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Eliminating Barriers to Transit-Oriented Development

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16. Abstract

"Transit-oriented development" refers to dense, mixed-use development near transit facilities, particularly denser housing development. Achieving such density is a politically difficult goal. In New Jersey, the main barriers are community concerns about the potential of new development to cause parking problems, increased traffic, and negative fiscal impacts because of increased school enrollments. This report provides evidence comparing the auto use, auto ownership, parking use, and school enrollment of residents of new housing near rail stations with those of households living in older housing near rail stations as well as households living farther away in both old and new housing. Data collection consisted of structured interviews; a field audit of parking supply and occupancy; and, a survey of households. Residents of new housing constructed close to a rail station have fewer children than households residing in new housing more than a half mile from stations, or households in older housing regardless of location. Auto ownership and auto commuting are correlated much more strongly with housing type and tenure, with on-street parking availability, and with the larger geographical context than with rail station access.

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TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY 1
INTRODUCTION 3
- Research Problem and Background 3
- Research Objectives and Approach 5

LITERATURE REVIEW 6
- Parking Impacts 6
- Fiscal Impacts 7
- Market Issues 8

STRUCTURED INTERVIEWS 8
- Identifying and Ranking Barriers 9
- Examples of Where Barriers Prevented Development 11
- Examples of Where Barriers Were Overcome 12
- Parking Issues 13

STATION AREA SELECTION 14
FIELD AUDITS OF PARKING 17
HOUSEHOLD SURVEY 21
- Sample Assembly 22
- Survey Questionnaire 23
- Survey Response Rate 25
- Data Description: Impacts of Transit-Oriented Development Households . 26
  - Presence of School-Age Children 27
  - Commute Mode and Non-Work Travel 28
  - Vehicle Ownership and Parking Choice 31
- Data Description: Supply-Side Factors of Station Areas 33
  - School District Quality 34
  - Parking Availability 34
- Factors Influencing Neighborhood Choice 37
- Perceptions of Neighborhood 39
- Household Differences in Size, Composition, Housing Type, Race/Ethnicity and Income 41

DATA ANALYSIS 47
- Number of school children 49
- Commute mode 50
- Auto ownership 52

SUMMARY AND POLICY IMPLICATIONS 52
REFERENCES 55
APPENDICES 57

LIST OF FIGURES

Page

Figure 1. Selection of rail station areas 17

Figure 2. Survey respondent locations 26

Figure 3. Number of children in public schools, by stratum 28

Figure 4. Work trip by mode, by stratum 29

Figure 5. Auto ownership, by stratum 32

Figure 6. Residential parking 33

Figure 7. Average SAT scores for respondent high schools, by nearest station . 34

Figure 8. Parking spaces per road mile on streets within 1/8-mile of respondents (for respondents within 1/4-mile of stations only), N=532 36

Figure 9. Reasons for choosing neighborhood, all respondents 38

Figure 10. Reasons for choosing neighborhood, by stratum 39

Figure 11. Percentage living in new housing 43

Figure 12. Housing type, all respondents 44

Figure 13. Housing type and location by stratum 45

Figure 14. Race/ethnicity by stratum 46

Figure 15. Household income of survey respondents 47

LIST OF TABLES

Page

Table 1. Characteristics of selected station areas 16

Table 2. Station areas and parking audit dates 18

Table 3. Parking availability and usage within a quarter mile of all stations 20

Table 4. Parking availability and usage by station (quarter mile radius) 20

Table 5. On-street parking availability and usage by station (quarter mile radius) . 20

Table 6. Off-street parking availability and usage by station (quarter-mile radius). 21

Table 7. Off-street resident-only parking by station (quarter mile radius) 21

Table 8. Sample distribution by stratum and by station 23

Table 9. Household survey mailing schedule 24

Table 10. Response rate by sample strata 25

Table 11. Non-work trips, cumulative 30

Table 12. Last three times you went to the grocery store, cumulative (Question 9) 30

Table 13. Last three times you went to get a meal or snack, cumulative (Question 10) 30

Table 14. Last three times you visited friends or relatives, cumulative (Question 11) 31

Table 15. Auto ownership by stratum 31

Table 16. Number of cars available in household 32

Table 17. Residential parking location 33

Table 18. Off-street and on-street parking by stratum 36

Table 19. How many floors should the tallest building on your block be? (Question 26) 40

Table 20. How would you feel about the following changes to your neighborhood… the replacement of buildings in your neighborhood with taller buildings? (Question 27a) 40

Table 21. How would you feel about the following changes in your neighborhood… the construction of a new mixed-use building (retail, office and residential) taller than existing buildings in your neighborhood? (Question 27b) 40

Table 22. How would you feel about the following changes in your neighborhood… the construction of a new mixed-use building near the rail station that is taller than existing buildings? (Question 27c) 41

Table 23. Number of people in household 41

Page

Table 24. Households with individuals age 18 to 34 42

Table 25. Households with seniors, age 65+ 42

Table 26. Multipliers for new housing within a half mile of rail stop vs. new housing farther from transit 49

Table 27. Multipliers for new housing within a quarter mile of rail stops vs. new housing farther from transit 49

Table 28. Number of respondents and auto commute mode share, for station area by stratum, using half mile distance..... 50

Table 29. Number of respondents and auto commute mode share, for station area by stratum, using quarter mile distance..... 51

EXECUTIVE SUMMARY

Transit-oriented housing developments are compact, mixed-use, pedestrian-friendly developments within walking distance of transit stations, typically defined as a half mile from a station. Advocates of transit-oriented development seek to direct population growth to locations where public transit and infrastructure already exist, with the expectation that the area's residents, employees, and shoppers will increasingly walk or use transit rather than autos for many of their trips.

Our interviews with municipal officials and other knowledgeable individuals suggest that high-density housing development on infill and greenfield parcels near transit stations has been limited in the state of New Jersey for a number of reasons, including difficulty with land assembly, financial complexity, lack of developer knowledge, and public opposition. Current residents fear increased auto traffic, problems with parking, and an influx of number of school-age children straining public school budgets and leading to property tax increases. The main purpose of this study is to investigate the extent to which these perceptions are accurate.

In order to observe differences between households located close to transit and those located more distant, we conducted a survey of households located within two miles of ten NJTRANSIT rail stations. We compared households located within a half mile of the stations with households living up to two miles away. We also examined the behaviors and preferences of households living in newly constructed or extensively renovated housing, the kind of housing most relevant to new development proposals, located both within a half mile and up to two miles from a transit facility.

To control for the effect of supply factors, especially the availability of parking, we conducted field audits of parking availability and usage in the same ten areas. The audits examined both on-street and off-street parking. To control for school district quality we used data collected by the NJ Department of Education, primarily Scholastic Aptitude Test (SAT) scores and college matriculation rates for high school graduates, as well as New Jersey Assessment of Skills and Knowledge test scores for the third and fourth grade (NJ ASK).

We found that households choosing to live near rail stations have substantially fewer public school children than households living farther away, both in simple tabulations and when controlling for a number of other factors. But auto commuting and auto ownership are correlated more strongly with housing type and tenure, and larger geographical context, and not nearly as much by rail station access.

New homes near transit stations have about half the number of school children as new homes elsewhere, regardless of the type of housing, the quality of schools, the location within the state, or other factors. Specifically, the number of public school children present in new housing near rail stations is about 60 percent lower than in new housing

farther away. Even when controlling for a number of other factors including school quality, the number is 50 percent lower.

In comparison to households in older housing farther away, households living in new housing near transit and households in new housing farther away from transit have substantially lower auto commuting and lower auto ownership. But lower auto ownership and usage for commuter purposes are not predicted primarily by rail station proximity. While households living in new housing near transit have about 30 percent fewer autos than those in new housing farther away, when controlling for other factors we find that variance in housing type, tenure, and area of the state accounts for most of the differences. Apartments and condominiums have much lower auto ownership, as do any rented units regardless of housing type. This likely reflects a self-selection process of more affordable housing for smaller families with fewer members.

Households living in new housing near transit are much less likely to use cars to commute to work, doing so 58 percent less than those living in new housing far from rail. But most of this difference has to do with the distribution of responses in the sample and the fact that most new housing near rail stops is in the most highly accessible station areas.

The policy implications of this study are in three areas:

1. While auto commuting is not lower across the board within a half mile of stations, it is lower within a quarter mile of rail stations with low amounts of on-street parking. Parking policies should be reformed to maximize the potential of transit-oriented development. Lower on-street parking is highly correlated with less driving to work. Smaller amounts of on-street parking require managing on-street parking with permits and metering. This enables higher density development. The results strongly imply that parking availability should be taken into account when estimating the traffic impacts of new development near transit.

2. Local land use policies for high density development should take into account substantially reduced auto use and ownership in high density housing and rental housing (whether in urbanized areas near or far away from rail stations). In this data set, auto ownership is a third lower in an apartment/condominium setting and 25 percent lower in a rowhouse/townhouse setting, compared to single family homes, when controlling for other factors. Auto ownership is also 22 percent lower in rental units regardless of housing type. These differences are roughly additive—in other words, our statistical model estimates a household living in a rented apartment will have about half the number of vehicles of a household living in an owner-occupied single family home. Development opportunities near transit facilities are often well-suited to high density and rental housing.

3. Land use policies near rail stations should take into account lower school enrollment impacts of housing there. Although local context will vary, a reasonable starting point is to estimate the number of school children living in new development near transit stations at half that of new development elsewhere.

Single-family home development causes more driving, whether near rail stations or not. Dense new housing development reduces driving and auto ownership, as does lowering and managing the on-street parking supply. From a larger environmental and congestion management perspective, permitting such development should strongly be encouraged.

Permitting higher density development in transit-accessible areas also has clear benefits for the state of New Jersey, including lower congestion and pollution, and lower greenhouse gases. From the perspective of local municipalities, such development is assumed to be associated with higher fiscal and traffic burdens than lower-density development. However, the results of this study suggest those local burdens are significantly lower than has been conventionally assumed.

This research took place from 2007 through 2009, a period that includes an economic downturn in the United States. Interviews were conducted during the spring 2007, the field audit of parking availability and usage was conducted during the summer of 2008, and the survey of households living near stations was conducted during the summer of 2009.

INTRODUCTION

Research Problem and Background

Transit-oriented development is the development of compact, mixed-use, pedestrian-friendly land uses within walking distance of transit stops. A major goal of transit-oriented development is to direct land development where public transit and infrastructure already exist, with the expectation that transit ridership will increase and auto use will decrease as the convenience of transit leads it to becoming the mode of choice for residents, employees, and shoppers.

Transit-oriented development has found resonance in many locations, both where there has been long existing transit and where transit is currently being introduced. Nationally, there are prominent examples of transit-oriented development activity and promotion by transit agencies and by state departments of transportation. The former include Denver's FasTracks program, Washington Metropolitan Area Transit Authority's joint development efforts and, recently, New York's Metro-North Railroad's transit-oriented development training sessions (done in anticipation of a proposed bus-rapid transit route in the Hudson Valley). The latter include policies promoting smart growth and transit-oriented development adopted by several states including Maryland,

Massachusetts and California. Through these efforts and policies, agencies and states are attempting to direct future growth toward transit rich locations so as to reduce auto dependency; promote walking and biking access to stations; reduce environmental impacts of travel; and, expand transit ridership.

In New Jersey, interest in transit-oriented development has grown steadily over the past two decades. In the late 1990s both NJ TRANSIT and the New Jersey Department of Transportation (NJDOT) initiated programs to focus resources and attention on how transit stations can be used as a catalyst for community development. NJDOT's Transit Village Initiative was created in 1999 as a "smart growth" strategy intended to foster transportation-efficient community redevelopment and revitalization around transit facilities. In addition to fostering smart community redevelopment, the Transit Village Initiative seeks to reduce traffic congestion and improve air quality by increasing transit ridership. There are currently twenty designated Transit Villages, each of which includes the half mile area surrounding a transit facility. NJ TRANSIT's Transit-Friendly Planning Program for New Jersey was also formally established in 1999. The program provides technical assistance to a wide range of communities interested in pursuing transit-oriented development in an effort to leverage transportation investments; create strong downtowns; expand transit ridership; and, make transit facilities the focus of community life.

While the concept of directing new development within walking distance of transit is gaining momentum across the country and the state, municipalities and developers are often faced with opposition from residents who fear increased school enrollments resulting in an added tax burden or strain on their schools, and the traffic and parking problems thought to accompany dense developments. These objections are not limited to residential development near transit. There are objections to all kinds of residential development.

The argument of proponents of transit-oriented development, conversely, is that transit access enables less auto use and ownership, leading to fewer parking problems and road traffic. Additionally, some argue that new developments near transit do not strongly attract households with children, because housing units in dense multifamily buildings are relatively small, and because new, small units are more likely to attract adult-only households with disposable income.

The supply aspects of the situation also have an important and little-mentioned role to play. School district quality, parking availability, and the quality of transit access in rail station areas may all affect the propensity of households with school-age children, or auto-reliant households, to locate there. Dense housing in poor-quality school districts is less attractive to households with school-age children, all things being equal, while it may be perfectly acceptable to retirees or young adults without children. If parking is scarce or expensive in the neighborhood, larger households such as those with children may find it unattractive, because larger households tend to rely more on autos. Therefore, housing near rail stations in poor school districts, with scarce and highly

managed on-street parking, might contain a small number of households with children, who own few cars and do not drive very often. This means that a study looking just at dense buildings near transit with poor schools and little readily available on-street parking may erroneously lead to a conclusion that transit-oriented developments don't "cause" parking, traffic, or fiscal problems, when they very well may in places where schools are of high quality and where parking is not well-managed.

Research Objectives and Approach

This research took place from 2007 through 2009. Interviews were conducted during the spring of 2007, the field audit of parking availability and usage was conducted during the summer of 2008, and the survey of households living near ten stations was conducted during summer of 2009. This work was undertaken so as to investigate the following demand-related characteristics of transit-oriented development:

1. The number of school children per household;
2. The number of personal vehicles per household; and
3. The frequency of work and non-work trip making by travel mode.

The data collection was designed to allow a comparison of households living in new housing constructed near rail stations, in comparison to households living in areas located farther away from stations, and in older housing located both within a half mile and farther away from stations.

The aim of the research was to test two hypotheses. First, whether households living in new housing constructed within a half mile radius of a major transit stop were discernibly different than other households. Specifically would these households be home to fewer children, own fewer cars, and use transit more frequently than households living in suburbs or in areas located farther away from transit and/or residing in older housing.

A second, but closely related, objective of the study was to investigate how supply factors such as the availability of both on-street and off-street parking, school district quality and development restrictions influenced transit-oriented development households. Specifically, the research team examined whether:

1. Car ownership and usage were lower where less on-street parking was available.
2. School district quality influenced the number of school children living in new transit-oriented housing.

Finally, this research explores differences among households living within a half mile of stations compared to households located more than a half mile but less than two miles from stations. In order to facilitate data collection the household survey was

administered for a two mile area surrounding selected transit facilities. To ensure representation of households living closest to stations, we oversampled those located within a quarter mile of stations. We also conducted the parking audit for area within a quarter mile, rather than a half mile, of stations in order to work within budget constraints. Finally, some of the statistical modeling compares households located within 0.4 miles of stations versus those located between 0.4 miles and two miles away, as this resulted in more statistically robust findings.

LITERATURE REVIEW

Policies prohibiting or limiting transit-oriented development include local level development ordinances such as parking requirements and zoning regulations. Some of these restrictions are imposed by municipalities seeking to limit the costs of providing municipal services. In addition to policies, development practices may also limit intensification near transit stops. Often, these practices are highly political and can involve individuals in the public and private sectors, as well as institutional barriers resulting from long-standing, unchallenged practices.

Political and policy barriers to transit-based development arise largely from local opposition to increased development density. Many authors identify such opposition as the primary deterrent to transit-oriented development and high density development in a number of communities, including Atlanta, Miami and Oakland.[1,2] Local elected officials are pressured by citizens to maintain low density in order to preserve the character of existing neighborhoods; preserve property values; exclude low-income households; or, head off parking or traffic problems.

Some argue that planners have little comprehensive guidance to assist in overcoming policy and practical barriers to transit-oriented development.[3] Local regulatory, institutional, and policy environments vary greatly, necessitating strong leadership for successful implementation. The outcome is often a development compromise consisting of reduced density, more segregation of uses, and greater auto orientation than is considered desirable by transit-oriented development advocates.[3]

There is a large body of research on the impacts of transit-oriented development and transit investments on travel behavior, property values, and the economy. Here we discuss a smaller but more immediately relevant set of research studies on barriers to the dense development or redevelopment of areas near transit stops. We focus on market conditions, parking requirements, and fiscal considerations.

Parking Impacts

Dense development around transit stations in U.S. urban areas is expensive, due to the rising costs of materials, land clearance and demolition, and the costs of complying with development regulations.[1] Euclidean (segregated) zoning, limitations on density and bulk, and maximum floor-to-area-ratios (FAR) effectively require developers to seek

special permission to construct mixed-use, high-density developments. Many argue these development regulations present a significant barrier to transit-oriented development.[1,3,4]

Parking regulations are particularly problematic. Though transit-oriented development ostensibly enables the provision of fewer parking spaces than conventional development, municipalities often impose the same parking requirements as they do in other areas. This results in additional costs for providing structured parking, without which significant density is impossible to achieve. Some view parking provisions and similar density-reducing development regulations as subsidies for sprawl, arguing that they implicitly inhibit transit-oriented development by making low density, automobile-oriented, use-separated development more cost-effective.[5,6]

Parking requirements are often set by local governments through zoning ordinances. Many municipalities set minimum parking requirements based on the maximum parking needed for peak demand published by the Institute of Transportation Engineers. These requirements have been sharply criticized, yet they continue to be widely used.[1,6,7] Often, municipalities rely on these standards and then require additional parking spaces to be safe. Structured, on-site parking for new developments can cost $20,000 or more per space.[6] Using space for parking also means less rentable floor area or sellable units.[8]

Parking requirements may vary depending on whether a station area is to be used primarily as a “node” or as a “place”.[3] “Node” station areas are used as waypoints in a journey, and can be given over to parking, while “places” are areas that attract people to stay, shop, work, or recreate, and for which parking needs are not for the chained commute trip but for other uses. Dense development is consistent with place-making and irrelevant or even counter-productive for node-making. Parking lots can significantly hinder densification in place-making while facilitating nodal transfers.

