

2013 Parking and Transportation Services Survey Analysis

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Summary

A survey was performed asking faculty, staff, and students at the University of Colorado Boulder about their satisfaction with parking and transportation services. The results were analyzed in order to understand 1) the current state of satisfaction and 2) issues which had high leverage on satisfaction rates for potential targeting to improve satisfaction going forward.

There were five main findings.

- The overall satisfaction (“Satisfied” or “Very Satisfied”) of the respondents with parking and transportation services was 28.37% (Figure 1)
- The overall “not dissatisfied” (“Neither Satisfied Nor Dissatisfied,” “Satisfied” or “Very Satisfied”) was 52.5% (Figure 1)
- Satisfaction varied with the role at the university (refer to Figure 2 through Figure 4)

The service chosen as the most influential is associated with their assessment of Value of Parking (refer to

- Most Influential Services on page 10)
- Depending on the amount of improvement in satisfaction desired, and the role of the individual, different factors would be targeted for improvement (refer to Recommendations to Improve Satisfaction on page 31
- In general, the largest improvement in satisfaction across all respondents was linked with improving the fairness of the space allocation process in the eyes of our clients.

Results

Response Rate

The higher the response rate, the more representative our data is of our clients' voices and the more effective our reactions will be. Here is the response rate by role at the university:

Table 1 - Survey Response Rate

Role	Number of Invites Sent	Responses	% Response Rate
Faculty	2372	812	34.23%
Staff	3471	1938	55.83%
Student	2000	321	16.05%
Total	7843	3071	39.16%

As we use the data to drive those improvement activities that most affect you, we hope to see the response rates increase even further.

Overall Satisfaction

All Respondents

About 28.37% of all respondents said that they were satisfied or very satisfied. 52.5% did not indicate dissatisfaction (this category includes “Neither Satisfied Nor Dissatisfied,” “Satisfied” or “Very Satisfied”).

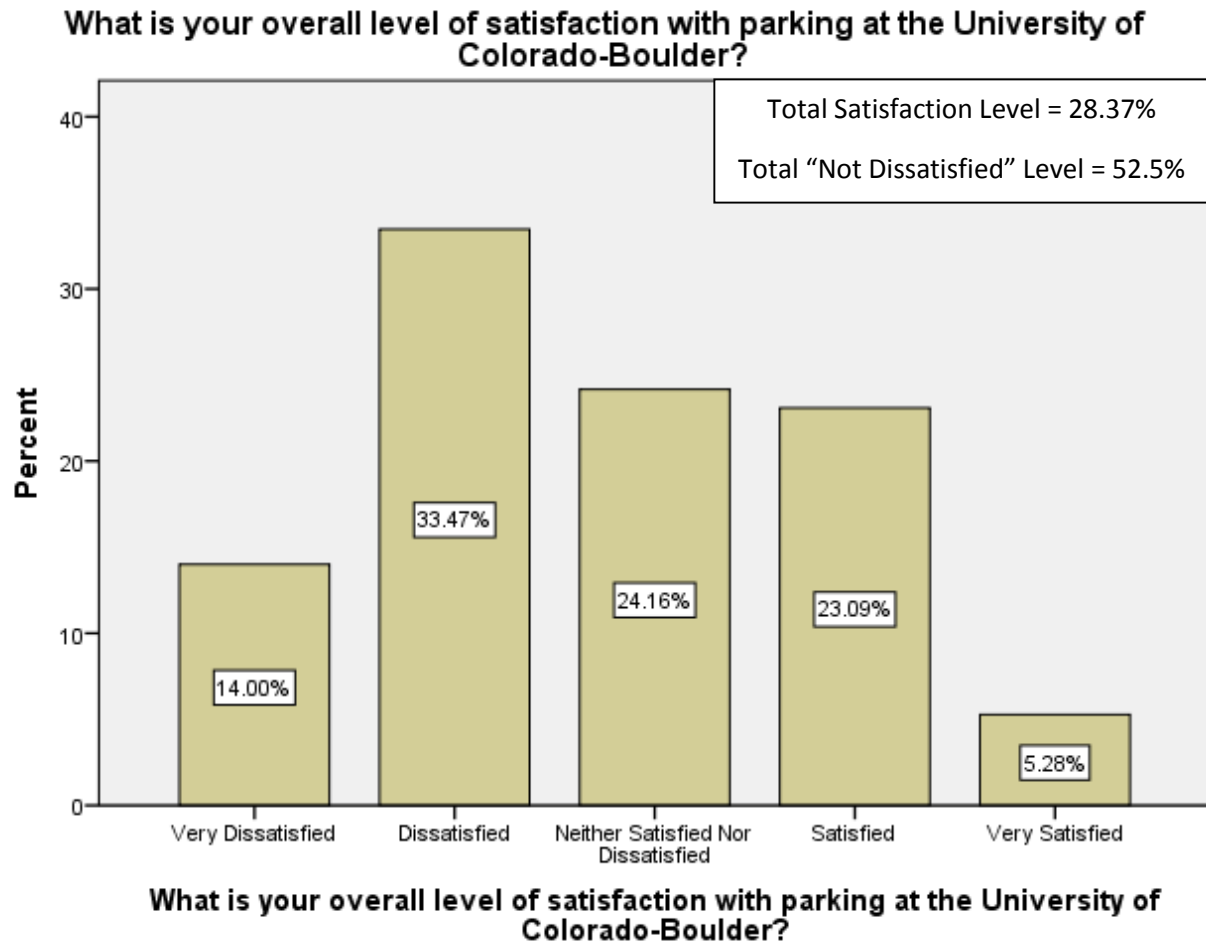


Figure 1 - Overall Satisfaction, All Respondents

These responses can also be broken out by role at the university:

