

EXAMINING THE CHANGING COMMUTE TO UNC



Prepared by Max Bushell, Jonathan Dees, Eric Feld, Lora Greco,
Ashley Kelley, Seth LaJeunesse, Robin Michler, & Joshua Weiland
Faculty Advisor—Daniel Rodriguez

Department of City and Regional Planning
University of North Carolina at Chapel Hill

Spring 2010

TABLE OF CONTENTS

Executive Summary.....	1
Introduction.....	5
Methodology.....	5
Cross-Sectional Analysis.....	6
Employee Results.....	9
Description of Survey Respondents.....	9
Trip Origins.....	10
County Origins.....	10
City and Town Origins.....	10
Zip Codes.....	11
Distance to Work.....	13
General Mode Attributes.....	13
Travel Mode Cross Tabulations.....	14
Travel Time to Work by Mode.....	14
Mode Choice by Distance from Campus for Employees.....	14
Travel Mode by Income.....	15
Characteristics of Employees Who Drive to Work.....	16
Days of the Week Employees Drive.....	16
Amount Employees Pay for Parking.....	16
Amount Employees Pay for Parking Per Month.....	16
Main Access Routes to Chapel Hill by Car.....	17
Main Access Routes to Campus by Car.....	18
Characteristics of Employees Who Ride the Bus.....	19
Distance from Home to Nearest Bus Stop for Employees.....	19
Mode to Bus Stop.....	19
Park & Ride Lots.....	19
Respondent Preferences.....	20
Student Results.....	23
Description of Survey Respondents.....	23
Trip Origins.....	23

County Origins.....	23
Zip Codes.....	23
Distance and Time to Campus.....	27
General Mode Attributes.....	27
Travel Mode Cross Tabulations.....	28
Travel Time to Campus.....	28
Travel Mode by Sex.....	28
Travel Mode to Campus by Student Type.....	29
Travel Mode to Campus by Enrollment Status.....	29
Travel Mode by Job Status.....	30
Characteristics of Students Who Drive to Campus.....	30
Days of the Week Students Drive to Campus.....	30
Park & Ride Lot Usage by Students.....	31
Travel Mode from Parking Place to Campus Destination.....	31
Parking Payment: Cost to Park Per Month for Students.....	32
Travel Mode from Parking Place to Campus Destination.....	32
Main Access Routes to Chapel Hill for Students Driving Alone.....	34
Main Access Routes to Campus for Students Driving Alone.....	34
Characteristics of Students who Ride the Bus.....	35
Main Access Routes to Chapel Hill by Bus.....	36
Main Access Routes to Campus by Bus.....	37
Respondent Preferences.....	38
Longitudinal Analysis.....	39
Introduction.....	40
Sample Survey Characteristics.....	40
Arrival and Departure Times.....	40
Trip Origins.....	40
Distance Between Home and UNC.....	43
Geocoded Intersections.....	44
Distance from Home to Campus.....	46
Dominant Mode Choice.....	49

Journey-Based Considerations as a Function of Mode Choice.....	49
Factors Which Contribute to Mode Choice Decisions.....	52
Service Coverage and Ridership.....	54
Sidewalk Improvements and Mode Choice.....	56
Potential Park & Ride Demand.....	59
Conclusions.....	61
Appendices.....	64
Appendix A: Bus Service Coverage Maps.....	65
Appendix B: Zip Code Origins.....	70
Appendix C: Distance Descriptive Statistics.....	72
Appendix D: Traffic Distribution.....	74
Appendix E: Self Reported Habit Index.....	76
Appendix F: Survey Instrument.....	78

EXECUTIVE SUMMARY

In 1997, The University of North Carolina at Chapel Hill commissioned its first study of campus commuting patterns. The purpose was to survey both students and employees about the various travel modes they use to commute to campus, as well as their origins and destinations. The data gathered was used to help UNC Department of Transportation and Parking and the Town of Chapel Hill plan for transportation needs. This study was repeated in 2001, 2004, and 2007.

In the spring of 2009, the University again surveyed the campus community to determine how campus commuting patterns have changed in the last two years. Using this latest data, we created two interrelated analyses. First is a comprehensive look at the current state of campus commuter behavior and characteristics; this is the *Cross-Sectional Analysis*. The second compares the 1997, 2001, 2004, 2007 and 2009 studies and offers analysis of trends in the data and the implications of these trends; this is the *Longitudinal Analysis*. We hope these provide interesting and compelling data for on-campus and off-campus decision makers.

The 1997 study was completed by UNC Department of City and Regional Planning students Matt Raimi and Joe DiStafano under the direction of then-transportation planner Raymond Magyar. The 2001 study was completed by UNC Department of City and Regional Planning student Patrick McDonough under the direction of transportation planner Deborah Freed. The original 1997, 2001, 2004 and 2007 reports are available through the UNC Department of Public Safety. The 2004, 2007 and 2009 studies were conducted by the UNC Office of Institutional Research and Assessment at the request of Associate Vice Chancellor for Campus Services Cayolyn Elfland.

This 2009 Cross-Sectional and Longitudinal analysis was completed by the Department of City and Regional Planning Workshop lead by Daniel Rodriguez, consisting of Max Bushell, Jon Dees, Eric Feld, Lora Greco, Ashley Kelley, Seth LaJeunesse, Robin Michler and Josh Weiland, assisted by Assistant Director for Planning and Transit Raymond Magyar and Director of Assessment Larry Mayes.

Below is the executive summary of six major areas of interesting findings. These

are: (1) decentralization, (2) the impact of fare-free service, (3) effects of bus service and sidewalk change, (4) access routes to campus, (5) potential demand for a South Point Mall park and ride lot, and (6) the importance of time for mode choice. Finally, we include six recommendations based upon our analysis.

Decentralization

In 1997, nearly 40% of UNC's employees lived in Chapel Hill. By 2009, this percentage had declined to roughly 28%. Also during this period, greater numbers of employees started their journey to work from locations increasingly farther away from UNC. Employees continue to originate in such cities and towns as Raleigh, Cary, and Durham.

Students also have moved progressively farther from UNC's campus. In 1997, nearly 61% of students resided in Chapel Hill. In 2009, this percentage had decreased to fewer than 45%. At the same time, towns and cities such as Carrboro and Durham have harbored more UNC students.

Impact of Fare-Free Service

After Chapel Hill Transit's implementation of fare free service, there were significant changes to mode-share, both for employees and students. Significantly greater number of employees rode the bus to campus and significantly fewer employees drove alone to campus. Amongst employees, the most significant post-fare free modal shift was the increase in use of park and ride facilities.

Meanwhile, significantly fewer students drove or used non-motorized modes (walking and cycling) after the change. On the other hand, significantly more students used the bus service and park and ride facilities.

Effects of Bus Service and Sidewalk Change

Changes in Bus Service and Mode Choice
In the years between 1997 and 2009, Chapel Hill Transit routes have changed several times. While service generally continued to grow, some routes experienced slight changes and some shortened.

Among those employees and students who live within areas of bus service additions,

there were increases in ridership. Conversely, amongst those who live within areas of service drops, there were decreases.

Another change has been the addition and loss of express service. For those who have access to express bus, average bus mode share increased. Likewise, commuting time is lower for those who have access to express service.

Sidewalk Improvements and Mode Choice

Significant efforts have been made to increase sidewalk coverage in Chapel Hill and Carrboro. For employees, the results of the impact of sidewalk improvements on walking and busing behavior are mixed.

Student patterns were very similar to the general commuting trends that were occurring at the time. In Carrboro bus use increased and walking decreased in the targeted areas. In Chapel Hill, student bus use increased dramatically.

As can be seen most clearly in the student changes with sidewalk improvements, future studies ought to look at this data and regularize it compared to changes in mode share within the entire system.

Access Routes to Campus

Access routes to Campus were examined at two levels: entry points into Chapel Hill and onto campus proper.

Employee Access Routes to Campus

Of those employees that drive to work alone, the largest percentage access Chapel Hill from NC-54 East, while Martin Luther King Jr. Boulevard, US 86 North and US 15-501 South accommodate the next largest access flows.

In terms of the entry onto UNC's campus, Manning Drive, South Columbia Road, and Raleigh Road/South Road have the highest percentages.

Most employee bus riders approach Chapel Hill via NC-54. Many approach Chapel Hill via NC-54 East from I-40 from Raleigh, which reflects the large concentration of employees who travel east from the direction of I-40 from Raleigh. The next largest proportions are of bus riders from NC-54 West, 15-501 S (Pittsboro direction) and 54 W Bypass (Graham/Mebane direction).

In terms of the entry onto UNC's campus, the highest percentage of bus

riders enter campus via S. Columbia St. The roads with the next highest entry flows are Manning drive, followed by Raleigh Rd./South Dr. and North Columbia St.

Student Access Routes to Campus

Similar to employees, Raleigh Road/South Road, South Columbia Street, and Manning Drive are the most used routes to access the UNC campus, while Mason Farm Road and McCauley Street are used least. The highest percentages of students travel from NC 54 East from the direction of Raleigh or from Martin Luther King Jr. Boulevard. Significantly lower percentages of students enter Chapel Hill from NC-54 West, 15-501 South, and 15-501 North. A large percentage of students enter Chapel Hill from West Franklin Street, which most likely reflects the large student population entering Chapel Hill from Carrboro.

Raleigh Road/South Road constitutes the largest percentage of students entering the UNC Campus, while South Columbia Street and North Columbia Street are also important entry routes to the campus. Mason Farm Road and McCauley Street are used the least.

Potential Demand for a South Point Mall Park & Ride

A mini analysis was conducted to test the potential latent demand for a park and ride lot facility in the area of South Point Mall in Durham. We based our analysis on (1) the current makeup of users of the Friday Center Drive lots and (2) the data on respondents who do not park at one of these lots, but do approach campus on US-54 from the east. We predict that there exists a latent demand of approximately 418 who would park in the vicinity of the South Point lots should they have the opportunity.

Importance of Time for Mode Choice

For both employees and students, time is the most important consideration associated with the commute to campus. Nevertheless, park and ride, which takes the most time, is growing as a mode choice. We do not have a good reason for this, but it may be worth investigating.

Secondly, the importance of time in employee and student responses suggests that more express routes may be justifiable.

Recommendations

Recommendation One

Transportation investments in terms of access to UNC and increasing bus service should occur on the east side of Chapel Hill. Of the routes entering Chapel Hill, the largest numbers of employees use access routes on the east side of campus.

Recommendation Two

As a large number of people, both students and employees, use the bus, enhancing transportation connections around bus stations should be a priority. This could include sidewalk and bicycle lane improvements. In addition, improving the coverage areas of the bus system to reach more students and employees (44% of employees and 17% of students live farther than 1 mile away from the closest bus stop) could boost bus ridership and reduce traffic congestion and parking issues.

Recommendation Three

A greater number of express routes, especially from Park and Ride facilities would be helpful, as the demand for Park and Ride lots seems to be increasing. Adding to the number of express routes to campus would be helpful as both employees and students rate reliability and time

as most important in choosing a mode to campus. Creating expressed bus routes on existing bus lines could also boost ridership and alleviate congestion and parking issues.

Recommendation Four

Transportation demand management (TDM) strategies, including the provision of showers on campus to a greater degree and particularly in new construction (Carolina North), provisions to increase the number of bicycles accommodated on transit, and provisions to increase the number of bicycle lanes around campus, could increase the number of bicyclists among students, though the survey provides little evidence that to support this recommendation.

Recommendation Five

In order to reduce the demand for parking on campus and Park and Ride lots in general, the University and town should initiate a plan to provide more affordable housing within the Chapel Hill and Carrboro boundaries. In addition, the survey analysis concludes that those with higher incomes are more likely to walk to campus, which reflects the high cost of real estate and housing around campus. By providing more affordable housing close to campus,

it is likely that more people will walk to campus instead of driving.

Recommendation Six

UNC should consider enhanced marketing of UNC's Commuter Assistance Program (CAP) to encourage greater proportions of students and employees to use car-alternative means of accessing campus. This and other program like it will strengthen modes non-motorized transportation to campus.

INTRODUCTION

In 1997, the University commissioned its first study of campus commuting patterns. The purpose of the study was to survey both students and employees about the various travel modes they use to commute to campus, as well as their origins and destinations. The data gathered was used to help UNC Department of Transportation and Parking and the Town of Chapel Hill plan for University and Town transportation needs. This study was repeated in 2001, 2004, and 2007.

In 2009, the University again surveyed the campus community to determine how campus commuting patterns have changed in the last two years. This latest study provides comprehensive information about the current state of campus commuter behavior and characteristics, makes comparisons to the 1997, 2001, 2004 and 2007 studies where they are possible and relevant, and offers analysis of trends in the data and the implications of these trends for on-campus and off-campus decision makers.

The report is divided into several sections: a brief explanation of the study's methodology, a chapter detailing employee commuting patterns, a chapter detailing student commuting patterns, and finally a discussion of major findings. Appendices are also included.

METHODOLOGY

The study was based on results of a survey of a random sample of UNC-Chapel Hill faculty, staff, and students, as well as UNC Hospital's employees. Development of the questionnaire, the sampling techniques used, response rates obtained, and analyses conducted are described below.

The Survey Questionnaire

The questionnaire used in the current study was originally developed for the 1997 survey, and has undergone only slight modifications for the 2001, 2004, and 2007 administrations (Appendix A). Designed and pre-tested by Department of Transportation employees in consultation with faculty in the Department of City and Regional Planning, the instrument was intended to be direct, brief, and comprehensive in terms of data collection. Most questions are close-ended and check boxes have been used to make answering these questions simple and efficient. Open-ended questions have been used for numerical reasons and a few qualitative free responses where respondents list reasons not listed in the survey under "other" in order to describe reasons they do or do not use certain modes to travel to campus.

Separate sections were developed to elicit more detailed information from those who drive and those who take the bus to campus, and the survey directs individuals to appropriate sections of the survey based on their habits. Great care was taken to make sure that the surveys addressed each target audience appropriately (e.g. having students describe their "travel to campus" and employees describe their "journey to work").

The 1997 and 2001 surveys were deployed as a paper-and-pencil questionnaire, and each response had to be manually keyed into an electronic database prior to analysis. To reduce the burden and expense of compiling results, both a Web-based version and a hard copy version that could be electronically scanned were developed for use in the 2004, 2007, and 2009 studies.

