The Impact of Transit Accessibility on Residents of affordable Housing Multifamily Apartment Complexes

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TABLE OF CONTENTS

1. Introduction

A great deal of public money, time and energy have gone into the financing and construction of "affordable" multifamily housing since the Low Income Housing Tax Credit was created in 1986. By providing interest-free capital through tax credits to investors, developers can build quality housing and charge rents at the 30 percent of Area Median Income level (AMI), making these units affordable to many low-to moderate-income working families. However, there appears to be a disconnect in how states and municipalities coordinate housing policies with mobility options. Instead of looking at families in this socio-economic strata holistically (considering all of their economic and social issues), funding streams are separated into different issue areas (housing, transit, child care, employment training, welfare, etc.) managed by different divisions of planning and social services.

This paper tries access how transit access impacts residents of affordable housing from an economic perspective. If financial benefits can be demonstrated, it is hoped that municipalities and transit authorities work to integrate new multifamily locations into the existing transit system. It is also hoped that the North Carolina Housing Finance Agency will add transit access in its evaluation of tax credit applications from major municipalities. These changes could help bring these two field of planning (transit and housing) closer together in recognizing common issues and concerns, particularly in serving low- to moderate-income workers in their communities.

1.1. Transportation Spending

A major impetus behind interest in this topic is the significant transportation cost to individuals and communities who are auto dependent. Part of the concern is that for the

population in question, the cost of auto ownership may prohibit savings that could move them forward economically by investing in equity through homeownership.

According to the 1998 US Consumer Expenditure Survey (CES), transportation spending is second only to shelter at 17.9 percent vs. 29.0 percent respectively. In the 2000 CES transportation increased to 18.8 percent and housing to 31.1 percent. This means that the average American household in the 2000 survey spent $7,564 on transportation. Those in the income range most applicable to this research ($20,000 to $29,999) spent 19.2 percent on transportation. Transportation costs jump from 16.5 percent to 20.6 percent when you move from the below $10,000 to the $10,000-$14,999 range. It is anticipated that at the latter income level auto ownership becomes possible and thus the rise in costs is reflects this. Transportation costs do not vary greatly (one percentage point) across income levels from $10,000 to $70,000, though they do not vary in a linear fashion (households with incomes between $15,000-$30,000 spent a lower percentage that those in the $10,000-$14,999). Transportation expense percentages increase again for those in the $30,000-$49,999 range and then decrease again for households above that level (Consumer Expenditure Survey, 2000). In comparison, housing cost percentages remain highest for the lowest income ranges and become lower as household incomes increase across the income ranges. The question remains, could transit access reduce the percentage spent on transportation, especially for those with $10,000-$29,999 household incomes and what would this impact mean for the location of affordable housing complexes?

Greater distances between trip origins and destinations and the lack of transportation choices means longer trips for these households and that they have limited options to own and operate a number of automobiles – this makes sprawl expensive for these households in terms of vehicle miles driven and auto ownership levels. In *Driven to Spend* (2001), a joint report of the

Surface Transportation Policy Project and the Center for Neighborhood Technology, the authors cite previous research that has shown that when household destinations are far apart, more trips are made by automobile. They note that while gas prices, gas taxes, and insurance rates are often thought to be major contributors to transportation expense, their research suggests that gas prices may be overstated in the estimation of transit expense. They found that the fourteen metro areas with higher transportation expenses had an average gas price eight cents less than the metro areas with lower transportation expenses. Also the high expense areas had an average insurance cost of $20 a year less than the lower expense metro areas (Surface Transportation Policy Project & Center for Neighborhood Technology, 2001). Thus something other than these traditional factors is driving up transportation costs in these cities.

In comparing the cities with the highest proportion of highway lane miles (highest amount of highway spending) to those with the lowest proportion, those with the most highway spending also have the highest portion of average household spending going towards transportation. The cities with the lowest highway spending had the lowest portion of average household spending on transportation (2001). This seems to suggest that looking to highways and additional lanes to solve transportation problems can actually drive up the cost of transportation for residents. Thus more roads lead to more sprawled development causing more driving and a higher cost to residents. It also implies that by locating housing in less dense, more suburban locations, residents are experiencing higher transportation costs because they have to drive further to reach desired destinations.

While the focus of this research is on residents of affordable housing communities, it is obvious that increasing the transit network can have cost benefits for middle- to upper-income residents as well if they choose to use it. Shifting a community's development pattern from

sprawling roads to transit-oriented development can have cost of living benefits for all residents in the form of reduced vehicle miles traveled per trip resulting in lower transportation spending.

1.2. Why is transit critical for segment of the population?

Are there substantial benefits to residents and the community in general if these locations were served by accessible transit service? Do residents of affordable housing complexes benefit from good transit access? How are these benefits realized? After accounting for sociodemographics, does good transit access result in lower transportation expenditures? The following research examines these questions by studying the residents of eight affordable housing apartment complexes in the greater Raleigh North Carolina area.

We surveyed seven affordable housing complexes and one mixed income complex as to their present transit usage, household transportation costs, other household costs, and demographics. Residents were also asked to evaluate the present transit system as well as a list of suggested improvements to the present system (Attachments A and B).

Results indicate that residents with good transit access spend less of their income on both transportation and non-transportation household costs but this difference cannot be shown to be statistically significant. Even after controlling for those residents who choose their location because of bus accessibility, the data show that this relationship holds true, though these savings could not be proven to have occurred because of transit access. Despite seeing present transit service as not applicable to them, respondents from locations with no transit access showed a strong interest in having better transit access. In all but one case, complexes with no or poor access were located in more isolated areas in terms of employment, retail and service opportunities.

Furthermore a linear regression analysis suggests that the key predictors of household transportation costs are number of vehicles owned, the level of work status, and number of businesses within a two mile radius. As a result we can conclude that while the difference in the share of household expenditures spent on transportation cannot be attributed to transit access alone, the location of the sites in areas with more businesses (in all cases, sites with transit access had high numbers of businesses nearby) was a significant predictor. Thus issue isolation from employment and retail opportunities becomes significant when making location decisions for affordable housing complexes.

2. Literature Review

This issue of transit is multifaceted. On one hand the access provided by transit is critical to participation in the labor force for those without automobiles in auto-dependent locations. The literature that focuses on the welfare to work transition reflects such views. However, much more attention has been given to transit's ability to shape the built environment (reduce sprawl) or whether transit can overcome spatial mismatches between jobs and housing that can reduce vehicle miles traveled by commuters. The literature review below pulls together literature that is rarely connected: literature on transit, household expenditures, and housing location to frame the examination of whether access to transit can be shown to provide an economic benefits for residents of affordable housing communities.

A large amount of resources have been given by local governments to the provision of affordable housing as a key ingredient to improving the economic well being of low-to moderate-income workers and their families. In recent years local governments have made conscious efforts to locate all affordable complexes away from traditional low-income areas and within suburban or middle/upper income sections of the community as a way to reduce the

concentration of affordable housing in historically low-income areas. In North Carolina, this is demonstrated in state housing finance agencies' awarding extra points to developers who propose housing in non low-income census tracts. Given that the competition for affordable housing credits is fierce, this preference has led to a site development pattern in that has resulted in these affordable units being located throughout suburban auto-dependant locations in the larger metro areas of the state. This ensures a dependence on the automobile for mobility for these residents and prevents residents from having the option of using transit to reduce auto costs or to improve the mobility of one-auto households.

2.1. Transportation Costs and Opportunity Costs

Holtzclaw's 1994 study was the first attempt to measure reductions in automobile usage and personal transportation costs that result from different characteristics of a neighborhood. He found that he could predict auto ownership and vehicle miles traveled per household as a function of average household density multiplied by certain constants. His study supports the idea of high-density development, as those communities with twice the density will have 25-30 percent less driving per family. After density, the only other variable to produce statistically significant results in his research was a transit accessibility index. Most importantly in relation to this research, he found income to not be a significant predictor of vehicles miles traveled when all other variables were not equal. When neighborhood characteristics are taken into account, income does not produce statistically significant results.

This implies that the amount of driving residents of affordable communities do may be more influenced by the resources in their neighborhoods and their level of accessibility via transit rather than the fact that they are low-income and have to drive far for employment. While density of development is not really under analysis in this research (all of the complexes are

between 44 and 50 units with 70 tax credit units in the 120-unit mixed income complex), his auto ownership, vehicle miles traveled to and from work and auto cost estimates, along with measures of businesses within one and two-mile radii, will all be utilized for comparison purposes with the survey data collected from the eight affordable apartment complexes.

Another interesting consideration of transportation costs is the notion of opportunity cost. *Driven to Spend*, the report mentioned earlier in the introduction of this paper, discovered that for every $10,000 invested in a home, the homeowner can get a return of over $4,730 in equity. This is compared to for every $10,000 invested in an automobile, a car owner receives equity of just $910. Thus, buying a cheaper car at $15,000 instead of a more expensive $25,000 model can result in an increase in equity of $3,820 a year if the money is invested in home ownership. For the residents in this study, a reduction in auto costs could take the form of less driving, owning only one auto instead of two (or none at all), as well as the costs that are associated with increased driving (maintenance, repairs, gas and insurance). Residents in the upper ranges of the income limits for these apartments are candidates for home ownership based on their household income. However, as the *Driven to Spend* study notes, automobile loans are the largest category of household debt outside of home mortgages, and such debts can stand in the way of qualifying for a mortgage (STPP, 2001). Thus any way to reduce this debt as well as increase the ability of these households to save through reduced costs, could result in some of these residents being able to access additional wealth in the form of home ownership.

2.2. Employment Benefits

The residents of affordable housing are employed in a variety of low- to medium-skilled jobs. Because this study looks at residents of affordable housing communities who typically must be employed to reside in these communities (in order to pay the rent), this research cannot

easily make inferences about the job benefits of transit for the entire population. While the lack of job access would be hard to demonstrate with this population (if they could not find work or have another source of income, they would have to move out) there are still important findings on transit's impact on employment that are relevant to this research.

Several researchers have recently studied transit's impact on welfare recipients and their ability to find and maintain employment as they leave Temporary Aid for Needy Families (TANF). The fact that research was found in both planning and social work journals is a demonstration of importance of transit beyond simply a planning issue. These studies confirmed what most suspected when the *Personal Responsibility Work Opportunity Reconciliation Act*, commonly known as "welfare reform", passed in 1996. Most public transit systems (as well as other human service systems) were ill-equipped to assist families making the transition from welfare to work through reliable and convenient transit service. In an early study critical of transit investment, Wachs and Taylor (1998) warn not to expect transit itself to lift people out of poverty or off of welfare. They see the investment of transit dollars going disproportionately to rail systems that largely serve car-owning suburban residents, while governments expect under-funded bus systems to play a significant part in welfare reform.

In particular, transit systems were generally not organized to accommodate the needs of women (the majority of those making the transition from welfare to work) because they were unable to travel easily with small children (Blumenberg, 2000). This is magnified by the fact that women typically make more trips. For example, Rosenbloom and Burns' 1993 research on commuting habits showed that working women make 12 percent more trips than working men. Women's trips are also more frequently strung together in a pattern termed "trip chaining". They are also 37 percent more likely than men to include at least one non-work trip in their commute

(1993). This indicates that simply having access to bus routes may not provide the convenience that lower-income, working women need to forgo auto transportation for public transit. These women need to be able to access several different locations sequentially between work and home and often picking up young children from childcare is one of the stops. Certainly offering complexes in areas where typically needed services are available (child care, grocery stores, discount stores, etc.) is part of this equation because transit access is a much smaller benefit if it cannot convenient link residents to desired location in a fairly efficient, rider-friendly manner.

After analyzing transportation issues of women coming off welfare, Evelyn Blumenburg (2000) made several suggestions to improve Los Angeles' transportation system for the working poor. She recommends that in order better serve this population, the transit authority must: enhance transportation services in job-rich neighborhoods, establish car programs and nonfixed–route transportation services in job-poor neighborhoods, provide transportation services to ease the burden of long-distance commutes, and adopt non-transportation solutions to transportation problems. These highlight the additional work transit must do to become a significant resource for those at the lower end of the economic spectrum. Despite the difference in size, the study area can benefit from all of these changes are still relevant for the local transit system and low-income residents.

Vartanian's 1999 longitudinal study on women exiting welfare looked at economic well-being on a broader scale in that it found that job loss within cities had the most significant impact on marriage, (lack of) increased earnings and job placement. However, when looking at city employment in large northern cities specifically, negative economic conditions and transportation were the key factors for successfully leaving welfare and increasing earnings. While greater job training was the author's central recommendation, he also noted the

importance of providing greater transportation opportunities and more accommodating service to women and children (1999).

Another study further emphasized the importance of the perception of transit as critical for those seeking employment from welfare (Brooks, Nakerud & Risler, 2001). This study tracked 40 members of a job-finding club in suburban Georgia and compared the factors between those that found and did not find jobs. While car ownership was not a significant factor in employment success, lack of transportation was the only barrier mentioned consistently by all participants. With the group that did not find jobs (15 of the 40 members) transportation was the most significant perceived barrier to employment. The authors go on to hypothesize that social capital could play a large role in the perception of transportation as a barrier. However, the implication strongly suggests that lack of an auto is a barrier/constraint and that transit is not currently a resource that gives people the mobility they need. This does not excuse discrimination as an employment barrier. In fact, it is hoped that by including it as a measure in evaluating transit that this issue will be confronted more openly by government officials.