Fiscal Impacts

Local governments often discourage high-density development because they follow an explicit or implicit policy of requiring a neutral fiscal impact on the municipal budget.[9] Fiscal impact analyses often show that residential development does not “pay for” the municipal services it requires. Thus local governments often favor commercial development in transit-proximate areas.[9,10]

One important municipal fiscal impact is the cost of providing public education. In New Jersey, the development of high density housing has been hindered by perceptions that the units will be purchased by families with school-aged children and that the cost of sending those children to school will create an increased property tax burden. Some research has shown that high density housing generally has fewer school children per unit.[11,12] But public officials must prove to residents that these developments will not

raise taxes or risk being voted out of office. The conservative route is to deny the requested zoning change or development permit.

Fiscal challenges are even more acute in older core urban areas requiring redevelopment with significant demolition costs, where projects around transit stations have failed to materialize.[5] The interests of large institutions such as universities and hospitals often make redevelopment difficult by increasing complexity. Many such areas are economically depressed, increasing the difficulty of attracting financially feasible, dense, mixed-use development.

Market Issues

The literature on transit-oriented development notes a number of market barriers. One relates to public sector decisions regarding where to locate new transit corridors. For a variety of political, community impact, environmental and fiscal reasons, it is quite common for new rail projects to be located on underutilized or unused rail rights-of-way that are either converted to or refurbished for passenger use. Alternatively, new lines are sited along freeway corridors. The locations of these existing rail and highway corridors, while convenient from a fiscal perspective, often limit their market potential for transit-oriented development.[2,7,13]

Many private investors view transit-oriented development as risky, partly due to their unfamiliarity and a lack of private firms with expertise in this type of development, although this is slowly changing. Capital financing subsidies such as tax increment financing, payments in lieu of taxes, and development grants to remediate brownfields provide incentives to risk-averse private investors. Risk is greater in redevelopment areas such as inner cities with slow economic growth rates.[5,7] Private developers also cite difficulty in assembling land without the aid of government intervention as another primary inhibitor to transit-oriented development.[14] Developers would like to see increased public incentives for transit-oriented development. These incentives could be used to address land assemblage, environmental cleanup, and infrastructure finance.[1]

Because of these risks, transit-oriented development projects are often priced for higher income residents. Accordingly, residents in search of affordable housing can be priced out.[7]

STRUCTURED INTERVIEWS

We conducted twelve interviews with housing developers, public officials, and other land use experts to gather opinions on barriers to transit-oriented development. Interviewees were asked to identify and discuss key obstacles to transit-oriented development in the state. We also asked respondents to identify and describe New Jersey municipalities that had succeeded in overcoming those barriers, as well as to identify and describe instances where transit-oriented development projects had failed. In addition, each was queried on parking strategies and asked to evaluate a number of forms of parking

(surface, structured, shared, shuttle to, and on-street) as well as the appropriateness of each for different end users (shoppers, commuters, residents, and workers) Finally, we asked only developers about the effect of local building and parking requirements upon their development costs; other interviewees independently in some cases brought up this topic.

The interviews were conducted via telephone in April and May 2007, prior to the economic downturn. Each interviewee was contacted in advance, asked to participate in the interview and given the questions. Interviews lasted for a minimum of 30 minutes. See Appendix 1 for the interview topic guide and list of interviewees.

Identifying and Ranking Barriers

The interviewees were asked to rate major barriers to building housing and/or mixed-use development in downtown areas, particularly near stations. The stated barriers were parking issues, increased traffic, increasing numbers of school children, lack of political will, and fear of density. Interviewees were also asked to name other barriers. Though asked to rank issues in descending order of significance, respondents often chose instead to discuss the relative difficulty of each.

Overall, the prospect of increasing numbers of school children was cited as the most significant factor limiting the potential for housing and mixed-use development in downtowns. Nearly all interviewees cited this as the most, or one of the most, significant problems facing communities. Robert Goldsmith, a well known land use attorney, and George Hawkins, former executive director of New Jersey Future, a non-profit smart growth advocacy group, drew attention to the difficulties that have arisen in Washington Town Center (Mercer County), in particular, rising property taxes that have resulted from a larger-than-expected number of school children residing in the Robbinsville development.[(15)] Collingswood Mayor James Maley said because Collingswood has capacity in its schools, officials there could pursue a transit-oriented development agenda. West Windsor Mayor Shing-Fu Hsueh expressed frustration that the public often cites the average cost of each public school student in the state (approximately $12,000) rather than the incremental cost of adding a small number of additional students, which he said is minimal.

Developers said they have faced difficulty because public officials and residents see housing as undesirable. John Taikina of Garden Homes and North Brunswick TOD Associates, LLC, said that during the public participation process for the North Brunswick transit-oriented development project, development alternatives were evaluated by participants without land use labels, using only performance criteria such as property tax income per square footage and the number of trips generated. A majority of participants chose residential usages based on performance, but when informed of their choices were still skeptical of residential development.

Two mayors, a land use attorney, and a developer, made note of a 2006 study by David Listokin and co-authors that counted public school students living in downtown, transit-friendly locations.[12] All said they hoped the study would help the public become more accepting of housing development in these locations. This being said, Mr. Taikina stated that for their North Brunswick project, his company used the more conservative numbers offered for all of New Jersey housing, rather than the transit-oriented development specific numbers.

Respondents rated the fear of density as the second most significant limitation to housing and mixed-used development. This fear of density is directly related to the issue of the costs imposed by additional school children as well as density itself. Anthony Marchetta, vice president of LCOR, said that some communities are willing to permit dense residential developments when they are age-restricted.

All of the interviewees said that it is far easier for public officials to do nothing than to take an active stand in promoting transit-oriented development or redevelopment, because of the controversy associated with transit-oriented development as well as the relative lack of both time and expertise to spend on this particular issue. Collingswood Mayor James Maley said the problem lies in a lack of interest by many elected officials. Most communities are run by people who do it for “fun,” but these jobs are a major investment in time, requiring office holders to address many issues such as property taxes, trash collection, and police oversight. Because they have a limited amount of time, officials are likely to address issues that are unlikely to generate controversy over those that require considerably more effort.

There are public officials who are experienced with transit-oriented development and who talk about these experiences so as to educate the public. However, some of the developers interviewed said that it can be difficult to educate inexperienced public officials. The problem as stated by one interviewee is that in public, officials must appear knowledgeable, while private, closed-door meetings designed to educate public officials can be problematic because they can be viewed as evidence of collusion.

Respondents cited several additional issues. Land use attorney Robert Goldsmith said that high property taxes, anti-eminent domain sentiments, and opposition arising from excessively tall buildings all constrain transit-oriented development. Property taxes may pose a significant hurdle for some projects, as the price of new construction combined with high taxes can easily price many projects out of the market. In order to address this concern, Mr. Goldsmith suggested that communities seriously consider the use of Payments In Lieu Of Taxes (PILOTs). PILOTs can be used to reduce the property tax burden for purchasers for a specified period of time. He cited successful examples in South Bound Brook, Franklin and West Orange. With regard to eminent domain, Mr. Goldsmith cited the growing backlash against its use. He suggested that the inability to use eminent domain may reduce a municipality’s capacity to effectively assemble land for redevelopment and can limit developer interest. Finally Mr. Goldsmith viewed building height as an issue distinct from density, and suggested it can usually be

addressed through careful design of building massing, such as reducing building height near the street.

Kathleen Prunty, director of Cranford's Downtown Management Corporation, suggested that a community's level of professionalism or attitude toward permitting can affect the success of transit-oriented development or other redevelopment efforts. Does a town make it easy for a business to get through the process? Is the process straight forward and predictable? A municipality's reputation for being either good or difficult to work with can influence whether a developer will move forward on a project.

Former Metuchen Mayor Edmund O'Brien said that communities face a lack of consistency in state policy and coordination among state agencies, particularly between the departments of transportation and environmental protection. In addition, Mr. O'Brien questioned the state's commitment to limiting development in "fully developed" communities. He suggested that if the state is asking these towns to increase their density and accept additional school children, then it should be willing to provide additional state aid and support. Limiting the location of development may be good public policy for the entire state, but individual communities should not be asked to shoulder the burden without compensation, he said.

George Hawkins of New Jersey Future said that transit-oriented developments can suffer when poor transportation conditions exist where development is to occur. He mentioned traffic bottlenecks in West Windsor, North Brunswick and South Brunswick, which are close to proposed projects.

Examples of Where Barriers Prevented Development

Respondents were asked to cite examples in the state where barriers prevented transit-oriented development from being completed. Most interviewees related personal experiences with these projects, in locations including: Haddon Township in Camden County, Westville Borough in Gloucester County, Hamilton Township in Mercer County, Avenel and Edison in Middlesex County, Matawan, Red Bank and Atlantic Highlands in Monmouth County, and Westfield in Union County.

Though the particular barriers preventing development were unique to each location, recurrent themes emerged. Interviewees most often cited situations where local leadership did not effectively address public opposition. Public officials, developers, and other experts all suggested that this was a result of insufficient political will. Reflecting on difficulties in other communities, West Windsor Mayor Shing-Fu Hsueh cited a lack of transparency in the development process as a potential contributing factor. Both public officials and developers felt that inadequate education of the public was one of the most pervasive obstacles to transit-oriented development.

In one case, a developer said that in some instances proposed projects do not move forward because elected officials and their communities don't understand the real estate

market and therefore have unrealistic expectations of the types and amount of development appropriate for a specific site. This mismatch between expectations and market realities can lead to a series of negotiations in which the developer proposes increasing the levels of undesirable but financially feasible uses such as housing, while counter proposals by community leaders increase demands for non-residential uses in order to make the project palatable to the public, uses that are not necessarily market-supportable.

Examples of Where Barriers Were Overcome

Many transit-oriented development projects have moved forward throughout the state. Interviewees cited development in locations including: Englewood City in Bergen County, Collingswood Borough in Camden County, Montclair and South Orange Village Townships in Essex County, Jersey City in Hudson County, Princeton Township in Mercer County, Metuchen Borough in Middlesex County, Belmar Borough in Monmouth County, Morristown in Morris County, Clifton City in Passaic County, Cranford Township and Rahway City in Union County. Most of these projects faced opposition similar to those confronted by the "failed" projects. Interviewees suggested that the difference between success and failure is largely a result of the actions that take place in anticipation of and during opposition, and that the outcome often depends on whether leaders adequately communicate to constituents, incorporate public opinion, and address concerns.

A recurrent theme cited by public officials is the need for ongoing public education on the potential benefits of transit-oriented development and for communities to counter "knee jerk" reactions against development. As Kathleen Prunty, director of Cranford's Downtown Management Corporation, stated, educating residents is the road to success. Public officials and developers must recognize that there "will be brouhaha… that there will always be critics." The public must be informed of the proposed changes to the community and understand that some people will not like the project despite efforts to make it more palatable. Ultimately, a community's leaders must stand up to unreasonable opposition and champion the cause.

Several interviewees observed that town officials have provided this kind of leadership in most cases where transit-oriented developments have been successful or partially successful. John Taikina defined the old model of development as occurring when a developer comes before the planning board with a complete plan for a project. The board is given only the opportunity to approve or reject the proposal. A different and more successful approach is the one followed by many of those pursuing transit-oriented development. This approach requires significant outreach to the community to elicit design input and to identify concerns. These efforts require that developers engage residents up front so that they are not left viewing the process from the outside. When the latter occurs, residents are left only with the options to fight development or agree to it.

Mr. Taikina also said the previous path of community development—state policy that supports suburban land use—is unsustainable. Most communities do not have much vacant land left, leaving high value redevelopment as their only option for additional ratables.

Parking Issues

Many interviewees believe that surface parking is not a "good use" of land in downtown locations. Several cited support for the redevelopment statute that allows surface parking to be deemed underutilized and in need of redevelopment. Collingswood Mayor James Maley said, "No one should use surface parking… [It] doesn't do anyone any good."

Structured parking (parking in garages) is very costly. The final cost of structured parking depends on a number of factors including the value of the land, requirements of the site, and whether it is freestanding or incorporated into a mixed-use building. Costs can be expected to vary greatly from site to site depending on construction details and the cost of land. The use of less expensive "semi-structured" parking—parking within buildings, sometimes descending one level below grade and one level on grade, with housing and/or offices above—was mentioned in several interviews. Anthony Marchetta of LCOR said surface parking costs about $10,000 per space, semi-structured parking $20,000, and structured parking about $35,000. Robert Goldsmith and Stephen Barcan, land use attorneys, each said it costs about $20,000 per space for structured parking (which may refer to either true structured or semi-structured parking).

Structured parking requires a high level of financial, structural engineering, and urban design expertise. Robert Goldsmith said that this is particularly true when it is implemented in a way that it is "masked" by the buildings around it.

Developers must decide how to both build enough parking for future residents and to balance surface parking with structured parking in order to manage costs. Robert Goldsmith suggested that municipalities can preserve adjacent land as open space and have developers finance a performance bond that can be used to build structured parking, if the need arises. Several respondents stated that shared parking should be used whenever possible. But Robert Goldsmith said shared parking does not necessarily work well in transit-oriented developments, because people living near transit are less likely to use their cars during the day, which is needed to free up space for use by nonresidential users.

Respondents named only a few instances in which parking was offered separately from the residential unit, or "unbundled" from the price of housing. One example is LCOR's Gaslight Commons project in South Orange. Each housing unit was entitled to a single parking space and additional parking was available for a monthly fee of $75 for an exterior surface space and $100 for an interior structured space. Based on this

successful experience, LCOR priced all parking separately from housing when they developed the Bank Street Commons property in White Plains, New York in 2003.

In Morristown, the Epstein project, which is currently under construction, will include high-end, owner-occupied housing and rental units that are both market rate and "affordable." Parking will be provided in a controlled structure that is accessible through the municipal parking garage. Owners of housing units that cost $600,000 or more will have designated parking. Higher priced units[1] will come with two stacked (end-on-end) parking spaces. Lower priced and rental units will be entitled to one space. Residents may purchase additional spaces. The municipal parking authority will administer the entire parking structure and will be able to resell spaces not used by residents of the Epstein project.

STATION AREA SELECTION

We selected ten station areas (and their nearby neighborhoods not readily served by rail) for a field audit of parking and a survey of households. We sought a representative cross section with respect to population density, housing type, frequency of rail and bus service, school district quality, and parking supply.

Logistical constraints on the set of choices were significant. We needed to ensure a high percentage of respondents would be living in dense housing, both near (within a quarter mile) and farther away (farther than a half mile) from rail stations. We also needed a critical mass of population, a minimum of about 800 residents, to ensure a sufficient number of respondents to enable statistically significant inter-station comparisons. Finally, we needed to ensure that a fair percentage of housing had been built in the previous ten years.

Thus we considered the following variables when choosing station areas: 2000 Census population, 2000 Census multifamily housing units, recent multifamily development (certificates of occupancy and recent permits), station parking supply, school district quality (test scores, college enrollment, student to teacher ratio, and high school graduation rate), and station usage by patrons. In addition, we included some station areas where new developments have been proposed and have encountered opposition.

Parking supply at the station may signal different things: potential for development at the site itself (if it consists of surface parking); auto-orientation of the station (and low potential for nearby development as well as few households nearby walking to the station); and availability of parking on the street around households living within walking distance of the station.

We considered the following station characteristics:

[1] At time of the interview, exact price had not yet been determined.

- Population—The residential population near selected stations must be large enough to ensure responses from at least 100 households. Municipal population, population density and population within a half mile radius were examined; the latter two measures were calculated in an intensive computation process using a geographical information system, 2000 Census data (the most recent data available), and Census tracts trimmed to a distance of half mile from stations. We limited our selection set to stations from the upper three quartiles of population.
- New housing characteristics—In order to ensure a sufficient number of new housing units we examined certificates of occupancy and permits for multifamily and mixed use housing units provided by the New Jersey Department of Community Affairs.
- School district characteristics—The New Jersey Department of Education collects and makes available data on a large number of variables which it uses to evaluate district quality. We relied primarily on SAT scores and college matriculation rates for high school graduates; we also looked at the third and fourth grade test scores.
- Rail line representation—In order to control for other characteristics of service, it was determined two stations would be selected from each of the investigated rail lines.
- Commuter parking supply at station—According to data provided by NJ TRANSIT, eight of the ten stations have surface parking; two stations located on the Hudson-Bergen Light Rail line lack parking altogether. We also looked at reported usage of parking at associated surface lots, but there was little variance on this variable, as stations with parking tend to have reported usage of 80 percent or greater (80 to 98 percent).
- Boardings—Reported daily boardings from fiscal year 2007 were made available for all commuter and light rail stations by NJ TRANSIT. All locations with daily boardings in the upper half of ranked stations were considered further. These stations were more likely to have possible parking issues, especially those related to transit-oriented development and commuters.

In the end, the ten station areas selected provide a good representation of school district quality, a good number of station areas with recent development, and the remaining station areas had a high percentage of multifamily development (as of 2000) to assist with comparisons between old and new housing in the pooled sample. There is less variance on parking availability; but that reflects the station pool. Westfield and Trenton are examples of places with little recent development but providing a high percentage of multifamily residents within a half mile of the station, as well as both being places where high density developments have been proposed in the recent past (with or without subsequent political support).

Table 1. Characteristics of selected station areas

Station name	Rail line	Est. pop. ½ mile radius (2000)	Est. multifamily pop. (2000)	Multifamily share % (2000)	Multifamily & mixed use certificates of occupancy & permits[1] (2004-07)	% enrolling college (2007)	Average SAT total[2] (2006)	Average weekday boardings (2007)	Commuter parking supply at station (2006)
2nd St (Hoboken)	Hudson-Bergen Light Rail	26,465	24,108	91	6,245	37	1262	739	0
Cranford	Raritan Valley Line	4,017	1,382	34	6	90	1583	1,123	460
Essex St (Jersey City)	Hudson-Bergen Light Rail	5,700	5,371	94	6,245	100	1744	991	0
Morristown	Morris & Essex	7,464	5,232	70	623	70	1597	2,222	447
Perth Amboy	North Jersey Coast Line	14,533	11,192	77	268	53	1382	1,117	186
Rahway	NEC / NJCL	6,574	3,117	47	2,359	49	1324	3,014	679
South Amboy	North Jersey Coast Line	3,448	1,294	38	109	45	1460	1,305	657
South Orange	Morris & Essex	5,137	1,945	38	14	76	1528	2,984	513
Trenton	Northeast Corridor	8,620	4,358	51	128	30	1136	6,045	3,615
Westfield	Raritan Valley Line	3,719	1,536	41	42	85	1684	2,261	784

Source: Population, multifamily population & multifamily share, 2000 Census, Certificates of occupancy, NJ Department of Community Affairs; Percentage enrolling in college & average SAT, NJ Department of Education, Average weekday boardings & commuter parking supply, NJ TRANSIT

Note: (1) Multifamily certificate of occupancy data from the NJ Department of Community Affairs for Cranford is known to be incorrect. Cranford Crossing, completed in 2007, includes 50 housing units.
(2) Average SAT total refers to scores attained by students at the high school located closest to the station, not average SAT scores for all students within the district.