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

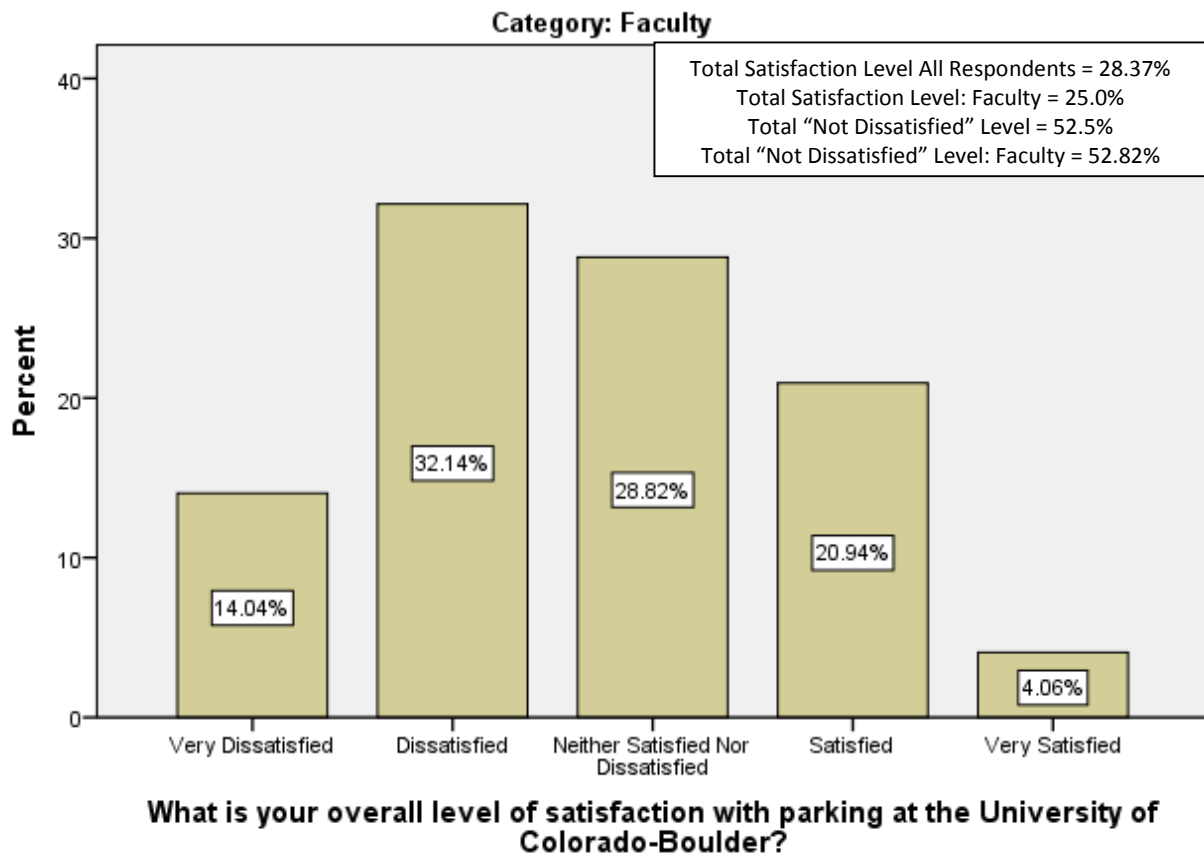


Figure 2 - Overall Satisfaction, Faculty

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

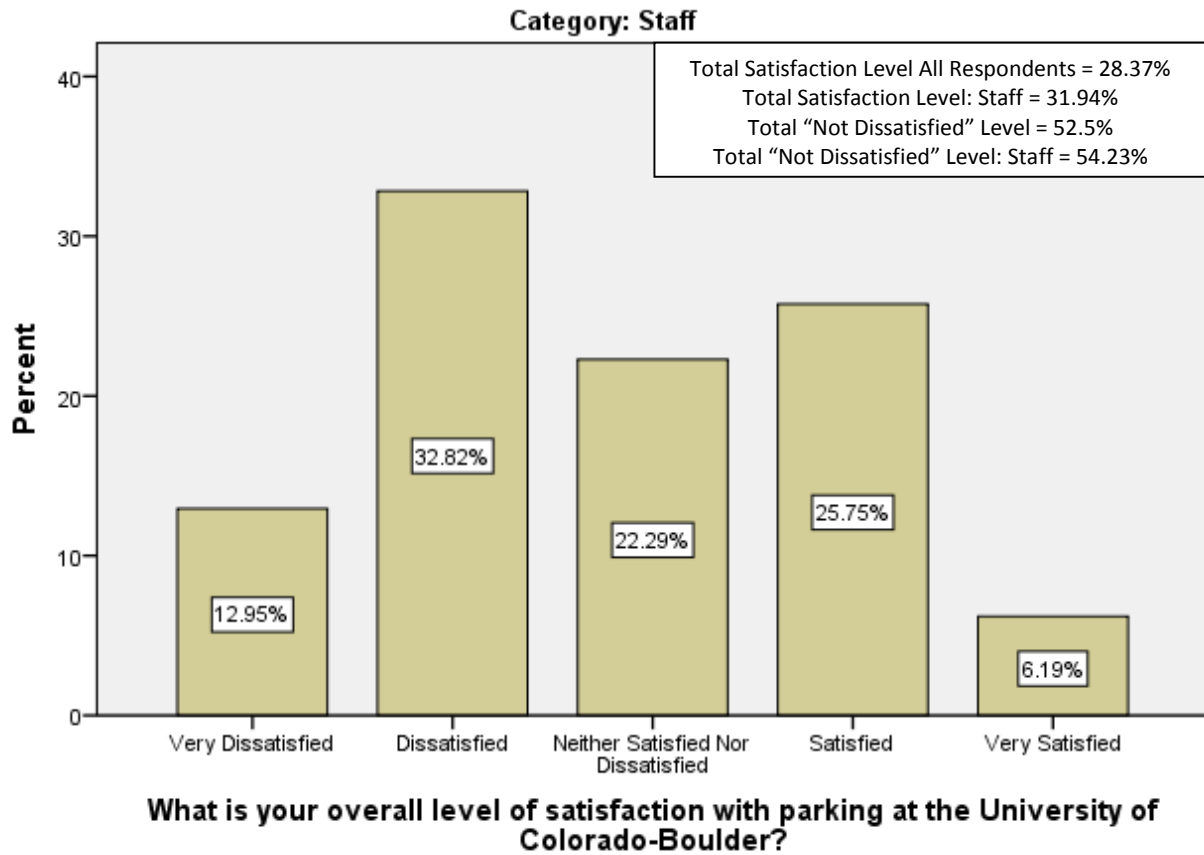


Figure 3 - Overall Satisfaction, Staff

Students

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

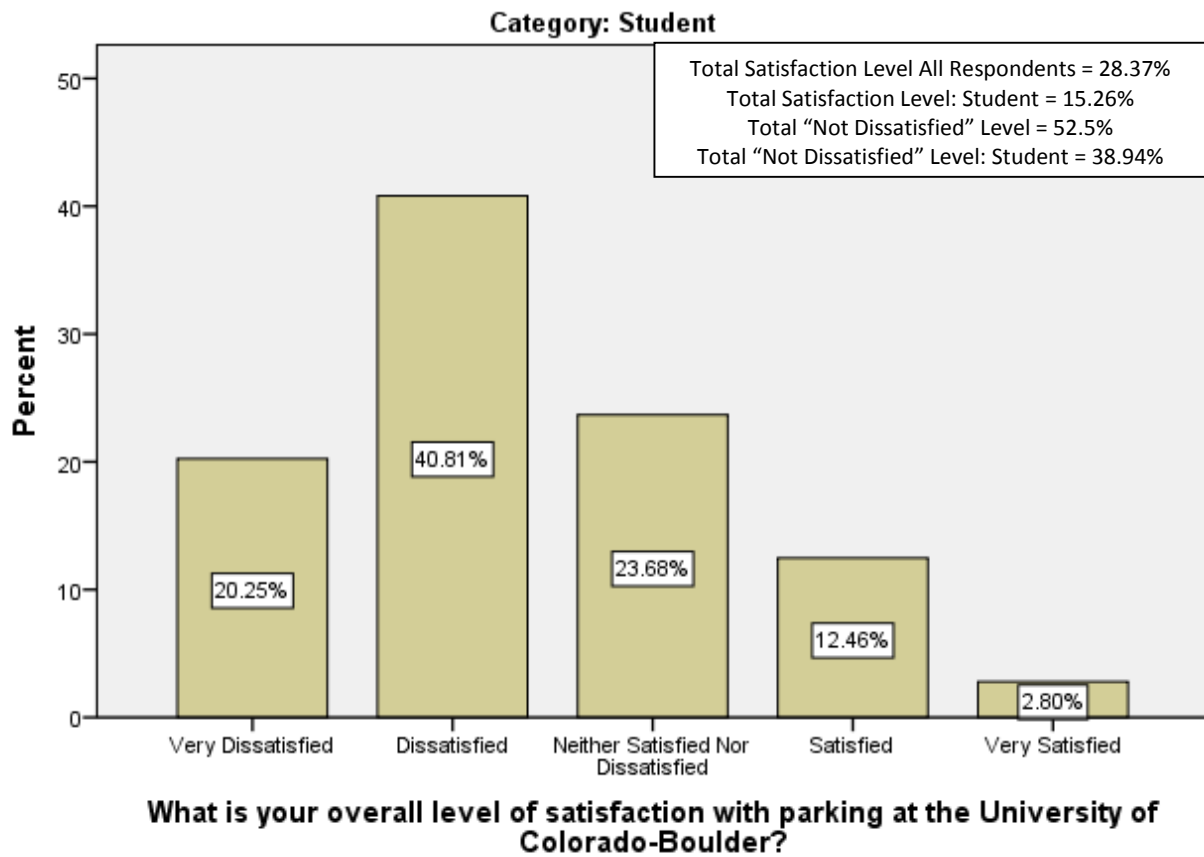


Figure 4 - Overall Satisfaction, Students

Most Influential Services

The different service categories were ranked to indicate how important it was in deciding client satisfaction with parking and transportation on campus.

This presents an indication of how important the service categories were in forming client satisfaction with parking and transportation on campus. Of the five service categories, Value of Parking was the most influential and Interactions with Staff was the least influential. The interpolated median values for each service category are shown in rank order below:

Table 2 - Interpolated Median of Most Influential Category Rank Orders

Service Category	Median(i)
Value of Parking	1.87
Parking Facilities	2.34
Parking Violation and Appeals	3.44
Transportation Options	3.46
Interactions with Staff	3.83

And a graphical representation of the responses. The boxes show the middle 50% of the responses, the dot is the interpolated median.

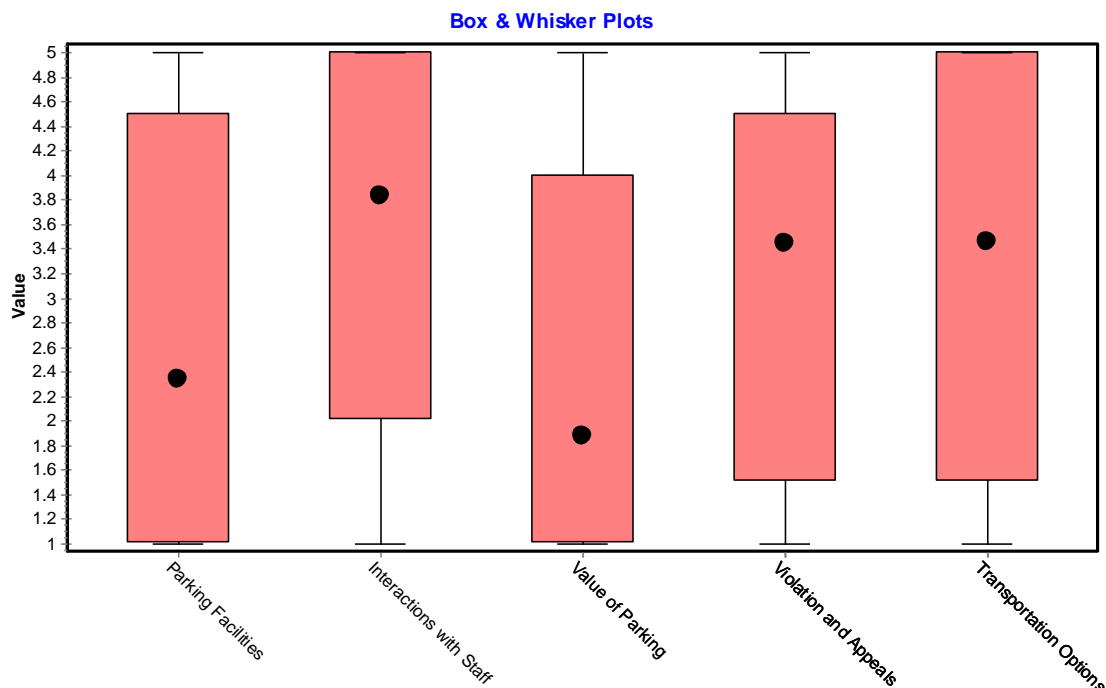


Figure 5 - Interpolated Medians, Quartiles, and Ranges of Most Influential Services Ranks

Because the lower the value of the Interpolated Median, the more important, Figure 5 illustrates that more people ranked Value of Parking and Parking Facilities as more important than the other categories, in terms of how influential they were in forming their opinion.

We also want to know whether the service selected by an individual as the most influential relates to their level of satisfaction. If there is no relationship, we would expect that the overall rates of satisfaction would be about the same for each service category that was selected as the most influential. Even if the number of respondents selecting a particular service aspect varies, the rate itself would be independent of the satisfaction if there were no relationship.

The following table shows the number of responses in each combination of satisfaction and most influential service.

Table 3 - Crosstabulation of Most Influential Category and Overall Satisfaction, Percentages

Selected Most Influential Category * What is your overall level of satisfaction with parking at the University of Colorado-Boulder? Crosstabulation

% of Total

		What is your overall level of satisfaction with parking at the University of Colorado-Boulder?					Total
		Very Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	
Selected Most Influential Category	Interactions with Staff	1.1%	2.2%	1.5%	1.8%	0.7%	7.3%
	Parking Facilities	2.4%	5.5%	5.2%	11.7%	2.7%	27.5%
	Parking Violations	2.4%	3.9%	1.5%	1.0%	0.3%	9.1%
	Transportation Options	0.9%	2.9%	6.0%	4.6%	1.2%	15.6%
	Value of Parking	7.2%	19.0%	9.9%	3.9%	0.4%	40.5%
Total		14.0%	33.5%	24.2%	23.1%	5.3%	100.0%

As an example, if the satisfaction level is independent of the most influential category the percent responses in the column under Very Dissatisfied would all be similar. As it is, we see that there are differences: the percentages range from 0.9% to 7.2%. Now we need to determine if these response rates are significantly different from that which would have been expected by random sampling error. In order to test that, we will be using a statistical test based on the χ^2 distribution. The actual number of respondents in each category is in the next table.

Table 4 - Crosstabulation of Most Influential Category and Overall Satisfaction, Counts

Selected Most Influential Service Category * What is your overall level of satisfaction with parking at the University of Colorado-Boulder? Crosstabulation

Count

		What is your overall level of satisfaction with parking at the University of Colorado-Boulder?					Total
		Very Dissatisfied	Dissatisfied	Neither Satisfied Nor Dissatisfied	Satisfied	Very Satisfied	
Selected Most Influential Service Category	Interactions with Staff	34	66	46	56	22	224
	Parking Facilities	73	168	161	360	83	845
	Parking Violations	75	119	45	31	8	278
	Transportation Options	28	90	185	140	36	479
	Value of Parking	220	584	305	121	13	1243
Total		430	1027	742	708	162	3069

In order to test the hypothesis that the satisfaction and service category are independent, the number that would be expected if the satisfaction rate were the same given the number of respondents in each service category is calculated and compared to the actual number of respondents. The differences are used to calculate the χ^2 test statistic.