While much attention (and money) are captured by rail transit systems, it is the more flexible, non-fixed systems that be the most efficient at overcoming spatial mismatch issues. This can be seen in Atlanta's attempt to adapt its transit system in order to reduce the spatial imbalance between housing affordable for the poor and the jobs they need to be able to leave the welfare system. To test this potential benefit, Sawicki and Moody (2000) created a database of all the entry-level jobs in Atlanta city and developed an occupational profile by SIC code. This list was coded into GIS and compared to a location map of low-income residents to identify the spatial mismatch and how convenient and accessible transit was at the present for this population. This methodology was detailed enough to help identify specific service needs for

different communities, as well as the particular barriers that transit was presenting to this population. Their work resulted in many small-scale mobility projects and served to effectively document the transit needs of those leaving welfare. This kind of smaller-scale transit planning could also be an effective way to network employment centers to the existing bus network in the greater Raleigh area being studied here.

Thomas Sanchez (1999) examined access to employment via public transit in both Atlanta and Portland. He found evidence to support the claim that improved access to public transit could overcome the physical separation between residential locations of nonwhite workers and job locations. However, he noted that when nonwhite workers had reasonable access to areas of concentrated employment and still remained unemployed, employer discrimination and adequate education were the dominant factors for their unemployment (1999). This highlights how discrimination can undermine planning strategies to reduce the spatial mismatch between jobs and housing for nonwhite workers. We cannot expect access itself to solve these more deeply entrenched and less visible barriers and must include this issue in any transit evaluation of this potential benefit for workers.

Other studies have also looked at this variable in evaluating transit's impact on employment. While a positive correlation between job proximity and neighborhood employment has been demonstrated, race and educational attainment were seen to have the largest effects on employment rates in a study of journey-to-work census data of the Chicago metropolitan area (Immergluck, 1998). This was true even when controlling for job skill requirements and the job skills of neighborhood residents. While Ihlanfeldt and Sojoquist (1990) recognized discrimination a predictor of employment for black youth versus white youth in Philadelphia, they found that access to jobs was the most significant predictor of employment for both white

and black youth in their study. Cevero, Rood and Appleyard (1999) found that residents of low-income inner-city neighborhoods face the greatest occupational mismatches spatially but that "race" was more strongly associated with unemployment that job accessibility, even after controlling for educational levels and other factors.

This indicates that access and mobility must be considered within the context of discrimination and equity. As planners, particularly in the transit field, we do not always discuss the human barriers (racism, educational access) to people's ability to move freely in space both in the short-term (transit) and long-term (relocation). Evidence of this kind of barrier usually arises whenever an affordable housing complex is proposed for construction in the form of protest from nearby neighborhoods, something non profit entity that developed the eight affordable complexes studied here has faced recently when it proposed building a mixed income affordable apartment development for families and seniors in a predominately white upper income community outside of Raleigh.

2.3. Overcoming Spatial Imbalances

Looking beyond just the issue of employment, this research examines the impacts of location and transit as tools to overcome the spatial issues that low-to-moderate income residents often find as their housing options are often not convenient to employment and services destinations.

Levine's (1998) re-examination of accessibility and jobs-housing balance focused specifically on how this impacted the commute time for workers. He looked at affordable housing and its attractiveness to low-to-moderate income workers depending on the commute time to work from that location. He focused on land use regulations that encourage large-lot low-density development and the negative externalities that result in affordable housing without

good transit accessibility. Levine found "that commute time remains the dominant determinant in residential location at the regional scale, and that the provision of affordable housing near employment concentrations can influence residential location decisions for low-to moderate-income, single-worker households" (p.133). In other words, if given the option, low-to moderate income workers will choose housing that reduces their commute. This is especially relevant to my research, as demand far exceeds supply (see Section 3) for the population being studied and the need for lower rent overrides their ability to wait for a conveniently located unit to become available.

Levine (1998) noted that the significant factor in improving the jobs/housing balance was not reducing congestion, it was "the relaxation of suburban regulation that could lead to improved matches between home and workplace…" (p.133). Thus it is not road-building or other congestion-reducing measures that will overcome the spatial distance but giving people the option to live closer through denser land use is the most effective method. This is an option that would produce mutual benefits to the household and the community though reduced commute lengths and lower vehicle miles traveled.

Studies have also found that there is a limit to the distance that low-wage commuters will travel unless they are offered higher wages than they would otherwise receive (Holzer, Ihlanfeldt, & Sojoquist, 1994). If this is true we should see higher household incomes in the housing complexes with longer distances from work to home in our survey results. However, since our population is limited by income maximums to qualify and the fact that affordable housing is so scarce in the region, it is logical to assume that income levels will not be a significant factor into location decisions related to commute distances.

Certainly multifamily housing developments are transit friendly, with 44 to 120 households located on a small amount of land that can be services by one centralized transit connection. Commute time will be an important consideration to which transit must always respond. Locating affordable sites that are far from employment centers increases the likelihood that even transit accessibility will not encourage usage because of the commute length. Transit must both be accessible and offer convenience to employment opportunities (though type of employment is relevant). If complexes are located near businesses that are largely low-wage retail, they may offer work but not a wage that will pay the rent at even an "affordable" unit.

In its entirety, this argument emphasizes the importance of mixed-use, higher density development. Having employment, housing and retail located closer together, linked by transit is an option rarely afforded to low-to moderate-income residents. In this case, transit access is an immediate solution (though not structural) to reducing this population's isolation.

Demonstrating the limitations of transit (as it was offered in the late 1970's and early 1980's), Taylor and Ong (1995) found that dependence on public transit reduced employment access far more than did any other factor analyzed, including residential location. Looking at American Housing Surveys for ten metropolitan area, they noted that the commute distances between whites and blacks were converging over time but that the time of commute varied significantly by mode. Those commuting by public transit had much longer commutes and minority workers were much more likely to depend on public transit.

Their research found that the movement of employment opportunities away from Black and Hispanic neighborhoods had isolated those who did not own cars. In their opinion, it was not the spatial issue of this employment dislocation but the fact that transit could not get workers

to these new employment areas easily and efficiently was limiting employment levels of these households.

Another research found similar findings in a more recent study of a metro area with an established transit network. Shen (2001) studied of job openings and accessibility in Boston and found that residential distance from jobs was not the key barrier for employment. They key question for Shen is whether there are there convenient transit systems to link job-poor neighborhoods to those that are job-rich (2001). It was the quality of network that was the most predictive variable. Thus, transit must be a dynamic service, anticipating changes in employment locations and housing developments that serve low-to-moderate-income households.

But we may not capture fully all of the issues related to accessibility if we focus solely on employment. Pratt (1996) noted that each household contains a range of social networks and needs and that any analysis of the relationships between labor markets, housing and transport must include the entire household rather the individual. Residential location near important institutions (churches, recreation, etc.) is an important consideration when contemplating the best location for affordable housing complexes. Only looking at nearness to employment areas may miss key benefits that the neighborhoods which hold these institutions possess. In addition, transit service to these institutions needs to be valued similarly to employment opportunities because of the quality of life elements involved.

This is especially relevant for residents of affordable housing communities who have children in school. Since nearly all of these households in the study area are minorities, their children are bused to schools across the city to try and balance out the racial enrollments of the public schools. Rarely do transit systems connect to schools which force parents who use public

transit for mobility to pay for expensive cab service to reach their child's school for illnesses or school functions. Given that school reassignment occurs annually (because of rapid population growth), combined with the scarcity of affordable housing options, it is quite difficult for parents to try and locate to areas convenient to their child's school.

Supporting the importance of non-employment destinations, Robert Cevero (1996) found that the distance of grocery stores and other consumer services had the largest impact on increasing usage of mass transit systems. This could imply that a better development model to serve affordable housing residents of these complexes is to look for locations near consumer services (serviced by transit) rather than locating these complexes in suburban locations away from any consumer services.

2.4. Literature Summary

In conclusion, the literature suggests that transit and expenditures are linked, though the extent remains unclear. It also notes how transit can help individuals overcome spatial distances, increase employment opportunities and reduce commute times. Most importantly, it demonstrates the importance of an effective transit network if it to be an effective tool for households to overcome the spatial barriers between themselves and desired locations.

Obviously in order for this benefit to be available, residents must have the option of locating where they have access to transit. The implication for local municipalities is that they must recognize these benefits and think more intently about how prevent the creation of isolated affordable housing communities. This calls into question the prioritization of awarding affordable housing tax credits to locations away from traditionally low-income areas (which are typically in central city areas).

More importantly, the criteria needs to look much deeper than the income of the surrounding community. These locations should be sited with consideration given to the nearness of employment opportunities, retail services and other community resources (parks, churches, etc.). This research hopes to build on the issued discussed above by demonstrating the actual cost savings residents of affordable housing communities can experience if they have convenient access to transit from their apartment complex.

3. Transit and Affordable Housing in the Triangle

3.1. Local Transit System

The Transportation Department's Transit Division administers the City of Raleigh's public transportation system - Capital Area Transit (CAT) and the Accessible Raleigh Transportation Program (ART), which is a service for Raleigh residents with disabilities.

CAT comprises two types of transportation services–a regular bus system and a system of feeder services connected to the regular bus routes, called the "CATconnector" system. The city owns the buses and other vehicles used by the system as well as the bus maintenance facility. The city contracts with a private company to operate the transit services (City of Raleigh, 2002).

CAT provides regular bus service throughout the City using 18 regular bus routes, five demand response CATconnector routes, four fixed CATconnector routes, and six night connectors. In addition, CAT operates a nighttime entertainment trolley in downtown Raleigh every Thursday, Friday, and Saturday night. Each of the routes serving the complexes with Good Access here are served by regular bus routes. The closest route to the site with Poor Access is a fixed CATconnector route (City of Raleigh, 2002).

The Raleigh City Council maintains budgetary control of the Transit Authority. The Authority is comprised of nine citizens appointed by the City Council. The City of Raleigh

Department of Transportation carries out the directives and the policies of the Transit Authority. Transit Division staff provide management oversight, perform planning, marketing, and grants administration. ATC/Vancom Management Services, Inc. provides operational management services to the City's Department of Transportation. They employ bus operators, as well as maintenance and administration personnel.

CAT has been publicly supported since 1975, when the City purchased the bus fleet from Raleigh City Coach Lines. Raleigh's citizens have had access to public transportation since Christmas day 1886, when streetcar service was started. Buses replaced the trolley lines in 1933 (City of Raleigh, 2002).

Raleigh is currently struggling with its transit planning, as there is a strong push to create a Triangle-wide regional rail system to reduce the high level of congestion in the Research Triangle Park area (an area roughly in the center of Raleigh, Durham and Chapel Hill). However, even if this strategy were to be successful in creating transit-oriented development and an increase in rail use over auto, the need for a strong local bus network will only become greater within the Raleigh area as getting to desired destinations from the transit stops becomes critically important for effective service.

3.2. Federal Tax Credits

The primary financial resource of affordable multifamily housing is the Federal Tax Credit program. These credits are awarded by the Internal Revenue Service to State-level housing finance agencies for each state. In North Carolina, competition for these credits is keen with over 165 initial applications requesting $27,514,479 in tax credits in 2002 (NCHFA, 2002). Out of these, $11,505,173 was awarded to 49 sites across the state to develop 2,059 units of affordable housing and 26 units of market rate housing.

These credits are sold to investors (typically large corporations or investment/pension funds) through private syndicators (Enterprise Social Investment Corporation and Carolina Affordable Housing Equity Corporation are the primary ones in NC) in return for funds that are used to pay for up to 80 percent of the site work and direct construction costs of these multifamily apartment complexes. In order for investors to maintain the tax credit benefits, residents must certify their eligibility at the appropriate income level (typically 40-60 percent of AMI, depending on the contract with the NC Housing Finance Agency). Since this reporting must be done quarterly and each resident recertified annually, these complexes are usually managed by for-profit companies who specialize in this kind of property management for both nonprofit and for-profit developers.

3.3. Median Income Levels and Rent

The Area Median Income estimates are updated every March by the Federal Department of Housing and Urban Development. This figure is the basis for determining the income limits for tax-credit financed rental complexes. In 2001, the Area Median Income for a family of four for the Triangle MSA was $66,100 (NCHFA, 2001) . This places the 50 percent income limit for DHIC apartment complexes at $26,450 for a two-person household and $29,750 for a three person household. The maximum housing expense is $669 for a two-bedroom apartment and $773 for a three-bedroom. This expense includes rent and utility allowance, and is based on 1.5 persons per bedroom but limited to 90 percent of the maximum expense for high income counties (of which the study area is one).

The 2000 Census estimates that more than 38 percent of the Triangle area renters pay more than 30 percent of their income for rent and of those, almost 1/3 pay more than 35 percent of their income for rent. The rapid growth of this region has driven housing costs up

significantly. Between 1990 and 1998, rents went up over 95 percent in the Triangle. By 2000, the Triangle had the highest rents in the state (US Census, 2001). In comparison to the affordable rents mentioned above, fair market rents were estimated at $662 for a basic one-bedroom, $777 for two bedrooms and $1,042 for three bedrooms in 2001 (Triangle J Council of Governments, 2001).

