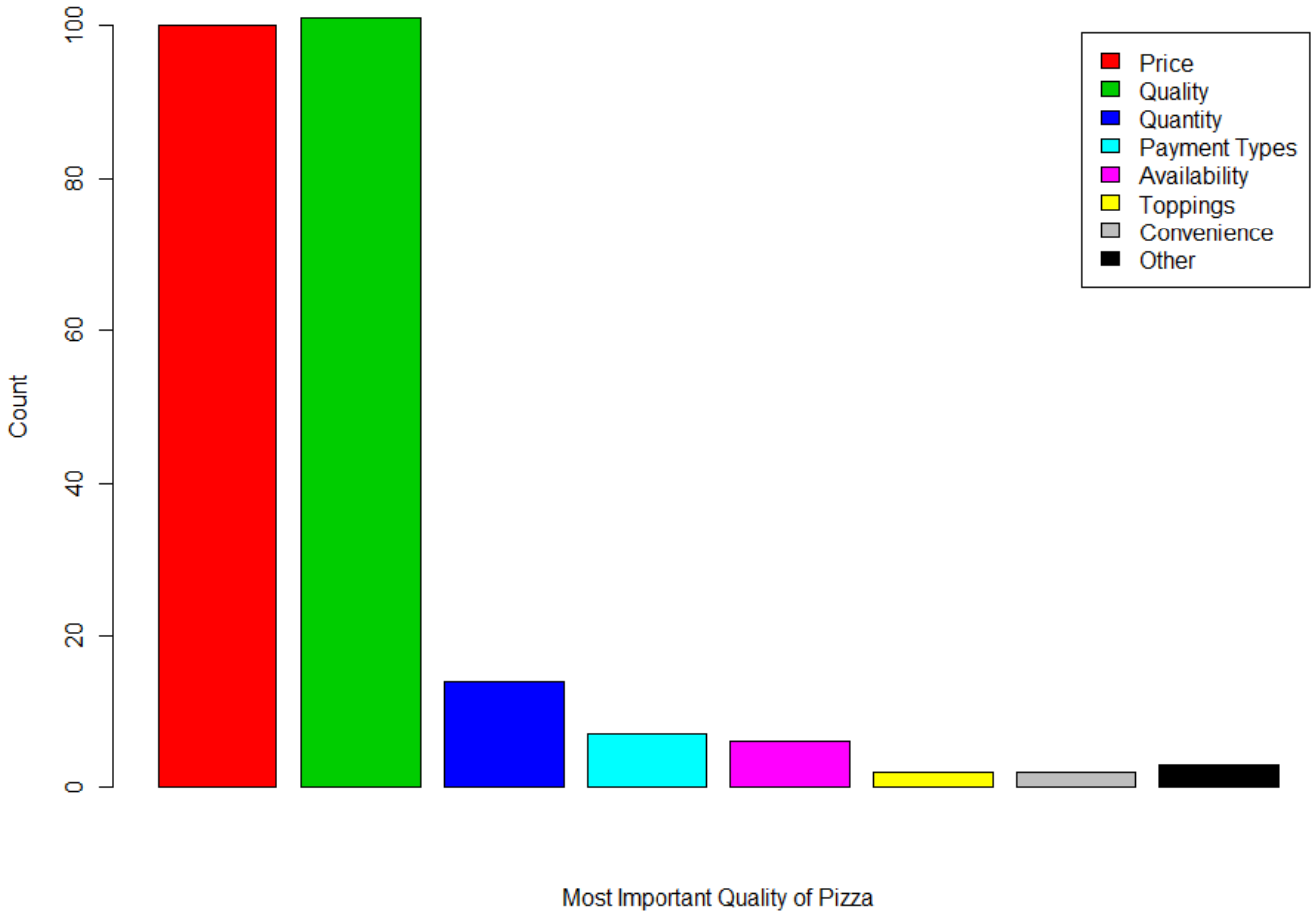


Response Demographics

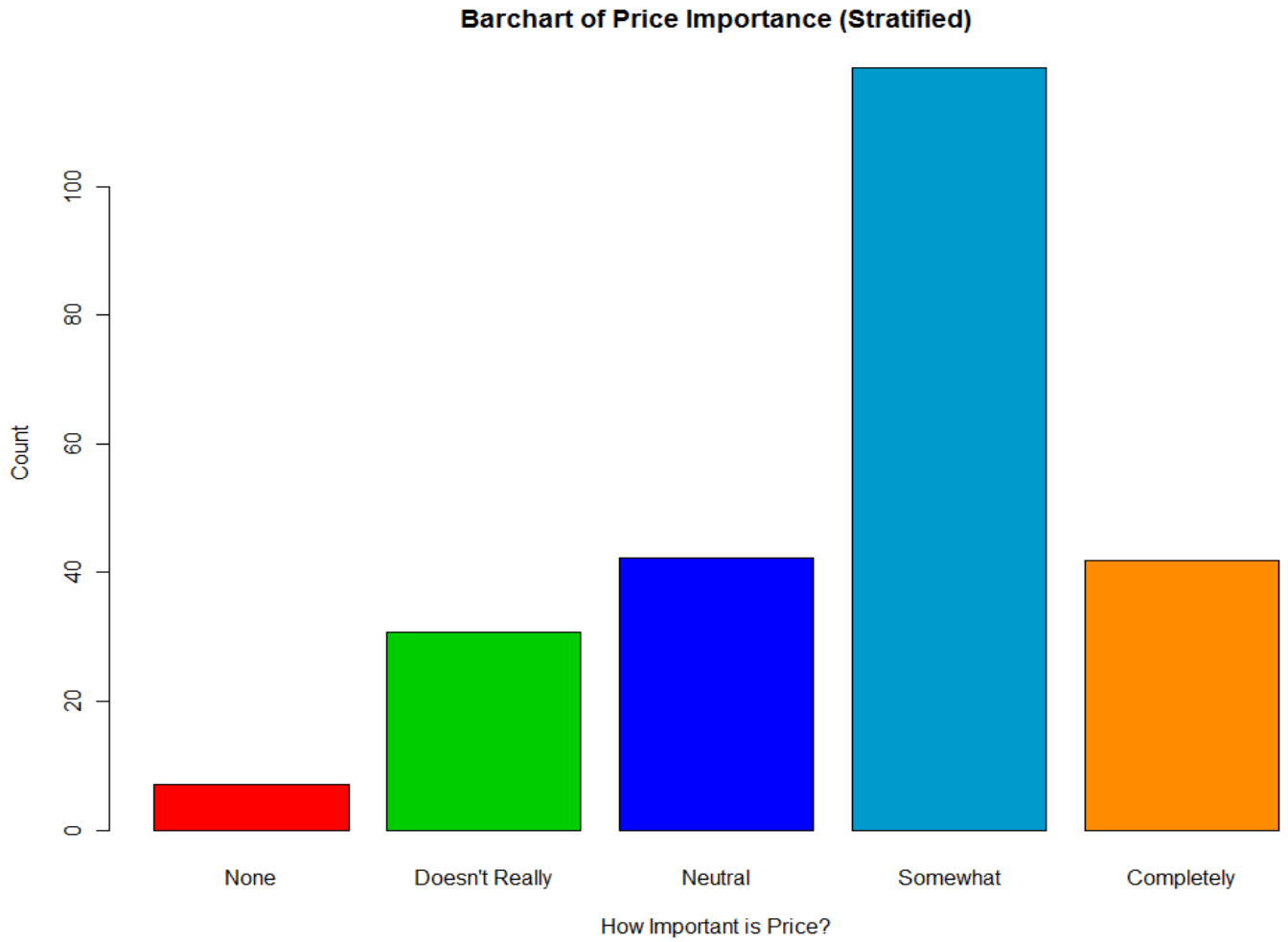
Final post-stratification weights:

	Freshman	Sophomore	Junior	Senior
CFA	.87	1.45	.8	1.64
CIT	.87	1.24	.71	1.2
HSS	1.31	.78	.81	1.67
MCS	.73	1.61	.53	3.7
SCS	.84	1.25	2.18	.95
TPR	.9	.49	.95	1.14