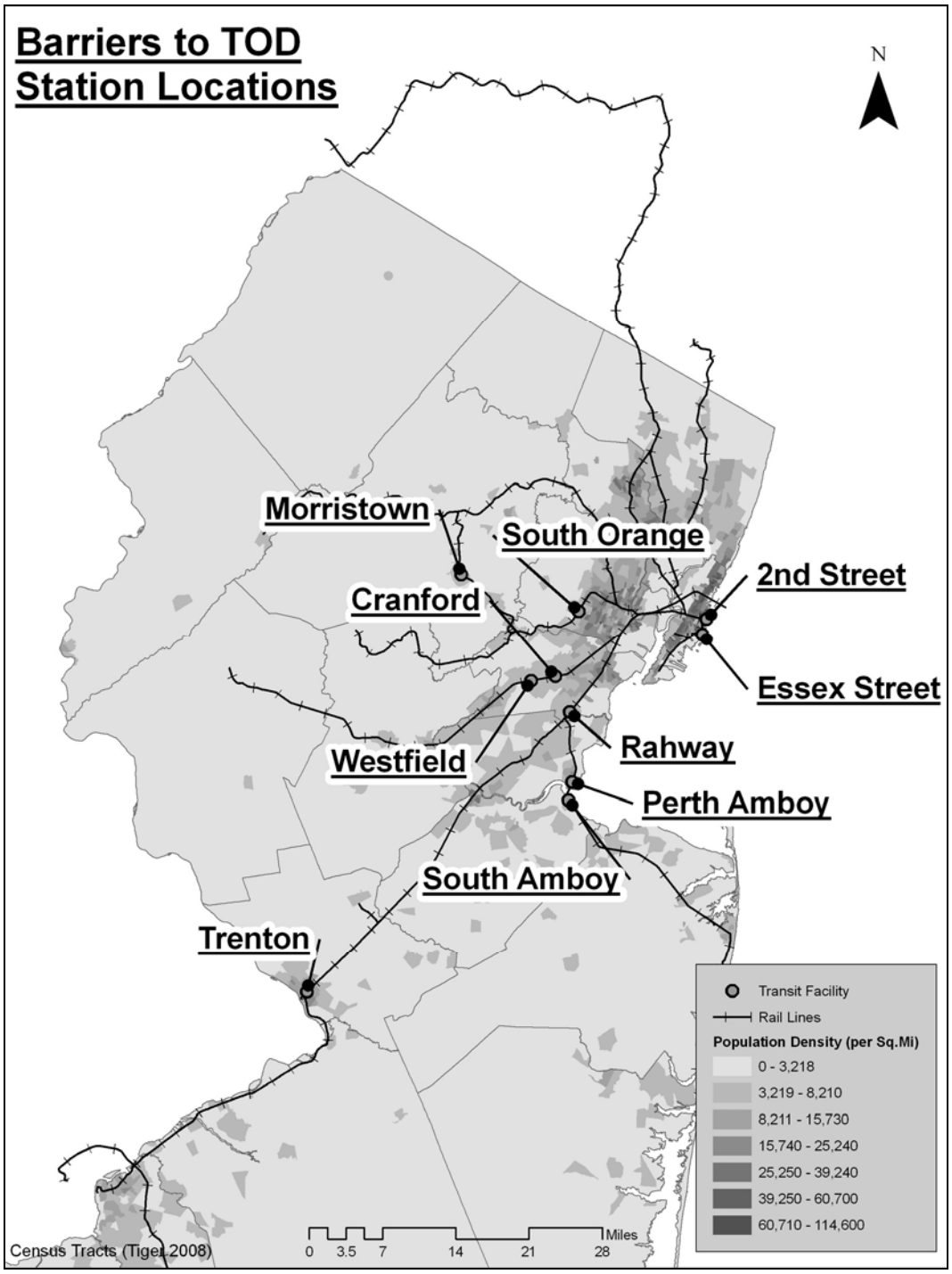

Figure 1. Selection of rail station areas

FIELD AUDITS OF PARKING

During the summer of 2008 we conducted field audits of parking availability and usage in the same ten transit station areas that would be targeted in the household survey, so

that we would be able to control for the effect of parking supply in our analysis. Due to budgetary and time constraints, parking audit were collected within a quarter mile of the selected rail stations, not for the larger half mile station areas. The parking audits were conducted by three-person teams from June 19 to July 24. The counts were taken in the evenings, between 5 and 8 pm, to capture a high-intensity parking period. The data was joined to street and block files in a geographical information system so that the usage patterns could be visualized and matched with household survey data. This allowed us to empirically test how parking supply measured locally (at the street and block level) and at the neighborhood level (nearby blocks) influences auto ownership and usage rates. This is an integral part of the question of whether development near transit causes more parking problems, versus whether parking difficulties near transit cause people occupying development there to own fewer cars and to drive less.

Table 2. Station areas and parking audit dates

Station	Audit date (2008)
Rahway	June 19 & 23
Perth Amboy	June 26
South Amboy	July 1
Cranford	July 2
Westfield	July 8
South Orange	July 10
Essex St (Jersey City)	July 15
2nd St (Hoboken)	July 17
Morristown	July 22
Trenton	July 24

Preparation for field work included the determination of procedures for counting parking spaces and occupied parking spaces, preparation of recording methods, and selection of test sites. Three documented parking audits conducted in Seattle, WA, Lincoln, NE, and Chapel Hill, NC proved useful for this undertaking. In 1999 the Seattle Department of Transportation (SDOT) conducted a parking survey of 36 areas, recording the number and identity of cars parked for each hour between 8 am and 7 pm (with breaks from 10-11 am and 2-3 pm). In their study, license plate numbers were recorded to measure turnover rates and parking durations.[16] In Lincoln, NE, a parking study was performed to enumerate the number of occupied spaces at three different times, 10 am, 12 pm, and 2 pm.[17] The Chapel Hill, NC survey was performed in 2003. Parking lots in the area were studied, as the survey was performed to evaluate a possible oversupply of parking caused by minimum space requirements for new construction (minimums base on land use categories). No reference was found to a state- or region-wide evaluation of parking supply and usage, nor was any evaluation conducted of parking associated with new development in transit-oriented development.[18]

As a primary objective was to detail on-street parking, the SDOT study proved to be the most useful. In their study, Seattle researchers assigned each block a number, and each block face a unique ID (starting on the north most face with "1" and continuing clockwise). This method was adopted during our recording stage, but final data does not show this unique ID, as the block number ID alone seemed sufficient. Off-street parking was recorded by block number as well, without any other identifiers.

In preparation for recording parking supply, maps were created using Google Earth and ArcGIS. One quarter mile buffers of the pilot stations were created in ArcGIS and these buffer layers were converted through an ArcGIS add-on to Keyhole Markup Language (KML), a file type used for representing geospatial data in Google Earth. Using maps generated through these programs, blocks were selected that met the criterion of fitting at least 50 percent within the quarter mile buffer. Drawings of each of these blocks were created from the maps created in Google Earth. These block maps served as diagrams for recording parking spaces. Blocks were equally divided among the three trained student surveyors with each student covering approximately one-third of the overall study site. In the field, parking spaces were recorded as they appeared on the block with notations used to designate many variables characterizing the spaces. Variables included number of on-street and off-street spaces[2] (marked and unmarked), parking space type (perpendicular, parallel, angle), parking duration limitations, costs, and adjacent land uses.

Two stations, Metuchen Station (on the Northeast Corridor) and Hoboken's 9th Street Station (on the Hudson-Bergen Light Rail), were chosen as test locations. These two sites allowed researchers to test and adjust procedures for different kinds of sites—suburban vs. urban, rail vs. light rail, commuter vs. neighborhood usage. However, no significant changes were made to the audit procedures after the field test.

Observations were made of 1,119 roadway segments as well as surface parking lots located within the areas. In all, nearly 30,000 parking spaces were observed at the ten station areas. Generally off-street parking outnumbered on-street parking two-to-one. Parking availability and usage varied among stations. Westfield Station area contains the most spaces (on-street and off-street) while Essex Street in Jersey City had the least. Parking was most utilized near the 2nd Street Station in Hoboken (Essex Street was the second most utilized). Parking in the Trenton Station area was the least utilized. On-street parking near the Perth Amboy Station was the most utilized, followed by Essex Street and 2nd Street, both located on the Hudson-Bergen Light Rail. Cranford's on-street parking was the least utilized. Off-street parking in the South Amboy Station area was the most utilized, while it was least utilized in Trenton. Westfield Station area had the most off-street parking availability.

[2] For on-street parking along roads without lines, a twenty-foot distance was deemed a parking space with attention paid to obstructions such as hydrants and driveways, as they limit the number of parking spaces.

Table 3. Parking availability and usage within a quarter mile of all stations

Parking Type	Number of Spaces	Number of Spaces in Use	Percentage in Use
Total all parking	25,952	11,797	46%
Total on-street	8,359	4,899	59%
Total off-street	17,593	6,898	39%
Total off-street resident-only parking	2,127	1,005	47%

Table 4. Parking availability and usage by station (quarter mile radius)

Station	All Parking Spaces	Occupied	Percent Occupied	Observations
2nd St (Hoboken)	1,915	1,285	67%	Most utilized
Cranford	3,359	1,146	34%	
Essex St (Jersey City)	1,189	724	61%	
Morristown	2,848	1,196	42%	
Perth Amboy	2,335	1,452	62%	
Rahway	2,656	826	31%	
South Amboy	2,238	1,249	56%	
South Orange	2,554	1,309	51%	
Trenton	2,496	676	27%	Least utilized
Westfield	4,362	1,934	44%	Most total parking available

Table 5. On-street parking availability and usage by station (quarter mile radius)

Station	Parking Spaces	Occupied	Percent Occupied	Observations
2nd St (Hoboken)	1,352	1,051	78%	Most on-street parking
Cranford	940	288	31%	Least utilized
Essex St (Jersey City)	584	467	80%	
Morristown	549	319	58%	
Perth Amboy	1,048	870	83%	Most utilized
Rahway	668	276	41%	
South Amboy	1,249	703	56%	
South Orange	549	239	44%	
Trenton	705	337	48%	
Westfield	715	349	49%	

Table 6. Off-street parking availability and usage by station (quarter-mile radius)

Station	Parking Spaces	Occupied	Percent Occupied	Observations
2nd St (Hoboken)	563	234	42%	
Cranford	2,419	858	36%	
Essex St (Jersey City)	605	257	43%	
Morristown	2,299	877	38%	
Perth Amboy	1,287	582	45%	
Rahway	1,988	550	28%	
South Amboy	989	546	55%	Most utilized
South Orange	2,005	1,070	53%	
Trenton	1,791	339	19%	Least utilized
Westfield	3,647	1,585	44%	Most off-street parking available

Table 7. Off-street resident-only parking by station (quarter mile radius)

Station	Parking Spaces	Occupied	Percent Occupied	Observations
2nd St (Hoboken)	308	118	38%	
Cranford	183	73	40%	
Essex St (Jersey City)	52	35	67%	Most utilized
Morristown	281	144	51%	
Perth Amboy	165	46	28%	
Rahway	307	190	62%	
South Amboy	204	93	46%	
South Orange	495	260	53%	Most available
Trenton	18	5	28%	Least utilized
Westfield	114	41	36%	

HOUSEHOLD SURVEY

During the summer of 2009, we conducted a mail survey of households located in the ten selected station areas. The purpose of the survey was to collect data on the characteristics of residents living in new housing built near transit stops and residents living in older housing near transit and those living in housing located more distant from transit. The collection of this data enabled an analysis of how the characteristics of these households differed in terms of auto ownership and usage, socioeconomics, and other factors of interest. It also enabled an exploration of the extent to which differences are attributable to transit proximity. The sample frame for the survey was comprised of a random sample of households living in a non-random selection of station areas, with over-sampling of transit-proximate housing and new housing.

Sample Assembly

The survey sample was stratified according to three distinct populations:

- households living in new housing.
- households living within a quarter mile of a station, living in old or new housing.
- households living outside a quarter mile but within two miles of a station, living in old or new housing.

A quarter mile was used in the sample design so as to guarantee responses from those living very close to the station. Survey responses were analyzed at several distances, including the area within a half mile of the station.

For all three populations we purchased a “listed sample” of households living within two miles of the selected stations from a commercial source, Genesys. We geocoded the sample to determine distance to the station, which was used to select households in the relevant populations. A total of 1,500 households within a two-mile radius were included.

In addition, the sample was augmented to ensure an adequate sample of residents living in new housing close to stations. We gathered information on new development near stations through a variety of sources including discussions with individuals knowledgeable about local development, review of online resources, and our own knowledge. Residents of buildings built or substantially renovated in 2000 or later were included in the sample pool. We collected addresses for the units in these new developments using two online databases, ReferenceUSA and www.whitepages.com. A total of 1,073 households living in new housing were included in the sample.

The household survey was fielded with a target sample of 500 households per station area to be split roughly 20-50-30 percent among the three groups, for a total sample of 5,000 households. Our target response rate for the mail survey was 20 percent for an intended final dataset size of 1,000 households: 200 living in new housing near transit, 500 living in other housing near transit, and 300 living farther away from transit stops.

Table 8. Sample distribution by stratum and by station

	Original	**Adjusted[3]**
Total Sample	5,000	**4,503**
By Stratum		
New Housing	1,073	**971**
Inside 1/4 Mile	2,427	**2,150**
Outside 1/4 Mile	1,500	**1,382**
By Station		
2nd St (Hoboken)	500	**467**
Cranford	500	**464**
Essex St (Jersey City)	500	**415**
Morristown	500	**446**
Perth Amboy	500	**438**
Rahway	500	**459**
South Amboy	500	**466**
South Orange	500	**441**
Trenton	500	**430**
Westfield	500	**477**

Survey Questionnaire

The questionnaire focused on household characteristics, work and non-work travel, and opinions about new, dense development in the community where the survey respondents lived (see Appendix 2). Information gathered from the literature review, structured interviews, and a review of survey instruments used in other studies informed the questionnaire design.

The survey questionnaire includes:

Household configuration and demography;

- Children in public, private or home school.
- Household size and age categories of household members.
- Income.
- Race and/or ethnicity.
- Occupation.

[3] The adjusted sample size is calculated by subtracting the bad addresses, vacant addresses, deceased, and mail returned from the original sample

Housing and neighborhood characteristics;

- Housing type (single-family, attached housing, apartment or condominium).
- Year of most recent move.
- City and state of most recent previous residence.
- Year of home construction.
- Top three reasons for choosing neighborhood.
- Tenure (renter/owner status).

Work commute and non-work travel;

- Mode of three most recent grocery, meal or personal visit trips.
- Employment status.
- Commute mode.
- Habitual transit use.
- Number of vehicles.
- Parking at or near home.

The survey was fielded from 12 June to 26 August 2009 using a protocol following procedures known as the total design method, originated by Dillman.[19] This protocol consists of an invitation letter with questionnaire, 3-day postcard, 20-day letter with questionnaire, and final contact letter as follow up.

Our final survey protocol included these steps as well as two additional mailings, to remedy difficulties encountered during the survey. A full Dillman Protocol also calls for first-class postage. As this procedure was mistakenly not used for the first two mailings, an extended survey protocol was employed. In all, a total of six mailings were sent to survey households.

Table 9. Household survey mailing schedule

June 3	Invitation letter and questionnaire mailed to 5,000 respondents
June 8	Reminder post cards mailed to 5,000 respondents
July 1	2nd letter and replacement questionnaire mailed to all non-responders
July 20	3rd letter and replacement questionnaire mailed to all non-responders
July 27	Last chance letter mailed to non-responders
August 26	Last day for returned surveys

Survey Response Rate

In total, 1,143 completed surveys were received for a response rate of 25.3 percent. Responses from individual station areas ranged from a low of 13 percent in Perth Amboy to a high of 33 percent in Westfield.