3.4. Affordable Housing Funding and Production

Unfortunately, due an antiquated record-keeping system and limited resources, the North Carolina Housing Finance Agency could not report the total number of tax credit developments awarded in Wake County since the program began in the late 1980's. Figures for awards since 1996 show that 49 awards were made resulting in 2,608 units of affordable housing. It should be noted that in 1996 tax credits were used to develop 17 single units of housing as part of this total (NCHFA, 2001).

The regional council of governments (Triangle J) has researched affordable housing the three-county Triangle region and offers a broader picture of affordable housing in the area. They found that in the past ten years Federal Tax Credits have financed 8,268 affordable apartments in the Triangle. Triangle J estimates that 4,400 units of tax credit-financed housing exist in Wake County with a total of 15,515 units produced by all of the available affordable housing production programs (tax credit included). In addition, another 13,228 single family homes and rental units have been made more affordable through a variety of state-operated financial assistance programs (Triangle J Council of Governments, 2001).

On the local level, the City of Raleigh has approved 2 bonds for housing ($20 million in 1990 and $14 million in 2000). By 1999, the 1990 investments resulted in 1,000 new homes, plus rental assistance for 775 renters and mortgage assistance for 300 homebuyers. The 2000

bond money is for buying land and building apartments in co-development ventures with nonprofit builders. Wake County committed $1.5 in its annual budget to housing programs (not including its homeless shelter) in 1999 after a task force documented the need for $7.2 million to be spent on housing programs yearly for the next five years (Triangle J Council of Governments, 2001).

How does all this production relate to estimated demand? The 2000 Census survey for the Raleigh/Durham MSA estimates that in spite of the growth in housing programs: 59,454 area renters pay more than 30 percent of their income for rental housing, 36,951 owners pay more than 30 percent of their income for their mortgage, 3,374 households are overcrowded, and 1,691 lack complete plumbing (for a total of 101,470 households with housing cost burdens) (Triangle J Council of Governments, 2001).

In terms of the target income range, the Triangle saw its population of households in the 30 percent to 60 percent of AMI range grow from 46,000 in 1990 to 72,000 in 2000. This means that approximately 3,260 affordable units would need to be produced each year to keep up with household growth in this income category. At best, 26,300 households of the 50,068 new households below 60 percent found affordable housing. Furthermore, the Triangle Council of Governments estimates that 80 percent of the 101,470 Triangle households with housing cost burdens (81,200) need significant subsidies such as rental subsidy or building subsidy comparable to public housing to afford their rent (Triangle J Council of Governments, 2001).

What does this mean for our target population? Competition for tax credits is strong, a large number of households are not able to access affordable rental housing and the likelihood of moving into home ownership is still difficult for those in the upper ranges of the income limits. Despite the production of more affordable units in recent years than anywhere else in North

Carolina, supply is still not keeping up with demand. This means that the ability of residents to choose a complex based on its location based on location is unlikely. Given the competition for these units, households are expected to have to take the first available unit, regardless of location.

4. Research Hypothesis

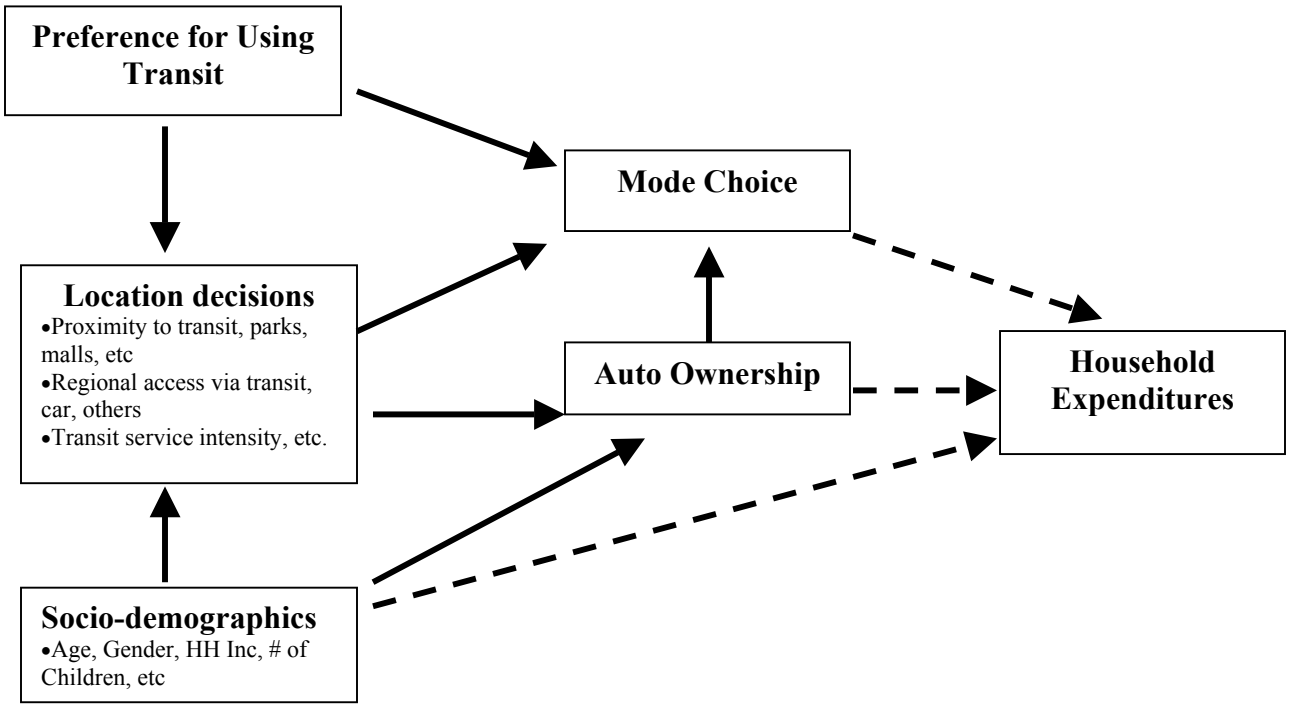
The research interest discussed here focuses on two related questions: first, is proximity to a bus stop related to transit usage? And second, how does transit availability influence the expenditure patterns of low-to moderate-income households? In this research the consequences of increased accessibility and mobility to residents of affordable housing complexes are gleaned by comparing household expenditures of those with good transit access to those with poor or no access. The hypothesis is that good accessibility may lead to reduced auto dependency, reflected in significant cost savings in transportation expenses, reductions in vehicle use with no overall difference in household income between residents with good access and those with poor or no transit access.

This hypothesis is consistent with the view that people's location decisions are based on a variety of personal characteristics and the characteristics of the location itself (access, intensity, distance, bus access to work, car access to work), which in turn influences vehicle ownership, usage of transit, and even driving distance to work. All of these subsequent impacts influence household expenditure patterns (see Figure 1).

Similarly, it is reasonable to expect that a variety of socioeconomic factors (such as income, number of adults and children) will influence choices of vehicle ownership, thus also influencing household expenditure patterns. What seems most important for this research is not whether it is the location decision or household socioeconomic factors that influence traits like vehicle ownership the most, rather what impact does use of transit have on household

expenditure patterns and available disposable household income? Taking the planner's perspective, it is not important why someone uses transit but mainly that benefits can be demonstrated from that choice (both for the individual and the community) and that individuals have the option to choose locations with good transit access/mobility to gain these benefits.

Figure 1



This research compares good, poor and no access locations of affordable housing communities using a quasi-experimental design. Quality of transit access is measured as the Euclidean distance from the complex location to nearest route using the definitions listed below:

- Good – Less than ½ mile from location to nearest route
- Poor – Between ½ mile and 1 mile from location to nearest route
- None – Greater than 1 mile from location to nearest route

Intensity of transit was measured as the number of seats on the bus serving the access route multiplied by of stops arrivals during the peak period (average of morning and evening).

Having a stop nearby or the convenience of frequent arrivals/departures during the peak demand period are two ways to gauge access but they do not reflect the walkability of a particular location. Based on this idea, pedestrian access to businesses was measured in one mile and two mile radii.

Household spending is analyzed through non-parametric independent means calculations with T-Tests used to determine statistics significance between Good and No Access locations (only one complex was determined to be Poor Access and had too few responses for comparison). Data observations on ownership, transit use for work trips, expenditures of households were made and Chi Squared statistical tests used to test for statistical significance

In addition to comparing means across groups, linear regression methods are used to compare household expenditures while controlling for transit access, household income per adult, number of vehicles, work status, number of businesses within a two mile radius, and whether they choose their location based on bus access. As a result, the regression model is specified as follows (eliminating respondents who chose their location based on bus access):

W = Share of Expenditures spent on Transportation

$W_i = f[\ \ln(inc/adults_i) + Work\ Status_i + \#\ of\ Businesses\ within\ 2\ miles_i + \#\ of\ Vehicles_i + Transit\ Access_i]$

It is expected that income per adults, number of businesses and transit access will decrease the share of expenditures spent on transportation. Number of vehicles and work status are expected to increase the transportation share of all expenditures.

5. Research Methods

Seven affordable housing complexes and one mixed income complex (a total of 370 affordable residents and 70 market rate residents) in Raleigh NC were surveyed as to their present transit usage, household transportation costs, other household costs (food, clothing,

health care, and entertainment), demographics and suggested changes they to the present transit system (Attachment B) during the fall of 2001.

All eight of these complexes were developed by Downtown Housing Improvement Corporation (DHIC), a nonprofit developer of affordable multifamily and single-family housing in Raleigh, NC. DHIC contracts out the management of its multifamily properties to Community Management Corporation (CMC), a for-profit company whose sole focus is the management of multifamily housing funded through Federal Tax Credits. Seven of the eight complexes studied were primarily funded through tax credits, with the mixed income complex only partially funded through this mechanism (70 units are at market rate rent, 50 units at 30 percent of the household income of those at 50 or 60 percent Area Median Income). Surveys were distributed by the site managers employed by CMC, with each household receiving a survey, cover letter (Attachment A) and postage-paid return envelope inside of their complex's monthly newsletter that was hung on their apartment doorknob.

The first round of surveys were distributed in the first week of September, 2001. Unfortunately, the events of September 11th brought a shape decline in responses after that day with a response rate of 10 percent for the first distribution. A second round of surveys were prepared and distributed in late October 2001 to all households who had not responded. The site managers again agreed to the door-to-door distribution of the surveys attached to the monthly complex newsletter. The cover letter was modified to respond to concerns about confidentiality and possible contact with employers. In addition, a flier was produced for each site to be displayed at the office or mailboxes encouraging response to the survey and emphasizing confidentiality (Attachment C). This second distribution raised the overall response rate to 16

percent. When considering only the tax credit units (324) involved in the survey, the overall response rate was 22 percent.

Each survey was coded with a complex and apartment unit number. The survey data was added to the information on each household's size, household income, rent and utility allowance that is updated annually for each household as required by the Federal Tax Credit certification process.

Auto costs were calculated by identifying the Kelly Blue Book© value of each household vehicle. Trade-in value was determined by selecting the midpoint of the range given by Kelly. In cases where it was unclear which class of model was owned, the class range in the midpoint of classes listed was used (for example, if only Honda Accord was entered on the survey, out of Accord DX, LX and EX, the range for Accord LX was chosen). The age of the auto was then subtracted from 13 (gauged to be the average lifespan of a vehicle) and then divided into the trade-in value to determine the annual opportunity cost of vehicle ownership (vehicles older than 13 years of age were determined to have no residual value). The amount was combined with annual car payments to produce an annual discounted cost for auto ownership.

Additional auto costs utilized are annual car maintenance, repairs and accident insurance. Non-transportation household expenses include annual food, clothing, health insurance and co-payments and entertainment. For households with two or more vehicles (ten households out of 72 respondents owned two, one owned three), annual discounted costs and car payments were combined for both vehicles. It should be noted that respondents did not have an additional designated space on the survey to list vehicle costs if they owned more than one. Based on the amounts entered, it is likely that households with more than one vehicle only entered costs related to the first vehicle mentioned.

6. Data

The rent at the six 50 percent AMI complexes averaged $510 for a two-bedroom ($85 average utility allowance) and $600 for a three-bedroom ($112 average utility allowance). The rent at the two 60 percent AMI complexes averaged $525 ($100 utility allowance) for a two-bedroom and $627 (107 utility allowance) for a three-bedroom unit. Utility allowance is calculated by the property owners as the expected utility costs for that location based on the number of bedrooms of each unit. This amount is subtracted from the rent calculated on Area Median Income statistics. Rent amounts discussed above are what is actually paid for residence.

6.1. Accessibility, Intensity of Transit and Distance of Closest Stop

Based on the definitions listed in the Methods section, the following calculations were made to determine the accessibility of each of the eight complexes.