Population and Sample

The 2009 study utilized the same methodology for determining sample size as the previous surveys. Of the combined population of approximately 18,302 faculty and staff at the University and UNC Hospitals, a random sample of 6,629 was drawn using employee records obtained from the personnel databases of those organizations. Valid responses totaling 1,603 were received for a response rate of 34%. At the confidence level of 95%, the margin of error for the employee survey is estimated at $\pm 1.9\%$. The student population consisted of all undergraduate, graduate, and professional students who lived off-campus during Fall 2009. From this population 16,383, a random sample of 5,000 was drawn. A total of 504 responses were received for a response rate of 12%. The margin of error for the student survey is $\pm 3.9\%$ at a confidence level of 95%.

Administration of the Survey

All students and most of the employees in the target sample received an email announcement directing them to the website containing the on-line survey, and one email reminder sent approximately 10 days after the first announcement. The responses went

directly to a secured server in the Office of Institutional Research and Assessment. Since email addresses were unavailable for UNC Facilities Services employees, members of the target sample in those organizations received a scannable version of the survey via regular mail. Completed surveys were returned by mail to the Office of Institutional Research and Assessment where they were checked carefully for completeness and to be sure they were filled out correctly before being scanned. Of the 1,603 responses received from employees, a total of 2,213 were submitted using the Web-based version and 69 were submitted on the scannable forms. No significant difference in response rates was observed between the two methods of data collection.

Responses collected from both the Web-based and scannable form administration methods were combined for the analysis. The results were analyzed using Stata and Microsoft Excel was used to create the tables and cross-tabulations in this report.



ANALYSIS OF THE 2009 SURVEY

EMPLOYEE RESULTS

This section presents the travel and mode characteristics reported by the 1,529 University employees and UNC Hospital employees who responded to the survey.

Table 1. Employee City, Town, and County Origins, 2009

County	City/Town	Number	Cumulative	Percent
Orange		593	38.9%	
	Chapel Hill	429		28.1%
	Carrboro	126		8.2%
	Hillsborough	59		3.9%
Durham		331	21.7%	
	Durham	317		20.7%
Chatham		179	11.8%	
	Pittsboro	89		5.8%
Alamance		169	11.1%	
	Graham	50		3.3%
	Mebane	48		3.1%
	Burlington	38		2.5%
	Snow Camp	22		1.4%
Wake		166	10.9%	
	Raleigh	70		4.6%
	Cary	55		3.6%
Person		19	1.2%	
	Other	202		13.2%
	Total Valid Responses	1,528	100.0%	100.0%

Description of Survey Respondents

Of the 1,529 employee respondents participating in the 2009 campus commuting survey, 68% were female and 32% male. Employees under the age of 34 represented

24% of survey respondents, while most employees (71%) were between the ages of 35 and 64. Another 2% reported being 65 years or older. Respondents were more likely to live in multiple-person households rather than alone. Approximately 77% of respondents reported living with at least one other individual, and 38% listed households of three or more people. Employees earning higher incomes were more likely to respond than those earning less than \$50,000, reflecting the large numbers of employees earning more than \$50,000. In fact, nearly 75% of respondents reported incomes in excess of \$50,000. About 24% listed an income between \$25,001 and \$50,000. Only about 1% reported an income of \$25,000 or less. An analysis of trip origins comparing employees and students shows, perhaps unsurprisingly, that students tend to live closer to campus than employees: 68 percent of students live in Chapel Hill and Carrboro, compared to 36 percent of employees. Many more students live in cities that would be considered urban in the North Carolina context, with Chapel Hill, Durham, Carrboro and Raleigh accounting for ninety percent (89.6%) of students and sixty-two (61.6%) of employees.

Trip Origins

County Origins

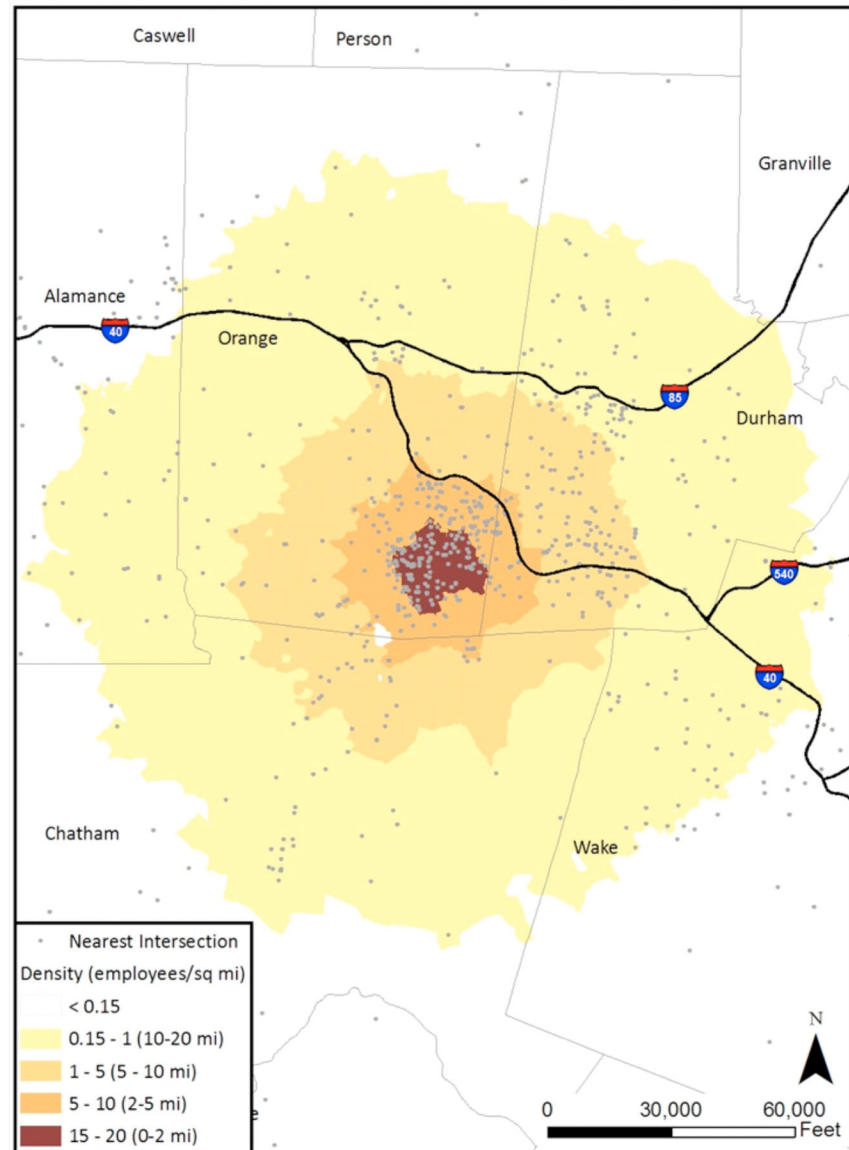
Thirty-nine percent (38.9%) of UNC employees live in Orange County, with another twenty-two percent (21.7%) living in Durham County. In addition, twelve percent (11.8%) of UNC employees reside in Chatham County, while eleven percent resides in Alamance and Wake Counties (11.1% and 10.9% respectively).

The population of employees is densest around $\frac{3}{4}$ to 1 mile from campus, though a large number of employees also live further than 20 miles from campus. In addition, the distribution of employee residences is dispersed relatively evenly around Chapel Hill. This is likely a reflection of employees having only a few variables that limit their housing options (see Map 1).

City and Town Origins

Twenty-eight percent (28.1%) of UNC employees live in Chapel Hill, with another eight (8.2%) percent living in Carrboro. Chapel Hill Transit, along with non-motorized modes, therefore has a potential ceiling of thirty-six percent (36.3%) of employees in terms of bus ridership. In addition, twenty percent (20.7%) of UNC employees reside in Durham, six percent (5.8%) in Pittsboro, and five percent (4.6%) in Raleigh. Other cities and towns housing more than 1% of employees are: Cary, Graham, Mebane, Burlington, Apex and Snow Camp. Sixty-two percent (61.6%) live in cities that would be considered urban in the North Carolina context, Chapel Hill

Map 1. Employee origin density at varying distances from campus



and Durham alone accounting for forty nine percent (48.8%). It should be noted that over thirteen percent (13.2%) of employees live in other communities (see table 1; map 1). The employee density within ½ a mile of campus is low.

The density of employees, however, increases after ½ mile from the campus boundary, which probably relates to the lack of affordable housing near the UNC campus and a lack of housing in downtown Chapel Hill overall (see Map 2).

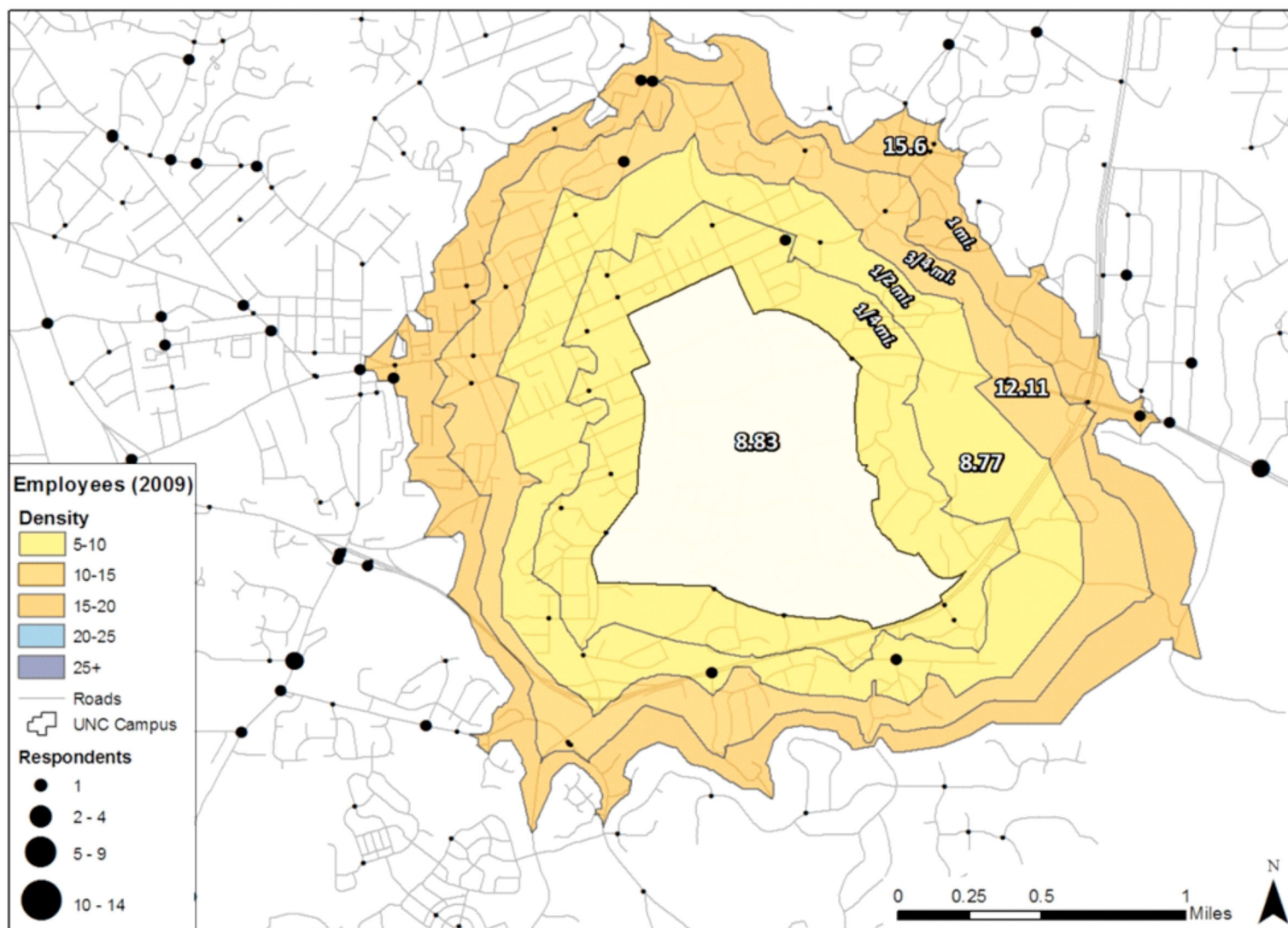
Zip Codes

The distribution of employees by zip code reflects the data seen in the previous table, with twenty-nine (29.2%) of current employees living in the Chapel Hill zip codes of 27516, 27514, and 27517. There are more non-responses (7.6%) in this group, which accounts for the higher percentage in the zip codes than in the city. Also interesting is that Siler City, which did not register above 1% in the cities and towns chart, is present in the zip code chart at 1.8%.

Table 2. Employee zip code origins

Zip code	Number	Percent
27516 (W. Chapel Hill)	192	13.0%
27713 (Durham/RTP)	132	9.0%
27514 (NE. Chapel Hill)	121	8.0%
27517 (SE. Chapel Hill)	119	8.0%
27510 (Carrboro)	109	7.0%
27312 (Pittsboro/Chatham Co.)	77	5.0%
27707 (Durham)	55	4.0%
27278 (Hillsborough/Orange Co.)	59	4.0%
27253 (Alamance Co.)	56	4.0%
27302 (Mebane)	45	3.0%
27705 (N. Durham)	44	3.0%
27703 (E. Durham)	22	2.0%
27215 (Burlington)	26	2.0%
27344 (Siler City)	27	2.0%
27712 (N. Durham)	20	1.0%
27513 (Cary)	21	1.0%
27502 (Apex)	18	1.0%
Other	338	23.0%
Total Valid Responses	1,481	100.0%
No Response	122	
TOTAL	1,603	

Map 2. Employee origin density within 1 mile of campus at varying distances from campus overlaid with number of respondents per intersection.



Distance to Work

Employees

A high percentage of respondents live between 6 and 30 miles away. While fewer employees live within 2 miles of campus, a large number live between 2 and 5 miles from campus. This graph supports the conclusion that employees are more likely to drive to campus (Figure 1).