Equation 1 - Chi-Squared Definition

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

If there is no difference between the observed frequency (f_o) and the expected frequency (f_e) then the formula would yield zero as we sum up the squared differences throughout all the cells. As the differences get larger, the statistic would get larger as well. At some point, the deviations from expected are large enough to where we cannot continue to act as if the satisfaction and the most influential category are independent from each other. That is what the following table shows – the category selected as most important in forming an opinion about parking and transportation services is related to how satisfied they are with parking and transportation services.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	651.124 ^a	16	.000
N of Valid Cases	3069		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.82.

In order to understand how important this association is, we calculate Cramér's V:

Equation 2 - Cramer's V Definition

$$V = \sqrt{\frac{\chi^2}{N(k-1)}}$$

where N is the total number of observations, k is the number of the rows or columns, whichever is smallest.

Table 5 - Cramer's V Statistic for Most Influential vs. Satisfaction

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Cramer's V	.230	.000
N of Valid Cases	3069	

Cramér's V indicates that satisfaction and the service selected as most influential are not independent and that the relationship is of moderate importance.

The following charts show satisfaction levels for groups of respondents who selected each of the categories as the most influential. You will see different distributions of satisfaction across these categories:

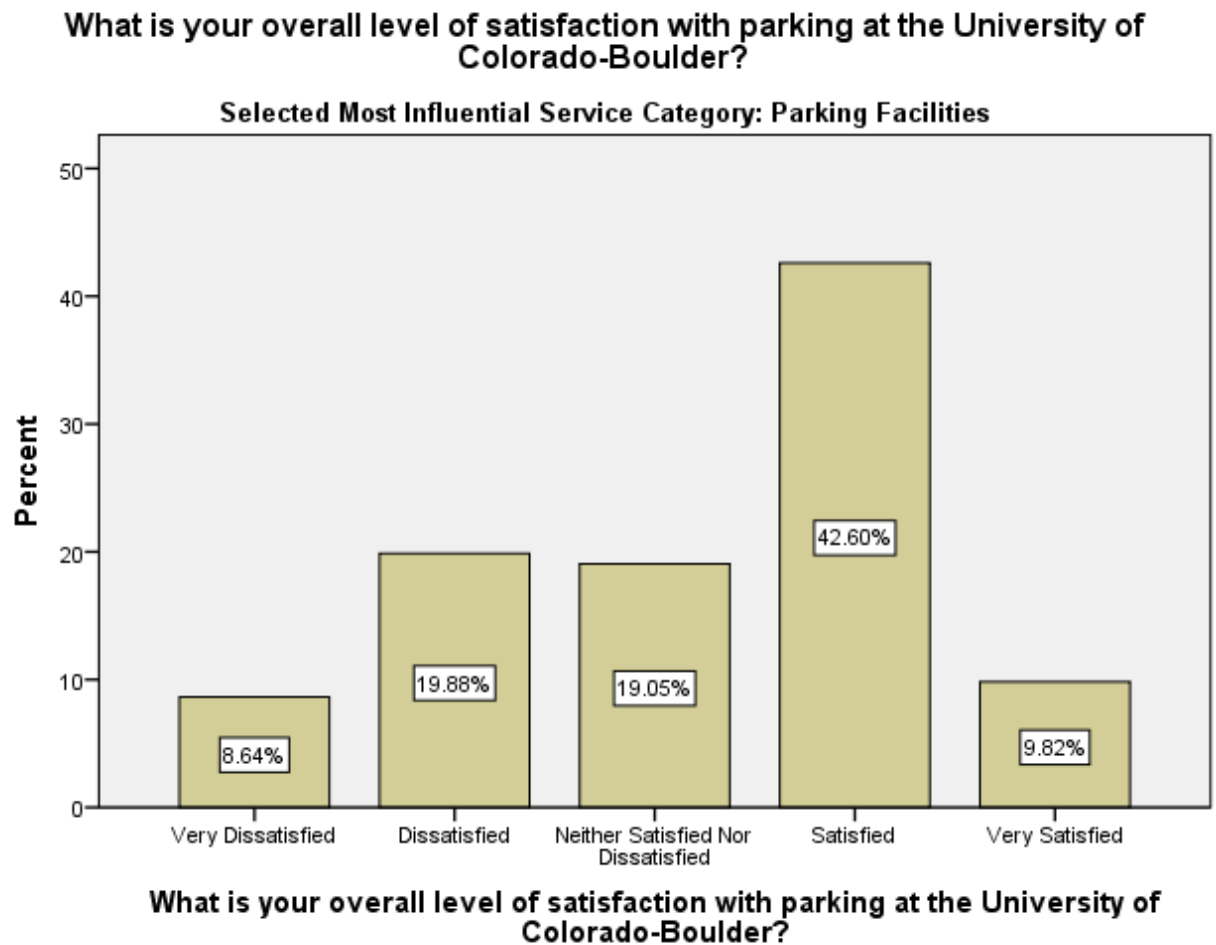


Figure 6 - Satisfaction for those who selected Parking Facilities

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

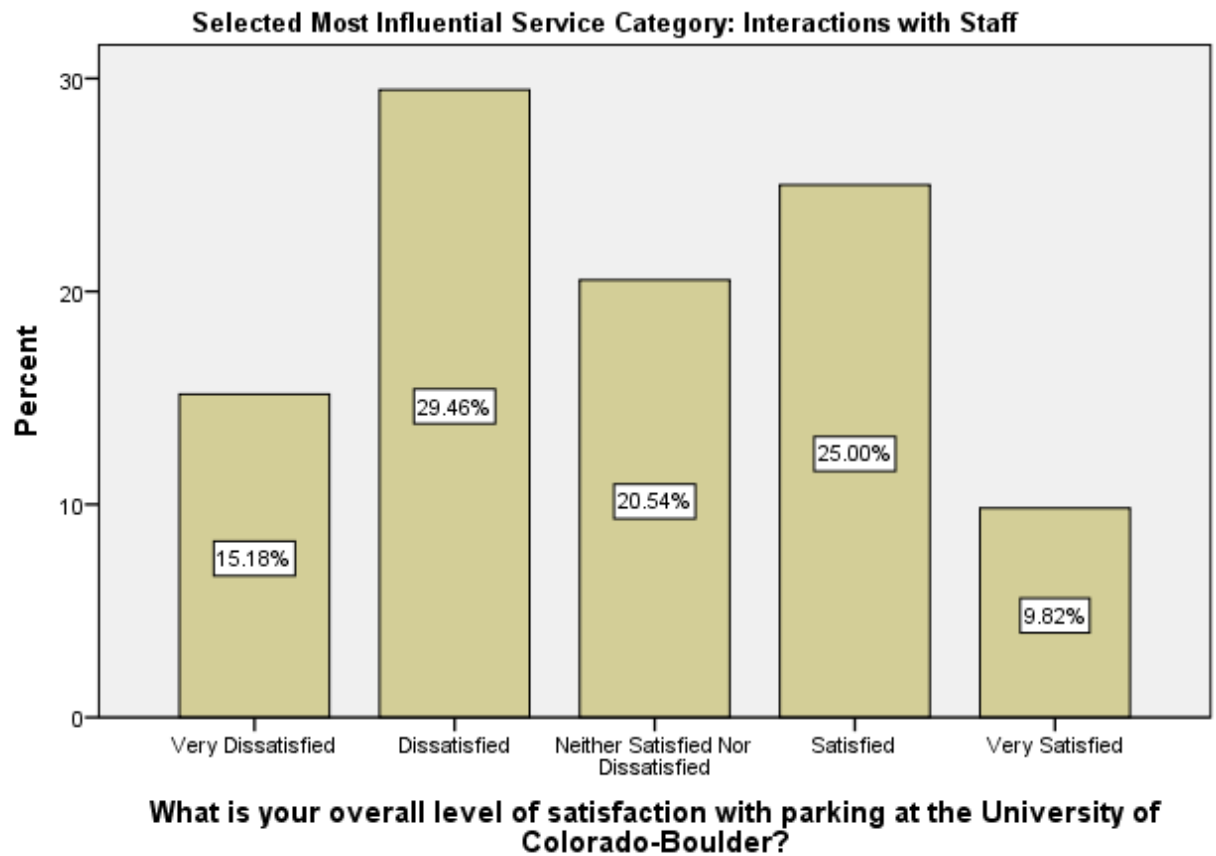