Table 1

Accessibility Measures

Affordable Housing Complex	Distance to Transit Stop	Level of Transit Access	Number of Transit Departures / Arrivals at Peak	Transit Intensity	Pedestrian Access to Nearby Activities*
Avonlea	Less than 100 yards	Good	7 - AM Departures, 5 - PM Arrivals	12x45=540	27/114
Jeffries Ridge	Less than 500 yards	Good	6 - AM Departures, 5 - PM Arrivals	11x45=495	52/107
Ripley Station	Less than 500 yards	Good	10 – AM Departures, 9 - PM Arrivals	19x45=855	20/78
Tryon Grove	Approximately .5 mile	Poor	7 - AM Departures, 6 - PM Arrivals	13x45=585	5/21
Beechridge	Greater than 1 mile	No	None		18/115
Madison Glen	Greater than 1 mile	No	None		8/57
Sedgebrook	Greater than 1 mile	No	None		0/30
Weston Trace	Greater than 1 mile	No	None		0/46

Peak is between 6:30 am – 9:00 am and 4:00 – 6:30 pm

* Pedestrian Access is shown as number of businesses in 1 mile and 2 mile radius of each complex.
Good Access: 299 businesses
Poor Access: 46 businesses
No Access: 202 businesses

Using mapping software, the number of businesses within one and two-mile radii were calculated for each complex. This measure shows Jeffries Ridge to have the highest access with twice the number of businesses within a one-mile radius than any other location. Only one of the

No Access sites (Beechridge) has a significant number of businesses within a two-mile radius. Beechridge is located in sprawling suburban town just outside Raleigh, so there is a fair amount of development close within two miles. However, there are no sidewalks along the main road and the complex itself is at the end of an approximately ½ long driveway, making it unlikely that residents would consider walking to reach desired locations.

Using several different measures of access shows how the each site compares in terms of transit mobility. The "Distance to Transit Stop" measure reveals Avonlea offering the best access, as the transit stop within about 25 yards from the edge of the complex. Tryon Grove is judged to have Poor Access because the stop is a little over ½ a mile away. More importantly, to reach the stop, pedestrians have to walk along a very busy two-lane road with no sidewalks.

Each site is served by the same sized bus but have different numbers of stops during the peak periods. Using "Transit Intensity" as the number of peak stops multiplied by the number of available seats on each bus, reveals Ripley Station as having the highest access. This location is served by more intensely during peak hours than Jeffries Ridge or Avonlea.

6.2. Demographics of Respondents

Survey respondents that did not answer a majority of the key survey questions were not used in data analysis. This reduced the response pool from 72 to 60. This pool of 60 respondents produced rather consistent totals for each set of questions though each set does not have an identical total.

The average household income of the selected respondents was $22,153. This amount was determined from tax credit recertification records and reflects the amount of income at the time of initial occupancy. Household income is updated at the anniversary of the move-in date. To ensure consistency, the most recent income available was used for all respondents. The

average household contains two individuals (one adult, one child) with the adult working (see Table 2 below).

Table 2

Basic Demographics of Respondents

	N	Mean	Minimum	Maximum	Standard Deviation
Household Income	59	$22,153	$4,056	$43,960	$6,714
Number of Individuals	62	2.19	1	5	0.97
How Many Adults	60	1.25	1	3	0.47
Adults Working	62	1.05	0	2	0.38
Number of Vehicles	60	1.02	0	3	0.60

Of the selected respondents, 81 percent work full time (see Appendix 11.5). Of the four respondents who do not work, three live in Good Access locations and one lives in the Poor Access location. About half of the selected respondents have worked for more than two years at their present employer with the remaining number spread fairly evenly between less than six months up to two years. Approximately 60 percent work the typical five day work week, however nearly 25 percent work less than 3 days. Given the relatively small number of part-time workers (12 percent), this would indicate that some may be working long shifts or out of their home.

Nearly 87 percent own or lease a vehicle and 91 percent drive to and from work. Commute times are fairly spread out between 5 to 45 minutes. The largest number (40 percent) of respondents have a commute between 12 and 20 minutes with nearly 35 percent having 25 to 45 minute commutes. Less than 2 percent have commutes of one hour or more. The majority leave to and return from work during the peak periods (7:00am-9:00am in the morning and 4:00pm-7:00pm in the evening). However, over 40 percent of respondents do leave and return at times other than the peak. Return times are especially spread out with the non-peak remainder

spread evenly among the other periods of the day (7:30pm-6:50am, 7:00am-9:00am and 9:10am-3:50 pm).

The majority of respondents found the questions asking them to rate the current transit service not applicable to them (68 to 78 percent). However, only 2 percent found each of the suggested improvements not applicable. Respondents spilt evenly on whether they applied to similar complexes. The reasons for choosing their particular location were centered around Low Rent (39 percent) and Apartment Quality (25 percent).

Respondents averaged $17,976 annually in household expenses with an average of $3,972 spent on transportation-related expenses and $14,005 spent on non-transportation expenses (see Table 3 below). Rent was the largest average expense ($6,472) with food ($2,430) the next largest. When only Car Payments are considered, this expense is similar to other costs like Health and Clothes. When Car Payments are combined with the Opportunity Cost, this expense is the third highest annual expense at $2,176.

Table 3

Mean Annual Household Expenditures for All Selected Respondents

	N	Mean	Minimum	Maximum	Standard Deviation
Car Payments + Opportunity Cost	62	$ 2,176	$ -	$ 9,903	$ 2,143
Car Payments	59	$ 1,464	$ -	$ 8,484	$ 1,989
Gas	60	$ 795	$ -	$ 2,400	$ 497
Car Maintenance	50	$ 212	$ -	$ 540	$ 153
Car Repairs	43	$ 298	$ -	$ 1,200	$ 265
Accident Insurance	53	$ 491	$ -	$ 2,400	$ 525
Food	60	$ 2,430	$ 240	$ 6,000	$ 1,404
Clothes	53	$ 1,639	$ 120	$ 9,600	$ 1,596
Health	42	$ 1,491	$ -	$ 6,000	$ 1,453
Entertainment	51	$ 801	$ 120	$ 7,200	$ 1,002
Rent	62	$ 6,472	$ 5,592	$ 8,028	$ 729
Utility Allowance	62	$ 1,172	$ 672	$ 2,052	$ 264

Mean Household Expenditures in the 1999 Consumer Expenditure Survey (CES) for the income range $20,000-$29,999 were compared to the annual household expenditures gathered in

this research (see Table 4 below). It is notable that for this income range, average annual expenditures in the CES exceed after-tax income by over $6,000 indicating that households in this income range are typically spending more than they bring in on an annual basis.

Table 4

Comparison of Household Expenditures

	Surveyed	CES ($20,000 - $29,999)
Transportation	17.9%	19.2%
Food	11.0%	15.1%
Clothes	7.4%	4.7%
Health	6.7%	6.8%
Entertainment	3.6%	4.7%
Rent	29.2%	31.4%
Utility Allowance	5.3%	7.5%

In general, respondents from these affordable housing communities spent less of their income on the areas than the respondents in the CES with the exception of clothes and car maintenance/repairs (these two categories in this research were combined to match the category of the CES. Since the respondents in this research have an average income at the low end of the range examined in the CES, it is to be expected that their expenses might by lower (they have lower disposable income). One area of note is that the percentage of income going towards rent is nearly the same for both groups. This can be attributed to the national scope of the CES. As noted earlier, residents in the study area spend a much higher percentage of their income for rent. Overall, when comparing the expenses gathered in this survey, the percentage of household income spent on these costs are nearly identical. This would seem to indicate that these results are appropriate for households in this income range.

7. Results

7.1. Vehicle Ownership and other Household Characteristics by Transit Access

Consistent with the hypothesis, vehicle ownership, its use, and household expenditures were examined for respondents in the different access scenarios. Of the selected respondents in the locations with no and poor access, 90 percent or more own or lease a vehicle compared to 77 percent of those in the good transit access complexes (see Appendix 11.5). It cannot be said that their location allowed them to forgo vehicle ownership or that those who did not already own a vehicle (or who cannot drive) chose their location based on transit accessibility. Independent of the underlying cause of such behavior, the presence of complexes with good access allowed for such outcomes. A slightly smaller percentage of the respondents in the good access group (just under 16 percent) take the bus to work which leaves some respondents who may not be working or borrowing a vehicle to get to work.

The educational level of residents of complexes with good and no access are similar, with the Good Access complexes having more respondents with some college or higher level of education than respondents in no access complexes.

Average household size and makeup are the same for both Good and No Access complexes but median income does vary slightly (see Appendix 11.3). Respondents in No Access sites averaged $23,296, those in Good Access averaged $22,167 and Poor Access averaged $18,437. Poor Access respondents also averaged a slightly larger household (2.5 individuals, with an average of two adults who both worked) than respondents in other areas. A T-test comparing the equality of means between good and no access respondents show the differences for number of individuals (P=.86) and number of adults (P=.87) and number of vehicles (P=.38) not to be statistically significant. However, the difference in the number of

adults working (no access households have a higher average number than those in good access locations) appears to be significant (P=.08). This is somewhat surprising given that good access households have a higher average household income, though this does not appear to be statistically significant (P=.55).

7.2. Commuting

Nearly 70 percent of those in the No Access complexes leave for work during the morning peak range (7:00am-9:00am) while only 38 percent of those in the Good Access sites leave for work during this time (see Appendix 11.5). The same percentage of selected respondents in the No Access sites return home during the evening peak period (4:00pm-7:00pm) while only 50 percent of those in the Good Access locations return home during this time. However, a Chi Square test does not show this differences to be significant.

The impact of these commuting times may influence the length of time that respondents take to get to work. Of those living in sites with Good Access, 69 percent have commutes of 20 minutes of less while only 56 percent of those in Poor Access sites have commutes that short and the remaining 44 percent have commutes between 25 minutes to 45 minutes (compared to only 25 percent of those in Good Access locations). A Chi Square test does show the differences in these commute times to be statistically significant. These longer times might be the result that Poor and No Access locations are more isolated from possible employment locations (see Table 1).

Looking at measures mentioned above in Table 1, transit accessibility coincides with proximity to employment and retail centers. The top three sites in terms of number of firms within a one-mile radius are Good Access locations. Within a two-mile radius, only one of the No Access sites offers as many companies as the sites with Good Access. Combining both

measurements shows the sites with Good Access having almost 100 more companies within a two-mile radius than the sites with No Access, despite the latter category having one more complex in the study.

When considering the transportation costs discussed below the question becomes, is the location simply more centrally located and therefore resulting in less driving or is transit playing a part in lowering costs? Taking the Good Access site (Avonlea) with a similar number of responses as the No Access site (Beechridge) with the most companies in a two-mile radius also yields a similar number of companies (114 for the Good Access site and 115 for the No Access site). A comparison of the household costs from the two sites yields a difference of less than $300 that is not statistically significant (though the Good Access location is lower, P=.77, see Appendix 11.10). This would seem to indicate that transit does not a make a difference in transportation expenditures if density of surrounding businesses are similar. This will be explored further in linear regression models.

7.3. Financial Impact

Despite having the same average income, using the combined figure of discounted ownership cost and car payments plus the other indicators listed in the survey (maintenance, repairs, insurance and gas) respondents from Good Access locations spend an average of nearly $400 less per year on transportation than residents of No Access locations (see Appendix 11.9). There is a larger difference in household expenditures in non-transportation expenditures. Good Access respondents spent an average of $1,000 less in these areas. These differences were determined using both annual car payments and annual discounted opportunity of ownership as one expenditure category. Given the limited incomes of these households, this calculation is a

more accurate measure of what vehicle ownership is "costing" these households in both direct spending and unrealized additional income.

However, an Independent samples T-Test to comparing the means of the total transportation, non-transportation and total combined expenses for the households of each transit group shows the differences are not enough to be statistically significant (P=.54 for transportation, P=.36 for non-transportation and P=.47 for all expenditures combined). Thus, transit access does not seem to significantly reduce household transportation expenditures (or non-transportation).

7.4. Evaluation of Current Transit System

In rating the current transit system the majority of each respondent group felt the question was "Not Applicable" to them, with the next highest percentage rating the transit system "Poor to Very Poor" for each purpose (see Appendix 11.6). However, those with Good Access had more spread out responses with 12 percent-32 percent rating transit as "Good to Very Good" for each Category.

For those in complexes with good access, using to transit get to work was the highest rated with 32 percent rating it "Good to Very Good". Nearly 25 percent of Good Access respondents rated transit "Good to Very Good" for meeting both their grocery and other shopping needs. A Chi Square test was used to evaluate whether the cross-tabulations mentioned above showed statistically significant differences. This test showed the differences in the responses from the three groups regarding the questions asking about Grocery Shopping, Getting to and From Work and Other Shopping were all statistically significant. This would seems to indicate that good access respondents recognize the potential benefits of transit and would utilize it more if it better met their needs.

The response areas that received the highest "not applicable" ratings were "Meeting Child's Needs" and "Getting to the Doctor". This may suggest that all respondents may see the present transit system as unsafe for their children to use with or without a parent or that the transit system does not connect them to places that serve their child's needs.

7.5. Rating Suggested Improvements to Transit System

Each of the questions concerning proposed improvements to the transit system had only one respondent who felt that theses changes were not applicable to them(see Appendix 11.7). This would seem to indicate that the transit system is relevant to almost all of the respondents, though 16-18 percent of the respondents rated each change as "Not At All Important" to them. As expected the least important change to those with Good Access is having a stop closer to their home (32 percent rated it "Not At All Important").

However, despite having "good" access, 62 percent of these respondents felt having a stop even closer was "Above Average to Very Important" to them. The majority of these responses came from Jeffries Ridge, where even though the stop is close distance-wise, residents must cross a relatively busy street to get to it. Also as expected, those in the Poor Access rated having a "Stop Closer to Home" the most important improvement to them. The improvement rated the highest among all three groups was "More Places Via Bus" with 71 percent of all respondents rating it "Above Average to Very Important". This emphasizes the need for transit to expand its service area in terms of destination locations. This is consistent with a typical complaint about transit that they would take transit more if it could take them where they needed to go.