Table 10. Response rate by sample strata

	Original sample[4]	**Adjusted sample[5]**
Overall Response Rate	23%	**25%**
By strata		
New Housing	25%	**28%**
Inside ¼ Mile	22%	**24%**
Outside ¼ Mile	23%	**25%**
By station		
2nd St (Hoboken)	19%	**20%**
Cranford	29%	**31%**
Essex St (Jersey City)	19%	**23%**
Morristown	28%	**31%**
Perth Amboy	12%	**13%**
Rahway	24%	**26%**
South Amboy	30%	**32%**
South Orange	23%	**26%**
Trenton	14%	**17%**
Westfield	32%	**33%**

By station— Post-survey geocode	Original sample	**Adjusted sample**
2nd St (Hoboken)	21%	**23%**
Cranford	29%	**31%**
Essex St (Jersey City)	17%	**20%**
Morristown	28%	**31%**
Perth Amboy	12%	**13%**
Rahway	24%	**26%**
South Amboy	30%	**32%**
South Orange	23%	**27%**
Trenton	14%	**17%**
Westfield	31%	**33%**

[4] Original sample response rate is calculated by dividing the completes by the original sample size
[5] Adjusted sample response rate is calculated by dividing the completes by the adjusted sample size

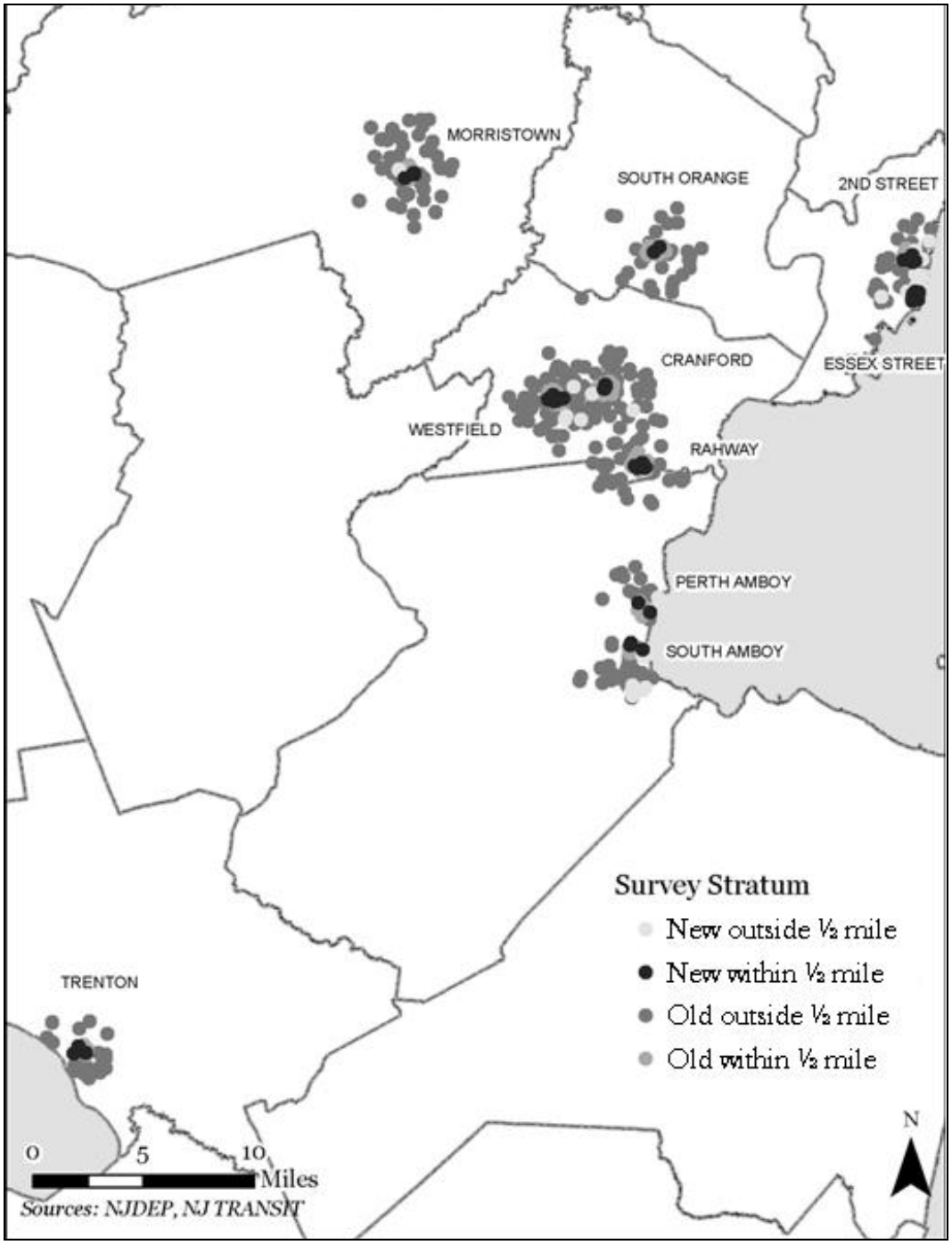

Figure 2. Survey respondent locations

Data Description: Impacts of Transit-Oriented Development Households

We begin describing the survey results by focusing on the main potential impacts of transit-oriented development. The survey responses were stratified to illustrate differences among four groups: respondents living in new and older housing, and

respondents living within walking distance and farther away from rail stops. We are particularly interested in differences between those living in new housing near transit, compared to the other three groups.

The following potential impacts of transit-oriented development are of primary interest and are described below: the number of public school children per household; commute mode and non-work travel; and auto ownership. So as to achieve a more statistically robust analysis, households located within 0.4 miles of stations were compared to those located between 0.4 miles and two miles away. Note that throughout the report, data and findings are reported as within a half mile and between a half mile and two miles, for the sake of clarity.

Presence of School-Age Children

An important aim of the survey was to document how many children on average live in new housing near rail stations. Among all of the responses, we find that about 76 percent of households are childless—matching the rate of childless households in New Jersey, overall, according to the 2006-2008 American Community Survey. Looking only at those living in new housing near transit, we find fewer children in these households than the other groups. Eighty-three percent of respondents living in new housing located near transit reported having no children. Thirteen percent reported having one child, and four percent reported two or more children. Seventy-seven percent of respondents living in older housing located near stations and 76 percent of respondents living in new housing located outside the half mile station area reported having no children. Residents living in older housing located outside the half mile station area reported the highest prevalence (29 percent) of children. The distribution of children actually attending public school, rather than private school or being homeschooled, was about the same and is shown in Figure 3.

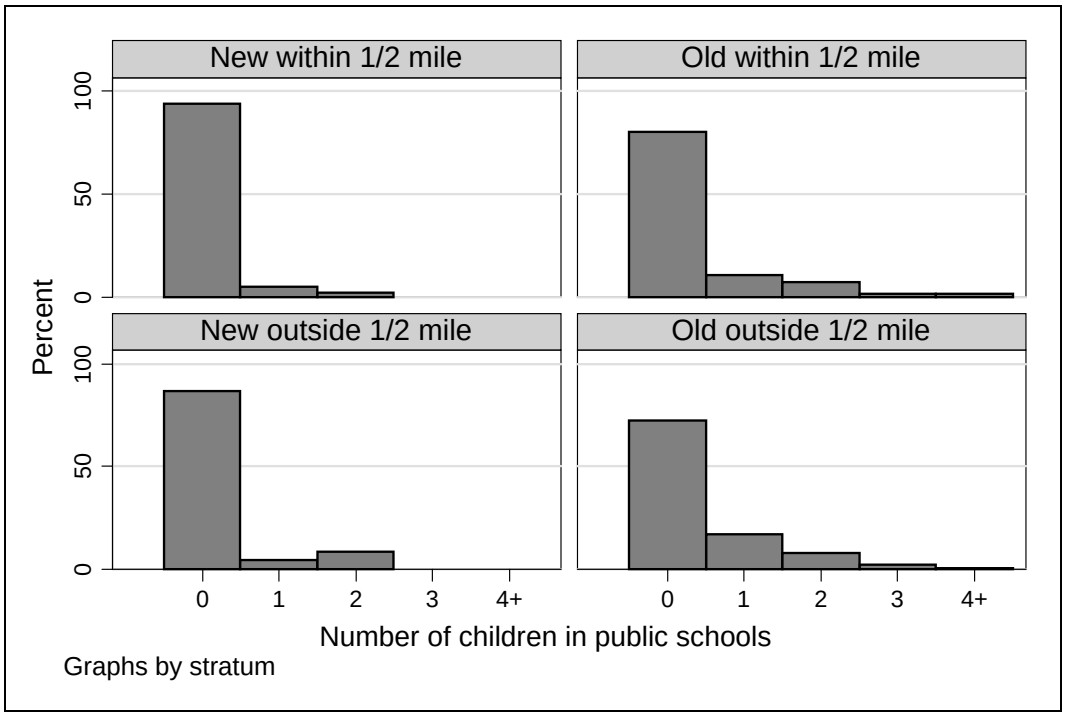

Figure 3. Number of children in public schools, by stratum

Commute Mode and Non-Work Travel

Respondents living in new housing near transit were more likely than any other group to use transit to commute to work. 48 percent of respondents living in new housing near transit reported using bus or rail for the majority of their trip to work. Another 48 percent of respondents living in new housing located near transit reported driving to work, while four percent walked or biked. Respondents living in older housing near transit reported lower rates of commuting by transit. Only 24 percent traveled to work by bus or rail, while 70 percent reported traveling by auto.

Interestingly, respondents living in new housing located outside walking distance to stations in this sample were more likely to commute by bus or rail than residents of older housing located near stations. Nearly 29 percent of those living in new housing outside the half mile distance reported commuting by bus or rail while only 20 percent of respondents living in older housing further from stations traveled by bus or rail. Overall residents of older housing were more likely to commute by auto, with those living in older housing outside the half mile station area exhibiting the highest rate of auto commuting (78 percent) among the four housing strata examined (see Figure 4).

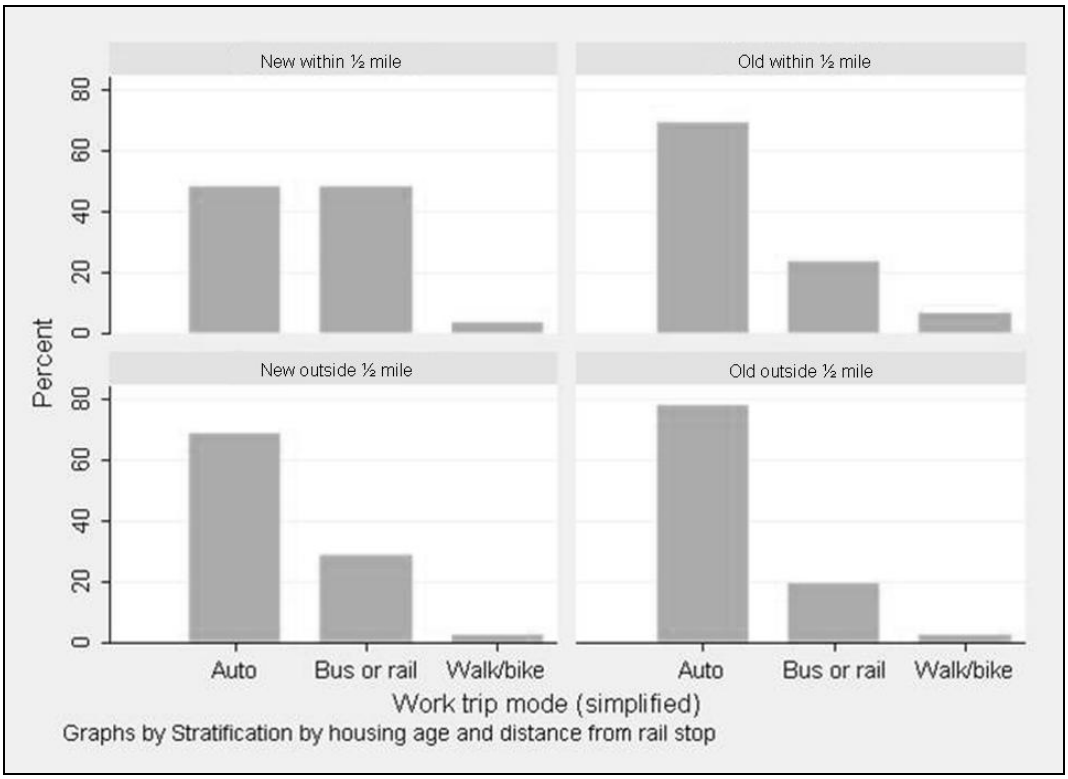

Figure 4. Work trip by mode, by stratum

Respondents were also asked about their non-work travel. They were asked to recount the time/date and mode of their last three trips to three different destinations/purposes: to go to the grocery store; to get a meal or snack; and, to visit friends or relatives. The data for each trip purpose were tabulated to examine mode choice among the four strata.

For all groups, travel by personal vehicle (car, truck or van) was reported as the predominant mode regardless of trip purpose. The analysis showed that respondents who live within walking distance of a station drive less and travel by transit or walk more than those who live further from a station, regardless of trip purpose. Looking only at those who live near stations, we find that residents of new housing drive less and travel by train/light rail or walk more than residents of older housing. Specifically, nearly one in eleven non-work trips by residents of new housing near stations is taken by train/light rail and about one in four non-work trips is on foot. For residents of older housing near stations, one in twenty-five non-work trips is by train/light rail and about one in five is on foot.

Table 11. Non-work trips, cumulative

	By car, truck or van	By train or light rail	By bus	Walked	Other
New within ½ mile	64%	9%	0%	24%	2%
Old within ½ mile	71%	4%	2%	20%	3%
New outside ½ mile	83%	3%	0%	12%	2%
Old outside ½ mile	85%	2%	2%	11%	1%

All groups are more likely to walk to get a meal or snack than to either shop for groceries or to visit friends or relatives; however, residents of new housing near stations are more likely to travel by train/light rail to visit friends and relatives than to use other non-auto modes.

Table 12. Last three times you went to the grocery store, cumulative (Question 9)

	By car, truck or van	By train or light rail	By bus	Walked	Other
New housing within ½ mile	77%	5%	0%	17%	1%
Old housing within ½ mile	78%	2%	2%	16%	2%
New housing outside ½ mile	91%	0%	0%	7%	2%
Old housing outside ½ mile	89%	0%	1%	9%	1%

Table 13. Last three times you went to get a meal or snack, cumulative (Question 10)

	By car, truck or van	By train or light rail	By bus	Walked	Other
New housing within ½ mile	47%	6%	0%	46%	1%
Old housing within ½ mile	59%	3%	2%	34%	2%
New housing outside ½ mile	76%	2%	1%	20%	1%
Old housing outside ½ mile	82%	1%	2%	15%	1%

Table 14. Last three times you visited friends or relatives, cumulative (Question 11)

	By car, truck or van	By train or light rail	By bus	Walked	Other
New housing within ½ mile	68%	17%	1%	10%	3%
Old housing within ½ mile	76%	8%	2%	10%	3%
New housing outside ½ mile	81%	7%	0%	9%	3%
Old housing outside ½ mile	84%	4%	2%	8%	2%

Vehicle Ownership and Parking Choice

Another concern, related to transit-oriented development, frequently cited by public officials and community residents is that intense development will cause problems with parking. The primary cause of parking demand is auto ownership. Parking supply is discussed below.

Table 15. Auto ownership by stratum

	Auto ownership per capita	
Stratum	N	Mean
New housing within ½ mile	213	0.73
Old housing within ½ mile	470	0.73
New housing outside ½ mile	102	0.84
Old housing outside ½ mile	324	0.76
Total	1,109	

Respondents living near transit had lower rates of vehicle ownership than those living further away. This was true for those dwelling in both new and older housing. Households living in older housing near stations had the lowest average vehicle ownership, while households living in new housing near transit were more likely to own only one vehicle. Residents living more than a half mile from a station were more likely to have access to multiple vehicles, with 60 percent of those living in new housing and 65 percent of those living in older housing having two or more vehicles available to use. (See Figure 5 and Table 16).

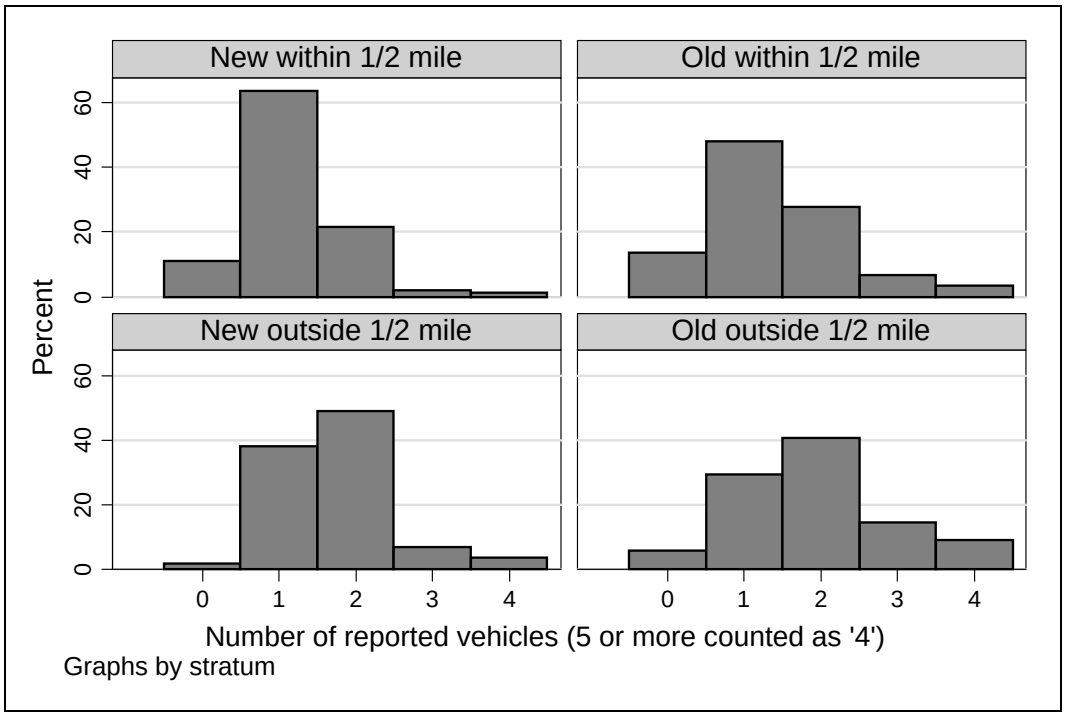

Figure 5. Auto ownership, by stratum

Table 16. Number of cars available in household

	0	1	2 or more
New housing within ½ mile	11%	64%	25%
Old housing within ½ mile	14%	48%	38%
New housing outside ½ mile	2%	38%	60%
Old housing outside ½ mile	6%	30%	65%
Total	10%	45%	45%

Residents living in new housing reported being less likely to park on the street than residents of older housing. For both groups, only 7 percent of respondents reported parking on the street. The majority (51 percent) utilized a private garage, carport or driveway. These respondents also reported the highest utilization rates for structured parking and parking lots (34 percent). Households living outside the half mile station area reported the highest utilization of personal off-street parking—private garage, carport or driveway (78 percent).

Residents of older housing, irrespective of location, reported using on-street parking more frequently than other groups. Among those living near transit, 27 percent reported parking on the street, while 24 percent of those living more distant from a station, reported the same. 19 percent of residents living in older housing near transit park in decks or lots, while only 7 percent of those living in older housing more distant from a station park in decks or lots.