Figure 7 - Satisfaction for those who selected Interactions with Staff

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

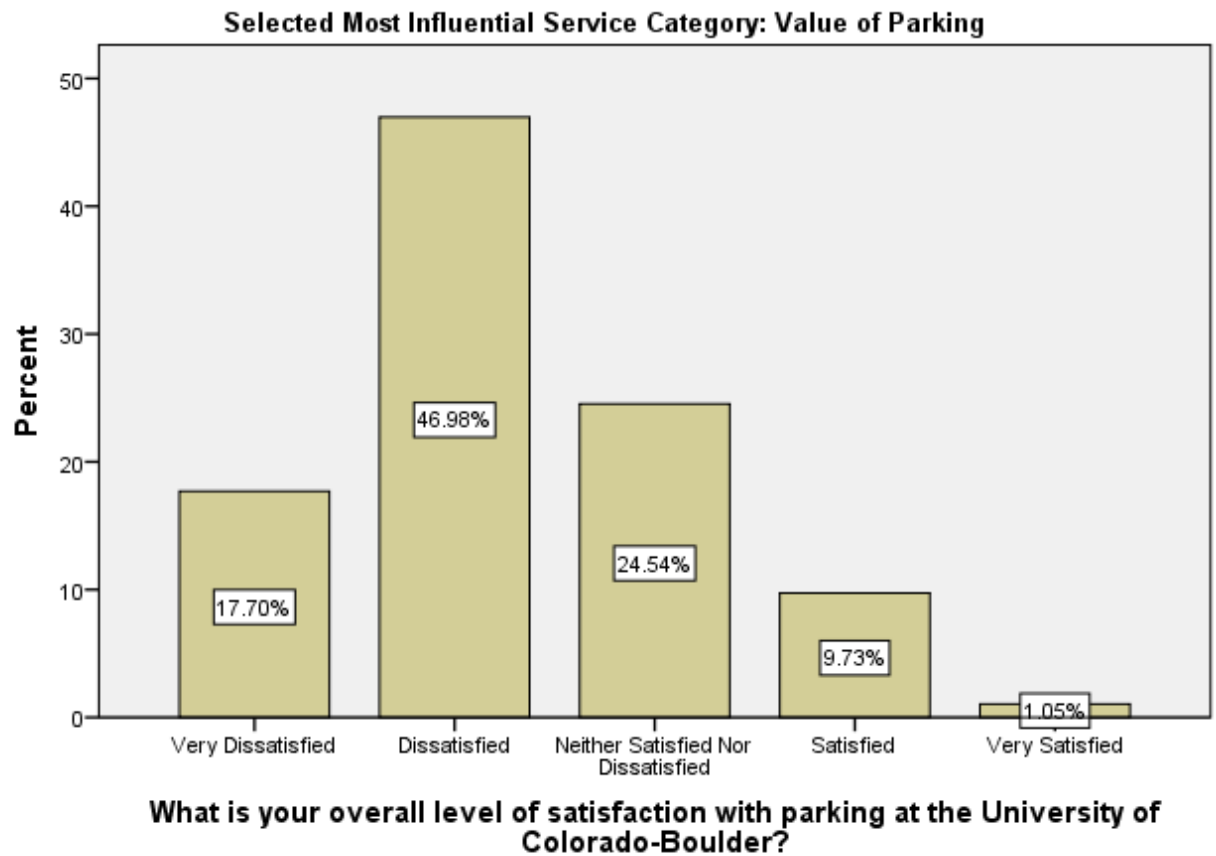


Figure 8 - Satisfaction for those who selected Value of Parking

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

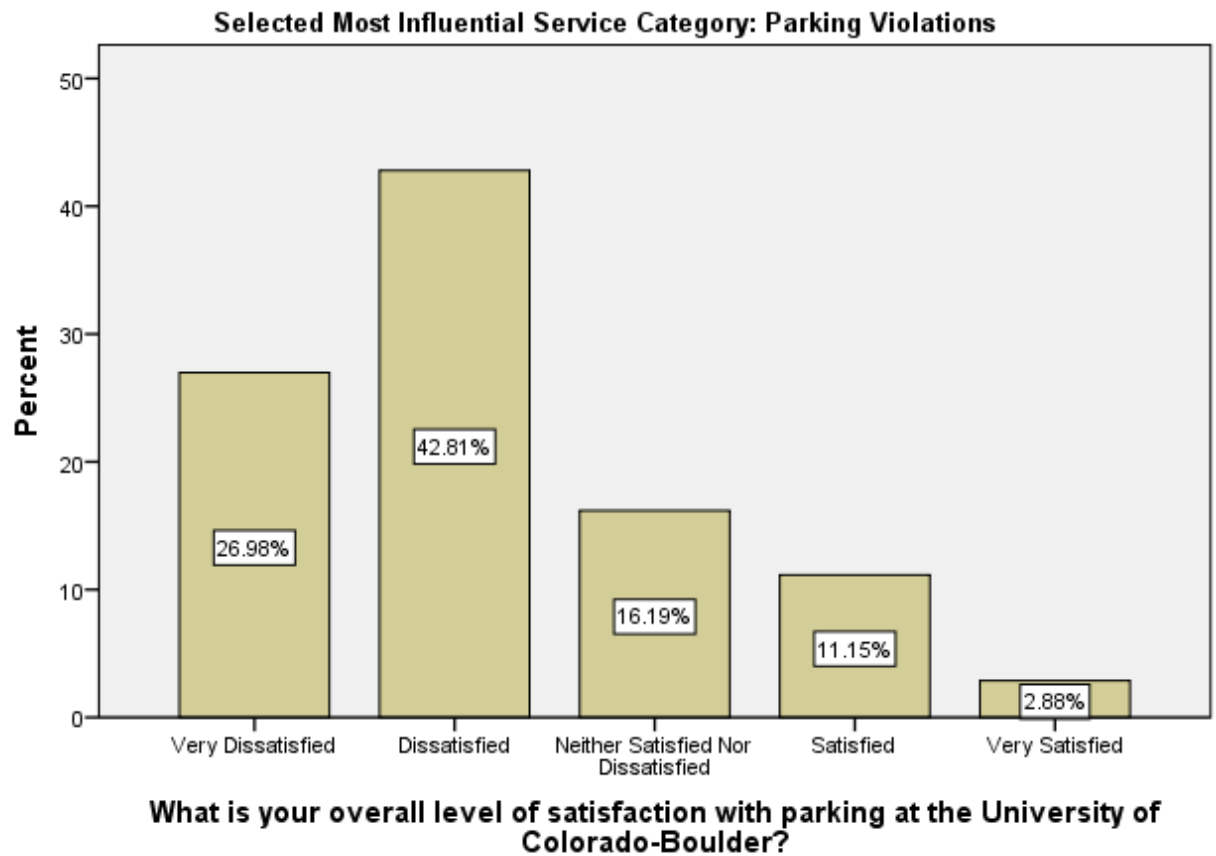


Figure 9 - Satisfaction for those who selected Parking Violations

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

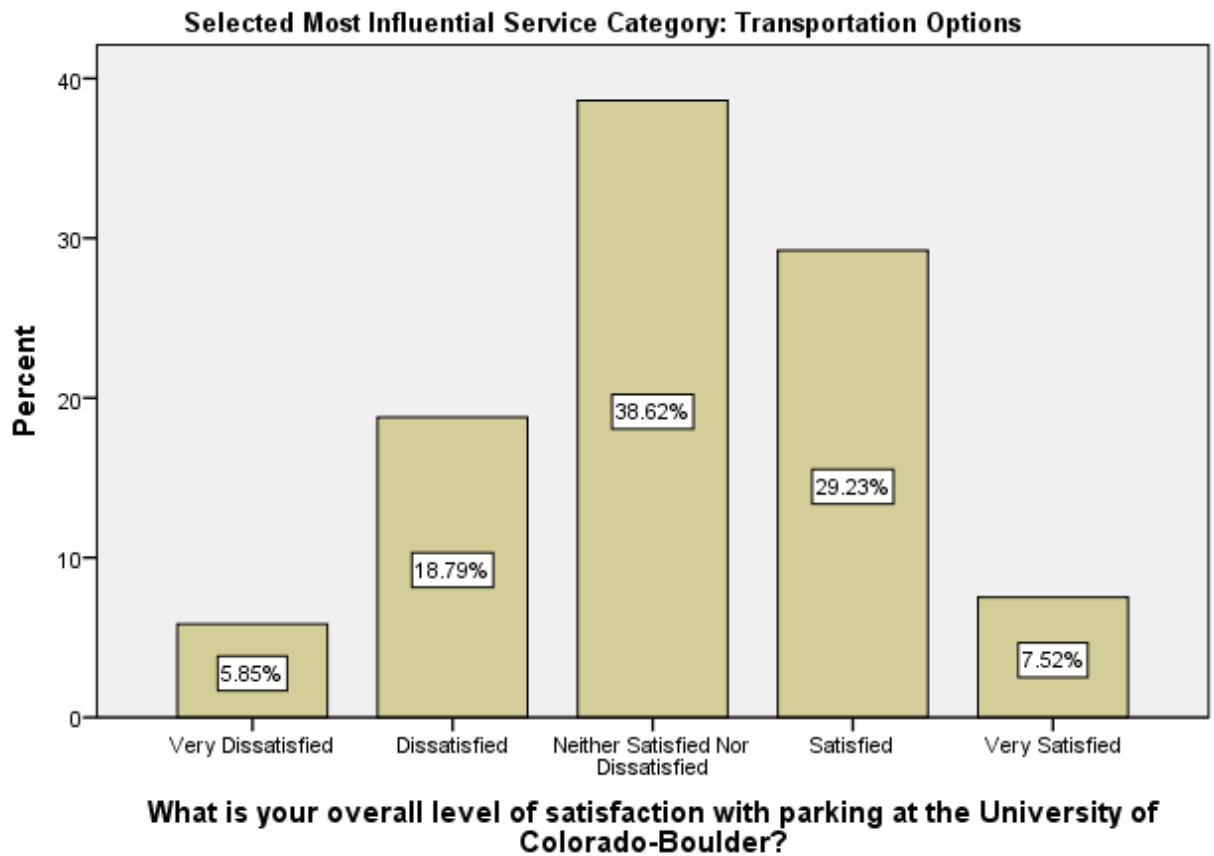


Figure 10 - Satisfaction for those who selected Transportation Options

CHAID Analyses

This CHAID (chi-squared automatic interaction detection) analysis seeks to identify the relationship between survey answers and satisfaction with parking and transportation services. Although causal links cannot be determined from these data, the expectation is that affecting the significant input measures will result in a benefit to the output measure. We examined this question by looking at the satisfaction at five levels (the original in the survey), at three levels (Dissatisfied, Neither Satisfied Nor Dissatisfied, Satisfied) and at two levels (Satisfied + Neither Satisfied Nor Dissatisfied and Dissatisfied).

To read the following CHAID trees, start with the top graph of the tree. This “node” shows the output measure responses, in our case client satisfaction. Located directly under this node is the question that resulted in the highest chi-squared statistic, indicating that the questions’ responses deviated the most from the responses you would expect if these two questions were unrelated. The answers to the question located under the node are the “branches” of the tree. Along each branch there is another node which indicates how the people who answered responded to the previous question. This process then repeats itself for all the remaining questions, until stop criteria are met. In this case, we used an α of 0.15, parent nodes of 100 or more, and child nodes of 50 or more.