Using the Chi Square test to determine statistical significance between the differences in the groups' responses revealed only having a stop closer to home as statistically significant. This

indicated that as whole, respondents want transit to improve and that even those with "good" access feel as strongly about these suggestions as those without good access.

7.6. Self-Selection Issues

How residents self-select which location to live could be an important variable in understanding their responses to the survey. If residents self-select themselves to the complexes with better transit access based on their preference for transit, any inference of the need to expand access to other sites would be biased. For those residents transit access is a desired asset and therefore they are just exercising their preferences. In such a case, good local access to transit is not the cause for the observed behaviors, but merely the catalyst of pre-existing transit preferences.

According to interviews with each of the site managers, residents of these apartments select the complex they live in based on availability and the location's accessibility to work or services. They all described the typical applicant as needing something quickly and not having time to wait around on a waiting list (though some sites in convenient locations did maintain waiting lists). Site managers attribute this to the fact that their present housing situation is often temporary (friends, relatives, etc.), the shortage of affordable housing in the area and that the types of jobs they typically hold usually have no transition time in the hiring process. Site managers felt that site location needs to be considered as a factor in determining where residents live but not necessarily in terms of transit access.

Similarly, in several locations (North Raleigh, Cary and Garner) very few tax credit apartment complexes are present, so the competition for these units is high (see Section 3 - Affordable Housing in the Triangle). Thus finding something affordable in an area you want to live in becomes the primary issue. Their perceptions were that nearness to friends and family

and jobs were the biggest reasons for wanting to live in a particular area and that rent and quality were the biggest reasons residents wanted to live in this type of housing in general.

Residents are often referred to tax credit apartment complexes by a variety of human service and housing agencies. They apply individually to each complex of their choosing (i.e. there is no central application for all the DHIC sites or tax credit sites in general) and they are not directed to or forced to live at any one complex. Managers felt that location decisions were based more on proximity to family and friends or nearness to work, though those with good transit access felt that some residents had chosen their site for that reason. Other factors that tend to be important in considering in potential self-selection problems, such as school quality, are not a concern because minorities (the majority of all residents in the study) are generally assigned to schools all over the county to bring racial balance to the school system. Furthermore, the school system is county-wide and reassigns students every year due to a rapidly growing population, so it would be very difficult to base a location decision on which particular school a parent wanted.

As mentioned before, the survey did attempt to examine, albeit imperfectly, the extent to which residents selected good access or bad access complexes based on their preference for local transit access. Survey results showed low rent and quality as the two dominant reasons; however, it should be noted that respondents were only allowed to choose two reasons. Looking at these answers by transit access shows that No Access respondents selected rent as the dominant reason, followed by quality (see Appendix 11.4). Good Access respondents also chose low rent as their dominant reason but divided evenly on quality and availability as their second most common reason. Interestingly, No Access respondents chose “Close to Work” twice as often as those in the Good Access category. This may indicate that even though overall access measures at these locations are low, residents are close to their employment site and this is

enough to make that particular complex desirable (though their commute times are significantly longer than Good Access respondents).

The fact that half of all selected respondents looked at similar complexes when they applied for an apartment would make it difficult to determine the impact of different complex locations on their location decision-making. However, nearly 60 percent of those living in No Access locations did look at similar complexes while nearly 70 percent of those in the Poor Access location did not. This would seem to indicate that those choosing those locations were more likely to be considering other locations than other respondents. All of the respondents who choose their location because of transit access ("Close to Bus")were in the Good Access location but made up only 8 percent of that group's responses and 3 percent of the overall total.

7.7. Non-Respondents

The only information available about non-respondents is household size and household income. Comparing these two qualities to the group of respondents shows a slightly lower mean income of $21,380 (compared to $22,153 average from respondent households) and a slightly larger household size (2.32 compared to 2.19). Comparing these averages for statistical significance shows neither to be statistically significant (P=.69 for number of individuals and P=.21 for household income, see Appendix 11.3).

Based on these characteristics it is difficult to determine what other attributes might differ between residents who completed the survey and those who did not. Several site managers noted that residents did not want to fill out the survey because they felt that the management company could use their expenditure statistics as justification to raise their rent.

This seemed especially a problem at Ripley Station, a site with good transit access but only three households completed the survey out of 44. Extra attention was given to this during

the second distribution, with text added to the cover letter clarifying that all individual information would be shared and that none of their responses would impact their rent. This may have helped at other locations but not at Ripley, where no additional responses were obtained. The fact that the survey was distributed through each complex's newsletter (to save on mailing costs) made the promise of confidentiality more dubious to respondents.

7.8. Regression Models

In addition to the cross-tabulations and summary statistics presented above, linear regression can help tease out the effects of access and household composition on household expenditure patterns. The dependent variable in the regression model is the share of household expenses dedicated to transportation. Independent variables are: the natural log of household income divided by the number of adults (both squared and not squared), work status (full-time, part-time or not at all), the level of transit access (good, poor, and no), the number of vehicles owned or leased, and the number of businesses within a two-mile radius (respondents who choose their location because it is close to bus access were excluded). The natural log of income over adults squared variable was excluded due to high collinearity with the not-squared term.

Regression Model 1 below produces an R-square of under .46, suggesting that 46 percent of the variation in spending is explained by the model. The regression equation is highly significant (P=0.00). According to the beta (normalized) coefficient, "Number of Vehicles" (positive impact) and "Number of Businesses Within a Two Mile Radius" (negative impact) are the most significant variables in the model. This follows the logic that the more vehicles that are owned results in higher transportation expenditures of a household. The fact that as income per adult increases, the share spent on transportation decreases would seem to indicate that as these households earn more, they spend it in other areas. This is consistent with the Consumer

Expenditure Survey, which showed transportation expenses dropping as income increased through the lower ranges and then increasing as income moved into the upper ranges.

Regression Model 1

```
Source   |       SS       df       MS              Number of obs = 54
---------+------------------------------           F(5, 48) = 8.33
Model    |  .435337048     5  .08706741             Prob > F = 0.0000
Residual |  .501513437    48  .010448197           R-squared = 0.4647
---------+------------------------------    Adj R-squared = 0.4089
Total    |  .936850485    53  .017676424            Root MSE = .10222

------------------------------------------------------------------------------
transinc |      Coef.   Std. Err.      t    P>|t|                 Beta
---------+--------------------------------------------------------------------
lninc_ad |  -.0632472    .031362    -2.02   0.049             -.2186355
doyouwrk |   .0481792   .0239552     2.01   0.050              .2315981
tranacc2 |   .0080608   .0097515     0.83   0.413              .0917346
novehcls |   .1124064   .0238388     4.72   0.000              .5184004
busintwo |  -.0010156   .0003656    -2.78   0.008             -.2942672
_cons    |    .661343    .307905     2.15   0.037
```

Transit access does not seem to be a significant predictor of transportation expenditures, and the sign is of opposite to what is hypothesized by this research. Yet, individuals located in areas with relatively high commercial activity do have significantly lower transportation spending patterns. The paradox is the transit best serves areas with mixed use and high degree of activity. Thus, even though the regression results are not as expected for transit, the issue of isolation remains as a factor on the economic well-being of households in affordable housing communities.

Regression Model 2 below uses the share of transportation expenses of all expenses instead of household income. It is a weaker model with an R-Squared of .35 (it predicts only 35 percent of the dependent variable). The results of this regression should be interpreted with caution because of the very low number of observations in the sample. The same variables remain significant, though at lower levels. Again, the squared log of income over adults was not included even though it is important in the calculation of the Engel curve.

Regression Model 2

```
      Source |       SS       df       MS              Number of obs =      30
-------------+------------------------------           F(  5,    24) =    2.63
       Model |  .127399554     5  .025479911           Prob > F      =  0.0496
    Residual |  .232769849    24  .009698744           R-squared     =  0.3537
-------------+------------------------------           Adj R-squared =  0.2191
       Total |  .360169403    29  .012419635           Root MSE      =  .09848

------------------------------------------------------------------------------
 trans_share |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
    lninc_ad |  -.1100801   .0667009    -1.65   0.112                -.2960817
    doyouwrk |  -.0323244   .0373217    -0.87   0.395                -.1597784
    tranacc2 |   .0030266   .0125379     0.24   0.811                 .0413418
    novehcls |   .0670293   .0322637     2.08   0.049                 .3561237
    busintwo |  -.0011458   .0005107    -2.24   0.034                -.3770668
       _cons |   1.371665   .7025407     1.95   0.063                        .
```

Why did transit access not have more of an impact on transportation spending? I believe that the limited pool of respondents prevented a more accurate representation of transportation spending from being demonstrated. The lack of responses from the Ripley Station location was especially problematic. The site manager described this site as having great demand because of its proximity to a bus stop and a major employer (Wake Medical Center) within walking distance. She said that unlike other locations, Ripley maintained a lengthy waiting list because its location was so desirable. Unfortunately, due to high turnover of site managers, she felt that residents were extremely suspicious of the management company and saw the survey as a way for management to raise their rent (by knowing how much they were spending on certain things). No amount of publicity to the contrary overcame this doubt.

8. Conclusions

Survey respondents living in affordable complexes having three different levels of local transit access categories (Good, Poor and No) show nearly identical demographic characteristics (household income and size, number of adults, etc.). There is a difference in household transportation expenditures (and non-transportation expenditures) between the respondents of the three different transit access groups but it cannot be shown to be statistically significant.

Differences in vehicle ownership and transit use exist, but again, they are not shown to be statistically significant.

Linear regression analysis cannot attribute this difference to transit access using the variables in this study. However, expected responses to number of vehicles and income per adult are significant as is the number of businesses within a two-mile radius of each complex. The majority of the households without any vehicles are in Good Access sites but again this relationship could not be shown to be significant. The lack of significance of many variables is likely due to the very low response rate. I believe that research with a much larger respondent pool and more extensive data on transit usage for non-work trips could reveal a clearer explanation for this difference (as well as show the difference to be significant). Hopefully, this research will prompt another larger examination of this issue with more data concerning transit ridership and other household expenditures such as education and debt. Further research is warranted in this area to ensure that the land use, transit and housing fields come together to develop the most beneficial affordable housing for residents.

It remains that isolating affordable housing communities away from employment and retail/service opportunities does increase resident's expenditures for transportation. Governments have committed a great deal of time and resources to provide affordable housing for the low-to-moderate income working population. The production of affordable rental housing benefits these households by reducing their housing burden, freeing up their limited income for other household needs and possible long-term savings that could lead to homeownership. Government officials and developers must recognize that if they are committed to helping these households improve economically, they must consider their transportation costs when deciding where to locate an affordable apartment complex. Given that the denser areas of

the greater Raleigh area are generally served by transit, locating these complexes in these will lead to more complexes being developed in transit-rich locations.

It is clear that in this study transit access alone cannot overcome the spatial problems of isolation. The local transit agency must work to expand its network to ensure that all affordable housing sites are linked to employment and retail locations. As this occurs, I believe that the additional benefit (in the form of lower transportation expenditures) from transit access will be evident. Survey results indicate that the transit network may need to improve in several mobility measures (serving more places, coming more often, etc.) in order to have the level of economic benefit possible from reduced vehicle miles driven. These improvements, when combined with a new location priority for denser locations should make transit a more attractive option for these residents and produce the level of costs savings that will improve their economic well-being.