Figure 1: Distance from Home to Work for Employees

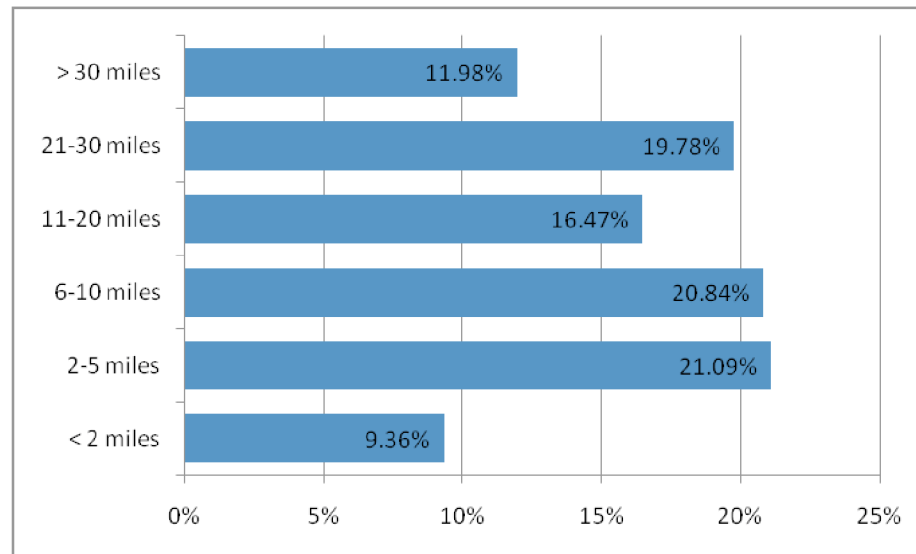
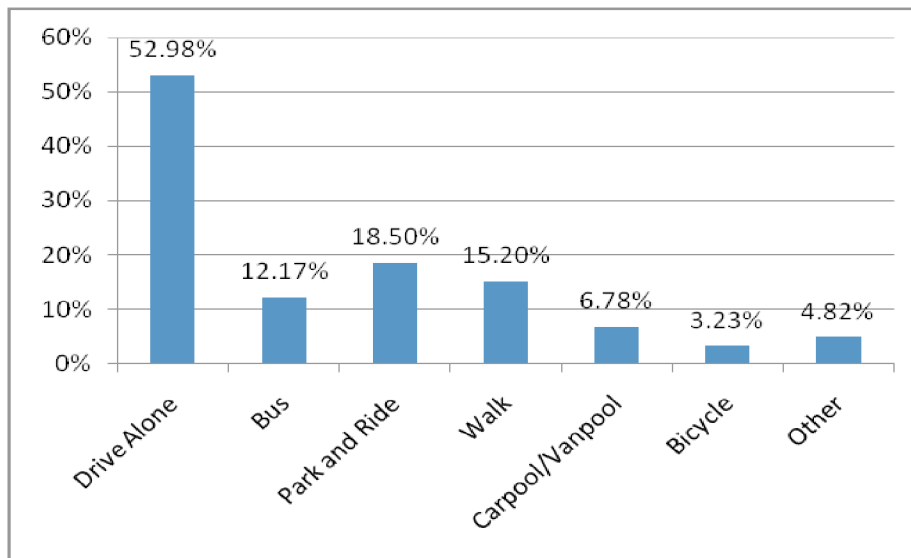


Figure 2: Home to Work Travel Modes for Employees



General Mode Attributes

Figure 2 shows the relative proportion of survey respondents that reported a particular mode. Among employees who responded to the survey, more than half (52.98%) reported that they drove alone to work and parked on campus, more than any other mode. The next most dominant modes are park and ride (18.5%) and bus (12.2%). Non-motorized travel (bicycling and walking) was the dominant mode for 4.75% of respondents.

Travel Mode Cross Tabulations

Travel Time to Work by Mode

Employees who travel by carpool/vanpool or use park and ride lots have a median travel time of 40 and 45 minutes, respectively (Figure 3). This average is significantly higher than any other mode, which may be in part because of the time it takes people to transfer from one mode to another or the time it takes to meet and pick up other commuters. Interestingly, the slowest modes, bicycling and walking, have the lowest median travel time, which indicates that people who bicycle or walk to campus for the most part live closer than those who drive. It also might indicate that people are less willing to walk or bike for as long as they are willing to spend driving to work.

Mode Choice by Distance from Campus for Employees

Virtually all of the employees commuting to work by non-motorized transportation live within five miles of campus (Figure 4). The bus mode share exhibits a steady decline the farther away people live from campus, changing from 24% to 9% between those who live 2 to 5 and 6 to 10

Figure 3: Travel Time by Mode for Employees

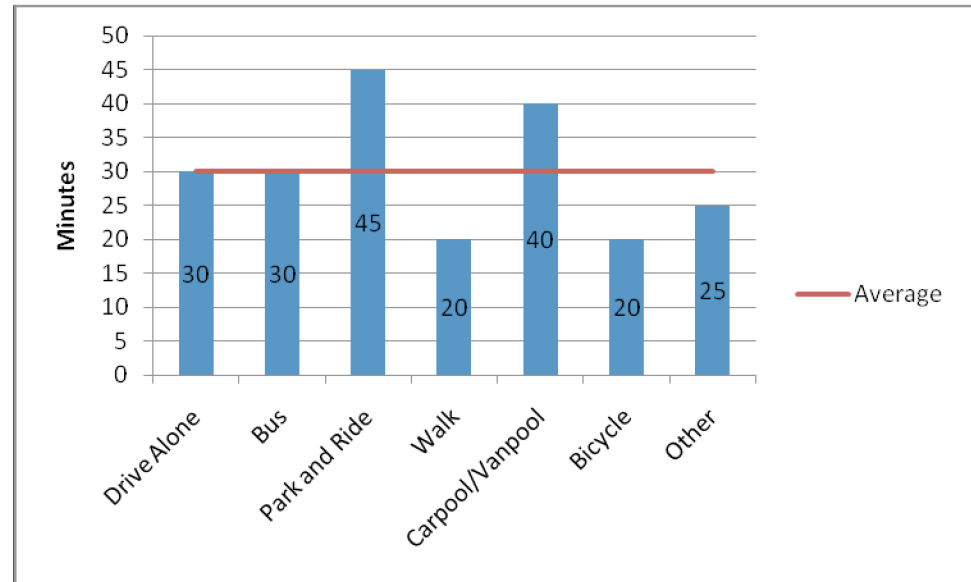


Figure 4: Mode Choice by Distance from Campus for Employees

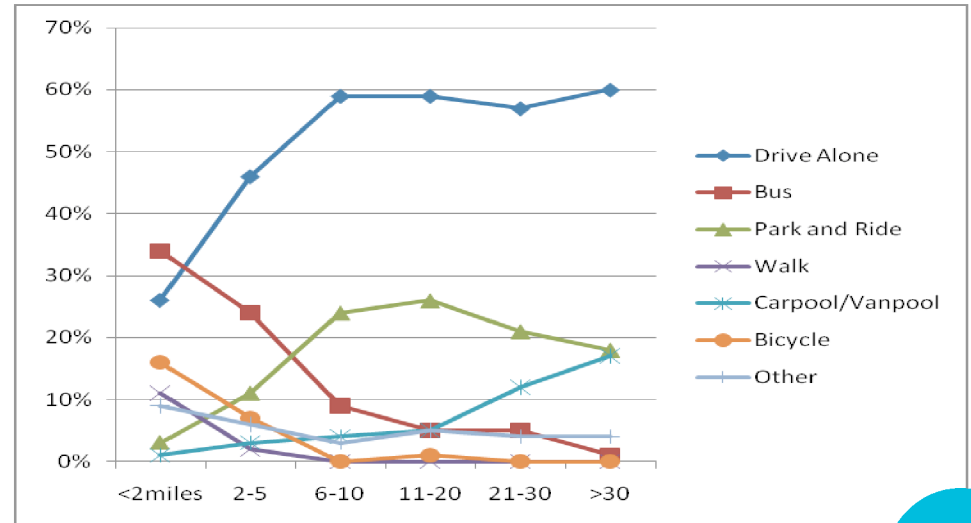


Table 3: Travel Mode by Income

	Drive Alone	Bus	Park and Ride	Walk	Carpool/ Vanpool	Bicycle	Other	Total
\$12,001-30,000	44 (38%)	27 (24%)	27 (24%)	1 (1%)	7 (6%)	2 (2%)	6 (5%)	114 (100%)
\$30,001-50,000	103 (41%)	35 (14%)	75 (30%)	2 (1%)	22 (9%)	7 (3%)	8 (3%)	252 (100%)
\$50,001-95,000	287 (52%)	75 (14%)	120 (22%)	5 (1%)	36 (6%)	12 (2%)	19 (3%)	554 (100%)
\$95,001-150,000	194 (56%)	30 (9%)	53 (15%)	6 (2%)	29 (8%)	18 (5%)	14 (4%)	344 (100%)
>\$150,000	117 (70%)	12 (7%)	7 (4%)	7 (4%)	3 (2%)	7 (4%)	14 (8%)	167 (100%)

miles away. The dominant mode share for people who live farther than two miles from campus is to drive alone, while the Carpool/Vanpool mode share also increases the farther away people live. This could represent the increased costs associated with driving a longer distance. Also of interest is that the use of the Park and Ride peaks at 26% for those people living 11 to 20 miles away.

Travel Mode by Income

Employees earning a higher income are

more likely to drive alone than those earning a lower income. The opposite trend occurs with the bus. Employees earning under \$30,000 per year are more likely to ride the bus (44%) than those who earn more. This could indicate that public transit is viewed as an inferior good by those who can afford to drive alone. Higher income employees are also more likely to walk or bike to campus. While walking and biking are not necessarily modes associated with higher income, this phenomenon is likely correlated with the high property costs for homes near campus.



Characteristics of Employees Who Drive to Work

Days of the Week Employees Drive

The survey responses for employees indicate that nearly half (45%) of employees do not drive to work on any day of the week. It is not very likely that an employee will drive only a few days a week, with nearly half (43%) driving to work every day of the week (Figure 5).

Amount Employees Pay for Parking

The cost to park per month varies greatly in Chapel Hill with the greatest numbers of people paying over \$40 to park (Figure 6). These wide variations in parking cost most likely reflect the desirability of the parking space.

Amount Employees Pay for Parking Per Month

The cost to park per month varies greatly in Chapel Hill with the greatest numbers of people paying over \$40 to park (Figure 6). These wide variations in parking cost most likely reflect the desirability of the parking space.

Figure 5: Days of the Week Employees Drive

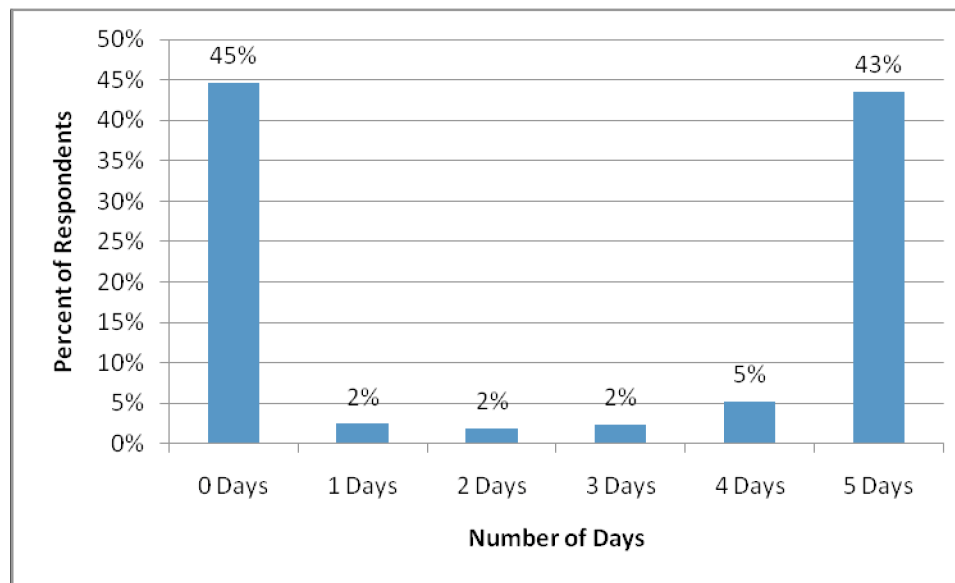
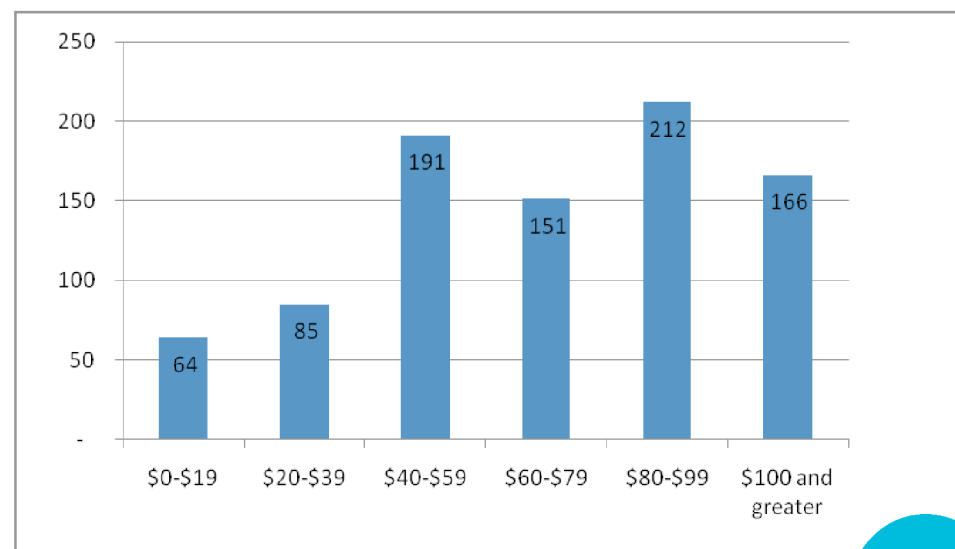