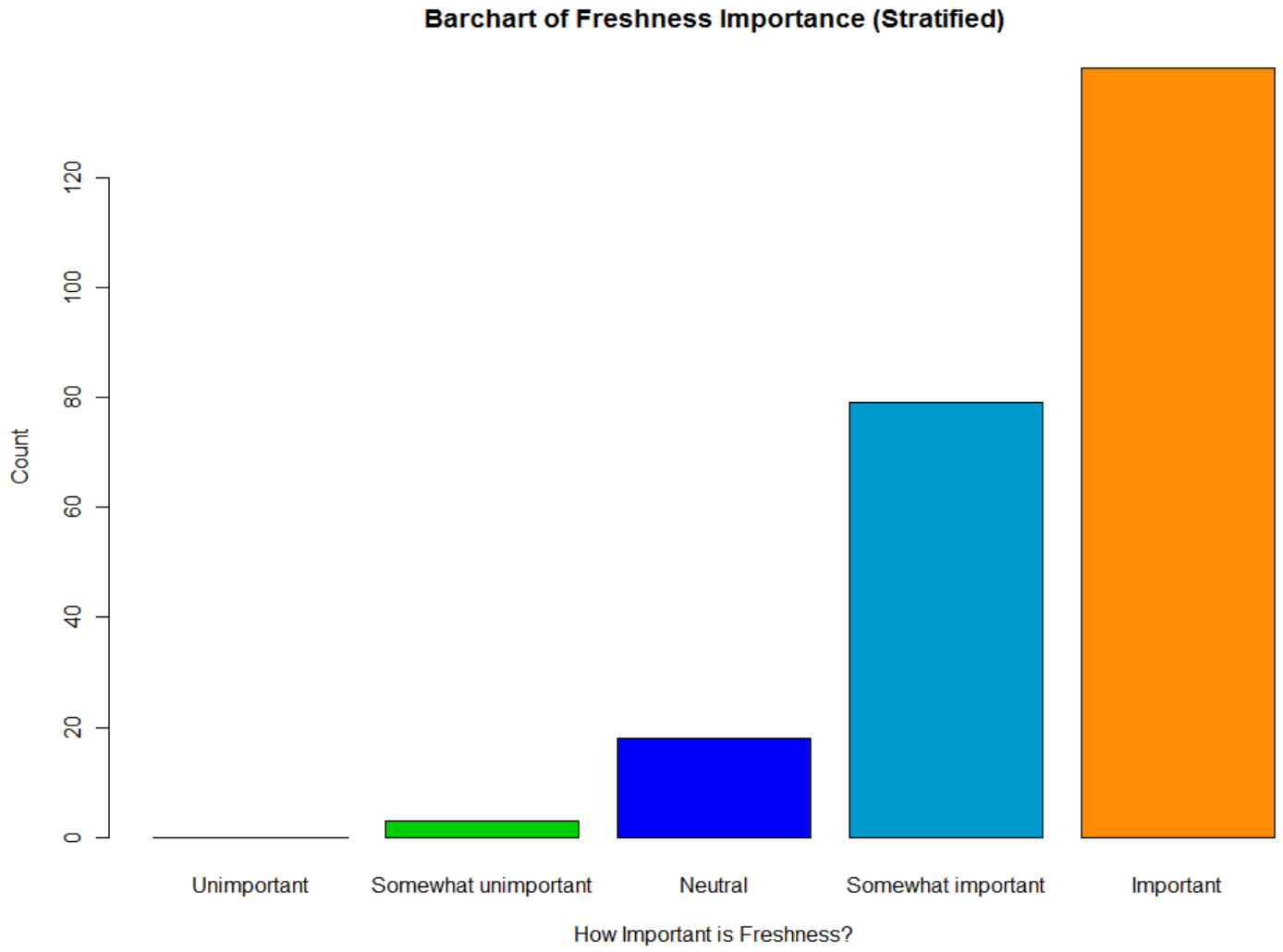
Most Important Quality of Pizza



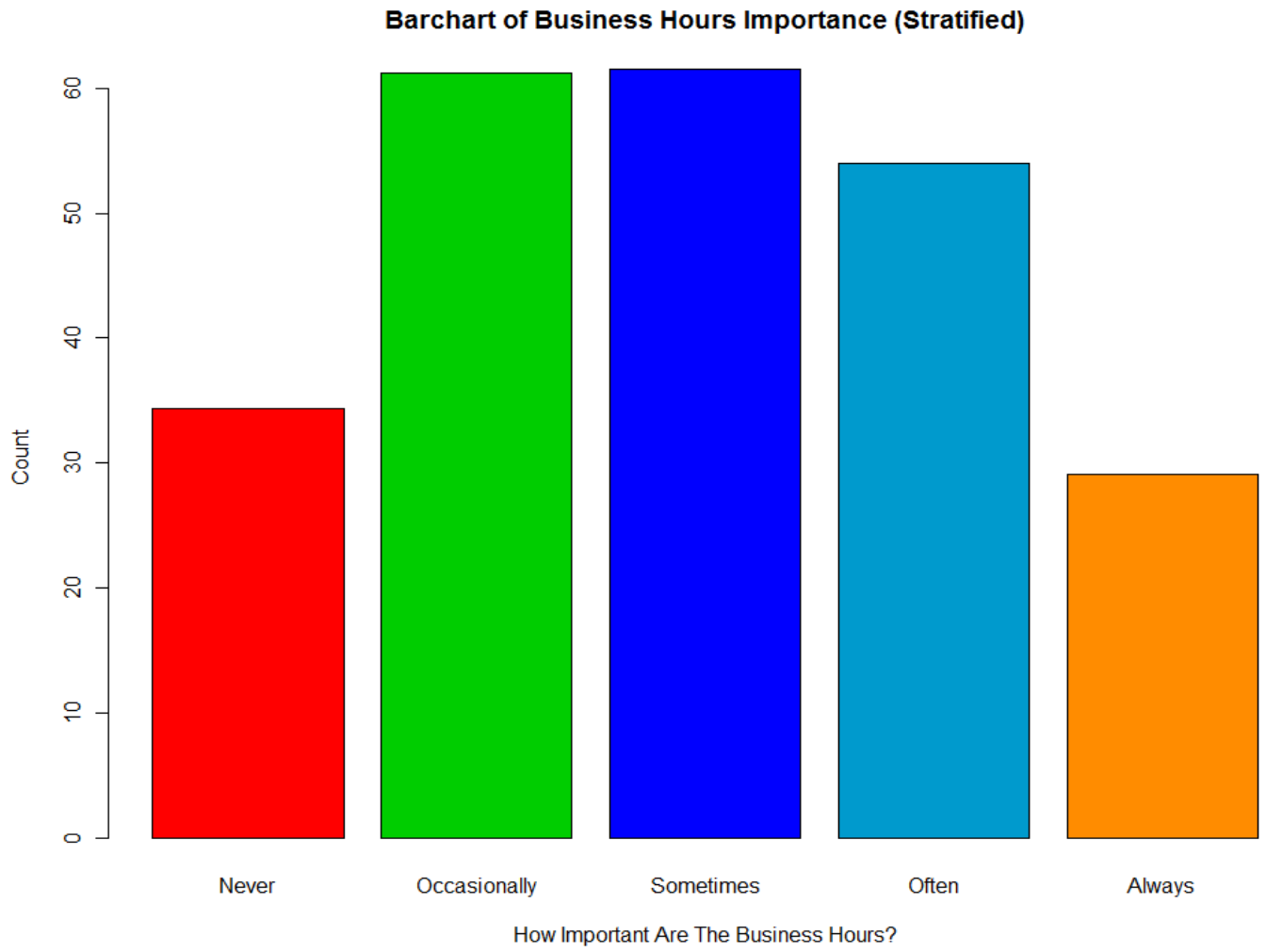
Importance of Price



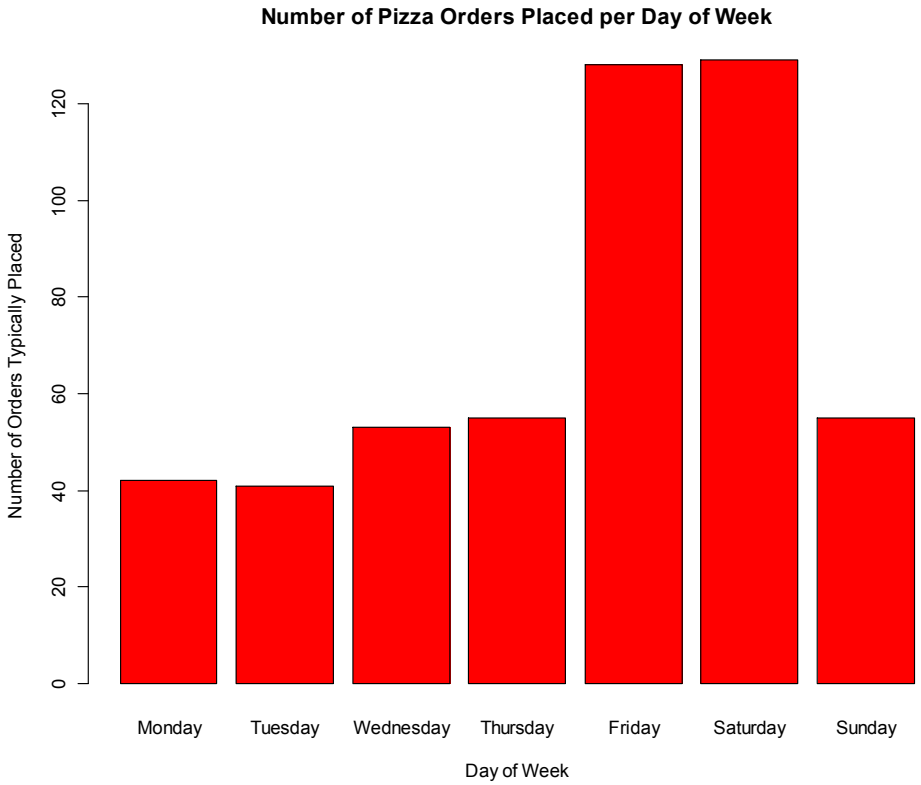
Importance of Freshness