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10. Appendix

10.1. Data Dictionary - Survey Questions

1. Employer name and address

2. Do you Work
FT=2
PT=1
Do not Currently work=0

3. For how long have you been working for your main employer?
Less than 6 months=1
Between 6 months and 1 year=2
Between 1 and 2 years=3
More than 2 years=4

4. How many days do you work out of home?
Less than 3 days=1
3-4 days=2
5 days=3
Other=6

5 & 6. How do you get to and from work regularly?
Drive=1
Bus=2
Walk=3
Bike=4
Carpool=5
Other=6

7. Ranges for how long it takes to get to work each day.
5 min – 10 min = 1
12 min – 20 min = 2
25 min – 45 min = 3
1 hour or more = 4

8. & 9. Ranges for Time of Departures to and Return from Work
7:30pm-6:50am=1
7:00am-9:00am=2
9:10am-4:50pm=3
4:00pm-7:00pm=4

10. How well does the bus system (CAT and TTA) serve you for the following purposes?
Not Applicable=0
Poor to Very Poor=1
Fair=3
Good to Very Good=5

11. How Important to you are the following Improvements to the Transit System?
Not Applicable=0
Not At All Important=1
Average to Below Avg. Importance=3
Above to Very Important= 5

12. Do you own or lease a car?
Yes=1, No=0

16. Have you been involved in any car accidents in the last three years?
Yes=1
No=0

19. What are the two most important reasons why you decided to live in this apartment complex?
Availability=1
Apt. Quality=2
Low Rent=3
Friends Close By=4
Close to Work=5
Close to Bus Stop=6
Other=7

20 a & b. How many adults live and work in your household?
One=1
Two=2
Three=3
More than Three=4

21. What is your highest level of education completed?
Some HS=1
HS Grad or GED=2
Some Tech School=3
Tech School Grad=4
Some College=5
College Grad or more=6

10.2. Other Variables Used in Data Analysis

target rent – Rental payments are calculated at 30 percent of the area median income percentage the complex is targeted to serve. This amount adjusted for the number of bedrooms for each unit and for the relative cost of living of the metro service area (as determined by the NC Housing Finance Agency).

rent – Annual Rental payments based on the number of bedrooms at a given complex (after utility allowance is subtracted from the target rent)

utilitya – Annual Utility Allowance deducted from target rent. Calculated to represent the expected utility expense based on the number of bedrooms at a given complex

totlauto - Total Annual Transportation Expenses = (Car Payment & Discounted Opportunity Cost + Gas + Maintenance + Repairs + Auto Insurance Premium)

nonauto – Total Annual Non-Transportation Expenses = (Rent + Utility Allowance + Food + Clothes + Health + Entertainment)

totalexp – Total Annual Household Expenditures = (totlauto + nonauto)

transinc - Share of Household Income spent on Transportation

inc_adult – Household income/number of adults

novehcls – Number of Vehicles owned or leased by each household

businone – Number of Businesses within a one-mile radius of a complex

busintwo – Number of Businesses within a two-mile radius of a complex (includes those counted in the one-mile measure)

Appendix

10.3 Demographics

Non Respondents

	N	Mean	Minimum	Maximum	Std. Deviation
Household Income	307	$21,380	$2,200	$56,000	$7,787
Number of Individuals	306	2.32	1	6	1.11

All Respondents

	N	Mean	Minimum	Maximum	Std. Deviation
Household Income	59	$22,153	$4,056	$43,960	$6,714
Number of Individuals	62	2.19	1	5	0.97
How Many Adults	60	1.25	1	3	0.47
Adults Working	62	1.05	0	2	0.38
Number of Vehicles	60	1.02	0	3	0.60

Comparison of Non-Respondents and Respondents

	Respondent	N	Mean	Std. Deviation	Std. Error Mean
Number of Individuals	1	72	2.19	0.97	0.11
	0	154	2.25	1.08	0.09
Household Income	1	71	$22,876	$6,850	$813
	0	154	$21,509	$7,905	$637

Independent Samples Test - Comparing Non-Respondents and Respondents

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Number of Individuals	Equal variances assumed	1.944	0.165	-0.394	224	0.694	-0.059	0.149	-0.353	0.235
	Equal variances not assumed			-0.409	152	0.683	-0.059	0.144	-0.343	0.225
Household Income	Equal variances assumed	0.316	0.575	1.256	223	0.211	$1,367	$1,089	-$778	$3,513
	Equal variances not assumed			1.324	156	0.188	$1,367	$1,033	-$673	$3,407

Poor Access Respondents

	N	Mean	Minimum	Maximum	Std. Deviation
Household Income	9	$18,438	$4,056	$25,560	$6,687
Number of Individuals	10	2.40	1	5	1.07
How Many Adults	10	1.30	1	2	0.48
Adults Working	10	1.00	0	2	0.47
Number of Vehicles	9	0.89	0	2	0.60

Comparison of Good and No Access Demographics

	Access to Transit	N	Mean	Std. Deviation	Std. Error Mean
Number of Individuals	0	30	2.13	1.07	0.20
	2	22	2.18	0.80	0.17
Household Income	0	29	$23,296	$6,895	$1,280
	2	21	$22,167	$6,178	$1,348
How Many Adults	0	28	1.25	0.52	0.10
	2	22	1.23	0.43	0.09
Adults Working	0	30	1.13	0.35	0.06
	2	22	0.95	0.38	0.08
Number of Vehicles	0	31	1.10	0.54	0.10
	2	20	0.95	0.69	0.15

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Number of Individuals	Equal variances assumed	2.010	0.162	-0.179	50	0.859	-0.048	0.271	-0.594	0.497
	Equal variances not assumed			-0.187	50	0.852	-0.048	0.259	-0.569	0.472
Household Income	Equal variances assumed	0.031	0.861	0.597	48	0.554	$1,129	$1,893	-$2,676	$4,935
	Equal variances not assumed			0.607	46	0.547	$1,129	$1,859	-$2,614	$4,872
How Many Adults	Equal variances assumed	0.251	0.619	0.166	48	0.869	0.023	0.137	-0.253	0.298
	Equal variances not assumed			0.170	48	0.866	0.023	0.134	-0.247	0.292
Adults Working	Equal variances assumed	0.506	0.480	1.777	50	0.082	0.179	0.101	-0.023	0.381
	Equal variances not assumed			1.755	43	0.086	0.179	0.102	-0.027	0.384
Number of Vehicles	Equal variances assumed	1.802	0.186	0.852	49	0.398	0.147	0.172	-0.199	0.493
	Equal variances not assumed			0.809	34	0.424	0.147	0.181	-0.222	0.516

Appendix

10.4 Other Demographics

Apply to Similar Complexes

	No	Yes	Total
No Access	12	17	29
	41%	59%	50%
Poor Access	6	3	9
	67%	33%	16%
Good Access	10	10	20
	50%	50%	34%
Total	28	30	58
	48%	52%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.517	2	0.468
Likelihood Ratio	1.537	2	0.464
Linear-by-Linear Association	0.299	1	0.585

2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.42.

2 Most Important Reasons Why They Choose This Complex

	Apt. Availability	Apt. Quality	Low Rent	Close to Friends	Close to Work	Close to Bus Stop	Other	Total
No Access	6	15	24	4	6	0	0	55
	11%	27%	44%	7%	11%	0%	0%	48%
Poor Access	4	6	6	2	0	0	1	19
	21%	32%	32%	11%	0%	0%	5%	17%
Good Access	9	8	14	2	3	3	1	40
	23%	20%	35%	5%	8%	8%	3%	35%
Total	19	29	44	8	9	3	2	114
	17%	25%	39%	7%	8%	3%	2%	100%

Education Level Crosstabulation

		Some HS	HS Grad or GED	Some Tech Sch	Tech Grad	Some College	College Grad+	Total
	No Access	3	7	1	2	10	6	29
% within Access to Transit		10	24	3	7	34	21	100
% within Education Level		75	41	33	50	43	60	48
% of Total		5	11	2	3	16	10	48
	Poor Access	0	4	1	2	3	0	10
% within Access to Transit		0	40	10	20	30	0	100
% within Education Level		0	24	33	50	13	0	16
% of Total		0	7	2	3	5	0	16
	Good Access	1	6	1	0	10	4	22
% within Access to Transit		5	27	5	0	45	18	100
% within Education Level		25	35	33	0	43	40	36
% of Total		2	10	2	0	16	7	36
	Total	4	17	3	4	23	10	61
% within Education Level		100	100	100	100	100	100	100
% of Total		7	28	5	7	38	16	100

Appendix

10.5 Crosstabs of Categorical Data

Do You Work

	No	Part-Time	Full-Time	Total
No Access	0 0.0%	3 11.1%	24 88.9%	27 45.8%
Poor Access	1 10.0%	1 10.0%	8 80.0%	10 16.9%
Good Access	3 13.6%	3 13.6%	16 72.7%	22 37.3%
Total	4 6.8%	7 11.9%	48 81.4%	59 100.0%

How Long w/Employer

	Less than 6 months	Between 6 months and 1 year	Between 1 and 2 years	More than 2 years	Total
No Access	3 11.1%	7 25.9%	4 14.8%	13 48.1%	27 50.0%
Poor Access	3 33.3%	0 0.0%	1 11.1%	5 55.6%	9 16.7%
Good Access	4 22.2%	2 11.1%	4 22.2%	8 44.4%	18 33.3%
Total	10 18.5%	9 16.7%	9 16.7%	26 48.1%	54 100.0%

Days work out of home

	Less than 3 days	3-4 days	5 days	Other	Total
No Access	7 25.9%	1 3.7%	15 55.6%	4 14.8%	27 50.0%
Poor Access	3 33.3%	0 0.0%	5 55.6%	1 11.1%	9 16.7%
Good Access	3 16.7%	0 0.0%	11 61.1%	4 22.2%	18 33.3%
Total	13 24.1%	1 1.9%	31 57.4%	9 16.7%	54 100.0%

Own or Lease

	No	Yes	Total
No Access	2 6.9%	27 93.1%	29 47.5%
Poor Access	1 10.0%	9 90.0%	10 16.4%
Good Access	5 22.7%	17 77.3%	22 36.1%
Total	8 13.1%	53 86.9%	61 100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.003	2	0.223
Likelihood Ratio	2.904	2	0.234
Linear-by-Linear Association	2.793	1	0.095
N of Valid Cases	62		

3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.29.

How to Work

	Drive	Bus	Walk	Bike	Carpool	Other	Total
No Access	26 96%	0 0%	0 0%	0 0%	0 0%	1 4%	27 49%
Poor Access	9 100%	0 0%	0 0%	0 0%	0 0%	0 0%	9 16%
Good Access	15 78.9%	3 15.8%	1 5%	0 0%	0 0%	0 0%	19 35%
Total	50 91%	3 5%	1 2%	0 0%	0 0%	1 2%	55 100%

How from work

	Drive	Bus	Walk	Bike	Carpool	Other	Total
No Access	26 96%	0 0%	0 0%	0 0%	0 0%	1 4%	27 49%
Poor Access	9 100%	0 0%	0 0%	0 0%	0 0%	0 0%	9 16%
Good Access	15 79%	2 11%	1 5%	0 0%	0 0%	1 5%	19 35%
Total	50 91%	2 4%	1 2%	0 0%	0 0%	2 4%	55 100%

How Long to Work

	5 min – 10 min	12 min – 20 min	25 min – 45 min	1 hour or more	Total
No Access	5 18.5%	10 37.0%	12 44.4%	0 0.0%	27 51.9%
Poor Access	1 11.1%	6 66.7%	2 22.2%	0 0.0%	9 17.3%
Good Access	6 37.5%	5 31.3%	4 25.0%	1 6.3%	16 30.8%
Total	12 23.1%	21 40.4%	18 34.6%	1 1.9%	52 100.0%

55.6%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.455	6	0.150
Likelihood Ratio	9.318	6	0.156
Linear-by-Linear Association	1.858	1	0.173

8 cells (66.7%) have expected count less than 5. The minimum expected count is .14.

Time Leave for Work

	7:30pm-6:50am	7:00am-9:00am	9:10am-3:50pm	4:00pm-7:00pm	Total
No Access	5 19%	18 69%	3 12%	0 0%	26 51%
Poor Access	3 33%	5 56%	1 11%	0 0%	9 18%
Good Access	9 56%	6 38%	1 6%	0 0%	16 31%
Total	17 33%	29 57%	5 10%	0 0%	51 100%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.537	4	0.638
Likelihood Ratio	2.520	4	0.641
Linear-by-Linear Association	0.856	1	0.355

6 cells (66.7%) have expected count less than 5. The minimum expected count is 1.02.

Time Home After Work

	7:30pm-6:50am	7:00am-9:00am	9:10am-3:50pm	4:00pm-7:00pm	Total
No Access	3 12%	0 0%	5 20%	17 68%	25 50%
Poor Access	1 11%	2 22%	3 33%	3 33%	9 18%
Good Access	2 13%	3 19%	3 19%	8 50%	16 32%
Total	6 12%	5 10%	11 22%	28 56%	50 100%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.635	6	0.195
Likelihood Ratio	9.730	6	0.136
Linear-by-Linear Association	0.051	1	0.821

9 cells (75.0%) have expected count less than 5. The minimum expected count is .58.

Appendix

10.6 Evaluation of Present Transit System

HOW WELL DOES THE PRESENT TRANSIT SYSTEM SERVE YOU FOR THE FOLLOWING PURPOSES?

Grocery Shopping

	N/A	Poor to Very Poor	Fair	Good to Very Good	Total
No Access	22	5	0	0	27
	81%	19%	0%	0%	46%
Poor Access	7	1	1	1	10
	70%	10%	10%	10%	17%
Good Access	14	2	0	6	22
	64%	9%	0%	27%	37%
Total	43	8	1	7	59
	73%	14%	2%	12%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.287	6	0.027
Likelihood Ratio	14.875	6	0.021
Linear-by-Linear Association	7.609	1	0.006

9 cells (75.0%) have expected count less than 5. The minimum expected count is .17.

Other Shopping

	N/A	Poor to Very Poor	Fair	Good to Very Good	Total
No Access	22	5	0	0	27
	81%	19%	0%	0%	47%
Poor Access	6	2	1	0	9
	67%	22%	11%	0%	16%
Good Access	13	1	3	5	22
	59%	5%	14%	23%	38%
Total	41	8	4	5	58
	71%	14%	7%	9%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.230	6	0.019
Likelihood Ratio	18.546	6	0.005
Linear-by-Linear Association	10.424	1	0.001

9 cells (75.0%) have expected count less than 5. The minimum expected count is .61.

Getting to and From Work

	N/A	Poor to Very Poor	Fair	Good to Very Good	Total
No Access	22	5	0	0	27
	81%	19%	0%	0%	46%
Poor Access	5	3	2	0	10
	50%	30%	20%	0%	17%
Good Access	13	2	0	7	22
	59%	9%	0%	32%	37%
Total	40	10	2	7	59
	68%	17%	3%	12%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.487	6	0.000
Likelihood Ratio	24.570	6	0.000
Linear-by-Linear Association	10.297	1	0.001

9 cells (75.0%) have expected count less than 5. The minimum expected count is .33.