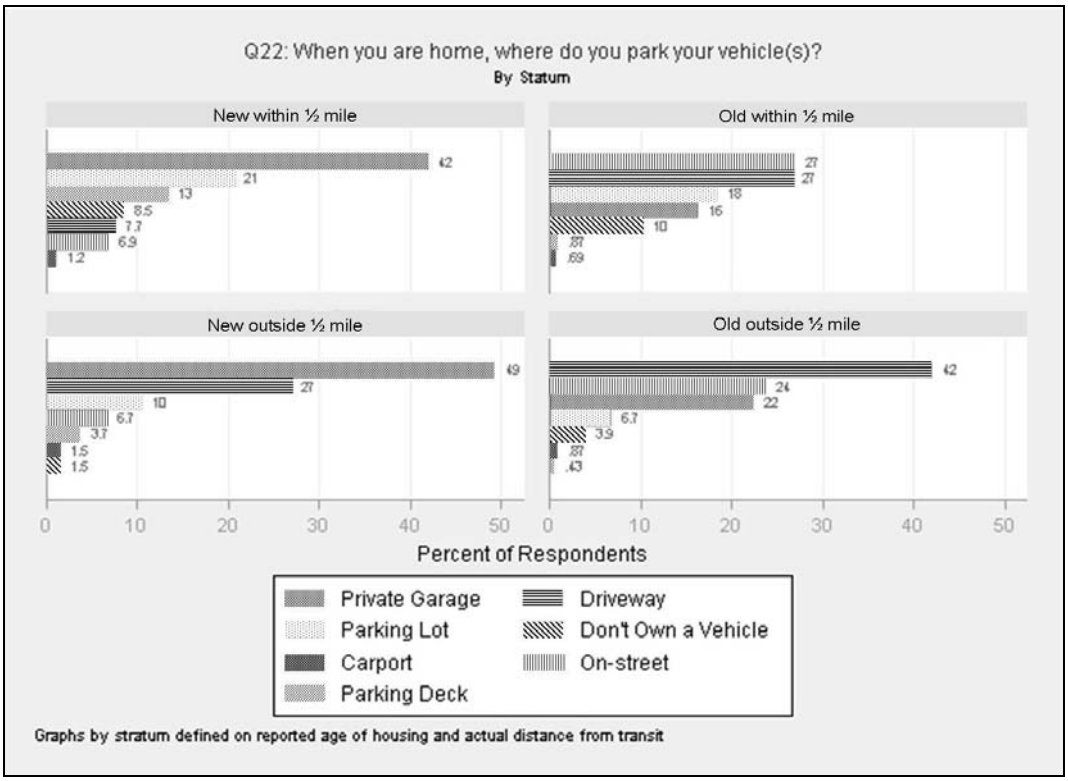

Figure 6. Residential parking

Table 17. Residential parking location

	Off-street private (garage, carport or driveway)	Off-street (deck or lot)	On-street	No car
New housing within ½ mile	51%	34%	7%	9%
Old housing within ½ mile	44%	19%	27%	10%
New housing outside ½ mile	78%	14%	7%	2%
Old housing outside ½ mile	65%	7%	24%	4%

Data Description: Supply-Side Factors of Station Areas

The traffic, parking spillover, and school-related fiscal impact effects of transit-oriented developments may be affected by existing conditions in the communities where development occurs. In higher-quality school districts near rail stations, new development tends to result in a larger number of school children because of greater demand by households with school-aged children for homes in those school districts. Similarly, parking usage will be greater for new developments in places where parking is not already over-utilized and controlled with meters and permitting. We summarize data on the variance in school quality and parking supply below, and we use these data in later controlled analysis.

School District Quality

It is possible that the presence of school-aged children is related to the quality of local schools. We geocoded households and associated them with the closest high school and elementary school within their school districts in order to measure quality of schools using Scholastic Aptitude Test (SAT) and New Jersey Assessment of Skills and Knowledge test scores for the fourth grade (NJ ASK4). Special care was taken to recognize sending/receiving districts and to associate respondent locations with the appropriate school. There is a fair amount of variance in school quality among the respondents, as shown by the average SAT score of the nearest high school (Figure 7). Information about school quality is used later in controlled regression analysis when modeling the number of school-aged children as a function of transit access and age of housing.

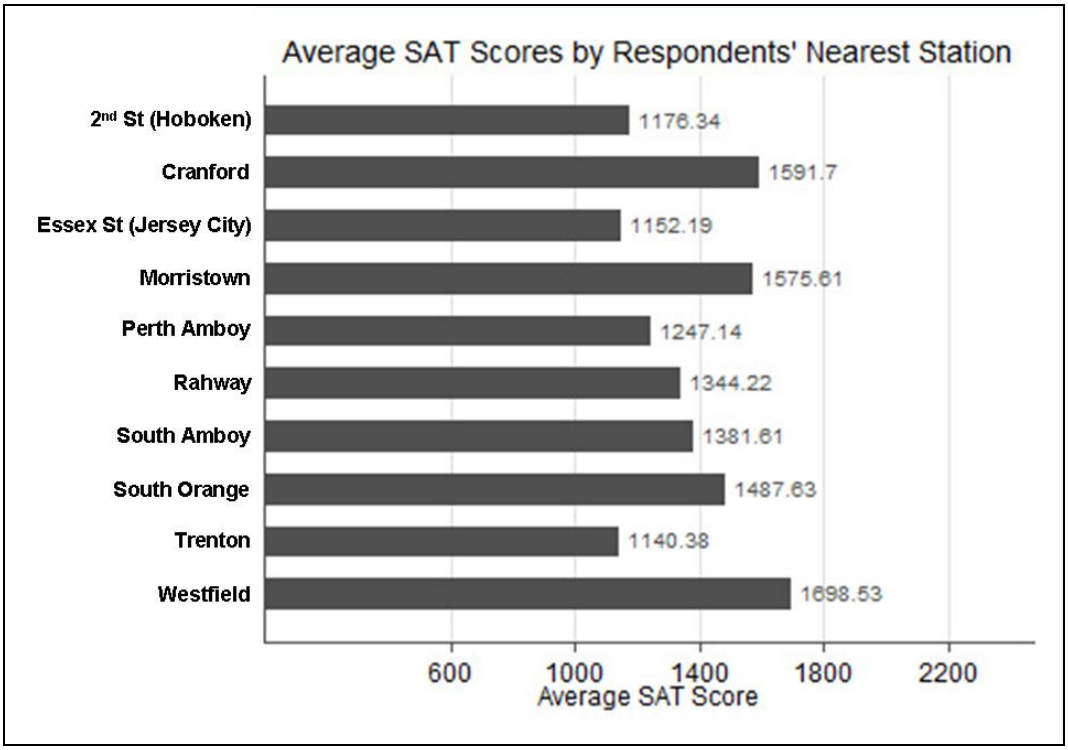

Figure 7. Average SAT scores for respondent high schools, by nearest station

Parking Availability

Respondents were asked about auto ownership and parking availability on and off street. But respondents who do not own cars or drive often may not accurately report parking availability, particularly for street parking. Thus we supplemented self-reported data about parking with field audits of on-street parking supply (described earlier). We focus on one measure here, the density of parking spaces, measured as the number of on-street parking spaces per mile of street. On-street parking audit data were available

for households within a quarter mile of stations (about half of all respondents). We used geocodes to join the on-street parking audit data for street segments within one-eighth mile of each household. Viewed together these data provide a robust understanding of the parking supply for particular households.

On-street parking conditions vary widely, from about 125 parking spaces per road mile to more than 300 spaces per mile (Figure 8). Most of the observed variation in on-street parking availability was between different station areas, rather than within specific station areas. Those living in new housing near transit have slightly higher on-street parking availability, on average—211 spaces per road mile in the nearby area, compared to 201 spaces for older housing near transit (Table 18).

For the purpose of the analysis we measured parking within an eighth mile radius for two reasons. Firstly, people who take into account street parking decisions when deciding whether to use or own autos, and in deciding where to live, likely focus on nearby parking (within a couple of blocks). Secondly, we were able to observe parking only up to a quarter mile way from the selected rail stations, so an eighth mile radius is the average radius that can be observed for station-area households.

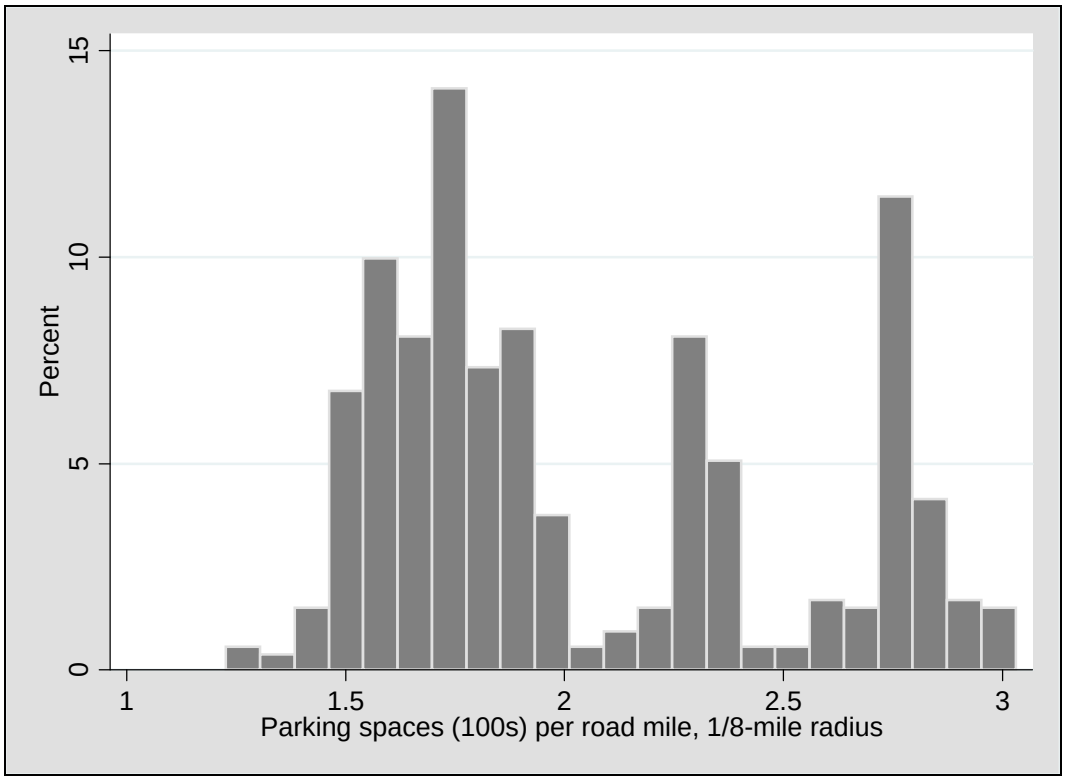

Figure 8. Parking spaces per road mile on streets within 1/8-mile of respondent residence (for respondents within 1/4-mile of stations only), N=532

The household survey also collected information about parking as reported by respondents (Table 18). Those living in new housing near transit reported having access to the smallest number of off-street parking spaces, about one space for each household member, while those living in new housing farther away had the highest number of off-street parking spaces per capita, approximately 1.5 spaces per household member. Among those living near stations, those in new housing are on average more reliant on on-street parking.

Table 18. Off-street and on-street parking by stratum

	On-street parking spaces per mile (parking audit)		Off-street parking spaces per capita (household survey)	
Stratum	N	Mean	N	Mean
New housing within ½ mile	186	211	212	1.01
Old housing within ½ mile	346	201	452	1.20
New housing outside ½ mile	0	N.A.	101	1.50
Old housing outside ½ mile	0	N.A.	309	1.29
Total	532		1,074	

Factors Influencing Neighborhood Choice

Respondents were asked about why they chose their current neighborhood and were asked to rate the top three criteria in choosing where they live now. As shown in Figure 12, overall convenience to job was the most important factor, followed by convenience to friends/relatives, convenience to public transportation, and house characteristics (house was an important consideration). The least significant reasons cited for why respondents selected their current neighborhood were quality of public services, distance to highways, distance to school, and distance to shops/services.

When stratified by housing location and age, it appears that convenience to job is the most important reason cited by all groups. Interesting differences emerge when looking at reasons that rank lower than access to work. Residents of new housing living near transit ranked convenience to public transit higher than convenience to friends/relatives. Also interesting was the finding that residents of new housing located near transit ranked the look and design of the neighborhood as important as characteristics of the house. Residents of older housing near stations valued convenience to friends/relatives over access to public transportation. They also ranked good schools over house characteristics and neighborhood design.

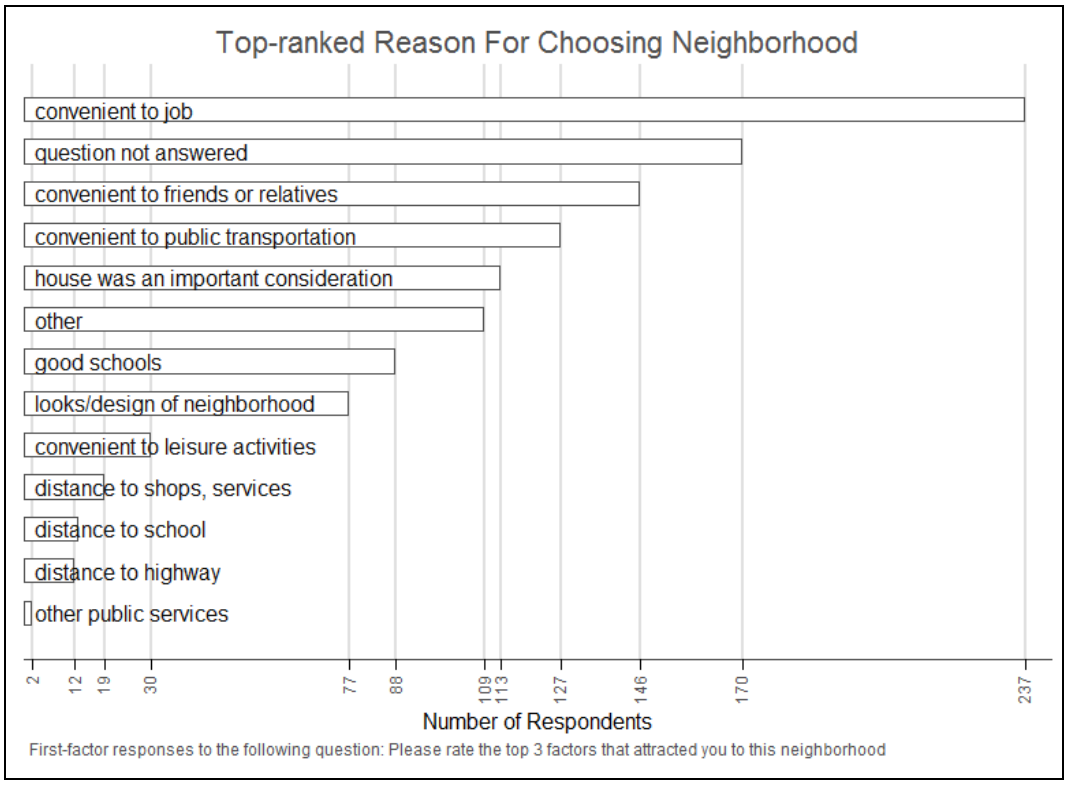

Figure 9. Reasons for choosing neighborhood, all respondents

Residents of new housing further from stations valued the look and design of the neighborhood more than home characteristics or convenience to public transportation. These respondents ranked good schools among their least important criteria. Residents of older housing located more distant from transit ranked house characteristics, good schools, and convenience to friends/family as most important, after access to work.

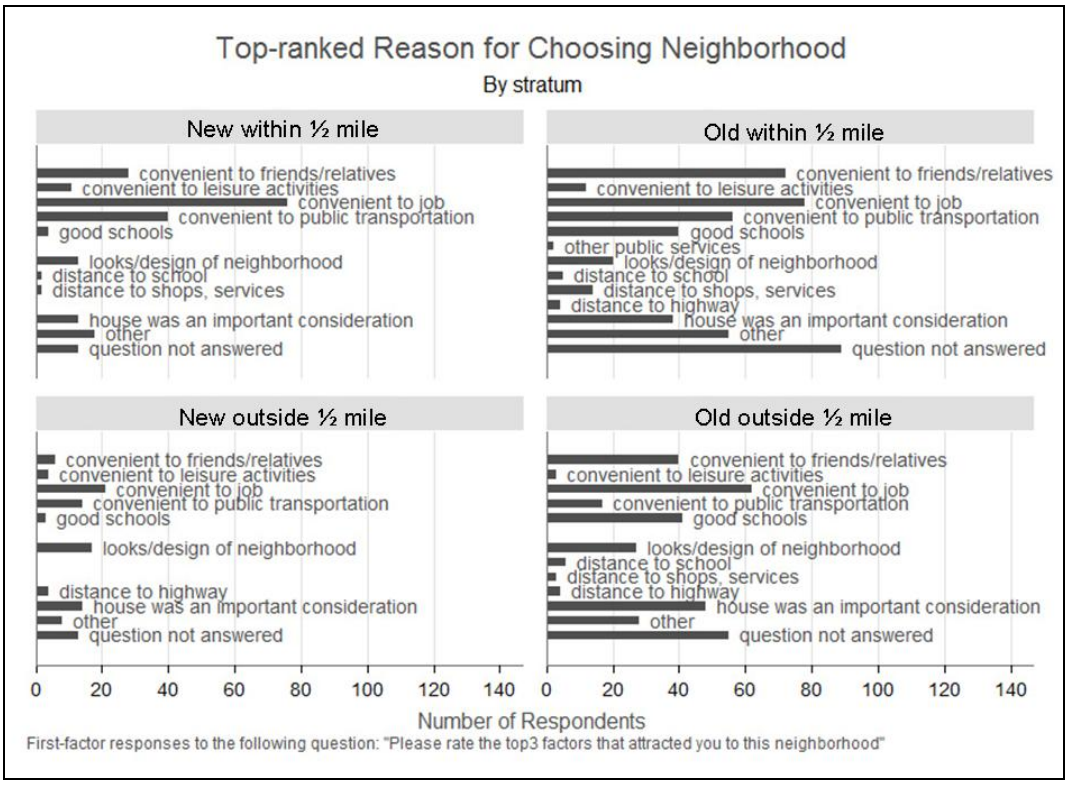

Figure 10. Reasons for choosing neighborhood, by stratum

Perceptions of Neighborhood

Respondents were asked about how they felt about their neighborhood and certain changes to that neighborhood. These questions were designed to gauge how receptive or resistant they were to transit-oriented development (or density more generally). Survey responses were mixed.

When asked how many floors the tallest building on their block should be, the strongest support for 7+ story buildings came from those living in new housing near stations. Residents of older housing near stations do not share this position. While more than 30 percent of new housing residents living near stations would favor buildings of 7+ story buildings, only 11 percent of residents of older housing would. 17 percent of residents of new housing more than a half mile from stations support 7+ story buildings. However, only 4 percent of older housing further from stations would support buildings of this height.

A majority of respondents in all groups reported being opposed to the replacement of existing buildings with taller buildings or the construction of new, taller mixed-use buildings in their neighborhoods. In both cases, residents of new housing near transit offered the least amount of opposition to these scenarios.

Table 19. How many floors should the tallest building on your block be? (Question 26)

	1 to 2 stories	3 to 4 stories	5 to 6 stories	7 or more stories
New housing within ½ mile	4%	45%	20%	31%
Old housing within ½ mile	20%	52%	17%	11%
New housing outside ½ mile	38%	37%	8%	17%
Old housing outside ½ mile	53%	36%	7%	4%

Table 20. How would you feel about the following changes to your neighborhood… the replacement of buildings in your neighborhood with taller buildings? (Question 27a)

	Support	Oppose
New housing within ½ mile	35%	65%
Old housing within ½ mile	21%	79%
New housing outside ½ mile	23%	78%
Old housing outside ½ mile	15%	86%

Table 21. How would you feel about the following changes in your neighborhood… the construction of a new mixed-use building (retail, office and residential) taller than existing buildings in your neighborhood? (Question 27b)

	Support	Oppose
New housing within ½ mile	44%	56%
Old housing within ½ mile	31%	70%
New housing outside ½ mile	39%	61%
Old housing outside ½ mile	18%	82%

When presented with the prospect of new, taller mixed-use buildings nearer to rail stations, respondents were more supportive. 60 percent of residents in new housing near transit and 65 percent of residents in new housing more than a half mile from stations support this change. Only a majority of residents of older housing near stations oppose this kind of change.