All Respondents

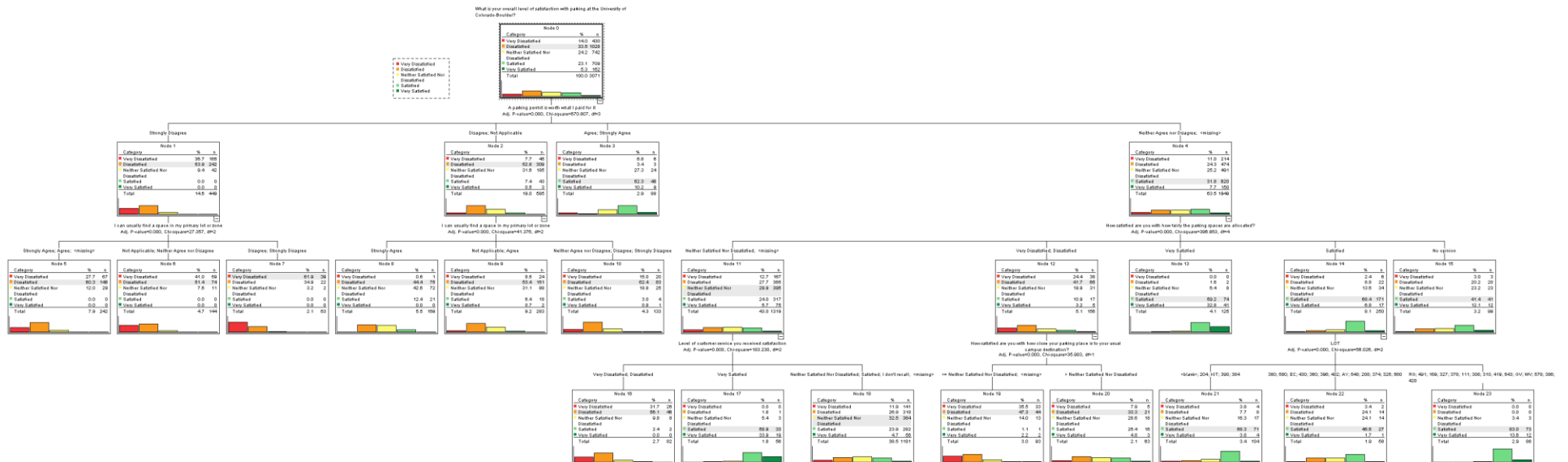


Figure 11 - All Respondents, Five-Level Satisfaction

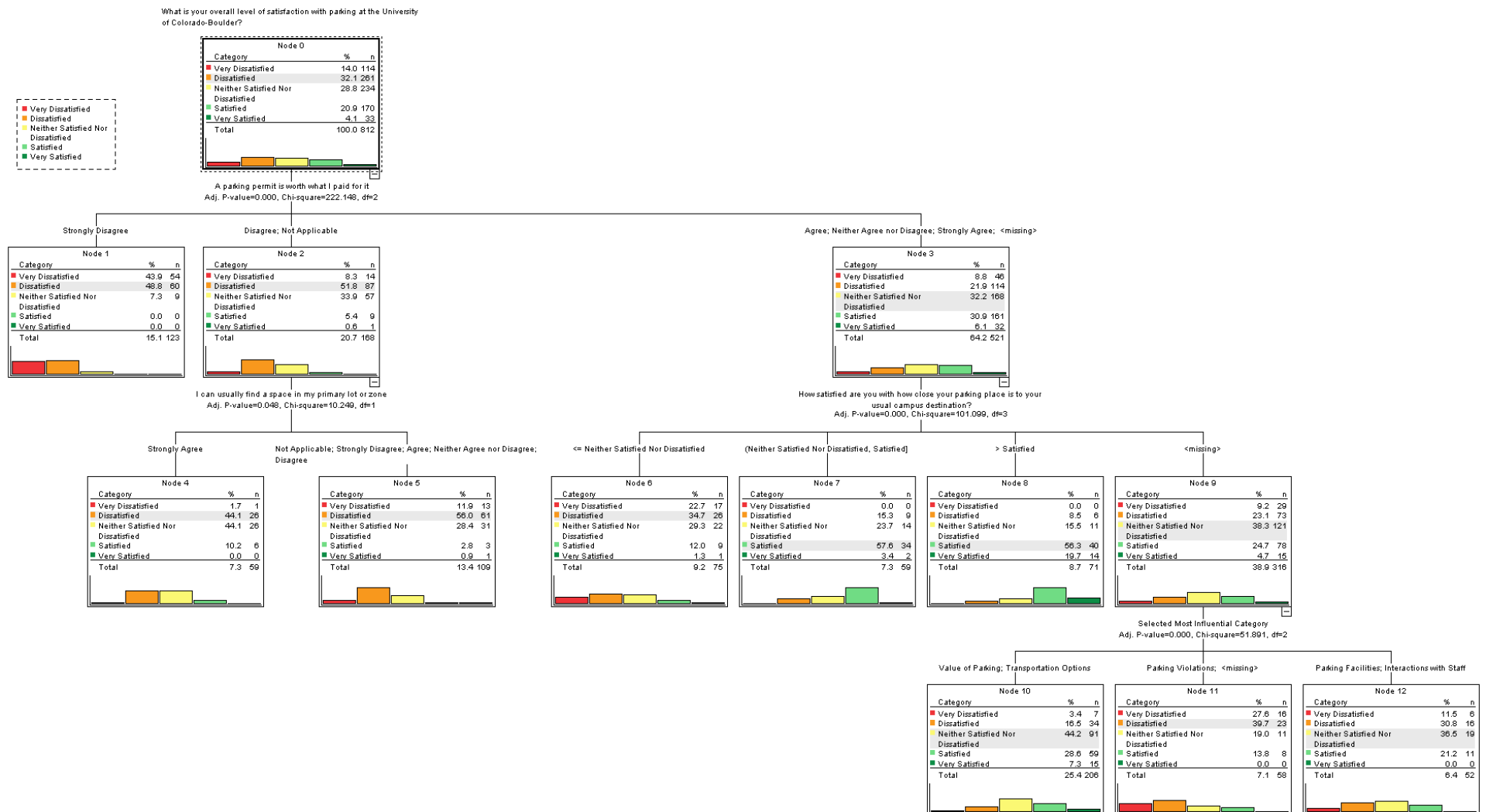


Figure 12 – Faculty, Five-Level Satisfaction

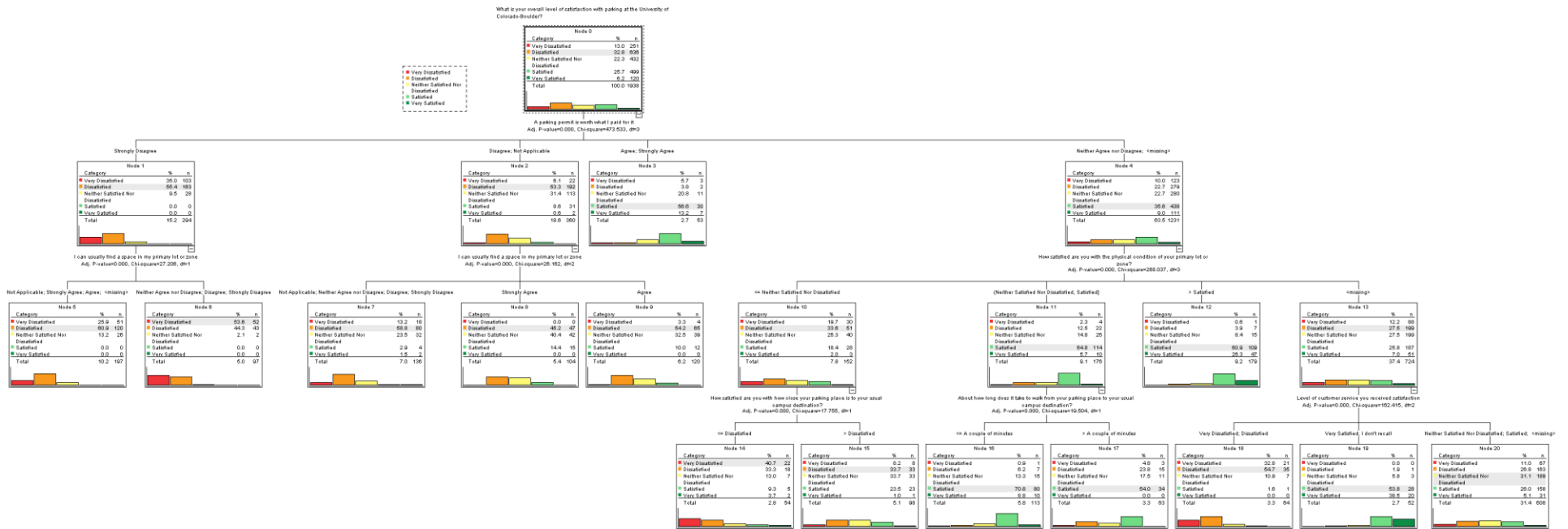


Figure 13 - Staff, Five-Level Satisfaction

What is your overall level of satisfaction with parking at the University of Colorado-Boulder?