Getting to Doctor

	N/A	Poor to Very Poor	Fair	Good to Very Good	Total
No Access	22	5	0	0	27
	81%	19%	0%	0%	46%
Poor Access	6	2	1	1	10
	60%	20%	10%	10%	17%
Good Access	15	3	1	3	22
	68%	14%	5%	14%	37%
Total	43	10	2	4	59
	73%	17%	3%	7%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.830	6	0.337
Likelihood Ratio	8.763	6	0.187
Linear-by-Linear Association	4.312	1	0.038

9 cells (75.0%) have expected count less than 5. The minimum expected count is .33.

Meeting Child's Needs

	N/A	Poor to Very Poor	Fair	Good to Very Good	Total
No Access	22	5	0	0	27
	81%	19%	0%	0%	46%
Poor Access	8	1	1	0	10
	80%	10%	10%	0%	17%
Good Access	16	3	0	3	22
	73%	14%	0%	14%	37%
Total	46	9	1	3	59
	78%	15%	2%	5%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.672	6	0.099
Likelihood Ratio	10.109	6	0.120
Linear-by-Linear Association	3.641	1	0.056

9 cells (75.0%) have expected count less than 5. The minimum expected count is .17.

Appendix

10.7 Evaluation of Suggested Improvements

HOW IMPORTANT ARE THE FOLOWING SUGGESTED IMPROVEMENTS?

More Places Via Bus

	N/A	Not At All Important	Average to Below	Above to Very Important	Total
No Access	1	3	3	18	25
	4%	12%	12%	72%	45%
Poor Access	0	1	1	7	9
	0%	11%	11%	78%	16%
Good Access	0	5	2	14	21
	0%	24%	10%	67%	38%
Total	1	9	6	39	55
	2%	16%	11%	71%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.536	6	0.864
Likelihood Ratio	2.874	6	0.824
Linear-by-Linear Association	0.196	1	0.658

9 cells (75.0%) have expected count less than 5. The minimum expected count is .16.

Come More Often

	N/A	Not At All Important	Average to Below	Above to Very Important	Total
No Access	1	4	4	16	25
	4%	16%	16%	64%	45%
Poor Access	0	1	2	6	9
	0%	11%	22%	67%	16%
Good Access	0	4	3	14	21
	0%	19%	14%	67%	38%
Total	1	9	9	36	55
	2%	16%	16%	65%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.745	6	0.942
Likelihood Ratio	2.140	6	0.906
Linear-by-Linear Association	0.105	1	0.746

9 cells (75.0%) have expected count less than 5. The minimum expected count is .16.

Starting Earlier and Later

	N/A	Not At All Important	Average to Below	Above to Very Important	Total
No Access	1	4	3	17	25
	4%	16%	12%	68%	45%
Poor Access	0	1	1	7	9
	0%	11%	11%	78%	16%
Good Access	0	5	3	13	21
	0%	24%	14%	62%	38%
Total	1	10	7	37	55
	2%	18%	13%	67%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.218	6	0.899
Likelihood Ratio	2.595	6	0.858
Linear-by-Linear Association	0.047	1	0.828

9 cells (75.0%) have expected count less than 5. The minimum expected count is .16.

Reduce Travel Time

	N/A	Not At All Important	Average to Below	Above to Very Important	Total
No Access	1	4	7	13	25
	4%	16%	28%	52%	45%
Poor Access	0	1	3	5	9
	0%	11%	33%	56%	16%
Good Access	0	4	4	13	21
	0%	19%	19%	62%	38%
Total	1	9	14	31	55
	2%	16%	25%	56%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.480	6	0.871
Likelihood Ratio	2.905	6	0.821
Linear-by-Linear Association	0.377	1	0.539

8 cells (66.7%) have expected count less than 5. The minimum expected count is .16.

Stop Closer to Home

	N/A	Not At All Important	Average to Below	Above to Very Important	Total
No Access	1	4	4	16	25
	4%	16%	16%	64%	45%
Poor Access	0	1	0	9	10
	0%	10%	0%	90%	18%
Good Access	0	7	1	13	21
	0%	33%	5%	62%	38%
Total	1	12	5	38	56
	2%	21%	9%	68%	100%

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.251	6	0.220
Likelihood Ratio	9.359	6	0.154
Linear-by-Linear Association	0.159	1	0.690

8 cells (66.7%) have expected count less than 5. The minimum expected count is .18.

Appendix

10.8 Descriptive Statistics of Household Expenditures

Mean Annual Household Costs for All Selected Respondents

	N	Mean	Minimum	Maximum	Std. Deviation
Annual Car Payments	59	$ 1,464	$ -	$ 8,484	$ 1,989
Car Payments + Annual Opportunity Cost	62	$ 2,176	$ -	$ 9,903	$ 2,143
Gas	60	$ 795	$ -	$ 2,400	$ 497
Car Maint	50	$ 212	$ -	$ 540	$ 153
Car Repairs	43	$ 298	$ -	$ 1,200	$ 265
Accident Insurance	53	$ 491	$ -	$ 2,400	$ 525
Food	60	$ 2,430	$ 240	$ 6,000	$ 1,404
Clothes	53	$ 1,639	$ 120	$ 9,600	$ 1,596
Health	42	$ 1,491	$ -	$ 6,000	$ 1,453
Entertainment	51	$ 801	$ 120	$ 7,200	$ 1,002
Rent	62	$ 6,472	$ 5,592	$ 8,028	$ 729
Utility Allowance	62	$ 1,172	$ 672	$ 2,052	$ 264

Mean Annual Household Costs for Selected Respondents with Good Access

Respondents who chose location based on Bus Access Excluded

	N	Mean	Minimum	Maximum	Std. Deviation
Annual Car Payments	19	$ 1,110	$ -	$ 7,320	$ 1,962
Car Payments + Annual Opportunity Cost	19	$ 1,611	$ -	$ 8,885	$ 2,233
Gas	19	$ 717	$ -	$ 1,440	$ 486
Car Maint	15	$ 168	$ -	$ 500	$ 151
Car Repairs	14	$ 282	$ -	$ 1,200	$ 331
Accident Insurance	14	$ 385	$ -	$ 1,100	$ 375
Food	18	$ 2,303	$ 240	$ 6,000	$ 1,390
Clothes	16	$ 1,605	$ 360	$ 3,600	$ 1,054
Health	15	$ 1,404	$ 60	$ 3,600	$ 1,168
Entertainment	16	$ 806	$ 240	$ 2,400	$ 541
Rent	19	$ 6,540	$ 6,300	$ 7,500	$ 478
Utility Allowance	19	$ 1,150	$ 804	$ 1,548	$ 225

Mean Annual Household Costs for Selected Respondents with No Access

	N	Mean	Minimum	Maximum	Std. Deviation
Annual Car Payments	30	$ 1,290	$ -	$ 4,320	$ 1,604
Car Payments + Annual Opportunity Cost	30	$ 2,068	$ -	$ 4,765	$ 1,625
Gas	29	$ 897	$ -	$ 2,400	$ 530
Car Maint	25	$ 226	$ -	$ 500	$ 135
Car Repairs	21	$ 345	$ -	$ 1,000	$ 248
Accident Insurance	27	$ 624	$ -	$ 2,400	$ 626
Food	30	$ 2,512	$ 600	$ 4,800	$ 1,494
Clothes	25	$ 1,980	$ 240	$ 9,600	$ 2,093
Health	20	$ 1,372	$ -	$ 6,000	$ 1,371
Entertainment	25	$ 900	$ 120	$ 7,200	$ 1,364
Rent	30	$ 6,483	$ 5,592	$ 8,028	$ 914
Utility Allowance	30	$ 1,206	$ 672	$ 2,052	$ 324

Mean Annual Household Costs for Selected Respondents with Poor Access

	N	Mean	Minimum	Maximum	Std. Deviation
Annual Car Payments	10	$ 2,658	$ -	$ 8,484	$ 2,747
Car Payments + Annual Opportunity Cost	10	$ 3,314	$ -	$ 9,903	$ 2,938
Gas	9	$ 777	$ -	$ 1,440	$ 402
Car Maint	8	$ 291	$ -	$ 540	$ 194
Car Repairs	6	$ 221	$ -	$ 400	$ 154
Accident Insurance	9	$ 331	$ -	$ 1,100	$ 352
Food	9	$ 2,260	$ 780	$ 4,800	$ 1,413
Clothes	9	$ 1,113	$ 720	$ 1,800	$ 410
Health	5	$ 2,398	$ 252	$ 6,000	$ 2,573
Entertainment	8	$ 533	$ 144	$ 840	$ 196
Rent	10	$ 6,240	$ 6,000	$ 7,200	$ 506
Utility Allowance	10	$ 1,123	$ 1,056	$ 1,392	$ 142

Appendix

10.9 Good and No Access Expenditure Comparisons

Means Comparison of Grouped Transportation and Non-Transportation Household Expenses between Good and No Access

Group Statistics

	Access to Transit	N	Mean	Std. Deviation	Std. Error Mean
Total Transportation Costs	0	31	$3,970	$2,444	$439
	2	20	$3,512	$2,827	$632
Total Non-Transportation Expenditures	0	23	$6,854	$3,707	$773
	2	15	$5,836	$2,623	$677
Total Household Expenditures	0	23	$10,761	$5,094	$1,062
	2	15	$9,587	$4,413	$1,140

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean	Std. Error	Lower	Upper
Total Transportation Costs	Equal variances assumed	0.304	0.584	0.614	49	0.542	$458	$746	-$1,040	$1,956
	Equal variances not assumed			0.595	36	0.556	$458	$770	-$1,102	$2,018
Total Non-Transportation Expenditures	Equal variances assumed	1.556	0.220	0.921	36	0.363	$1,018	$1,104	-$1,222	$3,257
	Equal variances not assumed			0.990	36	0.329	$1,018	$1,028	-$1,067	$3,103
Total Household Expenditures	Equal variances assumed	0.547	0.464	0.730	36	0.470	$1,174	$1,607	-$2,085	$4,432
	Equal variances not assumed			0.753	33	0.457	$1,174	$1,558	-$1,996	$4,343

Comparison of Specific Household Expenses for Selected Respondents of Good Access and No Access Complexes

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Rent	Equal variances assumed	14.348	0.000	-0.250	47.000	0.804	-56.800	227.652	-514.778	401.178
	Equal variances not assumed			-0.284	45.730	0.777	-56.800	199.693	-458.824	345.224
Utility	Equal variances assumed	3.942	0.053	0.657	47.000	0.514	55.895	85.069	-115.241	227.031
	Equal variances not assumed			0.711	46.497	0.480	55.895	78.559	-102.191	213.981
Food	Equal variances assumed	1.647	0.206	0.481	46.000	0.633	208.667	434.141	-665.213	1,082.547
	Equal variances not assumed			0.490	38.030	0.627	208.667	426.210	-654.128	1,071.462
Clothes	Equal variances assumed	1.817	0.185	0.663	39.000	0.511	375.000	565.801	-769.441	1,519.441
	Equal variances not assumed			0.758	37.397	0.453	375.000	494.660	-626.918	1,376.918
Health	Equal variances assumed	0.014	0.908	-0.074	33.000	0.942	-32.400	440.289	-928.176	863.376
	Equal variances not assumed			-0.075	32.392	0.940	-32.400	430.137	-908.146	843.346
Entertain	Equal variances assumed	0.586	0.449	0.263	39.000	0.794	94.500	359.060	-631.768	820.768
	Equal variances not assumed			0.310	33.967	0.758	94.500	304.530	-524.400	713.400
Car Payments + Annual Opportunity	Equal variances assumed	0.412	0.524	0.830	47.000	0.411	457.557	551.471	-651.859	1,566.973
	Equal variances not assumed			0.773	30.000	0.446	457.557	591.915	-751.295	1,666.409
Gas	Equal variances assumed	0.026	0.873	1.187	46.000	0.241	179.710	151.437	-125.118	484.537
	Equal variances not assumed			1.209	40.972	0.234	179.710	148.690	-120.582	480.002
Car Maint	Equal variances assumed	0.536	0.469	1.246	38.000	0.221	57.253	45.965	-35.798	150.304
	Equal variances not assumed			1.211	27.033	0.237	57.253	47.295	-39.783	154.290
Car	Equal variances assumed	0.456	0.504	0.642	33.000	0.525	62.857	97.864	-136.248	261.963
	Equal variances not assumed			0.606	22.458	0.551	62.857	103.766	-152.086	277.800
Accident	Equal variances assumed	2.867	0.098	1.307	39.000	0.199	238.975	182.877	-130.929	608.878
	Equal variances not assumed			1.525	38.027	0.136	238.975	156.742	-78.326	556.276

Comparison of Mean Annual HH Expenses for Selected Respondents of Good Access and No Access Complexes