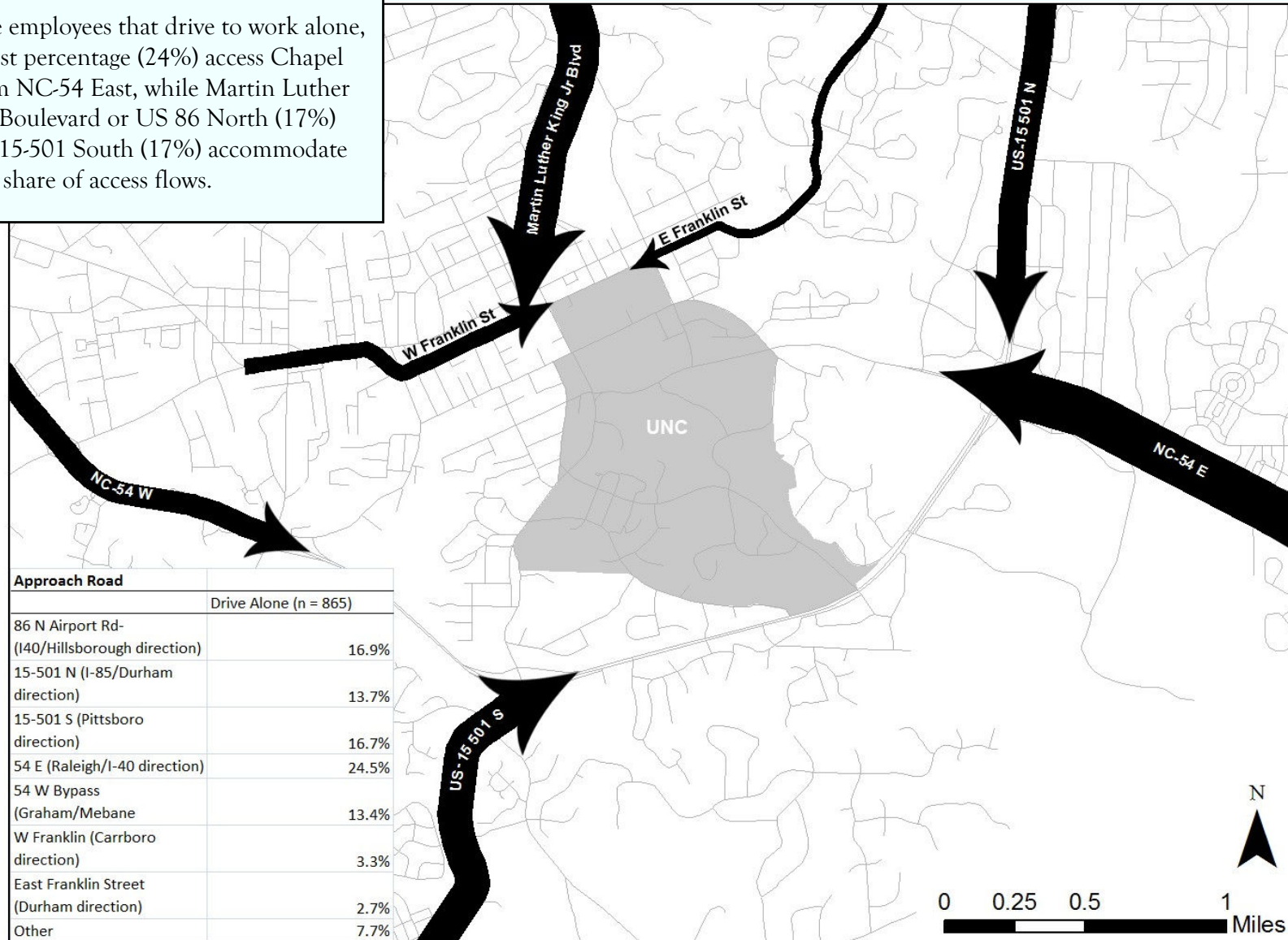
Figure 6: Amount Employees Pay for Parking per Month



Main Access Routes to Chapel Hill by Car

Of those employees that drive to work alone, the largest percentage (24%) access Chapel Hill from NC-54 East, while Martin Luther King Jr. Boulevard or US 86 North (17%) and US 15-501 South (17%) accommodate the next share of access flows.

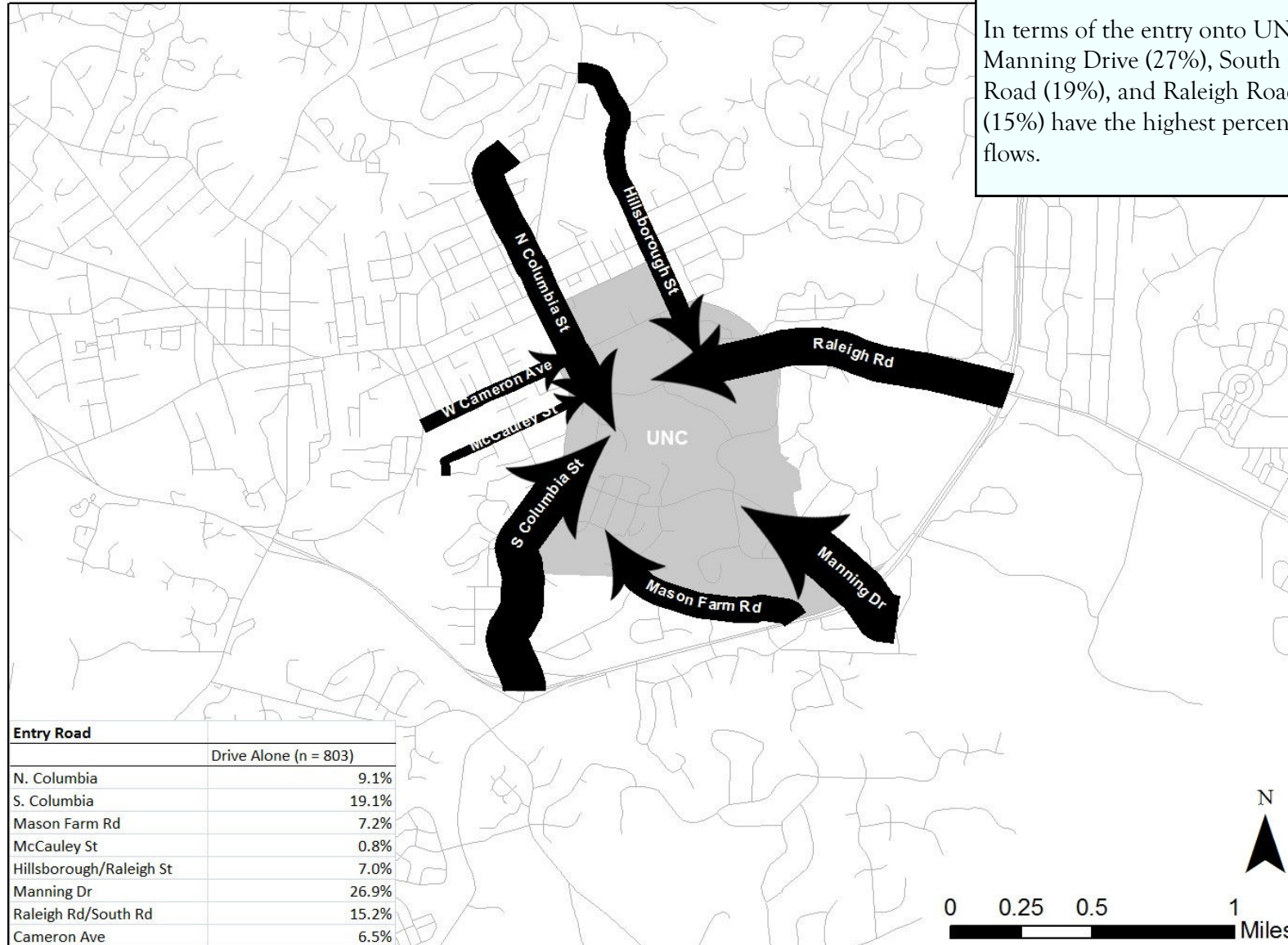
Map 3. Approach road to campus used by employees who drive alone



Map 4. Entry Road to campus used by employees who ride drive alone

Main Access Routes to Campus by Car

In terms of the entry onto UNC's campus, Manning Drive (27%), South Columbia Road (19%), and Raleigh Road/South Road (15%) have the highest percentage of entry flows.

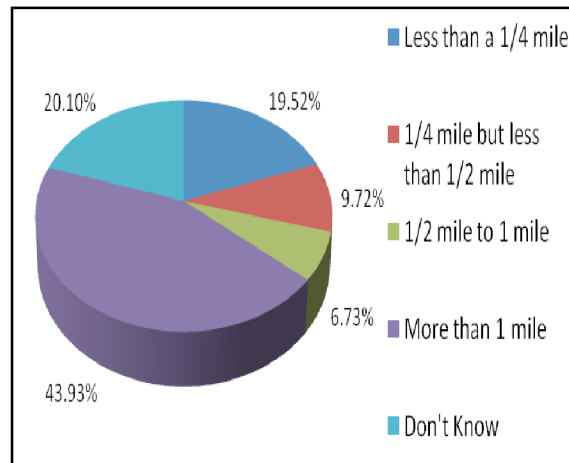


Characteristics of Employees Who Ride the Bus

Distance from Home to Nearest Bus Stop for Employees

Nearly 2/3 of employees are either not aware of the location of the closest bus stop or live more than 1 mile from the nearest stop, making it very unlikely that those employees will ever ride the bus. Almost 1/5 of employees (19.2%), however, live less than a quarter mile from campus, indicating that it will be very convenient for them to walk to the bus stop (Figure 7). One quarter mile is often thought of as farthest distance people will easily walk to a bus stop.

Figure 7: Distance from Home to Nearest Bus Stop for Employees



Mode to Bus Stop

More than 3/4 of employees who ride the bus to campus drive to the bus stop (Table 4). The next highest mode shares are other (10%) and walking (7%).

Table 4: Mode to Bus Stop

How do you get from your home to the Bus stop	Freq.	Percent
Walk	9	7%
Dropped off by a friend/spouse	3	2%
Drive	99	79%
Bicycle	3	2%
Other	12	10%
Total	126	100%

Park and Ride Lots

In the previous iterations of this survey, only 12 Park & Ride Lots were included. In 2009, the number of Park & Ride lots increased to 18. Of those employees that use the Park and Ride Lots, the Friday Center (14.7%) holds the largest percent followed by Hedrick Lot (12.7%). This verifies the previous conclusions that a large number of employees are commuting from the east to reach UNC's campus (Table 5).

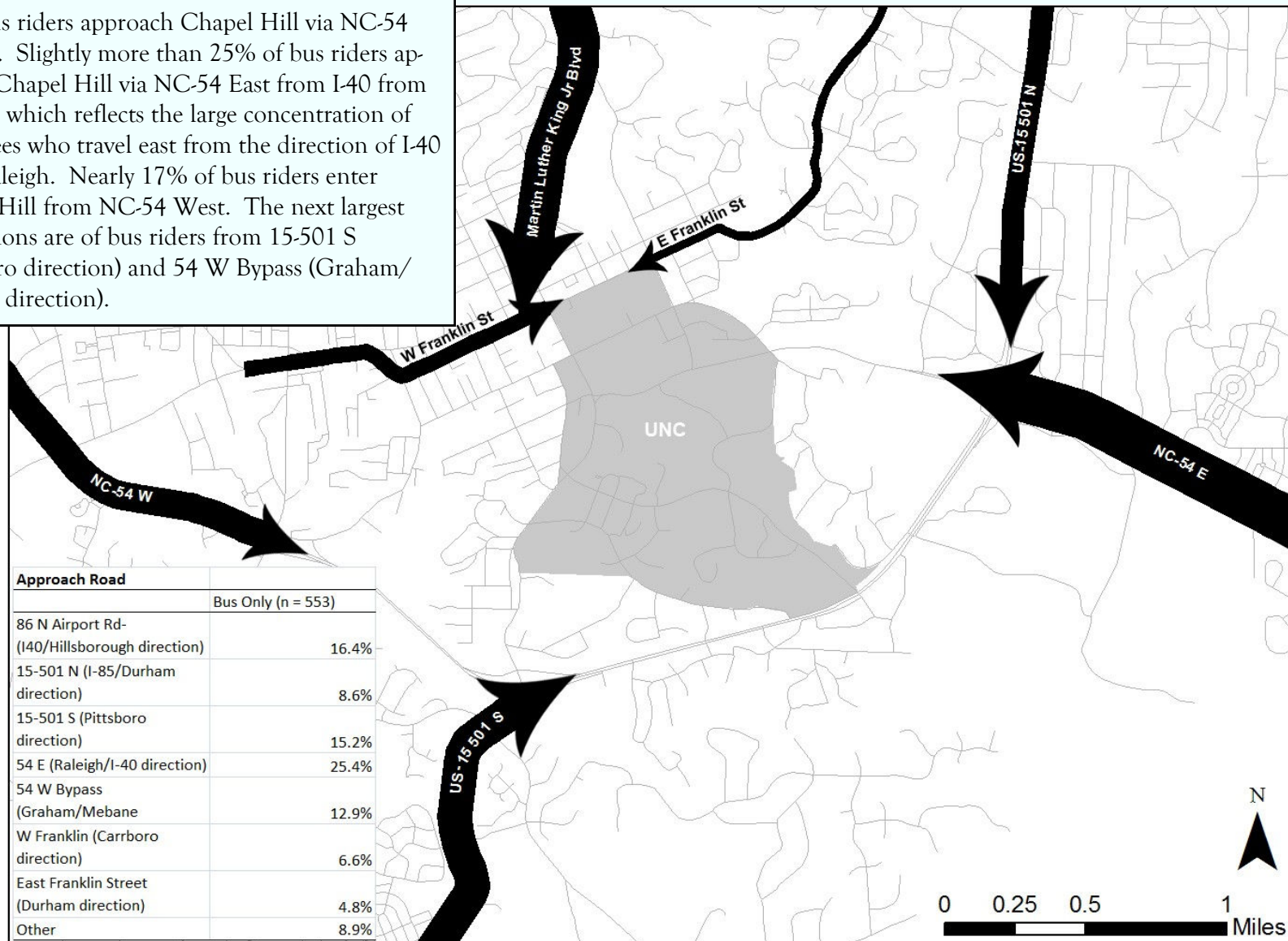
Table 5: Employee Park and Ride Lot Usage

Park & Ride Lot	Number of Riders	% of Total
Friday Center	60	15%
Hedrick Park and Ride	52	13%
Jones Ferry Rd	46	11%
Chatham County	41	10%
Southern Village/ 15-501 South	41	10%
Other	37	9%
NC 54	32	8%
Eubanks Rd	25	6%
Carrboro Plaza	22	5%
Franklin Street (Masonic Lodge)	18	4%
Southpoint Mall (Durham)	9	2%
725 MLK Blvd (Sheps Center)	7	2%
Private off campus lot	7	2%
Durham Tech (Hillsborough)	4	1%
District Drive (Raleigh)	3	1%
American Tobacco Deck (Durham)	2	1%
Regional Transit Center (RTP)	2	1%
Total	408	100%

Main Access Routes to Chapel Hill by Bus

Most bus riders approach Chapel Hill via NC-54 (Map 5). Slightly more than 25% of bus riders approach Chapel Hill via NC-54 East from I-40 from Raleigh, which reflects the large concentration of employees who travel east from the direction of I-40 from Raleigh. Nearly 17% of bus riders enter Chapel Hill from NC-54 West. The next largest proportions are of bus riders from 15-501 S (Pittsboro direction) and 54 W Bypass (Graham/Mebane direction). The next largest proportions are of bus riders from 15-501 S (Pittsboro direction) and 54 W Bypass (Graham/Mebane direction).