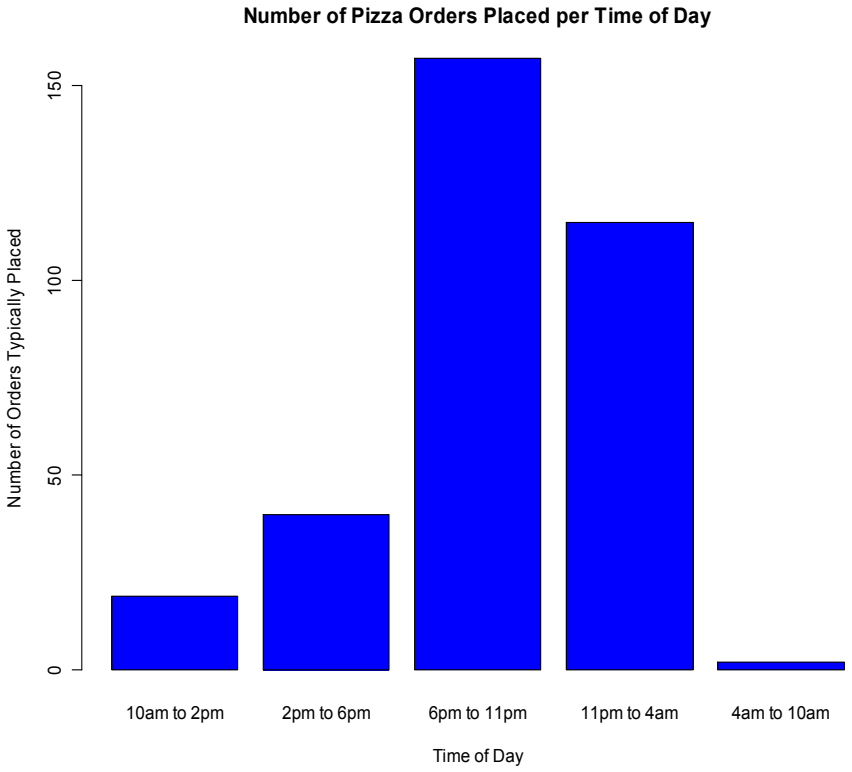


Importance of Business Hours

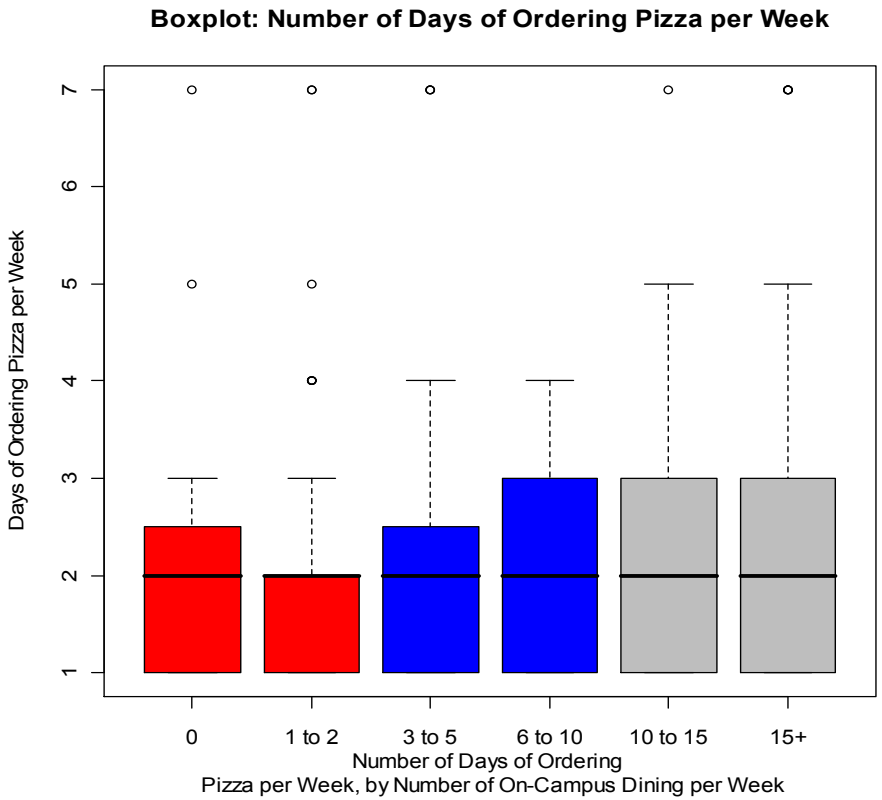


Analysis of Data on Pizza Orders

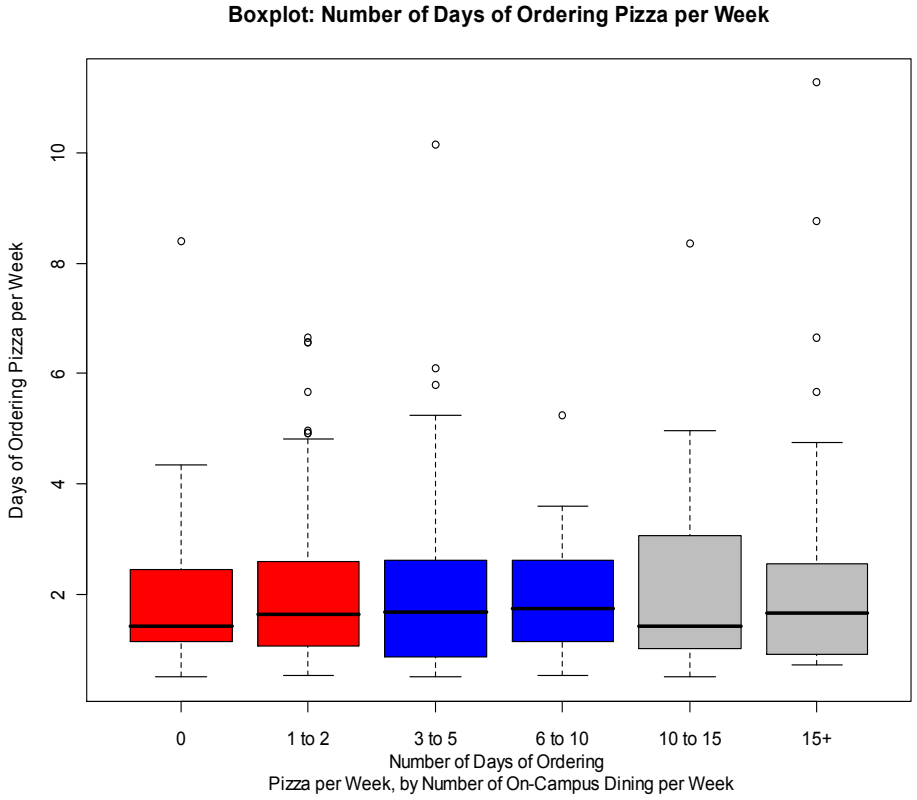