Group Statistics

	Access to Transit	N	Mean	Std. Deviation	Std. Error Mean
Rent	0	30	$ 6,483	$ 914	$ 167
	2	19	$ 6,540	$ 478	$ 110
Utility Allowance	0	30	$ 1,206	$ 324	$ 59
	2	19	$ 1,150	$ 225	$ 52
Food	0	30	$ 2,512	$ 1,494	$ 273
	2	18	$ 2,303	$ 1,390	$ 328
Clothes	0	25	$ 1,980	$ 2,093	$ 419
	2	16	$ 1,605	$ 1,054	$ 264
Health	0	20	$ 1,372	$ 1,371	$ 307
	2	15	$ 1,404	$ 1,168	$ 302
Entertainment	0	25	$ 900	$ 1,364	$ 273
	2	16	$ 806	$ 541	$ 135
Car Payments + Annual Opportunity Cost	0	30	$ 2,068	$ 1,625	$ 297
	2	19	$ 1,611	$ 2,233	$ 512
Gas	0	29	$ 897	$ 530	$ 98
	2	19	$ 717	$ 486	$ 111
Car Maint	0	25	$ 226	$ 135	$ 27
	2	15	$ 168	$ 151	$ 39
Car Repairs	0	21	$ 345	$ 248	$ 54
	2	14	$ 282	$ 331	$ 89
Accident Insurance	0	27	$ 624	$ 626	$ 121
	2	14	$ 385	$ 375	$ 100

Appendix

10.10 Comparison of Household Expenditures between Avonlea and Beechridge

7= Complex with Good Access, 3= Complex with No Access

Independent Samples Test

		Levene's Test for Equal		t-test for Equality of Means				Std. Error Difference	90% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean		Lower	Upper
Rent	Equal variances assumed	0.527	0.475	-3.856	22.000	0.001	-713.143	184.939	-1,096.683	-329.602
	Equal variances not assumed			-3.705	16.562	0.002	-713.143	192.504	-1,120.110	-306.175
Utility Allowance	Equal variances assumed	0.931	0.345	4.492	22.000	0.000	340.971	75.899	183.566	498.377
	Equal variances not assumed			5.066	18.741	0.000	340.971	67.299	199.980	481.962
Food	Equal variances assumed	0.190	0.667	-0.723	22.000	0.477	-471.429	651.947	-1,823.484	880.627
	Equal variances not assumed			-0.727	19.932	0.476	-471.429	648.270	-1,823.993	881.136
Clothes	Equal variances assumed	0.384	0.543	0.251	19.000	0.804	149.455	594.395	-1,094.629	1,393.538
	Equal variances not assumed			0.257	17.021	0.800	149.455	581.655	-1,077.614	1,376.524
Health	Equal variances assumed	0.053	0.822	0.312	14.000	0.759	255.000	816.147	-1,495.462	2,005.462
	Equal variances not assumed			0.312	12.749	0.760	255.000	816.147	-1,511.712	2,021.712
Entertainment	Equal variances assumed	1.707	0.207	-1.272	19.000	0.219	-290.000	228.000	-767.210	187.210
	Equal variances not assumed			-1.169	11.381	0.266	-290.000	248.139	-833.929	253.929
Car Payments + Annual Opportunity Cost	Equal variances assumed	2.865	0.105	1.417	22.000	0.171	853.667	602.466	-395.770	2,103.105
	Equal variances not assumed			1.520	21.886	0.143	853.667	561.708	-311.596	2,018.931
Gas	Equal variances assumed	0.015	0.905	-0.326	21.000	0.748	-79.846	245.102	-589.563	429.871
	Equal variances not assumed			-0.336	20.948	0.740	-79.846	237.813	-574.481	414.789
Car Maint	Equal variances assumed	0.249	0.624	0.786	16.000	0.443	67.500	85.876	-114.549	249.549
	Equal variances not assumed			0.797	15.786	0.437	67.500	84.665	-112.180	247.180
Car Repairs	Equal variances assumed	2.713	0.119	-0.644	16.000	0.529	-93.750	145.584	-402.375	214.875
	Equal variances not assumed			-0.601	9.955	0.561	-93.750	155.939	-441.417	253.917
Accident Insurance	Equal variances assumed	0.181	0.676	-0.198	19.000	0.845	-36.865	186.531	-427.280	353.549
	Equal variances not assumed			-0.196	14.566	0.847	-36.865	188.088	-438.809	365.079

Group Statistics - Categories Separate

	Apt. Complex	N	Mean	Std. Deviation	Std. Error Mean
Rent	7	14	$5,827	$401	$107
	3	10	$6,540	$506	$160
Utility Allowance	7	14	$1,443	$225	$60
	3	10	$1,102	$96	$30
Food	7	14	$2,349	$1,595	$426
	3	10	$2,820	$1,544	$488
Clothes	7	11	$1,565	$1,610	$485
	3	10	$1,416	$1,013	$320
Health	7	8	$1,905	$1,871	$661
	3	8	$1,650	$1,353	$478
Entertainment	7	12	$570	$360	$104
	3	9	$860	$676	$225
Car Payments + Annual Opportunity Cost	7	14	$1,733	$1,663	$445
	3	10	$879	$1,086	$343
Gas	7	13	$706	$634	$176
	3	10	$786	$506	$160
Car Maint	7	10	$253	$190	$60
	3	8	$186	$169	$60
Car Repairs	7	10	$300	$207	$65
	3	8	$394	$400	$142
Accident Insurance	7	13	$382	$410	$114
	3	8	$419	$424	$150

Group Statistics - Categories Combined

	Apt. Complex	N	Mean	Std. Deviation	Std. Error Mean
Total Non-Transportation Expenditures	7	11	$6,213	$3,733	$1,125
	3	9	$5,500	$3,083	$1,028
Total Transportation Costs	7	14	$3,138	$2,479	$663
	3	11	$2,851	$2,258	$681
Total Household Expenditures	7	11	$8,861	$5,166	$1,558
	3	9	$8,369	$4,134	$1,378

Independent Samples Test - Categories Combined

		Levene's Test for Equality of Variances		t-test for Equality of Means				Std. Error Difference	90% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean		Lower	Upper
Total Non-Transportation Expenditures	Equal variances assumed	0.554	0.466	0.458	18.000	0.652	712.727	1,554.722	-2,553.623	3979.077125
	Equal variances not assumed			0.468	17.992	0.646	712.727	1,524.041	-2,489.260	3914.714733
Total Transportation Costs	Equal variances assumed	0.053	0.820	0.299	23.000	0.768	287.070	961.187	-1,701.297	2275.4365
	Equal variances not assumed			0.302	22.432	0.765	287.070	950.075	-1,681.070	2255.209418
Total Household Expenditures	Equal variances assumed	0.946	0.344	0.231	18.000	0.820	492.005	2,128.258	-3,979.298	4963.3087
	Equal variances not assumed			0.237	17.998	0.816	492.005	2,079.607	-3,877.125	4861.135814

Attachment A

THE UNIVERSITY OF NORTH CAROLINA
AT
CHAPEL HILL

Department of City and Regional Planning
Carolina Transportation Program

CB# 3140, New East Building
The University of North Carolina at Chapel Hill

October, 2001

Dear Tenant,

About one month ago you should have received a survey from the Department of City and Regional Planning at UNC-Chapel Hill asking about what transportation changes you would like to see occur at you apartment complex. Because your opinion is very important to us, we have attached the same survey and a postage-paid envelope to this letter. Please take a few minutes of your time to respond to the survey

Your voluntary participation in this survey is greatly appreciated. When finished, please insert the survey in the postage-paid envelope provided and deposit it in a mailbox. Sending in the survey is an indication of your willingness to participate in the study. If you get to a question you don't want to answer, please skip it and go on to the next one. The number in the upper right-hand corner identifies you and the survey you received. For purposes of this study your survey will be combined with the latest information provided to your management office. Once this is done**, any information linked to you will be deleted. Your confidentiality is assured. The information we collect will only be used for studying and proposing improvements to transit services in communities like yours.**

Please Note:

- Your employer will not be contacted
- No personal information will be given to your site manager
- Your responses will have NO impact on your rent

To better complete the survey you may need to have the following paper records handy: checkbook, auto insurance bill, health insurance bills, and credit card bills. Once you have this information available, the estimated time to complete the survey is 10 minutes. We will be sharing the results of the survey with residents once they have been compiled. **We appreciate your participation in this survey!**

Gratefully yours,

Chris Estes
Graduate Student
UNC-Chapel Hill
City and Regional Planning
Tel: 919-967-3284

Dr. Daniel Rodriguez
Professor
UNC-Chapel Hill
City and Regional Planning
Tel: 919-962-4763

You may want to use your checkbook, credit card bills, insurance bills, and other records to help you answer some of the questions below.

1. Please provide us with the name and address of <u>your</u> employer. If you work for more than one employer use the second row in the table below.

	Name of Employer	Address where you go to work (Street Address, City)
1)		
2)		

2. Do you work? ❑ Full-time ❑ Part-time **OR** ❑ Do not work currently (skip to Question **10**)

3. For how long have you been working for your main employer?
❑ Less than 6 months ❑ Between 6 months and 1 year ❑ Between 1 and 2 yrs. ❑ More than 2 yrs.

4. How many days per week do you work out of home? ❑ Less than 3 ❑ 3 – 4 ❑ 5 ❑ 6 or more

5. How do you get <u>to</u> work regularly? ❑ Drive ❑ Bus ❑ Walk ❑ Bike ❑ Carpool ❑Other

6. How do you get <u>from</u> work regularly? ❑ Drive ❑ Bus ❑ Walk ❑ Bike ❑ Carpool ❑Other

7. How long does it take you to get to your main place of work (in minutes**)?** _____

8. At what time do you leave for work each day? _____ AM PM (circle one)

9. At what time do you get home after work each day? _____ AM PM (circle one)

10. How well does the bus system (CAT and TTA) serve you for the following purposes? (circle one per line)

	Very Poor	Poor	Fair	Good	Very Good	Not Applicable
Grocery shopping	1	2	3	4	5	❑
Other shopping	1	2	3	4	5	❑
Getting to and from work	1	2	3	4	5	❑
Getting to doctor's appointments	1	2	3	4	5	❑
Attending to the needs of your children	1	2	3	4	5	❑

11. In your opinion, how important are the following improvements to the bus system? (circle one per line)

	Not Important at all		Average Importance		Very Important
Increasing the places I can get to on the bus	1	2	3	4	5
Having the bus come more often	1	2	3	4	5
Starting bus service earlier and ending later	1	2	3	4	5
Reducing the travel time it will take to get to places	1	2	3	4	5
Getting a stop closer to home	1	2	3	4	5

12. Do you own or lease a car? ❑Yes ❑ No (If NO, please skip to Question **17**)

Over, please

We want to understand how options for travel affect the way households spend their money. Please provide us with the information below as accurately as possible. You may want to use your checkbook, credit card bills, insurance bills, and other records to help you answer the questions. Please remember that none of your responses will be linked to you and that your confidentiality is assured.

13. Please provide the following information about the two most-used cars in your household (example: Honda Accord, 1995, 3 years)

Vehicle 1				Vehicle 2			
Make	Model	Year	Time owned ? (years)	Make	Model	Year	Time owned ? (years)

14. Please estimate how much money does your household spend on the following items:

Monthly		Annually		
Car payments (for car loan or car lease)	**Gas**	**Car Maintenance (oil change, brakes)**	**Car Repairs**	***(Car)* Accident Insurance**
$	$	$	$	$

15. What is your car accident insurance deductible? _____

16. Have you been involved in any car accidents in the last 3 years? ❑ Yes ❑ No

17. Please estimate how much money does your household spend <u>PER MONTH</u> on the following items:

Food	**Clothes**	**Health** (include insurance premiums and co-pays)	**Entertainment** (cable TV, movies, music)
$	$	$	$

18. Did you apply to other similar apartment complexes when deciding where to live? ❑Yes ❑ No

19. What are the two most important reasons why you decided to live in this apartment complex? (select <u>only two</u>)

Availability	Apartment quality	Low rent	Friends or relatives live close by	Close to work	Close to bus stop	Other
❑	❑	❑	❑	❑	❑	❑

20. a. How many adults in your household? ❑ One ❑ Two ❑ Three ❑ More than three

b. How many of these adults currently work? ❑ One ❑ Two ❑ Three ❑ More than three

21. What is your <u>highest</u> level of education completed? (select only one)

Some high school	High school graduate or GED	Some technical school	Technical school graduate	Some college	College graduate or more
❑	❑	❑	❑	❑	❑

Please insert the survey in the postage-paid envelope provided and deposit in a mailbox at your convenience.

THANK YOU VERY MUCH FOR YOUR COOPERATION!

If you have any concerns about this survey or the information that it contains you may contact us or Dr. Barbara Goldman, Chair of the Academic Affairs Institutional Review Board at the University of North Carolina at Chapel Hill. Dr. Goldman can be reached at (919) 962-7760 or via mail at the Office of Research Service, 301B Bynum Hall, CB# 4100, Chapel Hill, NC 27599-4100.

NOTICE

Please help us by completing the transportation-needs survey

- **ALL Personal Information you provide is confidential**
- **Your employer will NOT be contacted**
- **Your Personal Information will NOT be shared with the manager of your complex or DHIC**
- **Your responses will have NO impact on your rent**

The results will help us propose transportation improvements to your community

Attachment C

For questions or comments about the survey or this ad, contact Barbara Goldman, Chair of the Academic Affairs Institutional Review Board at the University of North Carolina at Chapel Hill at (919) 962-7760 or via mail at the Office of Research Service, 201B Bynum Hall, CB# 4100, Chapel Hill, NC 27599-4100.