Table 22. How would you feel about the following changes in your neighborhood… the construction of a new mixed-use building near the rail station that is taller than existing buildings? (Question 27c)

	Support	Oppose
New housing within ½ mile	60%	40%
Old housing within ½ mile	45%	55%
New housing outside ½ mile	65%	35%
Old housing outside ½ mile	51%	49%

Household Differences in Size, Composition, Housing Type, Race/Ethnicity and Income

Some of the differences among the strata discussed above may be correlated with other differences among respondents, including the types of homes that they live in and socio-economic differences. We review these relationships briefly here, starting with household size.

Small households, consisting of one or two people predominate among all strata. Small households are most common among those residing in new housing near transit (83 percent). Only 3 percent of these households have three people and only 4 percent consist of four people or more. Households living in older housing more than a half mile from a station had the largest occurrence of larger households (26 percent).

Table 23. Number of people in household

		1 or 2	3	4 or more people
New housing within ½ mile	Count	181	27	9
	%	83%	12%	4%
Old housing within ½ mile	Count	334	65	78
	%	70%	14%	16%
New housing outside ½ mile	Count	73	15	15
	%	71%	15%	15%
Old housing outside ½ mile	Count	181	60	85
	%	56%	18%	26%
Total	Count	769	167	187
	%	68%	15%	17%

Literature on transit-oriented development has noted its appeal among two different age groups, twenty-somethings and seniors. Data from the household survey indicate that

individuals in the 18 to 33 age group are more prevalent among those living in new housing near transit, but are nearly as prevalent among those living in older housing located further than a half mile from stations. As for seniors, age 65 or older, these individuals are more likely to live in older housing, regardless of location.

Table 24. Households with individuals age 18 to 34

		No	Yes
New housing within ½ mile	Count	136	84
	%	62%	38%
Old housing within ½ mile	Count	329	156
	%	68%	32%
New housing outside ½ mile	Count	78	26
	%	75%	25%
Old housing outside ½ mile	Count	212	122
	%	63%	37%
Total	Count	755	388
	%	66%	34%

Table 25. Households with seniors, age 65+

		No	Yes
New housing within ½ mile	Count	191	29
	%	87%	13%
Old housing within ½ mile	Count	362	123
	%	75%	25%
New housing outside ½ mile	Count	94	10
	%	90%	10%
Old housing outside ½ mile	Count	248	86
	%	74%	26%
Total	Count	895	248
	%	78%	22%

As noted earlier, residents of new housing were oversampled to ensure adequate representation in the overall sample population. The areas near the two Hudson-Bergen Light Rail stations had a greater share of new housing respondents than other stations areas. The area near the Trenton Transit Center, an area with only a small number of new housing units yielded the smallest share of new housing respondents (Figure 11).

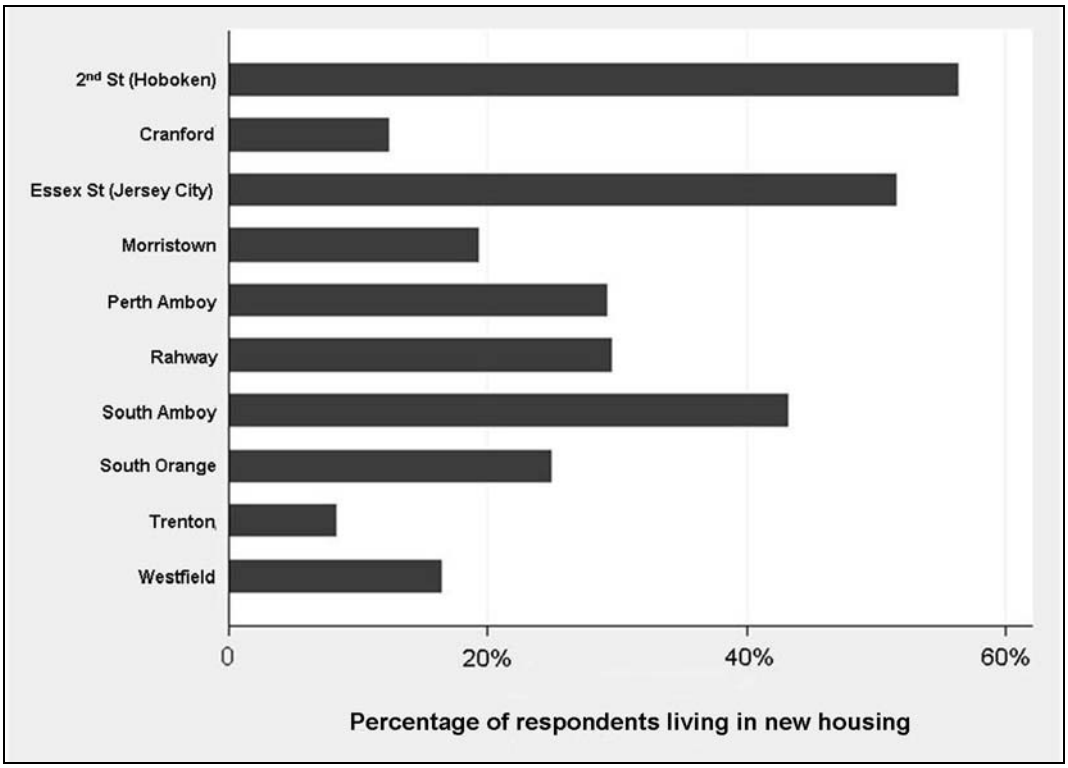

Figure 11. Percentage living in new housing

Survey respondents live in a variety of housing forms (Figure 12). Because of the spatial location of the sample, and the oversample of new housing and of housing near transit, the majority live in apartments or condominiums. Single family homes are also common. Row houses and townhouses are less common in this sample.

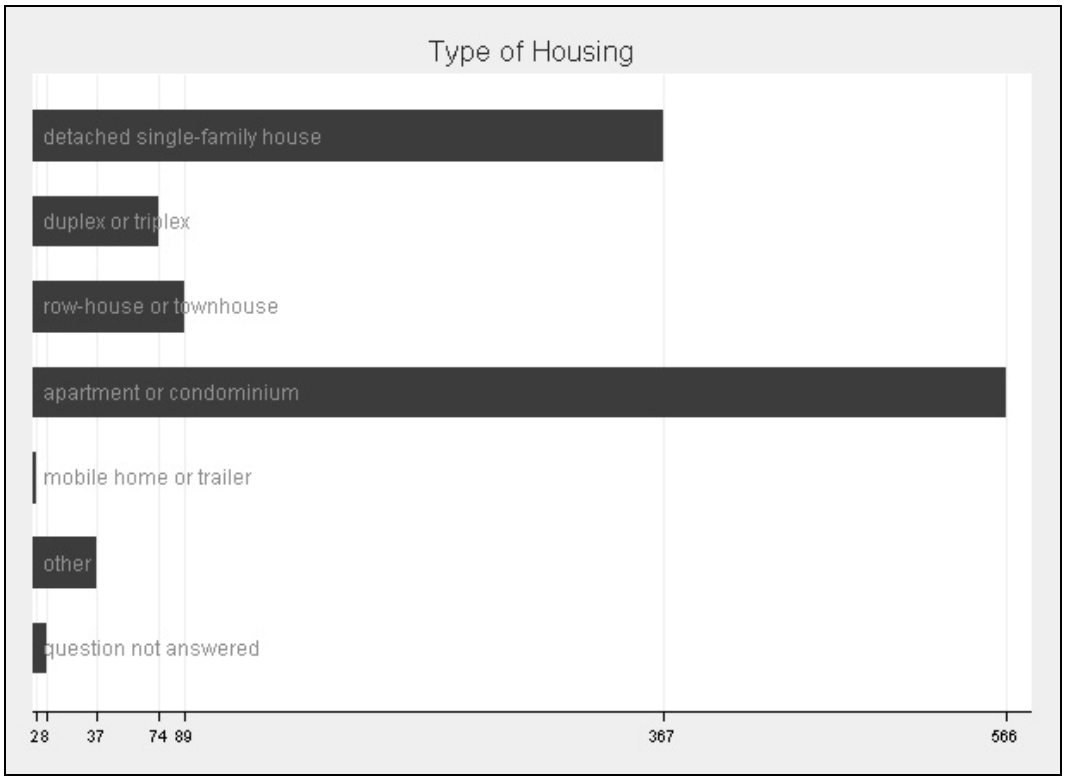

Figure 12. Housing type, all respondents

As expected, residents of new housing located near stations live primarily in apartments or condominiums (Figure 13). Further from stations, residents of apartments and condos slightly outnumber those living in either single family homes or duplexes/townhouses. Among those living in older housing, respondents living near stations are also somewhat more likely to live in an apartment or condominium than other housing forms. Further from stations, residents of older housing were more likely to live in single family homes.

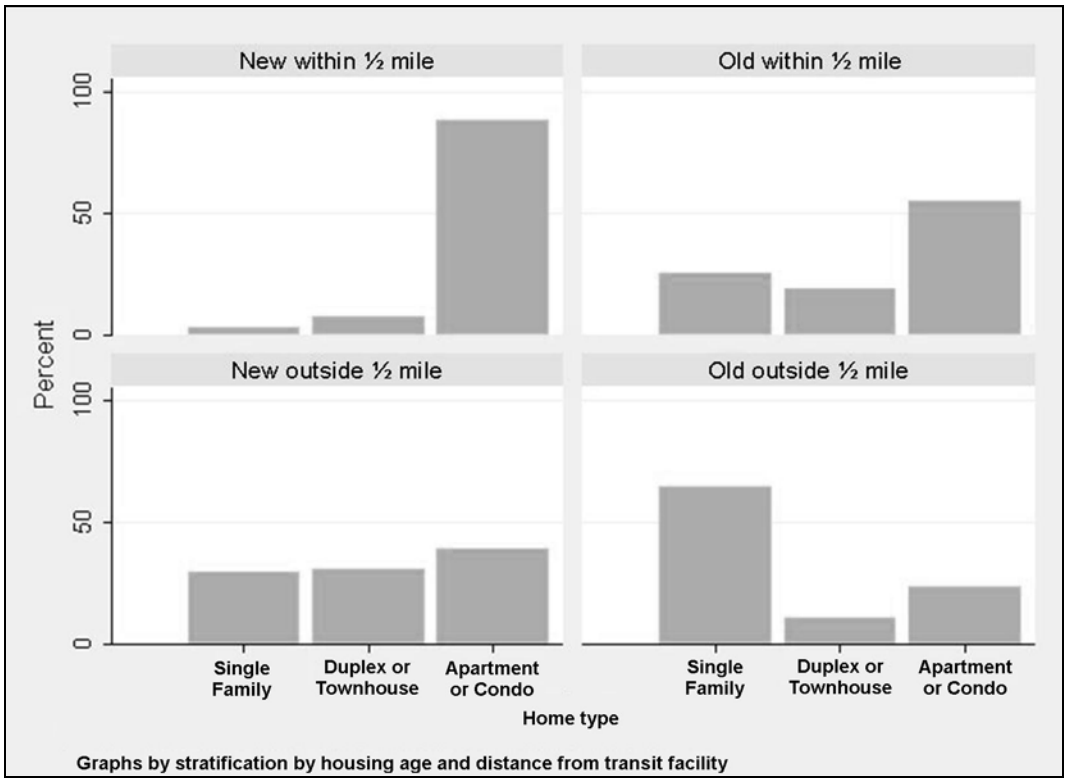

Figure 13. Housing type and location by stratum

Next we look at race/ethnicity, which is often correlated with alternative mode use. African Americans are more likely than Caucasians to rely on transit. Asian Americans are also more likely to use transit, particularly those who are recent immigrants to the United States.

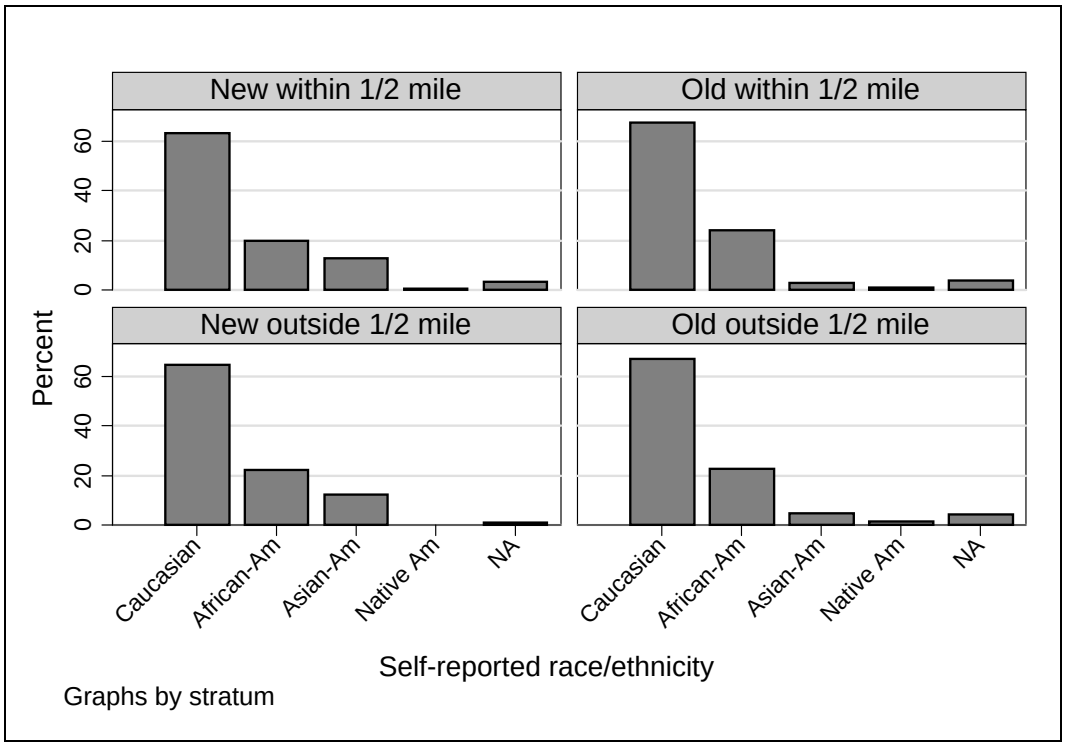

Figure 14. Race/ethnicity by stratum

Residents of new housing located within a half mile of a station are the least likely to report being Caucasian. Asian-Americans are much more common in new housing both near and farther away stations. African Americans are most common in older housing near stations. Survey respondents living within a half mile of a station (living in both new and older housing) are more likely to belong to an ethnic minority than those living further from a station. Residents of new housing are also more likely to belong to an ethnic minority.

Income also tends to be positively correlated with travel choices and auto ownership and is also likely correlated with living in newer, more expensive housing. Respondents living in new housing near stations have higher incomes than those living in older housing in similar locations, but have slightly lower income than residents of new housing located further from stations (Figure 15).

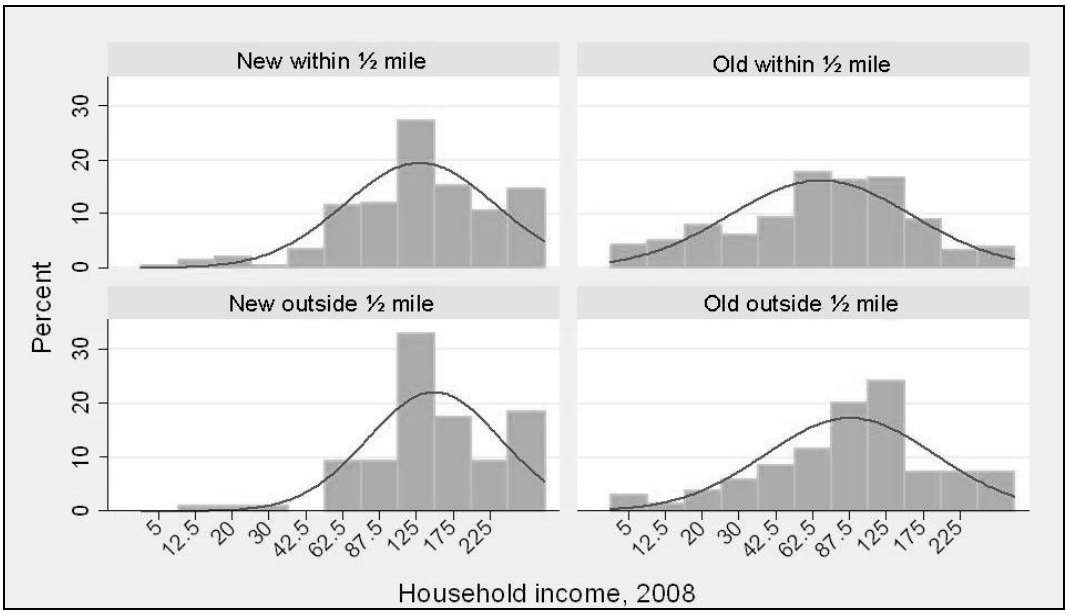

Figure 15. Household income of survey respondents

Overall, respondents living further from stations are wealthier than those living near stations, without regard to the age of housing, i.e., among those living near stations, residents of new housing are wealthier than residents of older housing and for those living further from stations, residents of new housing are also wealthier than residents of older housing.

DATA ANALYSIS

As shown above, differences among the strata relative to commute mode, non-work trip mode, parking use, auto ownership, and number of school-aged children support the claim that transit-oriented housing development is likely to have fewer impacts on traffic, parking problems and school fiscal impacts than existing development and new development farther away. In some cases the differences are small. These apparent differences may be misleading, driven by other characteristics and by the nature of the sample, and not primarily by proximity to rail stations.

In order to use this information to predict the likely impacts of future development, controlled statistical analysis is needed. This is in order to understand whether the observed differences are partly due to variation in housing type and households, as well as station area supply conditions—school district quality, which might affect the number of households with school-aged children choosing to live in transit-oriented development and the availability of parking, which might affect the propensity of auto users to locate in transit-oriented developments.