Number of Days of Ordering Pizza by Campus Dining Experiences



- Before post-strat weights were applied

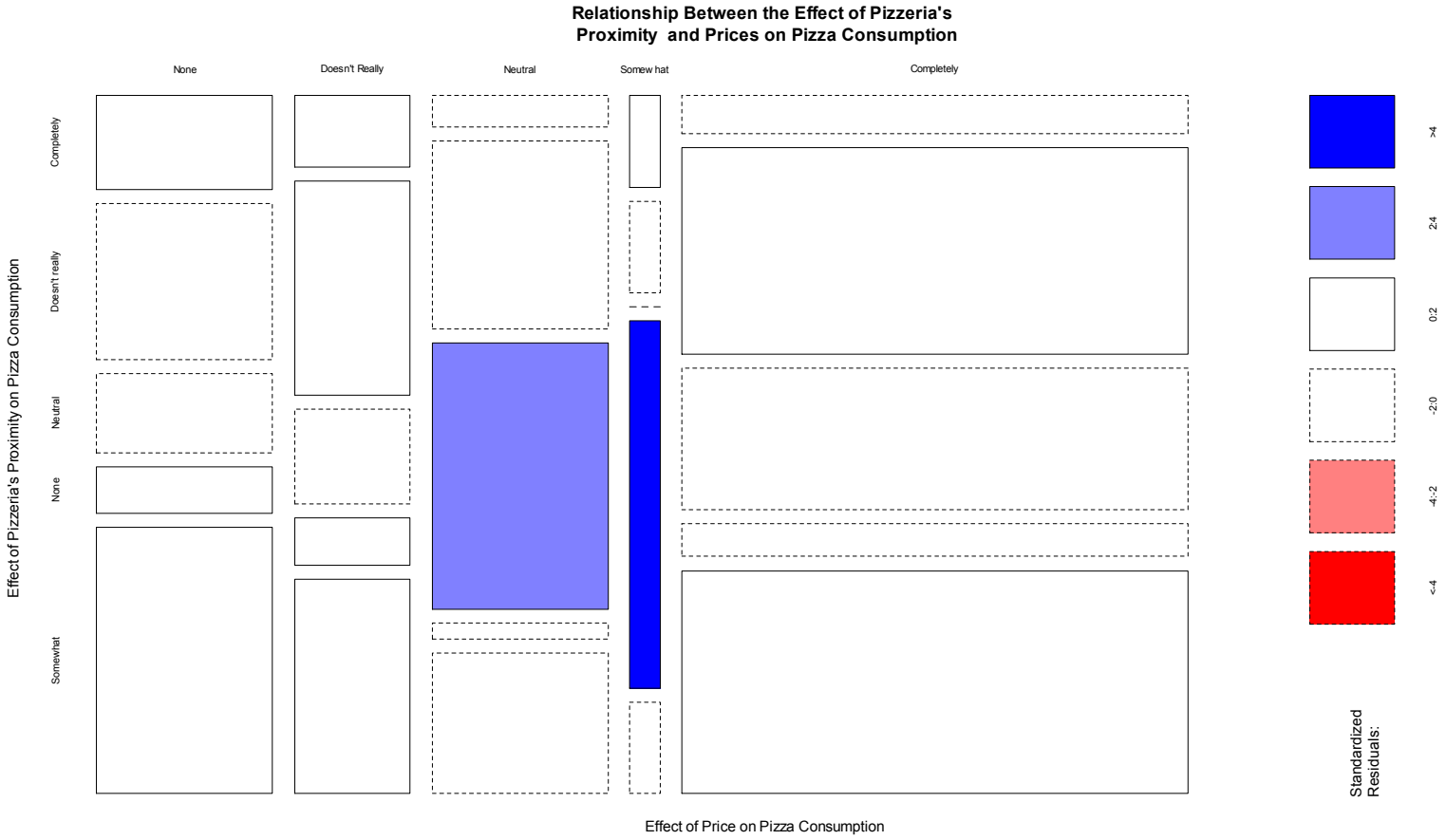


- After post-strat weights were applied

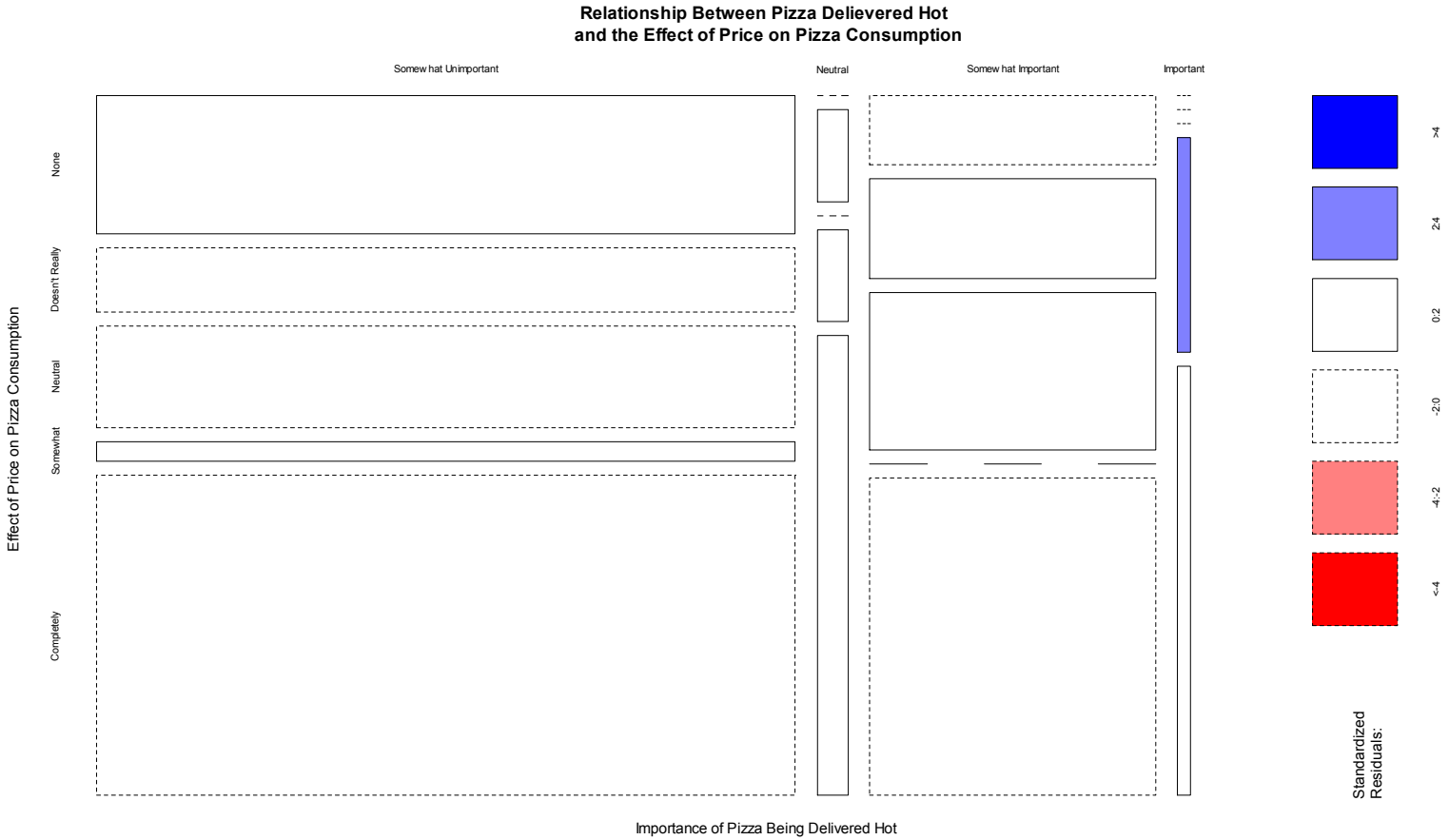
Relationships Among Pizza Variables

- We expect independence between the following variables on pizza consumption:
  - Effect of pizzeria's prices and proximity
  - Importance of pizza being delivered hot and effect of pizzeria's prices and
  - importance of pizza's freshness and effect of pizzeria's prices
- We expect dependence between the following variables on pizza consumption:
  - Importance of pizza's freshness and being delivered hot