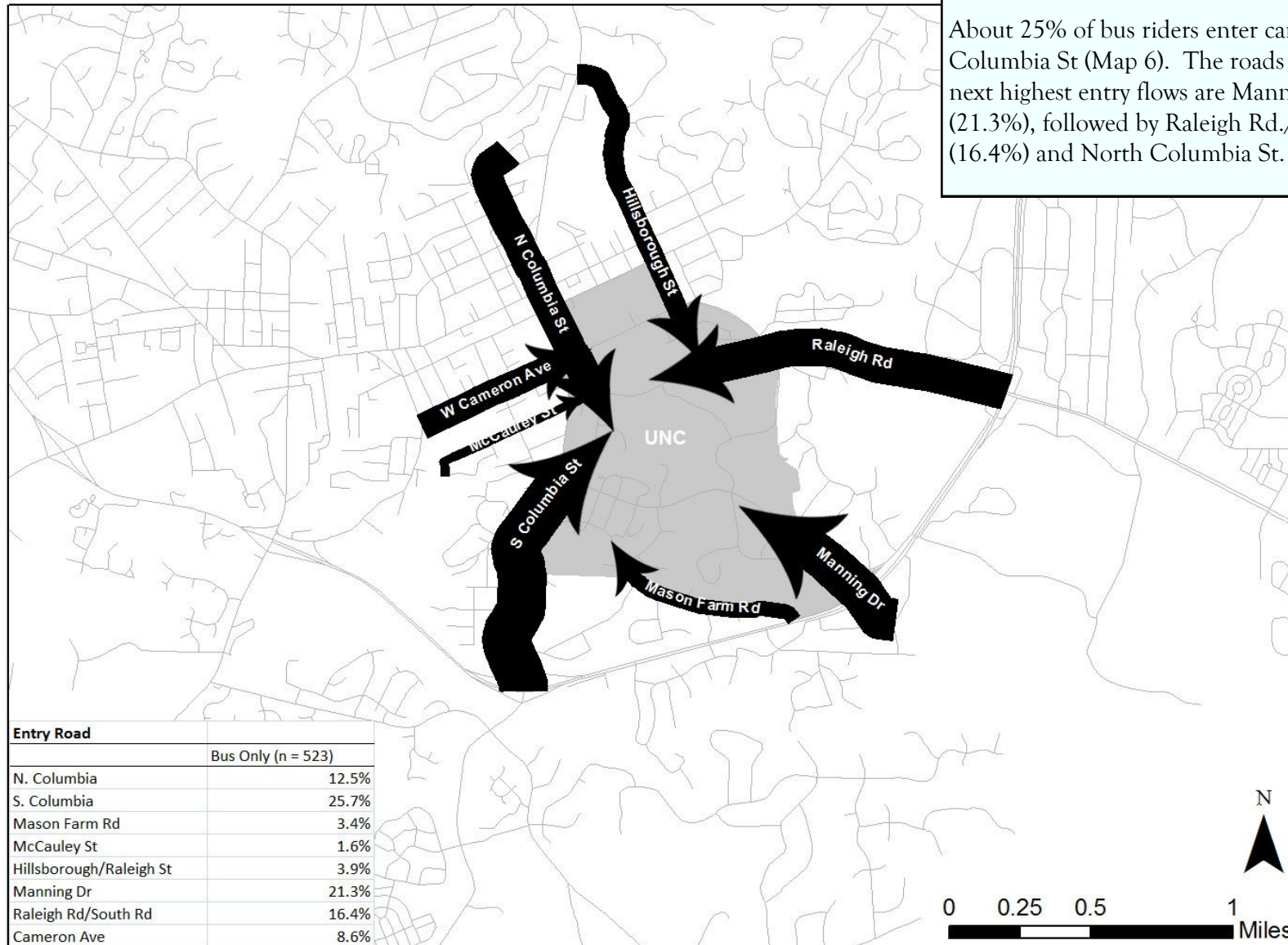
Map 5: Main Access Routes to Chapel Hill by Bus



Map 6: Main Access Routes to Campus by Bus

Main Access Routes to Campus by Bus

About 25% of bus riders enter campus via S. Columbia St (Map 6). The roads with the next highest entry flows are Manning drive (21.3%), followed by Raleigh Rd./South Rd. (16.4%) and North Columbia St. (12.5%).



Respondent Preferences

Employees were asked to rate six factors in terms of their importance in choosing a mode, with a score of 5 being “very important” and a score of 1 being “not important.” Time is the most important factor influencing mode choice followed closely by reliability and then safety. The less important factors are cost and comfort with environment being the least important factor.

Table 6: Respondent Preferences

Mode Choice Factors	Importance (range 1-5)
Cost (in dollars)	4.14
Safety	4.21
Time	4.86
Comfort	4.07
Reliability	4.79
Environment	3.57



STUDENT RESULTS

This section presents the travel and mode characteristics reported by the 482 UNC Chapel Hill students who responded to the survey.

Table 7: Student City, Town, and County Origins, 2009

County	City/Town	Number	Cumulative	Percent
Orange		306	65.8%	
	Chapel Hill	216		44.8%
	Carrboro	111		23.0%
Durham		89	19.1%	
	Durham	79		16.4%
Wake		46	9.9%	
	Raleigh	26		5.4%
	Cary	11		2.3%
Chatham		13	2.8%	
	Total responses for cities less than 1% of responses	39		8.1%
	Other	482		100.0%
Other		11	2.4%	
Total Valid Responses		465	100%	

Description of Survey Respondents

Of the 482 student respondents included within the 2009 UNC campus commuting survey, 71% were female and 29% male. The majority of student respondents described themselves as graduate students (50%), while only 30% described them-

selves as undergraduates. Of the remaining 20% of students, 18% were professional (law, medical, dental, pharmacy, health affairs, etc.) and 2% were post-baccalaureate. An overrepresentation of post-graduate respondents indicated the potential presence of some survey bias, as these students were less likely to live on campus in dormitory housing. Most student respondents (93%) described their student status as full-time, while 7% described themselves as part-time students. While many UNC students had off-campus jobs, students often did not select their mode of transportation based on the need to travel to a full-time or part-time off campus job. Of the student respondents, 67% reported that they had no job, while 27% reported part-time off campus employment and 7% reported a full-time job off campus.

Trip Origins

County Origins

Sixty-six percent (65.8%) of UNC students live in Orange County, with another nineteen percent (19.1%) living in Durham County. In addition, ten percent (9.9%) of UNC students reside in Wake County, and three percent in Chatham

County. Note that these percentages do not include non-responses, which total about fourteen percent (13.9%).

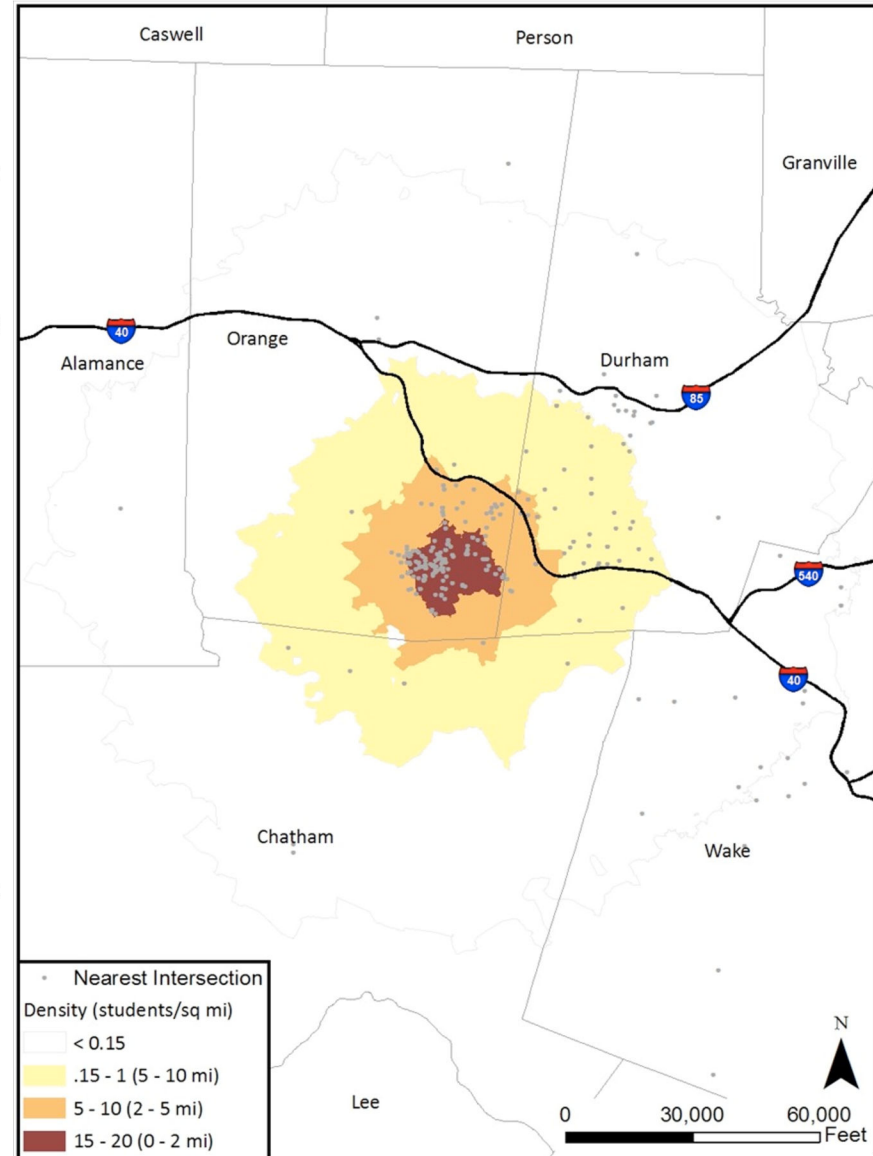
The nearest intersection to the student's home address is outlined in Figure 3, giving an impression of the where students live in 2009. The results validate the results in the table above, illustrating that the majority of students live in Orange County.

The closest intersection to home for most students was within a 2-mile radius of central campus. Central campus has been identified as the student store for the purpose of this study. Once you examine the distribution past the 2 mile mark, it is apparent that students who live outside of 2 miles tend to live to the east of campus in the direction of Raleigh and Durham. There is a very low density in the west (see map 7).

Forty five percent (44.8%) of UNC students live in Chapel Hill, with another twenty three (23.0%) percent living in Carrboro. Chapel Hill Transit, along with non-motorized modes, therefore has a potential ceiling of sixty eight percent (67.8%) of students. In addition, sixteen percent (16.4%) of UNC students reside in Durham, five percent (5.4%) in Raleigh, and two percent (2.3%) in Cary. Only eight percent (8.1%) of students live in other communities. Ninety percent (89.6%) live in cities that would be considered urban in the North Carolina context, Chapel Hill, Durham and Carrboro alone accounting for eighty four percent (84.2%).

Another pattern of population density becomes clear when examining the campus boundaries and zones one-quarter,

Map 7. Student origin density overlaid with respondent reported nearest intersection locations.



one-half, and one mile away from campus. The distribution of students is largely to the east and somewhat north. A very large proportion of students live in Carrboro and on the eastern side of Chapel Hill. This is likely a reflection of available affordable housing. There is a limitation in making an assumption about the location of students who reside on campus, because there were few larger population densities at the intersections tangent to the boundary of campus or within the campus boundary (see map 8).

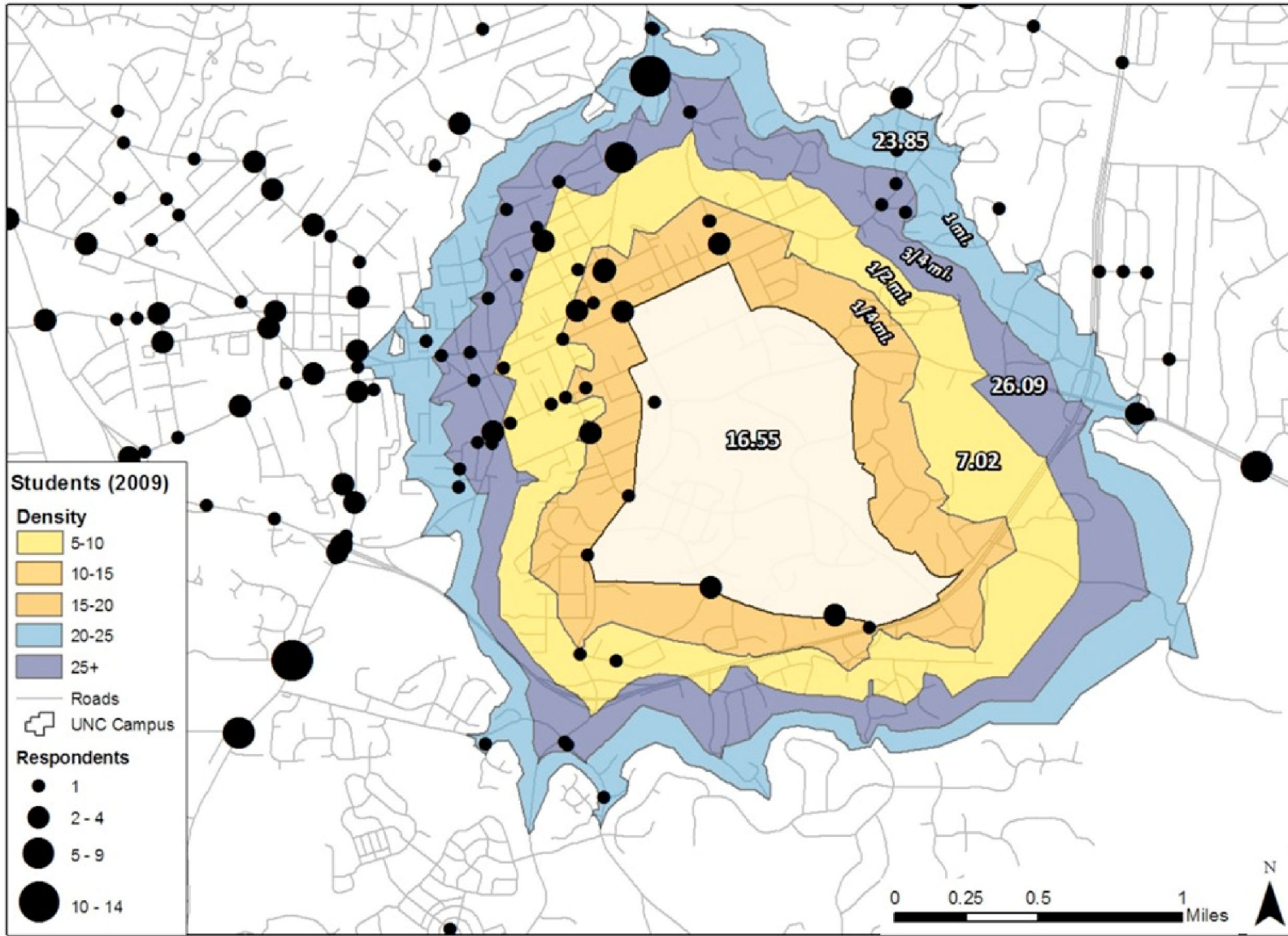
Zip Codes

The distribution of students by zip code reflects the data seen in the previous table, with forty seven percent (46.6%) of current employees living in the Chapel Hill zip codes of 27516, 27514, and 27517. Again, there are more non-responses (7.5%) in this group, which accounts for the higher percentage in the zip codes than in the city. More students live in Carrboro's 27510 (21.7%) than any of the Chapel Hill Zip codes.