We estimated several regression models to explore the impacts of new housing near rail stations on commute-mode choice, auto ownership, and the number of public school

children while controlling for parking availability, school district quality, and a number of other characteristics of housing and of households. The specifications for the models were as follows:

- Dependent variables: Commute mode; number of children in public school; number of autos owned.
- Main independent variables: Distance to nearest rail stop (e.g., within a quarter mile, within a half mile, etc.).
- Supply measures: School district quality; on-street parking supply.
- Other control variables: Age of home; housing type; income; race/ethnicity; dummy variables for the two mile area around each station.

Table 26 shows uncontrolled and statistically-controlled multipliers or adjustment factors that estimate the differences between households living in new housing within a half mile of rail stations compared to households located farther from rail stations in terms of their relative number of school children, percentage of auto commuting, and number of vehicles.

Table 27 details the multipliers for households located within a quarter mile radius of stations for comparison. The results for auto ownership and for the number of public school children do not change all that much from the half mile to the quarter mile. But the results for auto commuting are different, partly due to the availability of the on-street parking supply measure for the analysis using the quarter mile radius. (Note that the statistical regression analyses are not shown in detail here.)

For the number of public school children per household, the differences between new housing located within a half mile of rail stations and housing farther away are persistent even when controlling for all other factors. New homes near transit stations have about half (45 or 46 percent) of the number of school children as new homes elsewhere, regardless of the type of housing, the quality of schools, the location within the state, or other factors.

For the percentage of households commuting by auto, controlled analysis shows that households in the half mile radius appear to drive to work at about the same rate as those in new housing farther away. While the rates are slightly less, the difference is not statistically significant. But within a quarter mile of rail stations, when controlling for other factors, auto commuting is much lower if households have scarce on-street parking. We provide more detail below.

Finally, for auto ownership, when we control for other factors, we find that rail station access does not play a strong role. However, auto ownership in new housing near stations is much lower for apartments and condominiums. Both auto ownership and

commuting also vary greatly depending on where in the state the household is located (what is known as "station area fixed effects").

Table 26. Multipliers for new housing within a half mile of rail stop vs. new housing farther from transit

	Uncontrolled analysis		Controlled Analysis		
	Multiplier	95% confidence range	Multiplier	95% confidence range	Control variables
Number of children in public school	0.37***	0.18 to 0.76	0.45**	0.21 to 0.97	SAT scores, ASK4 test scores**, housing type, housing tenure, station area fixed effects
Share driving to work	0.42***	0.25 to 0.72	0.94		Housing type, housing tenure*, station area fixed effects***
Auto ownership	0.68***	0.57 to 0.82	1.12	0.88 to 1.44	Housing type***, housing tenure***, station area fixed effects**
*=statistically significant at 90% confidence; ** 95% confidence; *** 99% confidence. Multipliers without are statistically significant from 1.					

Table 27. Multipliers for new housing within a quarter mile of rail stops vs. new housing farther from transit

	Uncontrolled analysis		Controlled Analysis			
	Multiplier	95% confidence range	Multiplier	95% confidence range	Adjusted multiplier[1]	Control variables
Number of children in public school	0.39***	0.19 to 0.80	0.46*	0.21 to 1.00	NA	SAT scores, ASK4 test scores, housing type, housing tenure, station area fixed effects
Share driving to work	0.36***	0.22 to 0.56	[0.18**]	0.03 to 0.97	0.66	On-street parking supply*, housing type, housing tenure, station area fixed effects***
Auto ownership	0.70***	0.58 to 0.84	0.91	0.54 to 1.52	NA	On-street parking supply, housing type***, housing tenure***, station area fixed effects***
*=statistically significant at 90% confidence; ** 95% confidence; *** 99% confidence. Multipliers without are statistically significant from 1. [1]Multiplier adjusted for average on-street parking supply.						

Number of school children

The number of public school children in new housing near stations is about 60 percent lower than in new housing farther away. Even when controlling for a number of other factors including local school quality, the number is 50 percent lower. At the same time,

the mean total SAT score of the high school is highly predictive of the number of public school children; for each additional 100 points on SAT score, there is on average an additional 0.3 children attending public school per household. (Elementary test scores are not statistically significant.) Other factors that play a role include household income, decreasing amounts of public school children up to about $70,000 in income, and more public school children beyond that income range.

Commute mode

Households living in new housing near rail stops are much less likely to use cars to commute to work, doing so between 36 and 42 percent as much as those living in new housing far from rail. But for household living within the half mile radius, these differences are not apparently due to rail station access. Instead some of this difference has to do with the distribution of responses in the sample: most new housing near rail stops is in the most highly accessible station areas (see Table 28 below). These areas in particular include the two mile areas surrounding the Essex Street and 2nd Street stations on the Hudson-Bergen Light Rail line, the Rahway Station on the Northeast Corridor line, and the South Orange Station on the Morris-Essex line, as well as Morristown where households are substantially more likely to drive to work regardless of whether living in new housing near the rail station. Within station areas there is little difference in auto commuting between new housing nearby and new housing farther away.

Table 28. Number of respondents and auto commute mode share, for station area by stratum, using half mile distance

	New within ½ mile		Old within ½ mile		New outside ½ mile		Old outside ½ mile		Total	
Station area	Number	Auto commute share	Number	Auto commute share	Number	Auto commute share	Number	Auto commute share	Number	Auto commute share
2nd Street (Hoboken)	45	31%	23	35%	3	33%	12	33%	83	33%
Cranford	9	44%	60	80%	2	50%	33	85%	104	78%
Essex Street (Jersey City)	35	26%	15	27%	7	0%	14	21%	71	23%
Morristown	12	83%	41	90%	9	89%	36	89%	98	89%
Perth Amboy	5	80%	13	62%	10	80%	10	90%	38	76%
Rahway	29	52%	34	76%	4	50%	17	94%	84	70%
South Amboy	4	75%	38	71%	50	70%	19	79%	111	72%
South Orange	22	32%	37	46%			23	61%	82	46%
Trenton	5	80%	10	60%			12	92%	27	78%
Westfield	17	65%	53	66%	4	75%	38	82%	112	71%
TOTAL	183	44%	324	67%	89	65%	214	76%	810	64%

The results are different and, in the case of auto commuting, more interesting in the quarter mile area near transit stops. There are more distinct differences among new housing that are apparently attributable to parking availability (Table 29).

Table 29. Number of respondents and auto commute mode share, for station area by stratum, using quarter mile distance

	New within ¼ mile		Old within ¼ mile		New outside ¼ mile		Old outside ¼ mile		Total	
Station area	Number	Auto commute share	Number	Auto commute share	Number	Auto commute share	Number	Auto commute share	Number	Auto commute share
2nd Street (Hoboken)	41	32%	17	35%	7	29%	18	33%	83	33%
Cranford	9	44%	50	80%	2	50%	43	84%	104	78%
Essex Street (Jersey City)	33	24%	13	31%	9	11%	16	19%	71	23%
Morristown	7	71%	38	89%	14	93%	39	90%	98	89%
Perth Amboy			8	75%	15	80%	15	73%	38	76%
Rahway	25	52%	18	72%	8	50%	33	88%	84	70%
South Amboy	3	100%	26	69%	51	69%	31	77%	111	72%
South Orange	22	32%	26	42%			34	59%	82	46%
Trenton	2	100%	8	50%	3	67%	14	93%	27	78%
Westfield	14	57%	29	52%	7	86%	62	82%	112	71%
Total	156	40%	233	65%	116	66%	305	75%	810	64%

In the quarter mile regressions it is possible to include the measure of parking availability from the parking audit. Households in areas with the lowest parking availability (less than 100 spaces per road mile) have very low auto commuting likelihood in comparison to the average household in new housing farther away. The predicted likelihood is just 18 percent as high.

However, the average household located within a quarter mile of a station has about 200 on-street parking spaces per road mile, so the average relative likelihood of driving to work is actually much higher at 0.66 (this is called the “adjusted multiplier” in Table 27), which is not statistically significant from 1.0. We cannot say for certain that households within a quarter mile of rail with average amounts of on-street parking have lower rates of auto commuting than those living in new housing outside that radius, although the magnitude of the difference remains fairly large. With a larger sample size the effect might be statistically significant. But households in new housing with low amounts of on-street parking have lower auto commuting than the average.

The propensity for auto commuting is also related to other factors highly correlated with age of housing and distance to rail in this dataset, including household size (respondents in larger households are less likely to commute by auto), and occupation

(professionals and craftsmen are more likely to commute by auto, accountants less likely). Adding those household factors does not affect the calculated effect of new housing near transit very much.

Auto ownership

Households living in new housing near transit have about 30 percent fewer autos than those in new housing farther away. But when controlling for other factors we find that variance in housing type, tenure, and area of the state accounts for most of the differences. This result does not change materially for the quarter mile radius versus the half mile radius. Apartments/condominiums (multiplier of 0.68) and townhouses/rowhouses (multiplier of 0.77) have much lower auto ownership, as do any rented units regardless of housing type (multiplier of 0.78). Rail station proximity is not significant on its own. Almost 90 percent of new housing near transit stops is apartments or condominiums, and almost 50 percent is rented. These shares are much lower for new housing farther away (about 40 percent and 14 percent respectively). Auto ownership and parking problems associated with new housing near transit will be much lower for high-density development and rented units.

SUMMARY AND POLICY IMPLICATIONS

This study tested whether households living in new housing constructed within a half mile radius of ten selected rail stations in New Jersey are different than households living in the nearby region. The purpose of this investigation was to explore whether the conventional justifications for opposing transit-oriented development are warranted. We focused on three measures of greatest interest: the auto commuting patterns of households living near selected rail stops, their auto ownership, and the number of school age children in those households. A second, closely related objective was to investigate how the availability of both on-street and off-street parking and the quality of the local school district influenced these outcomes.

Advocates of transit-oriented development in the U.S. seek to direct population growth where public transit infrastructure and services already exist, expecting that residents, employees, and shoppers will increasingly walk or use transit rather than use autos. This study suggests that the reality is somewhat more complex in this study area. Only in new housing within a quarter mile of rail stations, and with scarce on-street parking, does auto commuting appear to be lower than for new housing without transit access. And it is new apartments and condominiums, and rented housing, that has substantially lower auto ownership; much of that housing happens to be located near rail stations. These results imply the potential to create parking and traffic impact factors that are based on on-street parking availability and density and rental status of proposed housing.

The commuting and auto ownership results also likely reflect several factors only weakly related to rail station access. First, smaller households seek smaller housing and also drive less. Second, our sample was constructed to represent areas within two miles of

rail stops, many of which have good transit access via bus. Nevertheless, if there is an undersupply of smaller housing and rental housing in the state, which our interviews suggest is the case, these results imply that existing restrictions on dense development likely cause more driving.

When housing development gets dense enough there are inevitably more people using the roads and trying to find parking spots. But these results suggest that at least twice as much development could be permitted to occur without exceeding the traffic and parking impacts of single-family home development. Auto ownership is lower for townhouses and apartments, and for rental units.

A separate issue, particularly important in the New Jersey context, is that dense new development near transit facilities is feared to increase school enrollments, and incur municipal fiscal deficits or tax increases, at a higher rate than conventional single-family home development. We find robust evidence that, in fact, the per-household impacts of new development are much lower in developments near rail station. This provides the strongest evidence that we are aware of to debunk the myth that new housing near transit will overload school districts. As our interviews illustrated, the impact of development on school districts is in any case largely dependent on whether school rooms and districts have existing capacity. Our results imply that 50 units of housing far away from a rail stop have the same effect on school enrollments as 100 units of housing near a rail stop.

To summarize, the policy implications of this study are in three areas:

- Local land use policies near rail stations should take into account lower school enrollment impacts of housing there. Although local context will vary, a reasonable starting point is to use a multiplier of 0.5 to estimate the number of school children in comparison to new development elsewhere.

- Local land use policies for high density development generally (whether in urbanized areas near or far away from rail stations) should take into account substantially reduced auto use and ownership in high density housing and rental housing. In this data set, auto ownership is a third lower in an apartment/condominium setting and 25 percent lower in a rowhouse/townhouse setting, compared to single family homes, when controlling for other factors. Auto ownership is also 22 percent lower in rental units regardless of housing type. These differences are roughly additive—in other words, our statistical model estimates a household living in a rented apartment will have about half the number of vehicles of a household living in an owner-occupied single family home. Development opportunities near transit facilities are often well-suited to high density and rental housing.

- While auto commuting is not lower across the board within a half mile of stations, it is lower within a quarter mile of rail stations with low amounts of on-street parking. Parking policies, for both on-street and off-street parking, should be reformed to maximize the potential of transit-oriented development. Lower on-street parking is highly correlated with less driving to work. Smaller amounts of on-street parking require managing on-street parking with permits and metering. This enables higher density development. The results strongly imply that parking availability should be taken into account when estimating the traffic impacts of new development near transit.

Single-family home development causes more driving, whether near rail stations or not. Dense new housing development reduces driving and auto ownership, as does lowering and managing the on-street parking supply. From a larger environmental and congestion management perspective, permitting such development is to be strongly encouraged.

Permitting higher density development in transit-accessible areas also has clear benefits for the state of New Jersey, including lower congestion and pollution, and lower greenhouse gases. From the perspective of local municipalities, such development is assumed to be associated with higher fiscal and traffic burdens than lower-density development. However, the results of this study suggest those local burdens are significantly lower than has been conventionally assumed.

In July 2009, Daniel Chatman joined the faculty of Department of City and Regional Planning at the University of California, Berkeley.

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APPENDICES

APPENDIX 1. ELITE INTERVIEW QUESTIONNAIRE

Barriers to transit-oriented development Study

Task 1 Key Interviews

Name: _____

Title: _____

Date: _____

1. What do you think are the major barriers to building housing and mixed-use development in downtown areas, particularly near transit? (Indicate rank: 1–6)

_____parking issues

_____fear of increased traffic

_____fear of school children

_____lack of political will

_____fear of density

_____other (explain)

2. Can you give some examples in New Jersey where these barriers prevented housing and/or commercial development from being built?

3. Can you give some examples in New Jersey where these barriers were surmounted? How was this accomplished?

4. There have been various ways to meet parking demand in downtown areas near transit, including:

- surface parking
- structured parking
- shared parking
- shuttle service from remote lots
- on street parking
- combination/other

Which of these options do you feel SHOULD be used for:

a. shoppers
b. commuters
c. residents who live in the downtown area
d. office workers or retail personnel

For Developers only:

a. Do local requirements affect your development decisions (where, how much, what kind)?
b. How much parking would you provide if you did not have parking requirements (per residential unit, per sq ft of commercial space)? Or would you provide as much as you do now regardless of requirements?
c. If the parking requirement does make you provide more parking than you would otherwise, can you estimate how much extra cost per unit the requirement adds?
d. Have you ever “uncoupled” the price of housing from the price of parking? Where?

Other comments _____

STRUCTURED INTERVIEW LIST

List of interview respondents

Three main groups of players were identified: developers, municipal officials and other professionals including planners, land use attorneys, transit agency personnel, and researchers. Two criteria were used to determine developers contacted. As a group they are responsible for a large portion of the development near transit stations in New Jersey. They also embody a variety of product configuration, design and size. These developers are well experienced and value the relationship between mass transportation and housing. The municipal officials selected are keenly aware of problems associated with redevelopment that calls for density and structured parking. They have experience reacting to residents' concerns and represent a variety of towns in size, income, and geography. In addition, a number of other professionals were contacted. These professionals represent a cross-section of entities calling for policies that support smart growth, transit-oriented development, and housing affordability. They have written articles, spoken publicly, or participated in legal and judicial settings. Their role is to bring the public and private sectors together to affect more and better transit-oriented development.

<u>Developers</u>

Jeff Nadell, former Director of northeast regional urban development, K. Hovnanian Homes
Hovnanian is a national builder that designs, constructs, and markets a variety of for-sale housing. The company has built 427 residential communities in 19 states. Hovnanian is listed on the NYSE and ranks among the largest homebuilding companies in the U.S., with total revenues of $6.1 billion on 20,201 home deliveries in fiscal 2006. [6] Corporate headquarters are located in Red Bank, NJ. Local transit-oriented projects include: The Bindery in East Rutherford (MNBN), Port Imperial (HBLR), K. Hovnanian at Paulus Hook, and 77 Hudson, Jersey City (HBLR), and designated developer of the Matawan Transit Village. Mr. Nadell is now the Senior Director for Real Estate and Economic Development at NJ TRANSIT.

John Taikina, Director, planning & development, Garden Homes/North Brunswick TOD Associates, LLC
Garden Homes/North Brunswick TOD Associates, LLC is engaged in a large redevelopment project in central New Jersey, commonly known as the Johnson & Johnson North Brunswick Campus. This is a 212-acre site bounded by US Route 1, Commerce Road, and the Northeast Corridor Passenger Rail Line. The developers have proposed a transit village concept that includes the potential for a new station.[7]

[6] http://www.khov.com/Home/IR/CorporateSummary/CorporateSummary.htm?Brand=KHV
[7] See http://www.ourtowncenter.info/index.html

Ian Jones, Vice President, Baker Residential
Baker Residential is a large national building company that has achieved success in South Amboy, a designated Transit Village with a blue-collar history on the Atlantic Coast Line. Baker defied conventional thinking by creating upscale waterfront neighborhoods, Lighthouse Bay and Harbor Village, on an old landfill created from dredging the Raritan Bay in the 1970s. These developments are a mix of large townhomes and single-family detached units on small lots. Waterfront parcels sell for more than $1 million. At the time of the interview, Baker was building a townhome project known as Beacon Pointe, located a short walk from the train station.

Anthony Marchetta, Vice President, LCOR Incorporated
LCOR is a real estate investment and development company specializing in complex urban development, including large-scale multifamily residential, commercial, and mixed-use properties. LCOR is principally focused in the eastern United States where it has done several major transit-oriented developments, notably: Gaslight Commons in South Orange, NJ, a designated Transit Village, and Bank Street Commons Apartments in White Plains, NY, which features 500 luxury residential housing units in two towers located within a 3-minute walk of the Metro-North Railroad station. At the time of the interview, LCOR was currently working on several high profile transit-oriented development projects. These included a project on a 32-acre site at the White Flint Metrorail Station in North Bethesda, Maryland and a public/private partnership with NJ TRANSIT redevelopment of the historic Hoboken Terminal in Hoboken, NJ.[8]

Municipal Officials

Edmund O'Brien, former Mayor, Metuchen (Transit Village)
While Metuchen has promoted a pedestrian friendly downtown, approved several compact development projects including Franklin Square and Central Square, it continues to struggle to determine how to best use its large surface parking areas located in the central business district, adjacent to the train tracks.