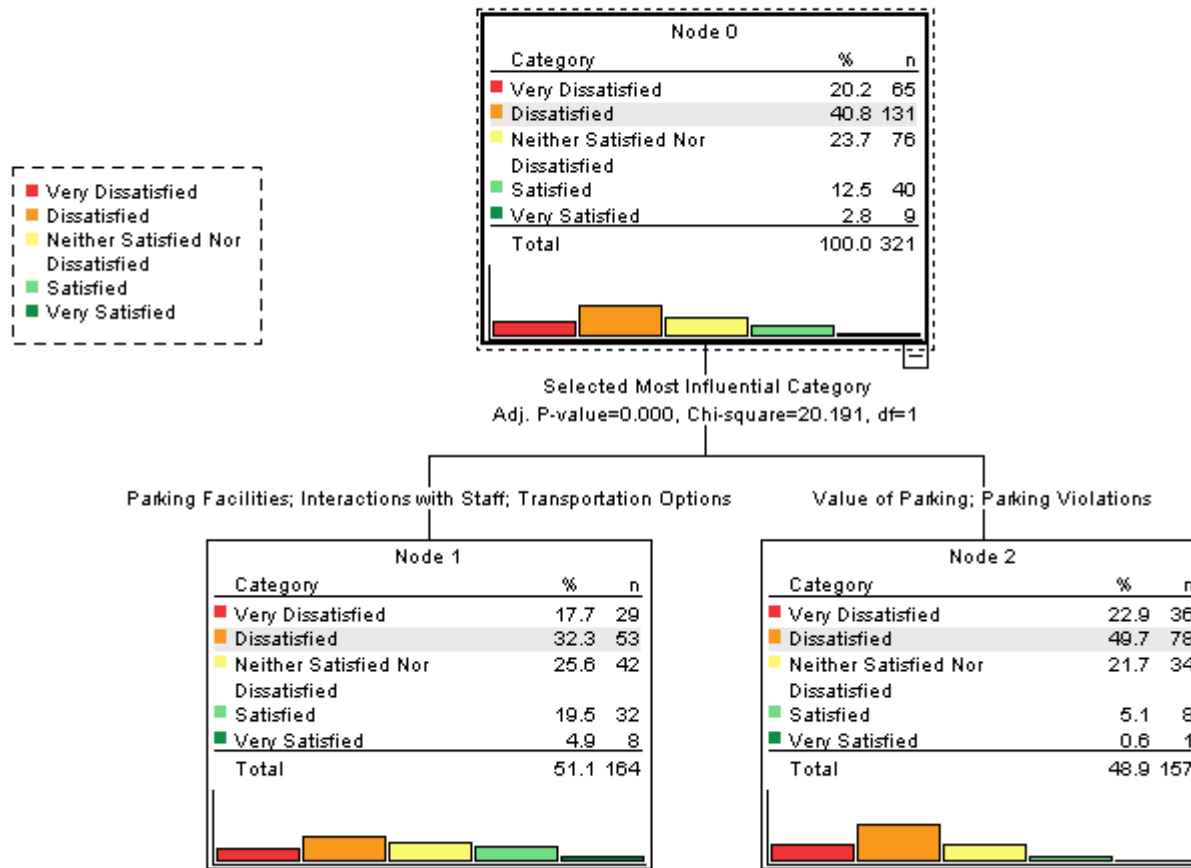


Figure 14 - Student, Five-Level Satisfaction

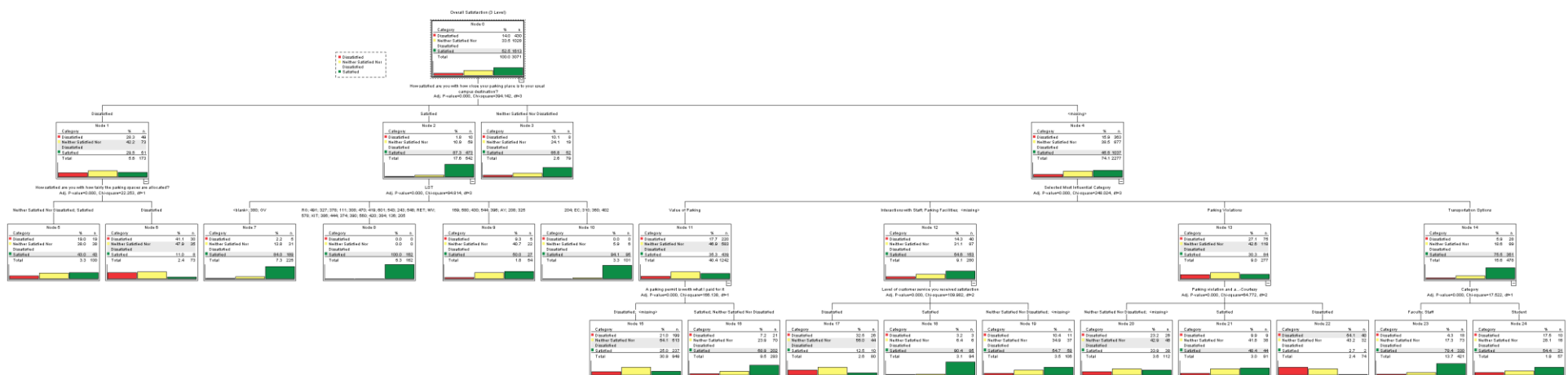


Figure 15 - All Respondents, 3-Level Satisfaction

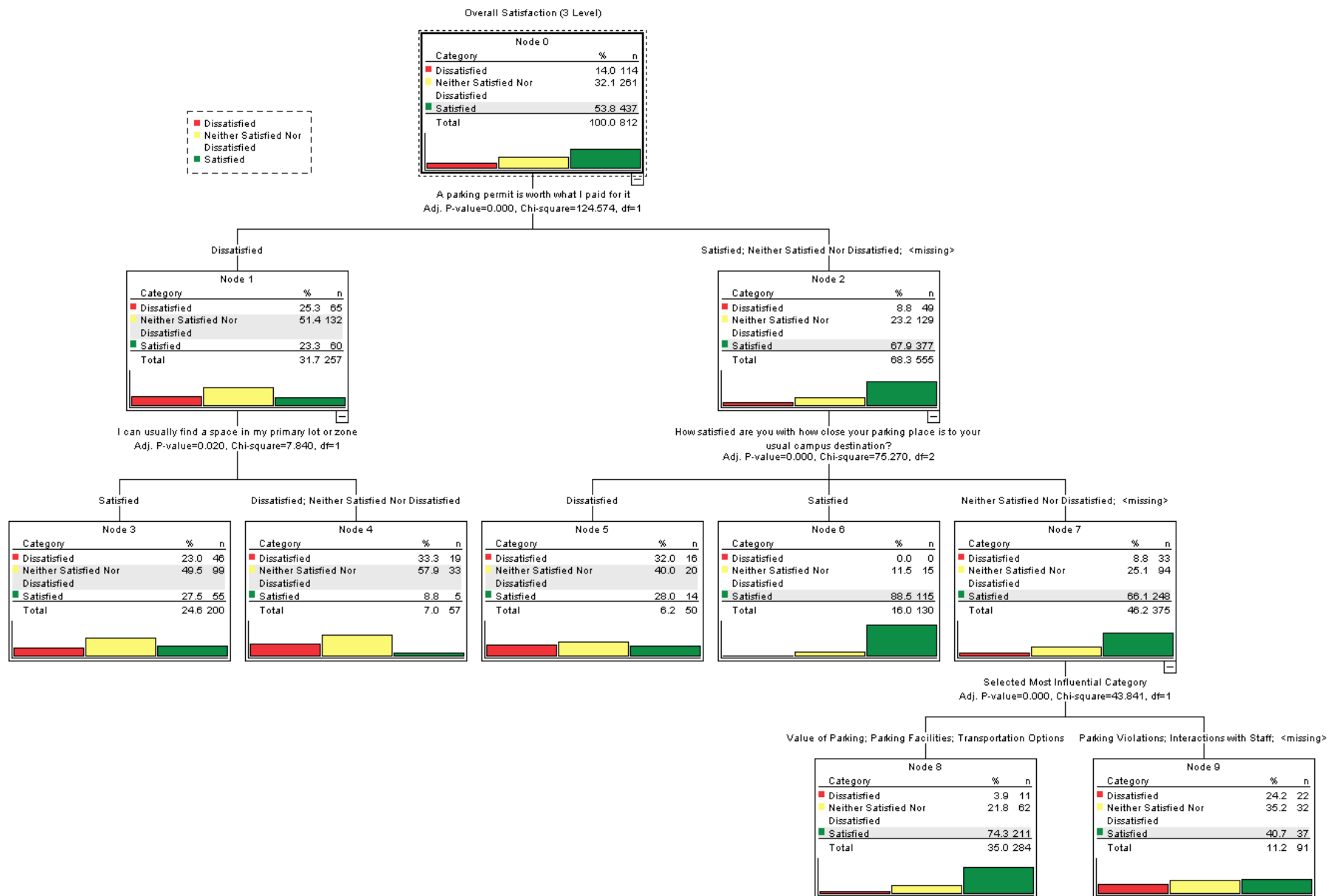


Figure 16 - Faculty, 3-Level Satisfaction

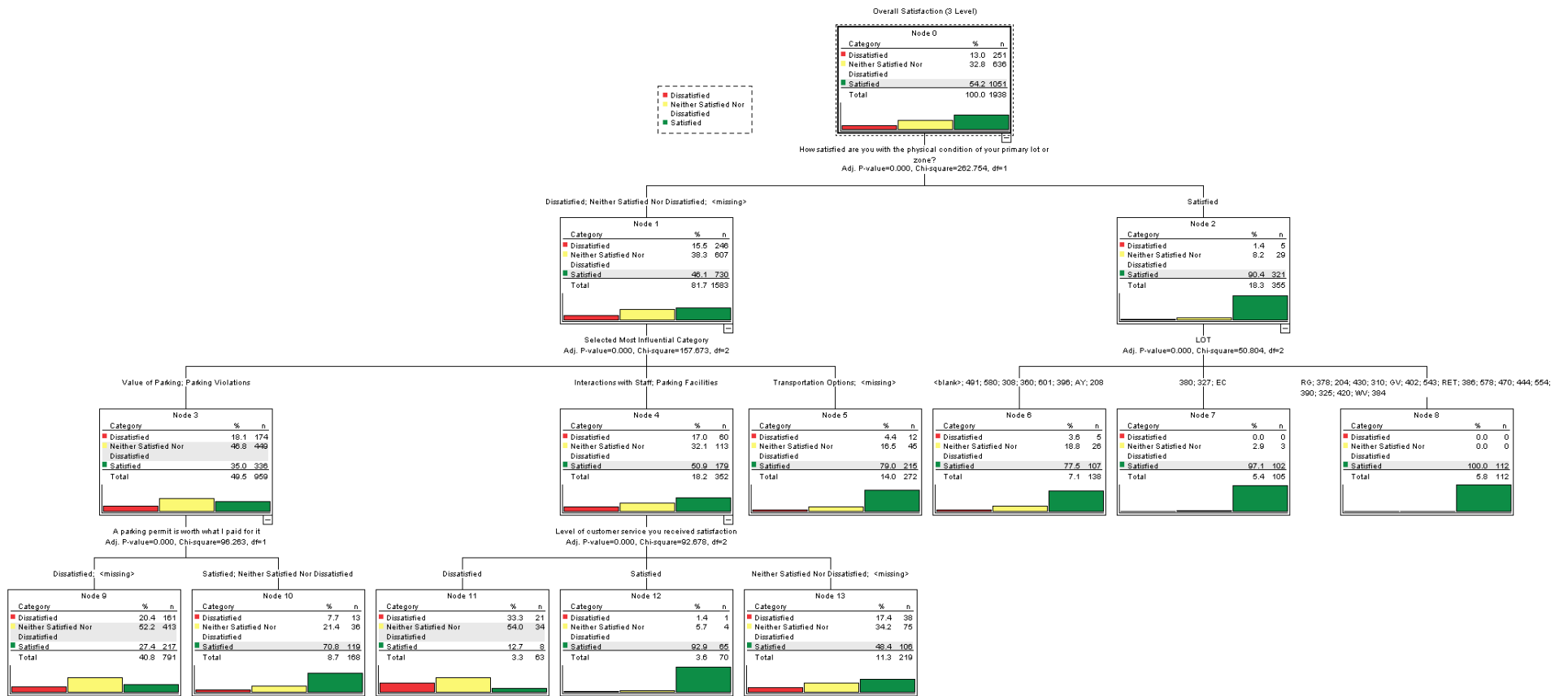


Figure 17 - Staff, 3-Level Satisfaction

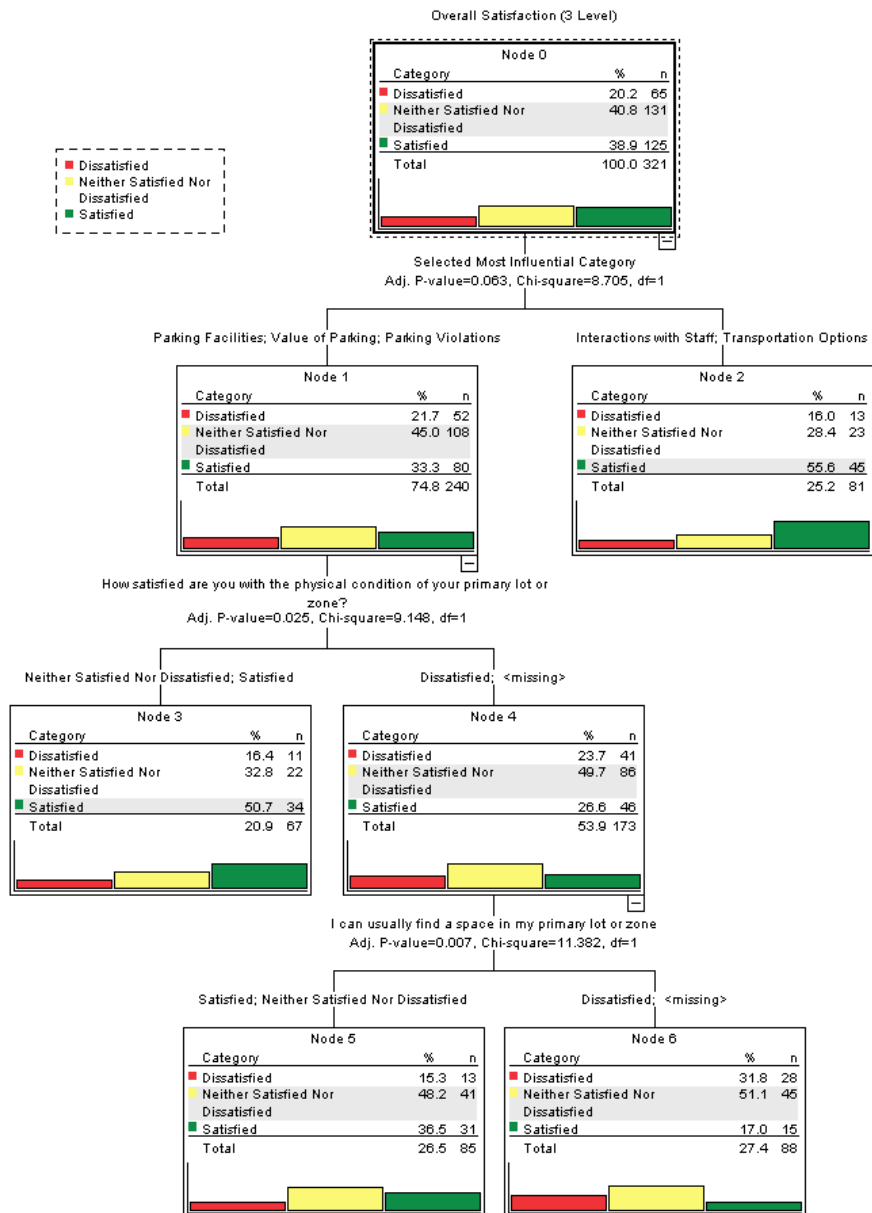


Figure 18 - Student, 3-Level Satisfaction

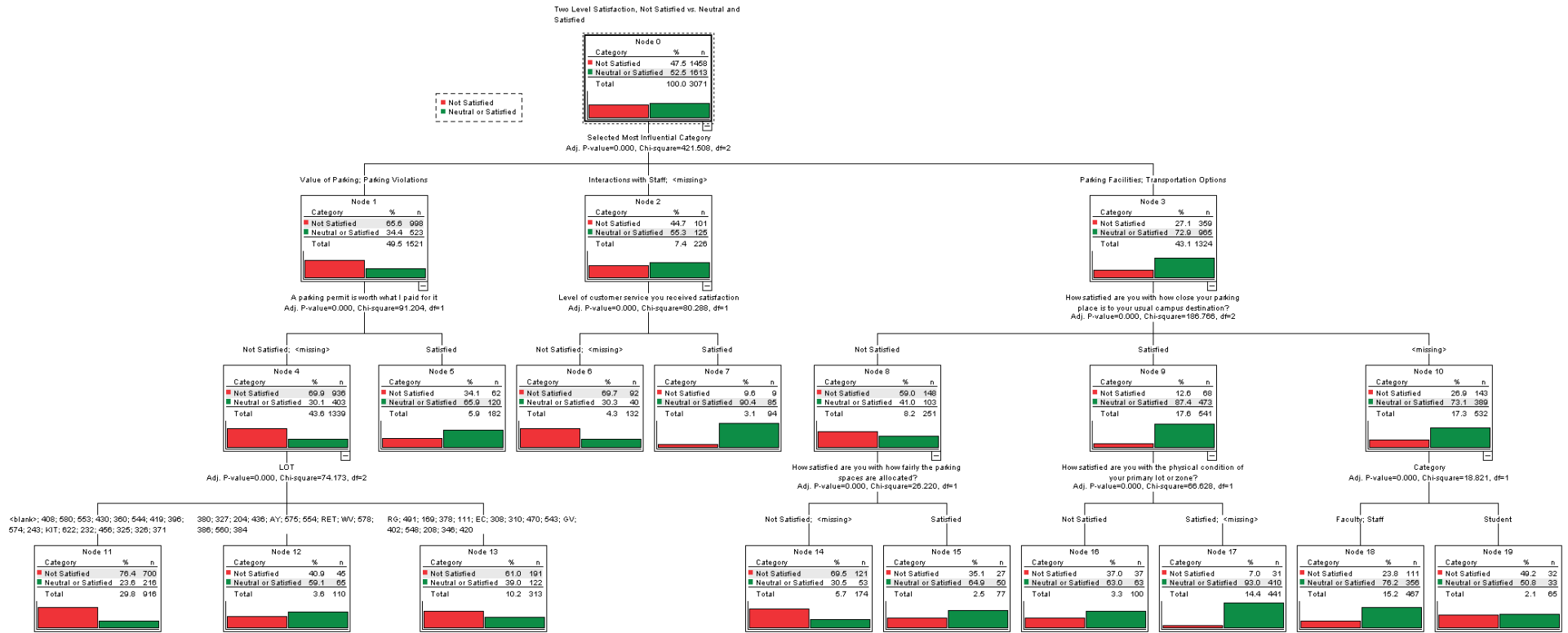


Figure 19 - All Respondents, 2-Level Satisfaction

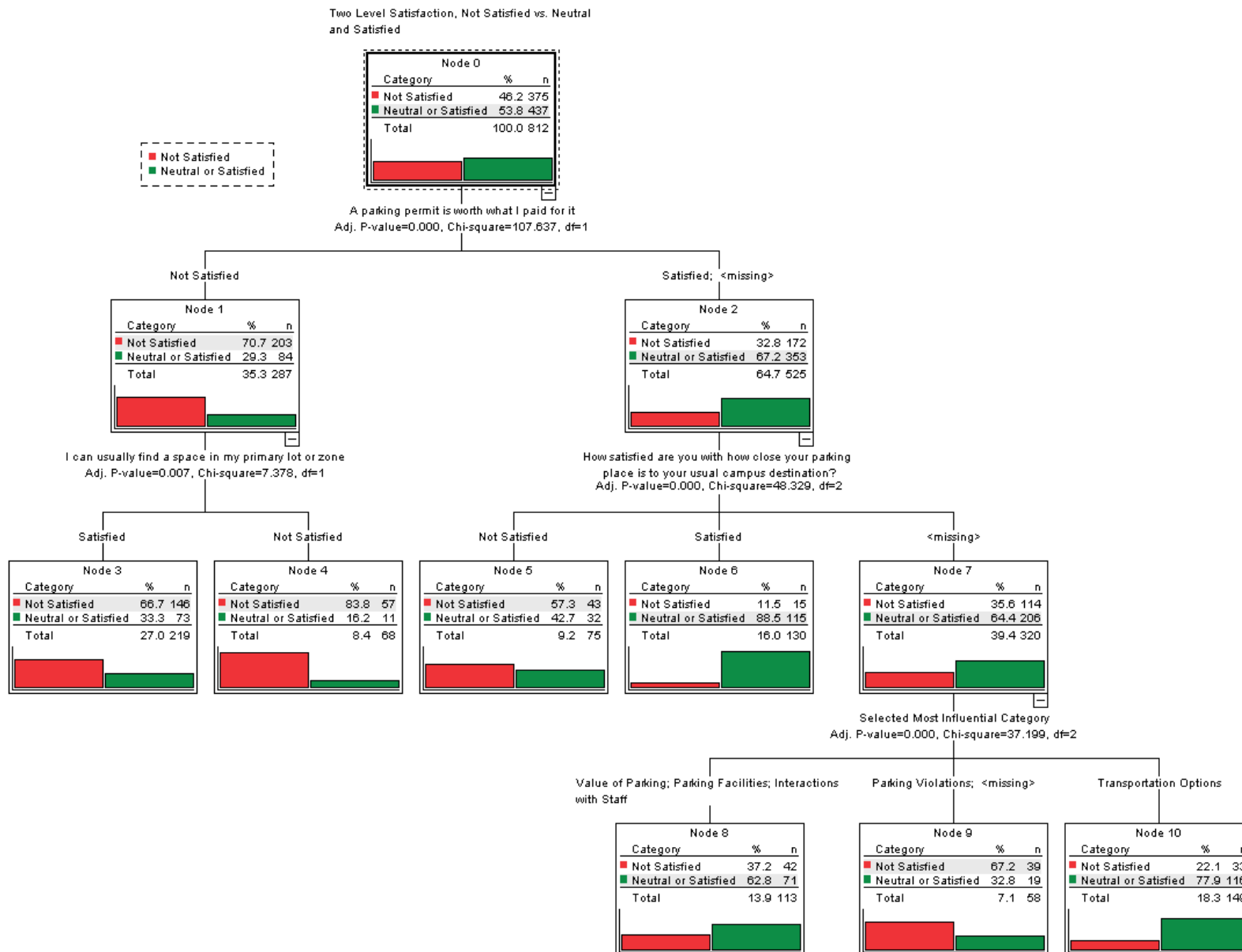


Figure 20 - Faculty, 2-Level Satisfaction

Two Level Satisfaction, Not Satisfied vs. Neutral and Satisfied

Node 0		
Category	%	n
Not Satisfied	45.8	887
Neutral or Satisfied	54.2	1051
Total	100.0	1938

Not Satisfied
Neutral or Satisfied

Selected Most Influential Category
Adj. P-value=0.000, Chi-square=307.913, df=2

Value of Parking; Parking Violations

Node 1		
Category	%	n
Not Satisfied	65.0	623
Neutral or Satisfied	35.0	336
Total	49.5	959

A parking permit is worth what I paid for it
Adj. P-value=0.000, Chi-square=51.647, df=1

Interactions with Staff

Node 2		
Category	%	n
Not Satisfied	44.9	76
Neutral or Satisfied	55.1	92
Total	8.6	167