Table 8: Student zip codes of origin

Zip code	Number	Percent
27510 (Carrboro)	101	21.7%
27514 (NE. Chapel Hill)	87	18.7%
27516 (W. Chapel Hill)	86	18.5%
27517 (SE. Chapel Hill)	44	9.4%
27713 (Durham/RTP)	29	6.2%
27707 (Durham)	23	4.9%
27705 (N. Durham)	13	2.8%
Other	83	17.8%
Total Valid Responses	466	100.0%
No Response	38	
TOTAL	504	

Map 8. Student origin density within 1 mile of campus at varying distances from campus overlaid with number of respondents per nearest intersection.



ANALYSIS OF THE 2009 SURVEY-STUDENTS

Distance and Time to Campus

Figure 8 displays the relative proportion of survey respondents that reported a particular mode. Among students who responded to the survey, the largest portion (38.6%) responded that their primary mode for getting to campus was bus. About 18% reported that they drove alone or used Park and Ride facilities each to get to campus. Non-motorized travel (bicycling and walking) was the dominant mode for 17% of respondents.

Table 8: Distance From Home to Campus

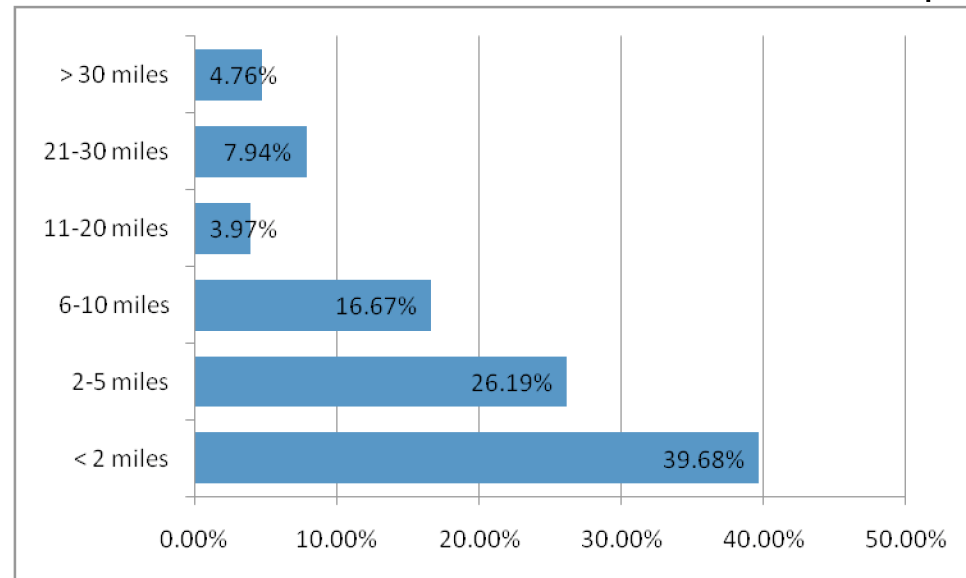
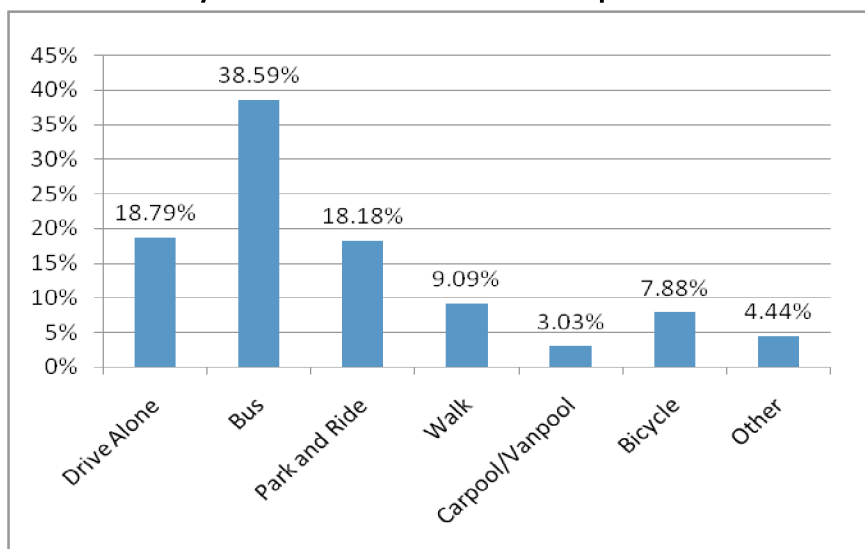


Table 9: Primary travel mode from home to campus



General Mode Attributes

As students tend to live close to campus and fall within the purview of the Chapel Hill bus system, nearly 39% take the bus to campus. The next largest modes to campus are both the Park and Ride and Drive Alone travel modes, which are roughly equal with 18% taking these modes from home to campus respectively. The walking and bicycling modes account for nearly 17% of home to campus trips for students (Figure 9).

Travel Mode Cross Tabulations

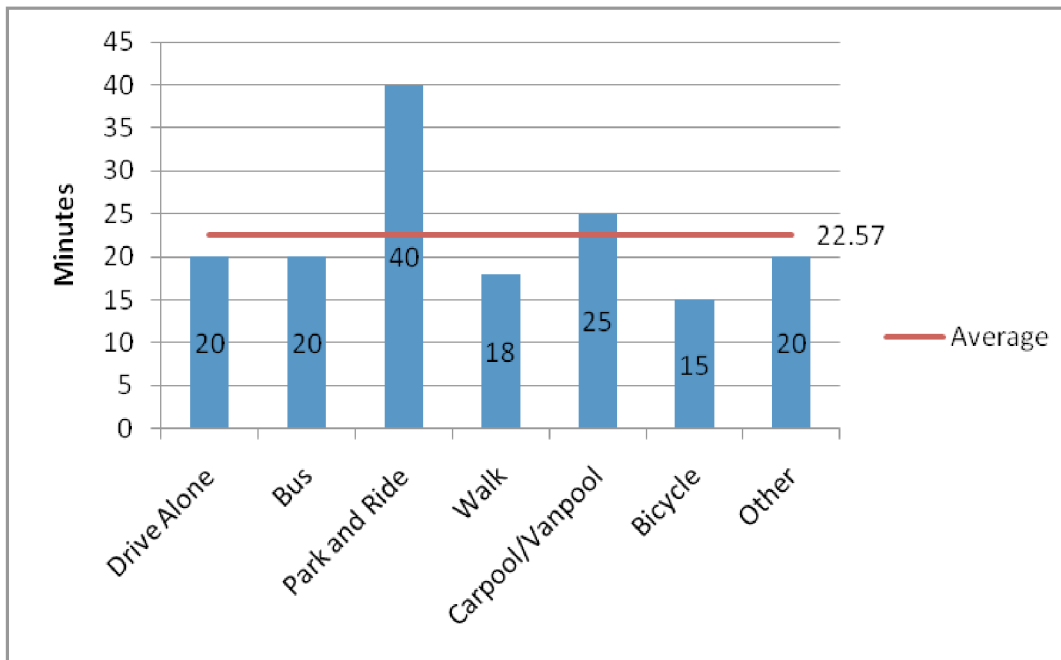
Travel Time to Campus

Student travel times are fairly consistent around 20 minutes. The one significant outlier is students who use Park and Ride facilities. This high travel time is likely caused by a combination of living farther from campus and the time costs involved with switching modes in the middle of the trip (Figure 10).

Sex	Drive Alone	Bus	Park and Ride	Walk	Carpool/Vanpool	Bicycle	Other	Total
Male	20	46	28	15	5	16	8	138
	14%	33%	20%	11%	4%	12%	6%	138
Female	71	141	60	28	9	20	12	341
	21%	41%	18%	8%	3%	6%	4%	341
Total	91	187	88	43	14	36	20	479
	19%	39%	18%	9%	3%	8%	4%	479

Table 10: Travel Mode by Sex

Figure 10: Travel Time to Campus



Travel Mode by Sex

Female students are more likely to drive or take the bus than male students, while male students are more likely to bicycle than female students. In contrast to the employee percentages which were mostly equal except with the bicycle mode, female students are less likely to use non-motorized transportation modes.

Travel Mode to Campus by Student Type

In terms of the travel mode by student type, the bus and drive alone travel modes are roughly equal, while the walk, bicycle, and park and ride modes exhibit differences. Professional students are much more likely to park and ride, possibly as a result of living in places other than Chapel Hill and Carrboro. Graduate and post-baccalaureate students are more likely to bicycle than undergraduates and professional students (Figure 11).

Figure 11: Travel Mode to Campus by Enrollment Status

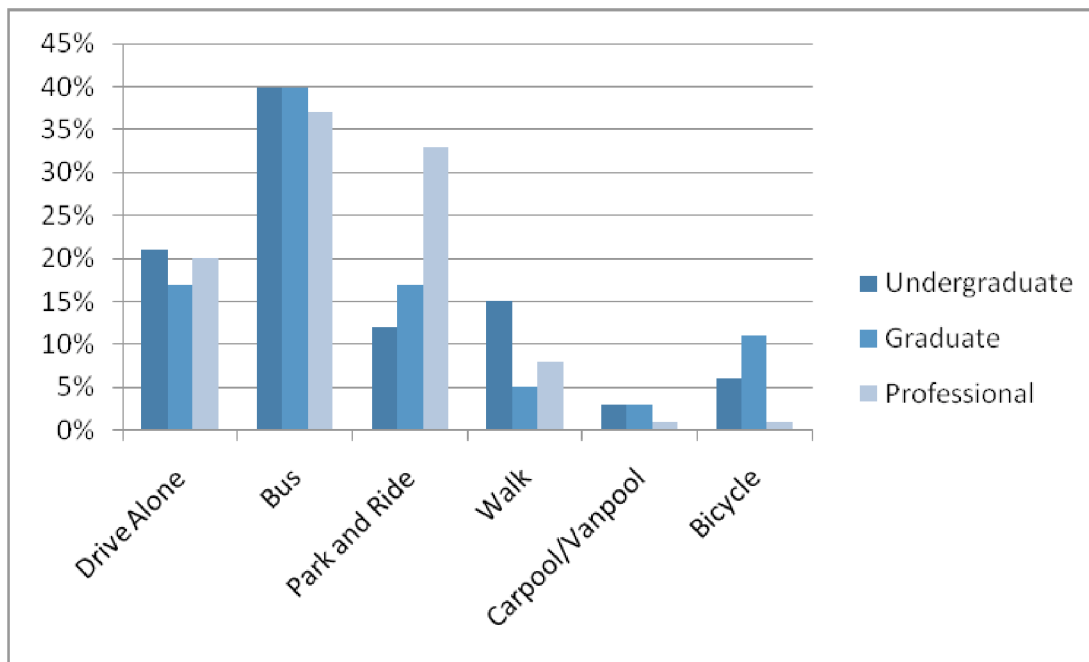


Table 11: Travel Mode by Enrollment Status

Enrollment Status	Drive Alone	Bus	Park & Ride	Walk	Carpool/Vanpool	Bicycle	Other	Total
Full-time	80	174	82	41	13	34	19	443
	18%	39%	19%	9%	3%	8%	4%	443
Part-time	11	10	4	2	1	2	3	33
	33%	30%	12%	6%	3%	6%	9%	33

Travel Mode by Student Enrollment Status

Part-time students are more likely to drive alone than full time students, perhaps as a result of other obligations that these students must fulfill that require the use of an automobile. Additionally, many part-time students may be more likely to take night classes when parking restrictions are not in place.

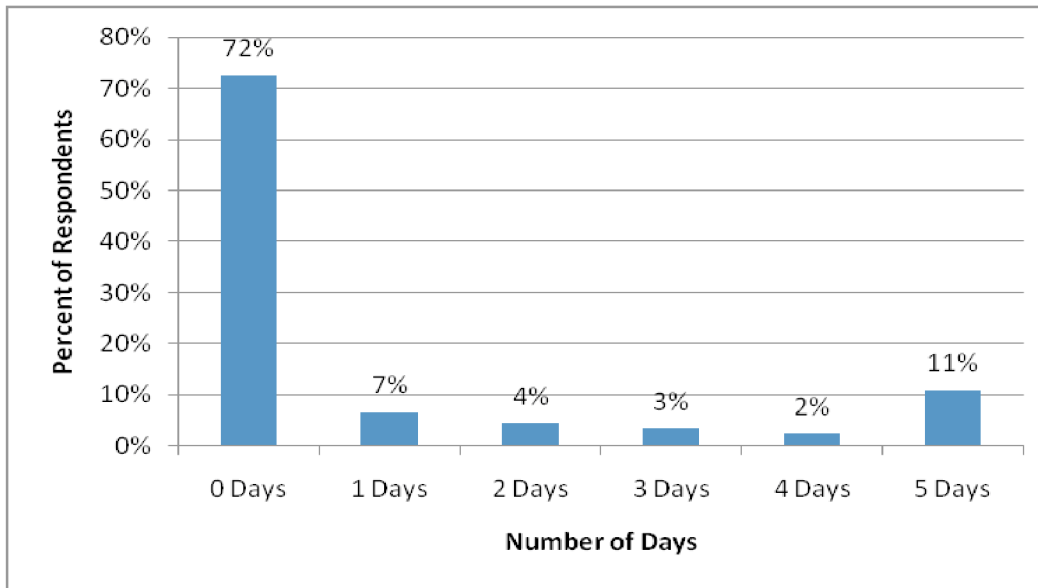
Travel Mode by Job Status

Students with a job are more likely to drive than students without a job. Students with a full time job are less likely to bus and walk, probably as a result of the increased time demands associated with full-time employment. Similar to the part-time students, off campus obligations might require the use of an automobile.