James Maley, Mayor, Collingswood (Transit Village)
Collingswood is a designated Transit Village, ten minutes from Philadelphia on PATCO. The town recently approved plans for 900 new housing units in compact developments at three sites near the River Line. The first, which is being built on a former lumberyard, is under construction.

Shing-Fu Hsueh, Mayor, West Windsor
West Windsor harbors the Princeton Junction Station on the Northeast Corridor line, which is served by NJ TRANSIT and Amtrak. The town was recently considering a "transit village" concept to replace the large parking areas surrounding the station. The redevelopment plan for Princeton Junction Station area was adopted in March 2009.

[8] See http://policy.rutgers.edu/vtc/tod/newsletter/vol1-num2/article_marchetta.html

Kathleen Prunty, director, Cranford Downtown Management Corporation (Transit Village)
Ms. Prunty has advocated for compact, mixed-use development with structured parking on underutilized property proximate to the train station. Two redevelopment areas were designated and at the time of the interview, the first, Cranford Crossing, was about to open. More recently, the success at Cranford Crossing has spurred on work at Riverfront project, a three-acre site located between the Cranford Station and the Rahway River.

Other Professionals

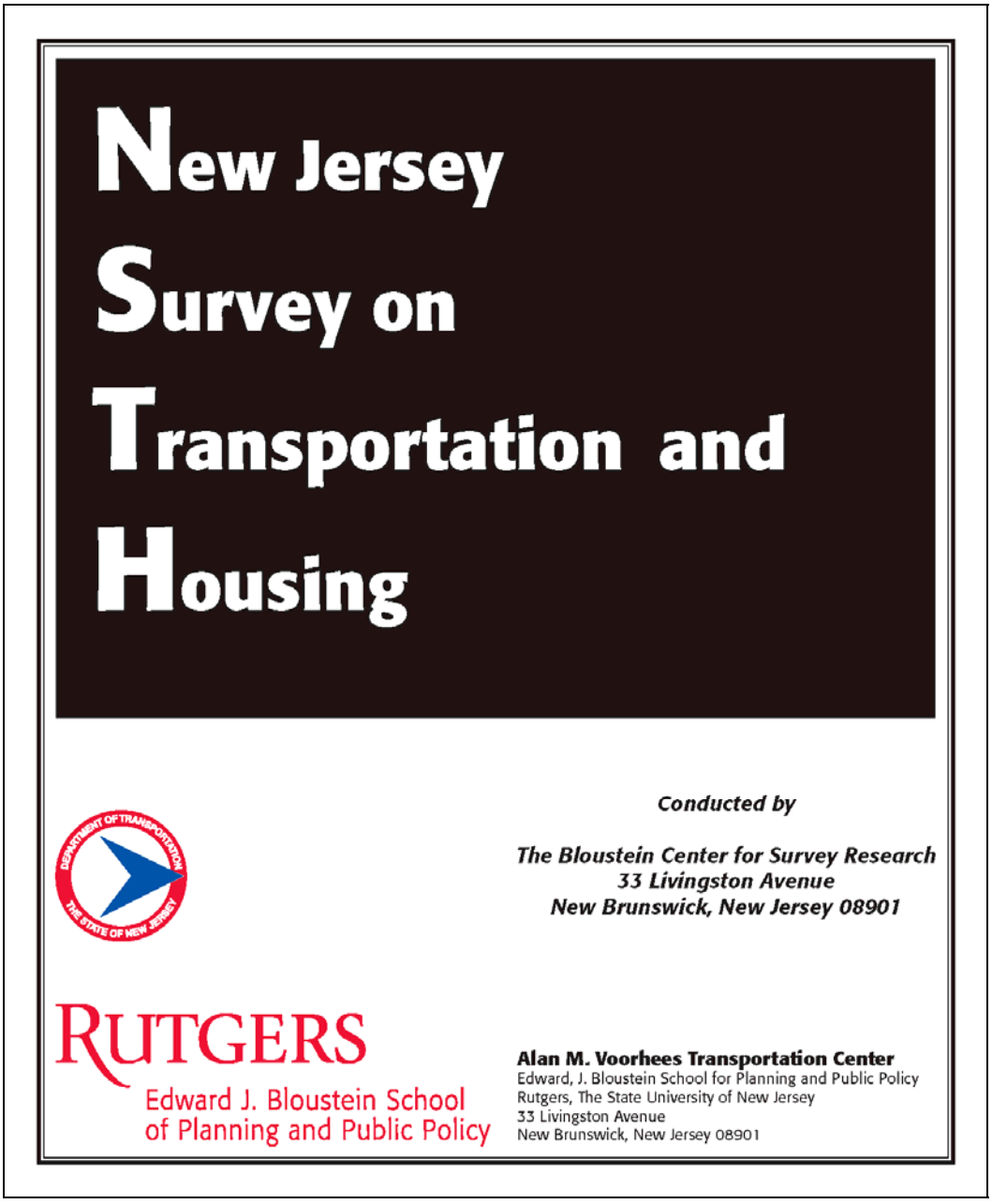
Robert Goldsmith, Attorney, Greenbaum Rowe Smith & Davis, LLP
Mr. Goldsmith is a specialist in parking financing issues and works with both developers and municipalities, particularly in Morristown, on public/private partnerships for structured parking facilities.

Stephen E. Barcan, Attorney, Wilentz Goldman & Spitzer
Mr. Barcan is a land use attorney who works with municipalities and developers on transit-oriented development projects.

George Hawkins, former Executive Director of New Jersey Future
New Jersey Future is a statewide research and policy group that advocates protecting open space and preservation of natural resources, revitalizing neighborhoods, keeping housing affordable, and providing more transportation choices. Mr. Hawkins was the director of New Jersey Future when he was interviewed and has since left the organization.

John Rahenkamp, Consulting Land Planner, Delanco, NJ
Mr. Rahenkamp has extensive experience with development issues in South Jersey.

APPENDIX 2. SURVEY QUESTIONNAIRE



Informed Consent

The Alan M. Voorhees Transportation Center (VTC) at Rutgers, The State University of New Jersey is conducting a study on the effect of transit accessibility on household configuration. The goal of this research is to identify household characteristics of those who live near transit stations and factors that affect residential location choice. Roughly 5,000 households will be asked to take part in this study.

This mail survey will take less than 15 minutes to complete. You will be asked about your household and your assessment of conditions near transit stations. Answering any or all of these questions is voluntary. You may refuse to answer any of the questions and you may stop the survey at any time.

This research is anonymous. Anonymous means that VTC will record no information about you that could identify you. This means that VTC will not record your name, address, phone number, date of birth, etc. If you agree to take part in the study, you will be assigned a random code number that will be used on each test and the questionnaire. Your name will appear only on a list of subjects, and will not be linked to the code number that is assigned to you. Your address will be kept separate from your survey responses. We will not associate your name with any of the responses you give and your address and other facts that might identify you will not appear when we present this study or publish its results, which will be published in aggregate form only. There will be no way to link your responses back to you. Therefore, data collection is anonymous.

There are no known risks to participating in this study. Although you will get no direct benefit from being a part of this study, your participation will help transportation and economic development professionals better understand the effects of transit improvements on the local economy. The results will be shared with the New Jersey Department of Transportation and NJ TRANSIT. The research team, the New Jersey Department of Transportation, NJ TRANSIT and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. All study data will be kept for three years.

If you have any questions about how the study works, you can contact Dr. Daniel Chatman, Research Director of the Alan M. Voorhees Transportation Center, Edward J. Bloustein School of Planning and Public Policy, Rutgers University, 33 Livingston Avenue, New Brunswick, NJ 08901 at 732-932-3822 x724 or by email at chatman@rci.rutgers.edu. If you have any questions about your rights as a research subject, you may contact the IRB Administrator at Rutgers University at:

Rutgers, The State University of New Jersey
Institutional Review Board for the Protection of Human Subjects
Office of Research and Sponsored Programs
3 Rutgers Plaza
New Brunswick, NJ 08901-8559
Tel: 732-932-0150 x2104
Email: humansubjects@orsp.rutgers.edu

Yes, I consent to take this survey. If so, please initial here, and proceed to the next page:_____

No, I do not consent to take this survey. If so, please return blank survey in the prepaid envelope provided.

2

START HERE:

Please tell us about your household

1. **Including yourself, how many people live in your household?** ***[Fill in number]***

___ number of people

2. **How many children in your household attend the following?** ***[Fill in number]***

___ Public school
___ Private or parchocial school
___ Home school

○ No children
○ No children attending school

3. **How many motorized vehicles are available for use by members of your household? Please be sure to include motorcycles, mopeds and RVs.** ***[Fill in number]***

___ number of vehicles

Please tell us where you live

4. **Do you live in a ....** ***[Check one]***

○ Detached single-family house
○ Duplex or triplex
○ Row-house or townhouse
○ Apartment or condominium
○ Mobile home or trailer
○ Other _____

5. **What year did you move to your current home?**

_____ year

6. **Where did you live 5 years ago?**

Town: _____ County: _____ State: _____ Country: _____

3

7. About when was your house or building first built? *[Check one]*

- ○ 2005 to 2007
- ○ 2000 to 2004
- ○ 1995 to 1999
- ○ 1990 to 1994
- ○ 1980 to 1989
- ○ 1970 to 1979
- ○ 1960 to 1969
- ○ 1950 to 1959
- ○ 1949 or earlier
- ○ Don't Know

8. People's reasons for selecting a new neighborhood may be different from their reasons for choosing a particular home. Please rate the top 3 factors that attracted you to this NEIGHBORHOOD.
[Rank 1, 2, and 3, please]

Example: 2 *Factor one*
3 *Factor two*
1 *Factor three*

___ Convenient to friends or relatives
___ Convenient to leisure activities
___ Convenient to job
___ Convenient to public transportation
___ Good schools
___ Other public services
___ Looks/design of neighborhood
___ Distance to school
___ Distance to shops, services
___ Distance to highway
___ House was an important consideration
___ Other _____

4

Please tell us about how you travel

9. The last three times you went to the grocery store, when and how did you travel? If you used more than one method of transportation during the trip, mark the box of the one used for most of the distance.

Trip 1	Trip 2	Trip 3
When? ***[Check one]***	When? ***[Check one]***	When? ***[Check one]***
○ Never	○ Today	○ Today
○ Today	○ Yesterday	○ Yesterday
○ Yesterday	○ _____ days ago [Fill in]	○ _____ days ago [Fill in]
○ _____ days ago [Fill in]		
How? ***[Check one only]***	How? ***[Check one only]***	How? ***[Check one only]***
○ By car, truck or van	○ By car, truck or van	○ By car, truck or van
○ By train or light rail	○ By train or light rail	○ By train or light rail
○ By bus	○ By bus	○ By bus
○ Walked	○ Walked	○ Walked
○ Other: _____ *[Please specify]*	○ Other: _____ *[Please specify]*	○ Other: _____ *[Please specify]*

10. The last three times you went out to get a meal or snack, when and how did you travel? If you used more than one method of transportation during the trip, mark the box of the one used for most of the distance.

Trip 1	Trip 2	Trip 3
When? ***[Check one]***	When? ***[Check one]***	When? ***[Check one]***
○ Never	○ Today	○ Today
○ Today	○ Yesterday	○ Yesterday
○ Yesterday	○ _____ days ago [Fill in]	○ _____ days ago [Fill in]
○ _____ days ago [Fill in]		
How? ***[Check one only]***	How? ***[Check one only]***	How? ***[Check one only]***
○ By car, truck or van	○ By car, truck or van	○ By car, truck or van
○ By train or light rail	○ By train or light rail	○ By train or light rail
○ By bus	○ By bus	○ By bus
○ Walked	○ Walked	○ Walked
○ Other: _____ *[Please specify]*	○ Other: _____ *[Please specify]*	○ Other: _____ *[Please specify]*

5

11. The last three times you went to visit friends or relatives, when and how did you travel? If you used more than one method of transportation during the trip, mark the box of the one used for most of the distance.

Trip 1	Trip 2	Trip 3
When? ***[Check one]***	When? ***[Check one]***	When? ***[Check one]***
○ Never	○ Today	○ Today
○ Today	○ Yesterday	○ Yesterday
○ Yesterday	○ _____ days ago [Fill in]	○ _____ days ago [Fill in]
○ _____ days ago [Fill in]		
How? ***[Check one only]***	How? ***[Check one only]***	How? ***[Check one only]***
○ By car, truck or van	○ By car, truck or van	○ By car, truck or van
○ By train or light rail	○ By train or light rail	○ By train or light rail
○ By bus	○ By bus	○ By bus
○ Walked	○ Walked	○ Walked
○ Other: _____ *[Please specify]*	○ Other: _____ *[Please specify]*	○ Other: _____ *[Please specify]*

Please tell us about work

12. Last week, did you work...? *[Check one]*

○ Full time
○ Part time
○ Did not work - **Please Skip to Question 16**
○ Retired - **Please Skip to Question 16**

13. How did you usually get to work LAST WEEK? If you used more than one method of transportation during the trip, mark the box of the one used for most of the distance. *[Check one]*

○ Personal vehicle (car, van, SUV, truck or motorcycle)
○ Bus
○ Train
○ Light rail or subway
○ Taxicab
○ Bicycle
○ Walked
○ Other, please specify: _____
○ Worked at home

14. If you took a personal vehicle to work last week, how many people, including yourself, rode in the vehicle?

_____ people (including yourself)

○ Did not take a personal vehicle

6

15. Do you pay for parking at work? ***[Check one]***

○ Yes
○ No - **Please Skip to Question 16**

15a. How much do you pay? $ _____

○ Per day
○ Per month
○ Per year

Please Check One

Please tell us about your use of trains and buses

16. Do you ride trains or use the bus? ***[Check one]***

○ Yes
○ No - **Please Skip to Question 21**

17. Do you use trains or buses to avoid traffic congestion? ***[Check one]***

○ Yes
○ No

18. How often do you travel by... ***[Check one for each]***

	Every Workday	Few Times a Week	Once a Week	Once a Month	Occasionally	Rarely	Never
Train	○	○	○	○	○	○	○
Bus	○	○	○	○	○	○	○

19. When you use the train or bus, how do you <u>usually</u> get to the station or stop? ***[Check one]***

○ Personal vehicle (car, van, SUV, truck or motorcycle)
○ Bus
○ Train
○ Light rail or subway
○ Taxicab
○ Bicycle
○ Walk
○ Other, please specify: _____

7

20. If you drive to the station, do you park? ***[Check one]***

○ Yes
○ No - **Please Skip to Question 21**
○ Do Not Drive - **Please Skip to Question 21**

20a. How much do you pay? $ _____

Please Check One

○ Per day
○ Per month
○ Per year
○ Do not pay for parking

Please tell us about parking in your neighborhood

21. How many off-street parking spaces are available exclusively for your household? Include your garage and driveway. ***[Check one]***

○ None
○ One
○ Two
○ Three
○ Four
○ Five or More

22. When you are home, where do you park your vehicle(s)? ***[Check all that apply]***

□ Private garage
□ Driveway
□ Parking lot
□ Carport
□ On-street
□ Parking deck
□ Don't own a vehicle

23. When visitors drive to your home, where do they park? ***[Check all that apply]***

□ Private garage
□ Driveway
□ Parking lot
□ Carport
□ On-street
□ Parking deck

24. How far away from your home do you <u>usually</u> park your vehicle(s)? *[Check one]*

- ○ In private driveway/garage
- ○ On street or parking lot less than 100 yards (a football field) away
- ○ On street or parking lot more than 100 yards, but less than ¼ mile away
- ○ More than ¼ mile away
- ○ Don't own a vehicle

25. How often do you have difficulty finding a parking space near your home? *[Check one]*

- ○ Never
- ○ Once a month
- ○ Once or twice a week
- ○ Daily

Please tell us how you feel about your neighborhood

26. How many floors should the tallest building on your block be?

_____ floors

○ Don't Know

27. How would you feel about the following changes to your neighborhood... *[Check one for each]*

	Strongly Support	Somewhat Support	Somewhat Oppose	Strongly Oppose
a. the replacement of buildings in your neighborhood with taller buildings?	○	○	○	○
b. the construction of a new mixed-use building (retail, office and residential) taller than existing buildings in your neighborhood?	○	○	○	○
c. the construction of a new mixed-use building near the rail station that is taller than existing buildings?	○	○	○	○

28. Please indicate your agreement or disagreement with the following statements ***[Check one for each]***

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
a. "I feel safe walking in my neighborhood during the day."	○	○	○	○
b. "I feel safe walking in my neighborhood at night."	○	○	○	○
c. "Traffic congestion is a problem around my home."	○	○	○	○
d. "Parking is a problem in my neighborhood."	○	○	○	○
e. "The children who attend public schools in my neighborhood receive a quality education."	○	○	○	○

Please tell us about yourself

29. Please indicate how many people in your household, including yourself, are in each of the following age categories. ***[Fill in number]***

___ Under 5 years
___ 5 to 13 years
___ 14 to 17 years
___ 18 to 24 years
___ 25 to 34 years
___ 35 to 49 years
___ 50 to 64 years
___ 65 to 74 years
___ 75 years or older

30. Is your house, apartment, or mobile home... ***[Check one]***

○ Owned by you or someone in your household with a mortgage or loan?
○ Owned by you or someone in your household free and clear (without a mortgage or a loan)?
○ Rented for cash rent?
○ Occupied without payment of cash rent?

10

31. Which of the following best describes your current primary occupation? If none of these apply, please write in your occupation on the last line. *[Check one]*

- ○ Accounting/financial
- ○ Clerical/secretarial
- ○ Manager/administrator
- ○ Craftsman
- ○ Laborer
- ○ Sales
- ○ Service
- ○ Professional
- ○ Not currently employed
- ○ Retired
- ○ Other, please specify_____

32. So we can be sure we are getting a cross-section of all people, please estimate your household's total annual income for 2008. By "total," we mean adding together the annual income of everyone in your household. Which of the following categories does it fall in? *[Check one]*

- ○ Less than $10,000
- ○ $10,000 to less than $15,000
- ○ $15,000 to less than $25,000
- ○ $25,000 to less than $35,000
- ○ $35,000 to less than $50,000
- ○ $50,000 to less than $75,000
- ○ $75,000 to less than $100,000
- ○ $100,000 to less than $150,000
- ○ $150,000 to less than $200,000
- ○ $200,000 to less than $250,000
- ○ $250,000 or more
- ○ Don't know

33. Which race or ethnicity best describes you? *[Check one]*

- ○ White Hispanic
- ○ Black Hispanic
- ○ White not Hispanic
- ○ Black not Hispanic
- ○ Asian
- ○ Native American

Thank you for completing the survey!

Please return survey in the prepaid envelope provided. 11