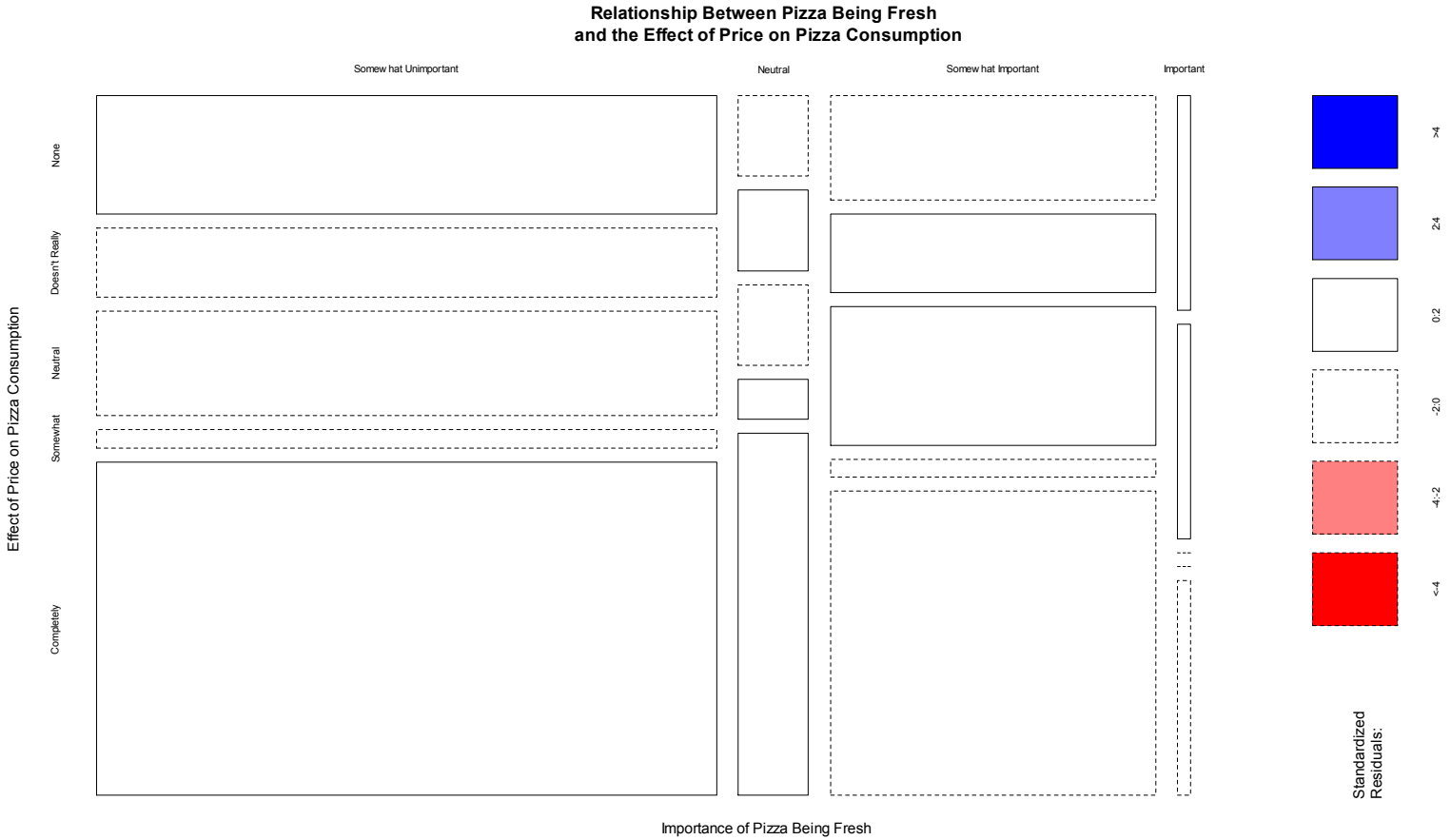
Effect of Pizzeria's Prices vs. Proximity