Table 12: Primary Travel Mode by Job Status

Work Status	Drive Alone	Bus	Park & Ride	Walk	Carpool/Vanpool	Bicycle	Other	Total
Full-time job	10	9	3	1	1	3	4	31
	32%	29%	10%	3%	3%	10%	13%	100%
Part-time job	29	45	22	11	1	11	7	126
	23%	36%	17%	9%	1%	9%	6%	100%
No job	52	130	61	30	12	22	11	318
	16%	41%	19%	9%	4%	7%	3%	100%

Figure 12: Days of the Week Students Drive to Campus



Characteristics of Students who Drive to Campus

Days of the Week Students Drive to Campus

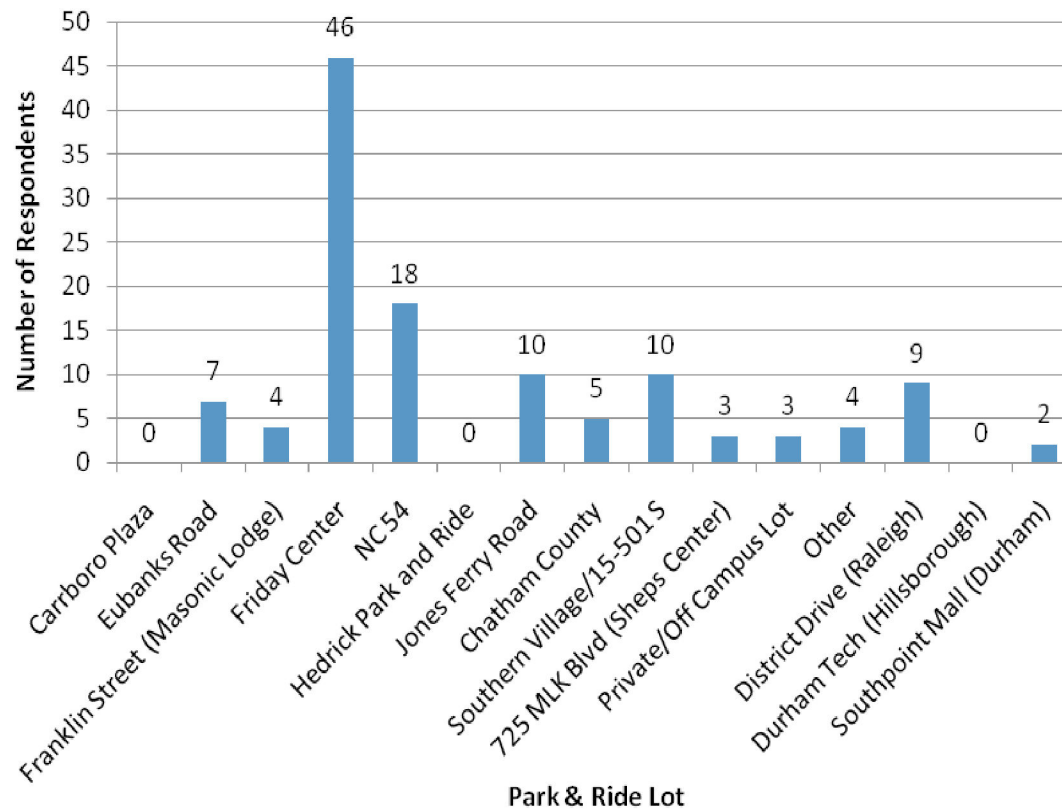
As opposed to employees, almost half of whom drove to work 5 days a week, the majority of students (72%) access the UNC campus via modes other than driving. Some students do drive all of the time, most likely those that do not live in Carrboro or Chapel Hill, while very few students drive to school only a few days per week (Figure 12).

Park & Ride Lot Usage by Students

The most intensively used Park and Ride lot by students is located at the Friday Center. The NC-54 Park and Ride lot was also used to a greater degree than other lots by students. This indicates that a number of students are using NC-54 East to access the

UNC campus. Fewer students were driving from areas west, south, or north of Chapel Hill and Carrboro, with no one parking at the Carrboro Plaza Park and Ride lot and only a few parking at the Jones Ferry, Chatham County, Southern Village, and Martin Luther King Junior Boulevard Park and Ride Lots (Figure 13).

Figure 13: Park & Ride Lot Usage by Students



Parking Payment: Cost to Park Per Month for Students

The price of parking varies greatly in Chapel Hill, which is indicated by the large numbers of individuals paying both high and low prices to park. The most people are paying is over \$100 per month, but a large percentage also pay over \$40 per month (Figure 14). This information, however, also includes those individuals that do not drive to campus every day, which could skew these results.

Travel Mode from Parking Place to Campus Destination

The majority of students walk from their parking place to their campus destination, while a small percentage rides a bicycle or takes the bus (Figure 15).

Parking Payment: Cost to Park Per Month for Students

The price of parking varies greatly in Chapel Hill, which is indicated by the large numbers of individuals paying both high and low prices to park. The most people are paying is over \$100 per month, but a large percentage also pay over \$40 per month (Figure 14). This information, however, also includes those individuals that do not drive to campus every day, which could skew these results.

Figure 14: Cost to Park per Month for Students

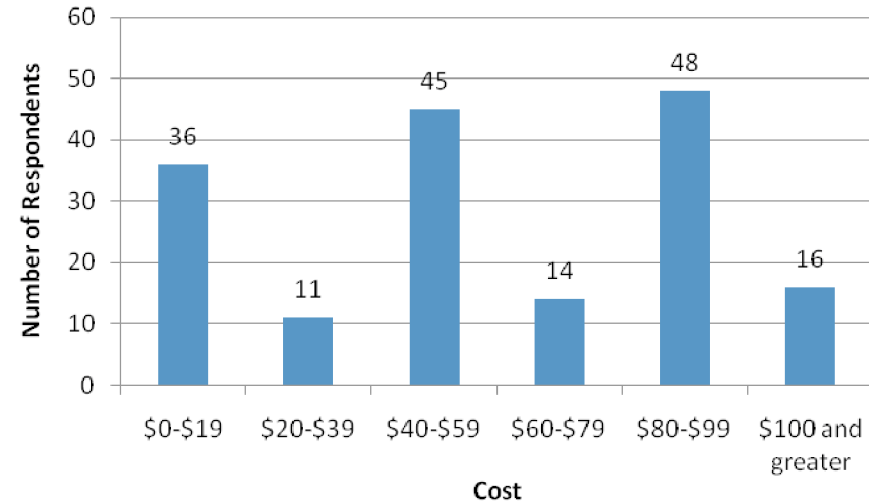
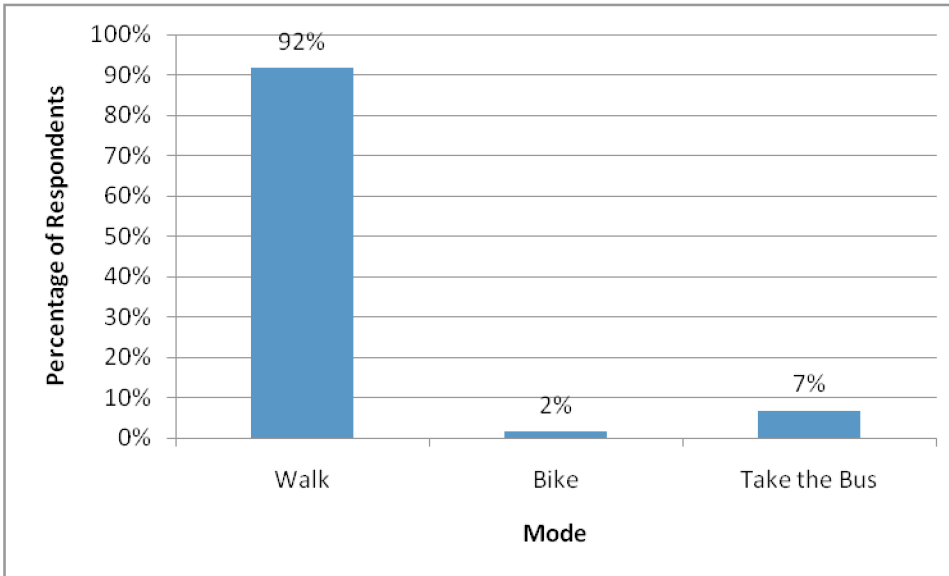


Figure 15: Travel Mode from Parking Place to Campus Destination



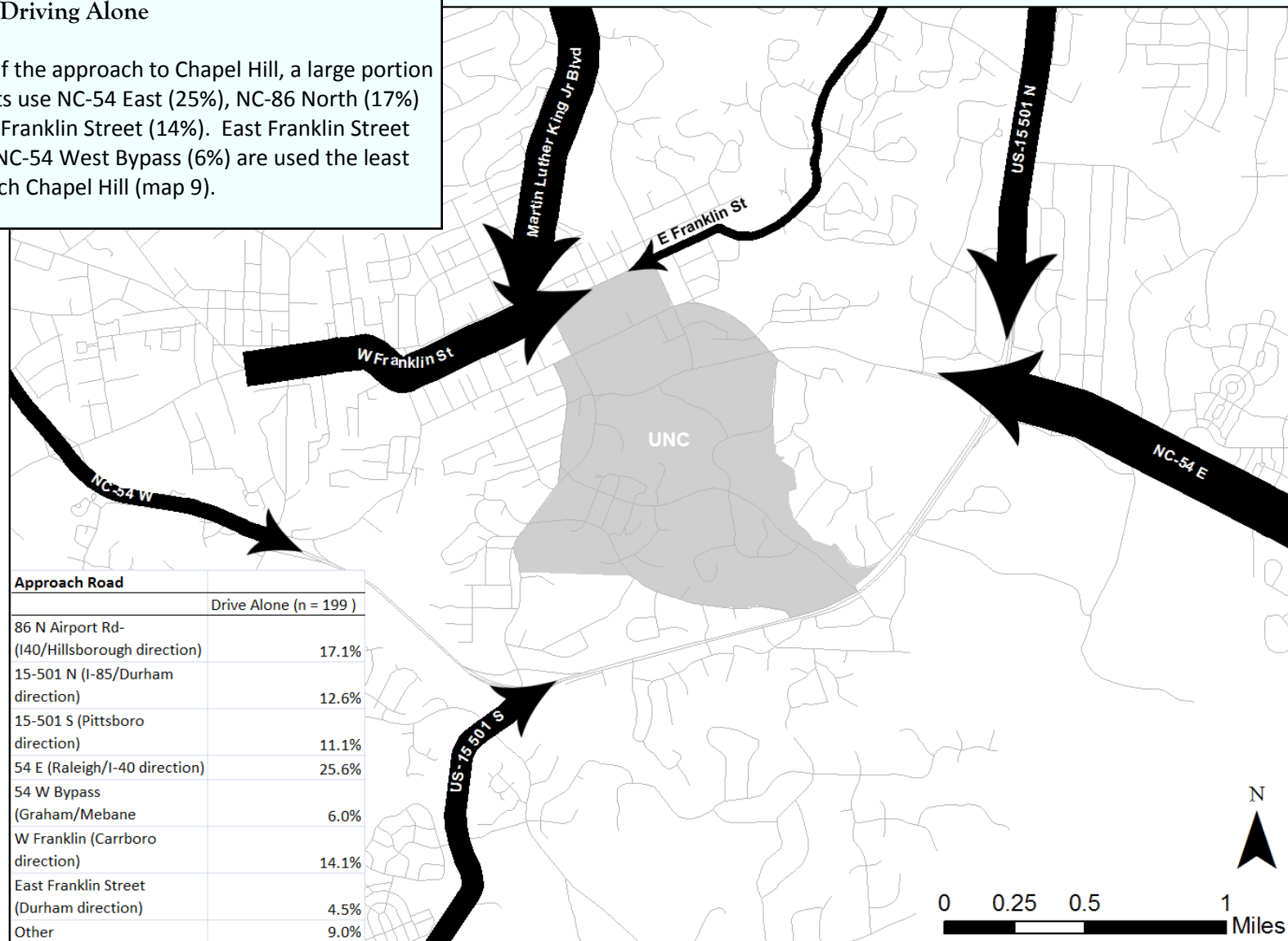
Travel Mode from Parking Place to Campus Destination

The majority of students walk from their parking place to their campus destination, while a small percentage rides a bicycle or takes the bus (Figure 15).

Main Access Routes to Chapel Hill for Students Driving Alone

In terms of the approach to Chapel Hill, a large portion of students use NC-54 East (25%), NC-86 North (17%) and West Franklin Street (14%). East Franklin Street (5%) and NC-54 West Bypass (6%) are used the least to approach Chapel Hill (map 9).