Level of customer service you received satisfaction
Adj. P-value=0.000, Chi-square=73.315, df=1

Parking Facilities; Transportation Options; <missing>

Node 3		
Category	%	n
Not Satisfied	23.3	189
Neutral or Satisfied	76.7	623
Total	41.9	812

How satisfied are you with the physical condition of your primary lot or zone?
Adj. P-value=0.000, Chi-square=114.141, df=2

Not Satisfied; <missing>

Node 4		
Category	%	n
Not Satisfied	68.7	592
Neutral or Satisfied	31.3	270
Total	44.5	862

Satisfied

Node 5		
Category	%	n
Not Satisfied	32.0	31
Neutral or Satisfied	68.0	66
Total	5.0	97

Not Satisfied

Node 6		
Category	%	n
Not Satisfied	76.1	87
Neutral or Satisfied	23.9	21
Total	4.5	88

Satisfied; <missing>

Node 7		
Category	%	n
Not Satisfied	10.1	8
Neutral or Satisfied	89.9	71
Total	4.1	79

Not Satisfied

Node 8		
Category	%	n
Not Satisfied	53.3	81
Neutral or Satisfied	46.7	71
Total	7.8	152

How satisfied are you with how close your parking place is to your usual campus destination?
Adj. P-value=0.001, Chi-square=10.644, df=1

Satisfied

Node 9		
Category	%	n
Not Satisfied	9.8	34
Neutral or Satisfied	90.4	321
Total	18.3	355

<missing>

Node 10		
Category	%	n
Not Satisfied	24.3	74
Neutral or Satisfied	75.7	231
Total	15.7	305

LOT
Adj. P-value=0.000, Chi-square=65.300, df=2

<blank>; 408; 580; 430; 360; 574; 402; 543; 208; 232; 456; 325; 326; 371

Node 11		
Category	%	n
Not Satisfied	77.7	404
Neutral or Satisfied	22.3	116
Total	26.8	520

380; 327; 378; 204; AY; 548; 575; RET; 386; 578; 470; 554; 111; 560; 384

Node 12		
Category	%	n
Not Satisfied	40.0	42
Neutral or Satisfied	60.0	63
Total	5.4	105

491; 169; R6; EC; 308; 310; 396; GV; 346; 420

Node 13		
Category	%	n
Not Satisfied	61.6	146
Neutral or Satisfied	38.4	91
Total	12.2	237

Satisfied

Node 14		
Category	%	n
Not Satisfied	40.3	31
Neutral or Satisfied	59.7	46
Total	4.0	77

Not Satisfied

Node 15		
Category	%	n
Not Satisfied	66.7	50
Neutral or Satisfied	33.3	25
Total	3.9	75

Satisfied

Node 16		
Category	%	n
Not Satisfied	4.6	14
Neutral or Satisfied	95.4	290
Total	15.7	304

Not Satisfied

Node 17		
Category	%	n
Not Satisfied	39.2	20
Neutral or Satisfied	60.8	31
Total	2.6	51

Figure 21 - Staff, 2-Level Satisfaction

Two Level Satisfaction, Not Satisfied vs. Neutral and Satisfied

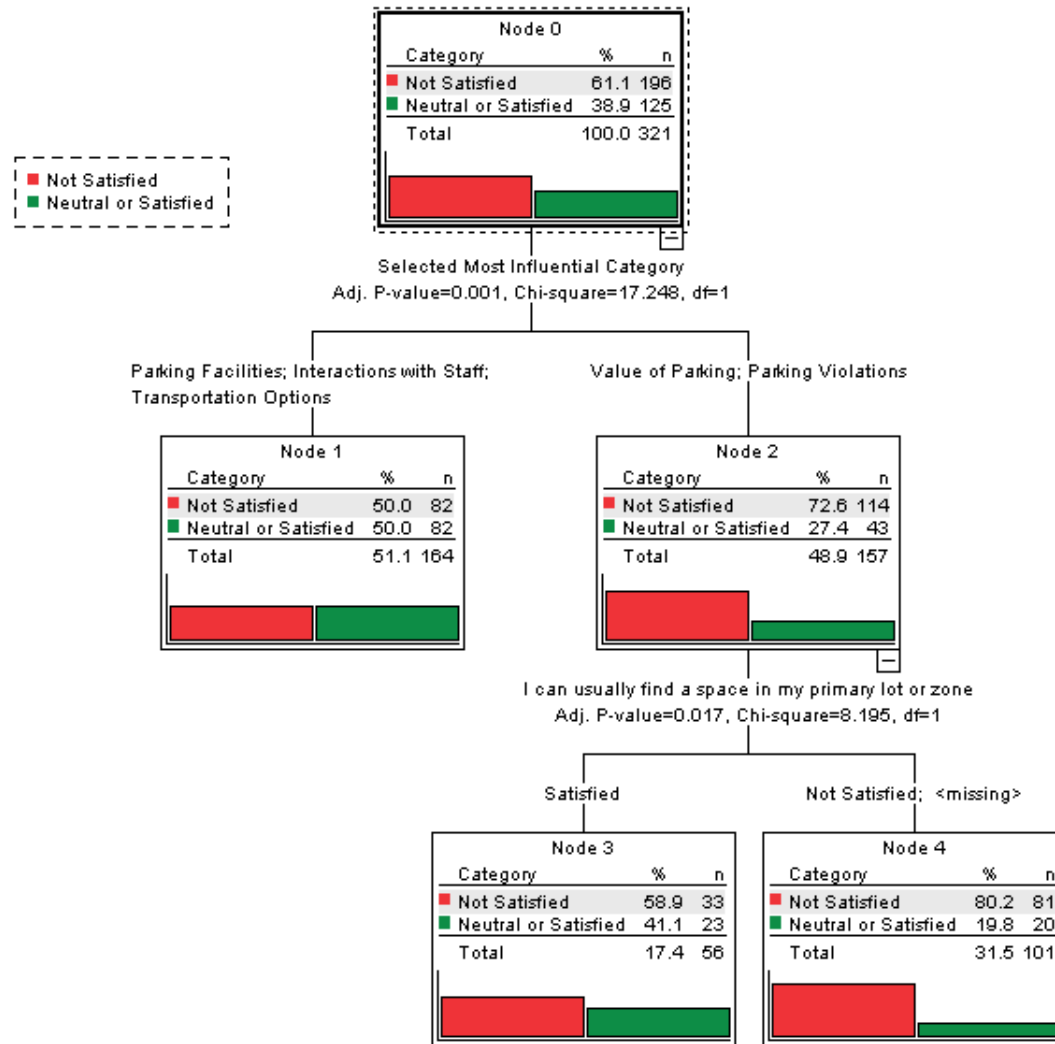


Figure 22 - Students, 2-Level Satisfaction

Recommendations to Improve Satisfaction

Depending on the target level of satisfaction across the campus and within the three categories (faculty, staff, student), different activities are hypothesized to have the greatest effect on satisfaction with parking and transportation services. Some example scenarios are presented below, along with how to use the CHAID plots to inform what to improve first. In reality, it is likely that no effort will result in 100% of respondents moving from a disagree category into an agree one, so a combination of efforts is most likely. Using the CHAID, we can hypothesize about the relative effect of various efforts to change the satisfaction. By understanding that as well as costs and probable changes to the response rates, a best-case plan of action can be devised.

Improving All Respondents' Satisfaction

If we are to target improvement of all respondents, refer to Figure 19. Those who considered the value of parking and parking violations to be the most influential category are only 34.4% likely to say they are neutral or satisfied with Parking and Transportation Services. However, if they could be convinced that the parking permit is worth what they paid for it, the CHAID model would predict that 65.9% of them would now be neutral or above. For those who considered parking facilities and transportation options the most important factor, we would instead work to increase their satisfaction with how close their parking was to their usual campus destination, potentially reaching 87.4% neutrality or satisfaction.

Improving Faculty Satisfaction

If we target the faculty's satisfaction with parking and transportation services, refer to Figure 20. Here we would need to convince the faculty that the parking permit is worth what they paid for it. If so, the CHAID model would predict that they would go from 53.8% neutral or satisfied to 67.4% neutral or satisfied. If needed, we could further work on how close their parking was to their usual campus destination in order to further increase their response to 88.5% neutral or satisfied.

Improving Staff Satisfaction

If the satisfaction of university staff is to be targeted, refer to Figure 21. Those who considered the value of parking and parking violations to be the most influential category are only 35.0% likely to say they are neutral or satisfied with Parking and Transportation Services. However, if they could be convinced that the parking permit is worth what they paid for it, the CHAID model would predict that 66% of them would now be neutral or above. For those who considered parking facilities and transportation options the most important factor, we would instead work to increase their satisfaction with the physical condition of their primary zone. We could achieve as much as 90.4% neutrality or satisfaction for that group.

Improving Student Satisfaction

Refer to Figure 22 for the student satisfaction CHAID. Students were only 38.9% likely to state they were neutral or satisfied with Parking and Transportation Services. The CHAID has identified two camps – those who consider value of parking and parking violations most influential, and those who don't. The latter category was too small to inform activities to improve. If we students consider students who based their satisfaction on the value of parking and parking violations, we would try to increase their ability to find a space in their primary lot or zone. To do so, that category of student would increase

from 27.4% likely to be neutral or better up to 41.1% likely. Overall, if we were perfectly able to achieve that, the CHAID would expect the probability of students expressing neutrality or better to go from 38.9 to 45.65%.

As an illustration of how to use the CHAID to make policy decisions, let's examine that last number and Figure 22. If we target the students in the right branch (those who considered value of parking and parking violations the most influential in making their decision about satisfaction, $n=157$) and we were able to allow 100% of them to find a space in their primary lot or zone, then all of those students would look like node 3 rather than being split between node 3 and node 4. So the 101 students in node 4 would be added to node 3 in the same proportions as node 3 has. Therefore, node 3 would now show $(101+56) \times 0.411 = 64.527$ students neutral or satisfied out of a total of $(101 + 56) = 157$. (We keep the decimal since the students in the sample theoretically represent the whole student body). That means that node 2 has added $(64.527 - 43) = 21.527$ more students to neutral or satisfied. If we go ahead and add those back in node 0 we can calculate what the effect would be on the overall satisfaction number: $(125 + 21.527) = 146.527$. So overall, the new rate of neutral to satisfied is: $(146.527 / 321) = 45.65\%$, an improvement of $(45.65 - 38.9) = 6.75\%$. If it is not possible to allow 100% of the students to find a space in their primary lot or zone, we would decrease the number moving from node 4 to 3 and recalculate accordingly.

Using this approach, various scenarios of what could be worked on and the expected improvements in client satisfaction can be compared against the resources needed to achieve these improvements, while generating specific expectations of the improvements.