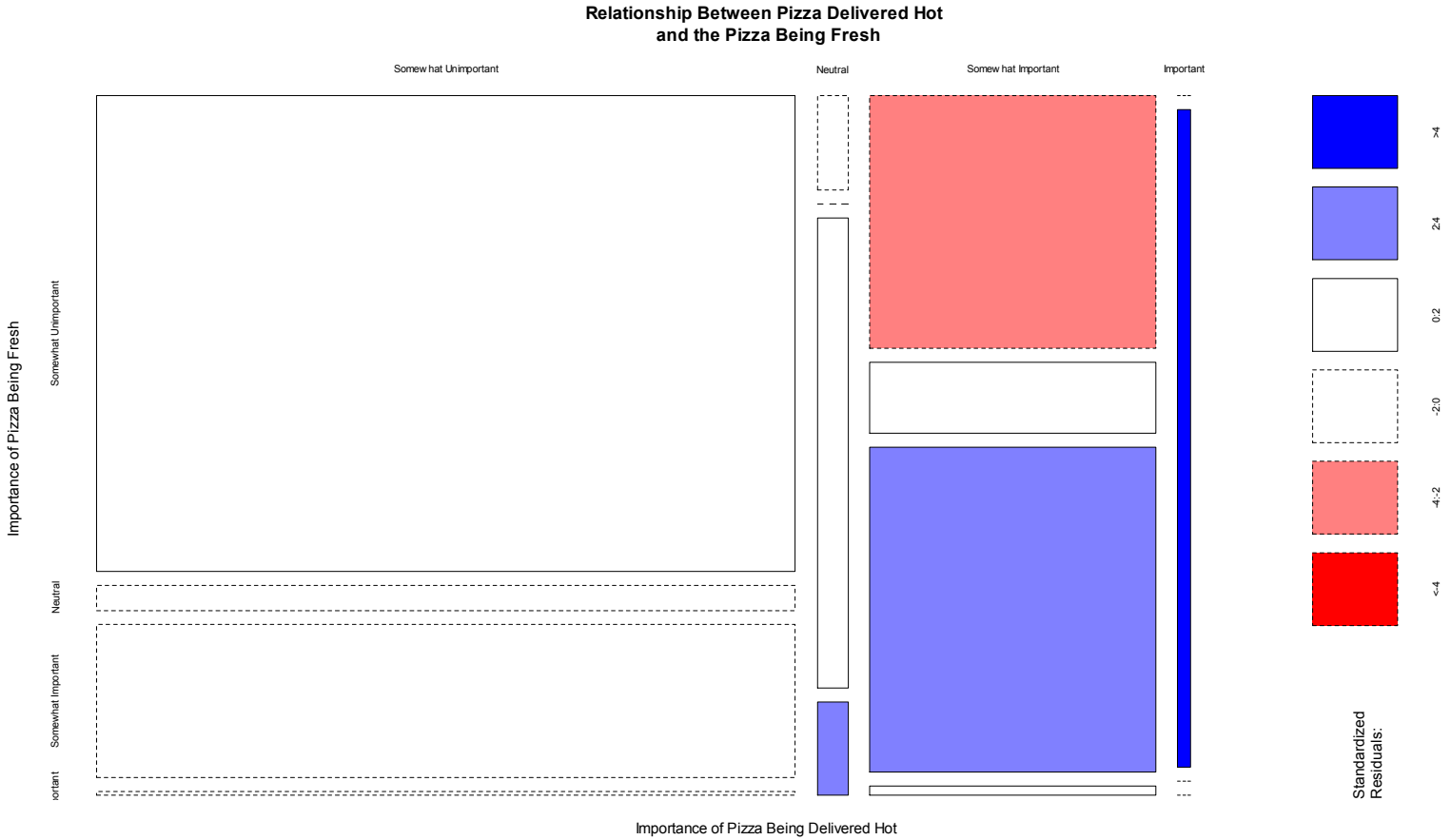
Importance of Pizza Being Delivered Hot vs. Effect of Pizzeria's Price



Importance of Pizza Being Fresh vs. Effect of Price on Pizza Consumption



Importance of Pizza Being Delivered Hot vs. Pizza Being Fresh



Results For Favorite Pizzeria

Most popular responses for favorite pizzeria:

- Vocelli's (60 votes)
- Papa John's (46 votes)

Over 20 different pizzerias received write-in votes

Comparing Results By Pizzeria

- Goal: compare the distributions of explanatory variables for different pizzerias
- Chi-square tests for those who listed Vocelli's as favorite vs. those who chose Papa John's
- H_0: μ (Vocelli's) = μ (Papa John's)

  H_a: μ (Vocelli's) $\neq$ μ (Papa John's)

Weighted Chi-Square Tests

- Use weights obtained from stratification on class and school
- Use R to sum weights, conditioning on favorite pizzeria and value of explanatory variable
- Use R to perform weighted chi-square tests on the frequency tables of variable vs. pizzeria

Weighted Chi-Square Frequency Tables

Weighted Frequency of Business Hour Importance

	never	occasionally	sometimes	often	always
Vocelli's	7.88	16.16	11.04	15.09	7.53
Papa John's	9.13	6.79	17.3	5.54	4.73

p-value = 0.0739; means are not significantly different

Weighted Frequency of Acceptable Delivery Time

	0-15 min	16-30 min	31-45 min	46-60 min	>60 min
Vocelli's	0.78	15.44	36.13	4.1	1.25
Papa John's	0.87	16.76	21.31	4.55	0

p-value = 0.521; means are not significantly different

Chi Square p-values

Variable	p-value
frequency of eating pizza	0.2449
preference type	0.0671
most important factor	0.5708
business hour importance	0.0739
price importance	0.1007
proximity importance	0.6343
acceptable delivery time	0.521
importance of hot pizza	0.0618
freshness importance	0.0541

Results

- The means were not significantly different for Vocelli's vs. Papa John's for any of the variables, but some are close to the threshold ($.05 < p < .08$)
- These tests did not use all observations. Most responses to the pizzeria question did not have enough observations to merit a reliable test.
- The results for the "other" group as a whole have too much variance and are too unreliable

Conclusion

- Price and Quality are the two most significant factors to consider from the consumer side
  - Quality =Function(Flavor, Texture, Smell, Appearance)
- Freshness of pizza is another important characteristic
- 80% order pizza for delivery
- Pizza is frequently consumed during the hours 10pm-3:00am
- Tie-up with dining system (Recommendation: Papa John's)
  - Huge Demand (average of 2 pies/person/week)
  - Vocelli Bias
  - Competition could potentially lower prices for students
  - Secondary option caters to a larger audience (variety)