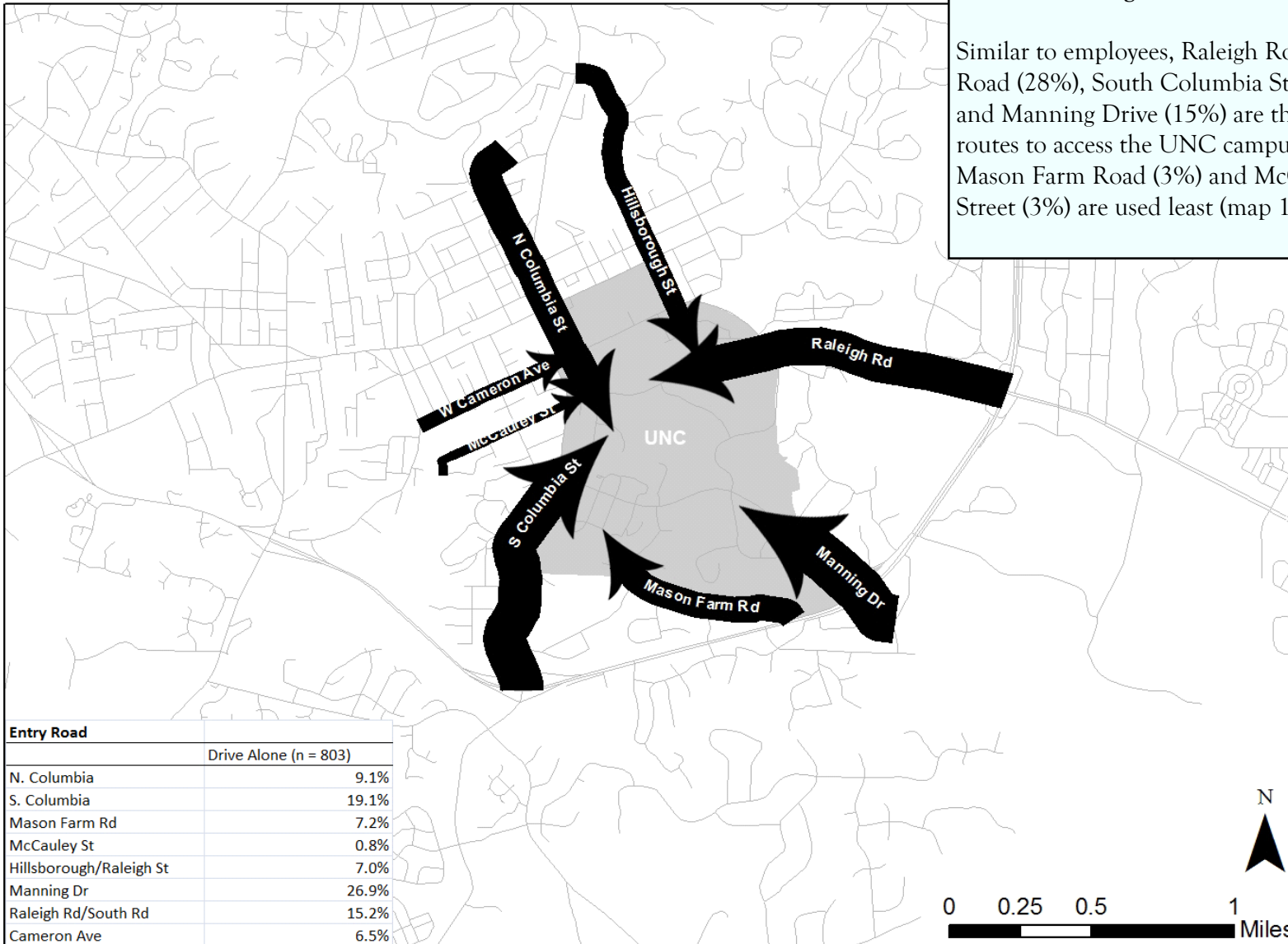
Map 9. Approach road to campus used by students who drive alone



Map 10. Entry Road to campus used by students who ride drive alone

Main Access Routes to Campus for Students Driving Alone

Similar to employees, Raleigh Road/South Road (28%), South Columbia Street (19%), and Manning Drive (15%) are the most used routes to access the UNC campus, while Mason Farm Road (3%) and McCauley Street (3%) are used least (map 10).



Characteristics of Students Who Ride the Bus

The majority of students (57%) live less than ¼ mile from the nearest bus stop, while 11% live ½ to ¼ mile from the closest bus stop. Only about 20% of students live farther than a mile from the closest bus stop or do not know where it is. These figures are almost the exact opposite of the percentages for employees, indicating that more students live within Carrboro and Chapel Hill, use the bus, and are aware of the bus system or the location of bus stops (Figure 16).

Most students who ride the bus to campus drive from their home to the bus stop, which probably includes Park and Ride users. The next highest mode share is walking, which makes up ¼ of the remaining bus riders. Bicycling makes up nearly 7% of all modes (Table 13).

Figure 16: Distance from Home to Nearest Bus Stop

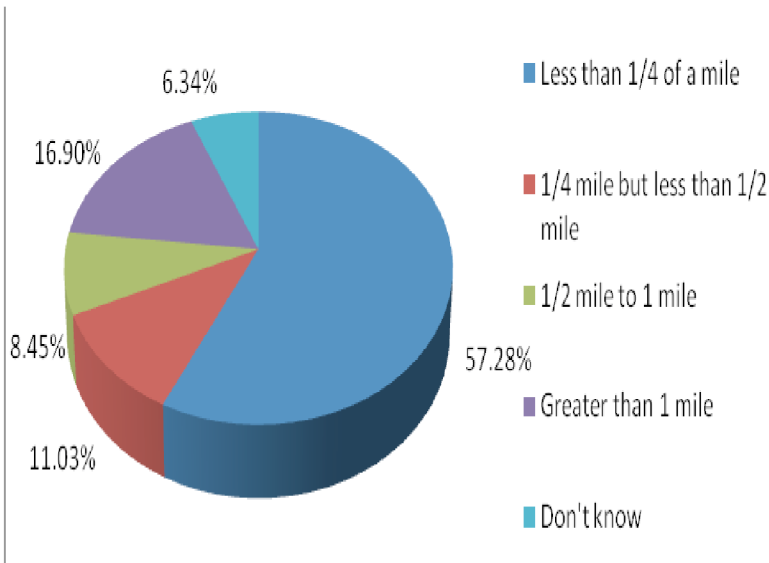


Table 13: Mode to Bus Stop

Mode	Frequency	Percent
Walk	11	25%
Dropped off by friend/spouse	1	2.27%
Drive	27	61.36%
Bicycle	3	6.82%
Other	2	4.55%
Total	44	100%

Park and Ride Lots

The Friday Center has the highest percent of students using Park and Ride lots with 37%, followed by NC-54 which has almost 15%.

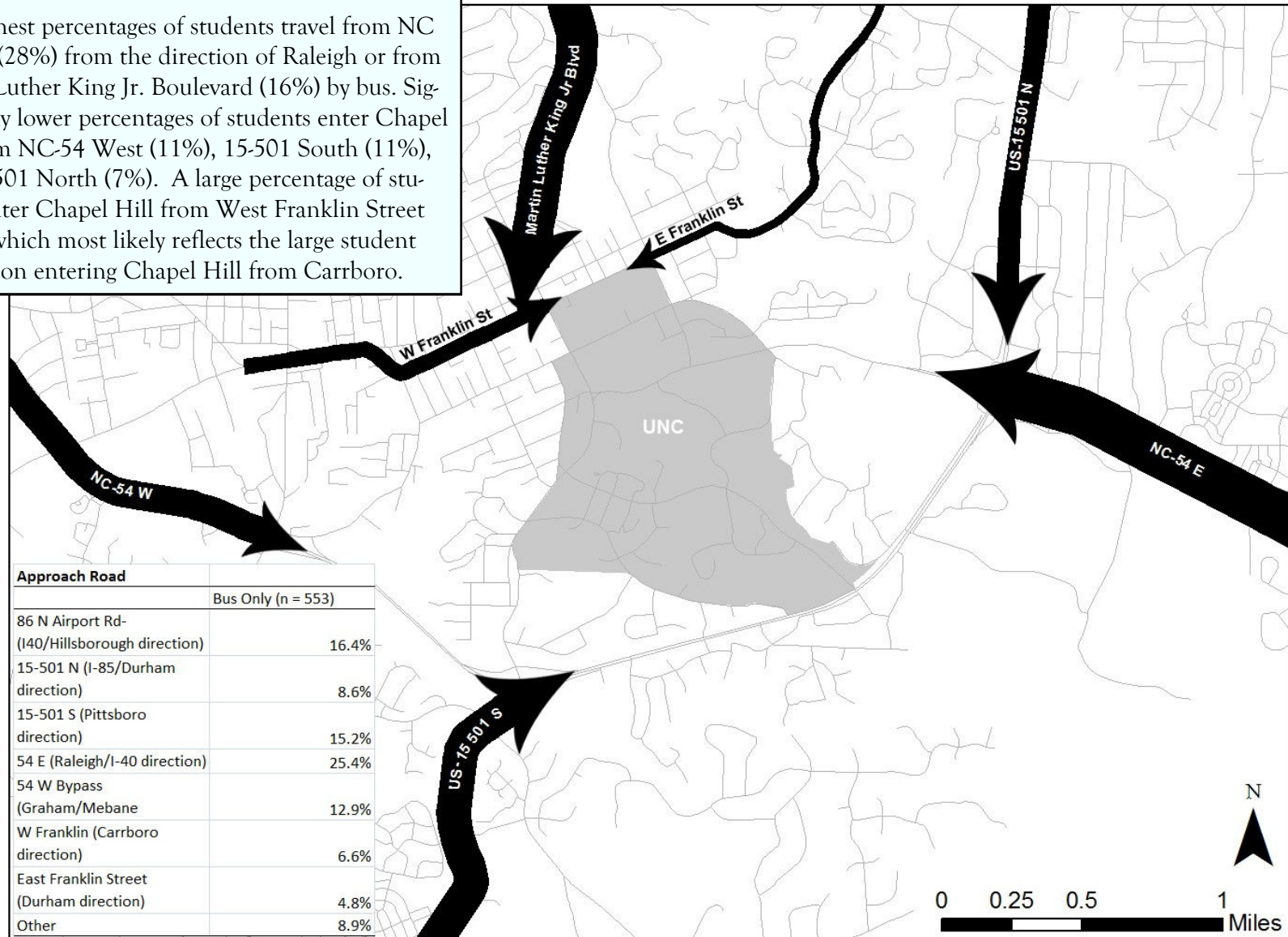
Table 14: Student Park and Ride Lot Usage

Lot	Frequency	% of Total
Friday Center	46	37.10%
NC 54	18	14.50%
Jones Ferry Rd	10	8.10%
Southern Village/ 15-501 South	10	8.10%
District Drive (Raleigh)	9	7.30%
Eubanks Rd	7	5.60%
Chatham County	5	4.00%
Franklin Street (Masonic Lodge)	4	3.20%
Other	4	3.20%
725 MLK Blvd (Sheps Center)	3	2.40%
Private off campus lot	3	2.40%
Carrboro Plaza	2	1.60%
Southpoint Mall (Durham)	2	1.60%
Regional Transit Center (RTP)	1	0.80%
Total	124	100%

Main Access Routes to Chapel Hill by Bus

The highest percentages of students travel from NC 54 East (28%) from the direction of Raleigh or from Martin Luther King Jr. Boulevard (16%) by bus. Significantly lower percentages of students enter Chapel Hill from NC-54 West (11%), 15-501 South (11%), and 15-501 North (7%). A large percentage of students enter Chapel Hill from West Franklin Street (16%), which most likely reflects the large student population entering Chapel Hill from Carrboro.

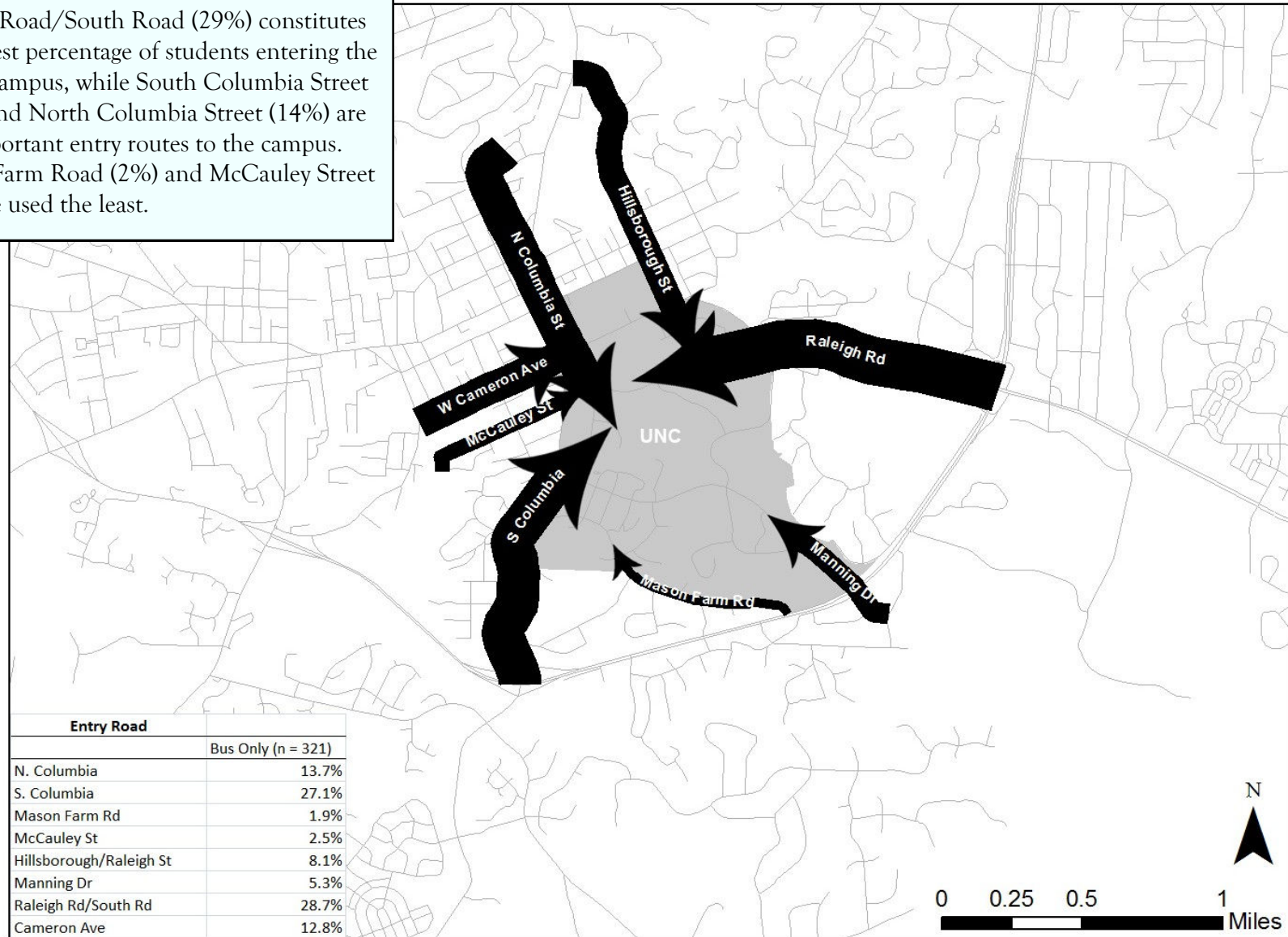
Map 11. Approach road to campus used by students who ride the bus



Main Access Routes to Campus by Bus

Raleigh Road/South Road (29%) constitutes the largest percentage of students entering the UNC Campus, while South Columbia Street (28%) and North Columbia Street (14%) are also important entry routes to the campus. Mason Farm Road (2%) and McCauley Street (3%) are used the least.

Map 12. Entry Road to campus used by students who ride the bus



Respondent Preferences

Students were asked to rate six factors in terms of their importance in choosing a travel mode, with a score of 5 being “very important” and a score of 1 being “not important.” Time and Reliability are the most important factors for students in choosing their mode of transportation with an average of about 4.6 each. Environmental concerns and Comfort are the least important with a rating of 3.49 and 3.35.

Table 15: Respondent Preferences

Mode Choice Factors	Importance (range 1-5)
Cost (in dollars)	4.09
Safety	3.96
Time	4.54
Comfort	3.35
Reliability	4.60
Environment	3.49

