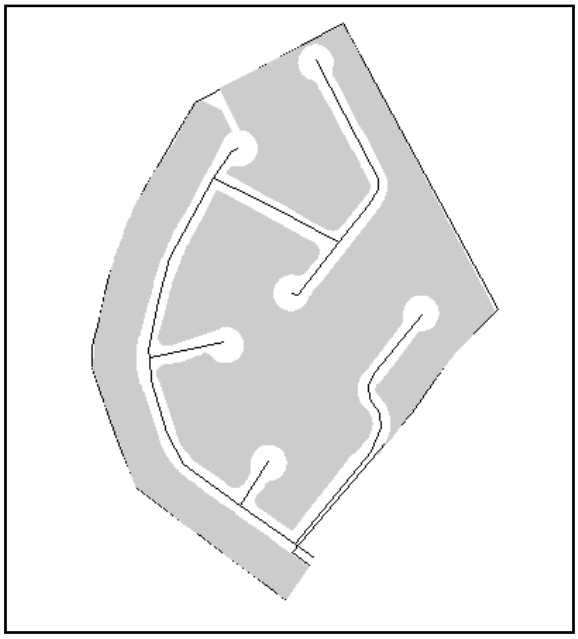
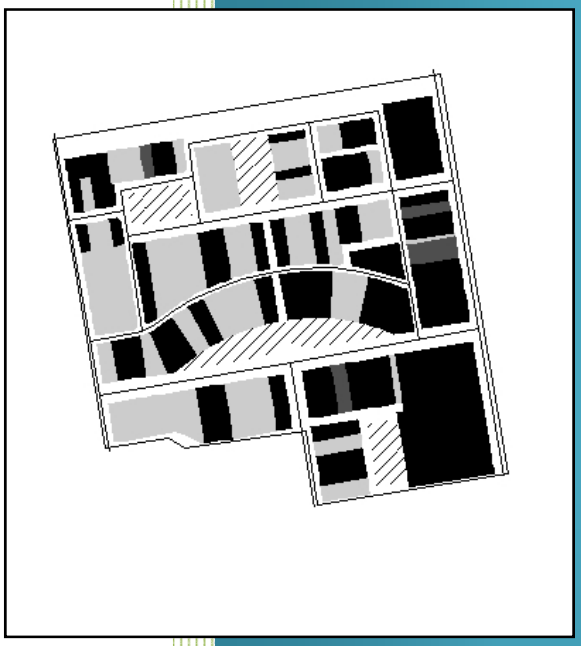
Travel Behavior, Residential Preference, and Urban Design: A Multi-Disciplinary National Analysis





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Contents

SUMMARY

The prevalence of and the support for neo-traditional developments (NTDs) in the U.S. has grown over the years, and NTD proponents have long emphasized the development paradigm's ability to alter travel behavior, reduce dependence on motorized vehicles, and foster social capital among its residents. However, little is known nationally about the actual travel behaviors and social relationships of residents in these neighborhoods, relative to residents of typical suburban neighborhoods. This report summarizes the findings of a national project to examine the travel behavior and social capital of residents of NTDs. We compare survey results from residents of matched pairs of neighborhoods in seventeen U.S. cities and towns, with each pair comprised of one NTD and one typical suburban neighborhood of similar size, age, and socio-demographic composition. The matched-pair design controls for differences in local policies, values, and priorities across cities. The study addresses salient themes in the transportation, planning and health literatures: a national study, surveying populations of diverse incomes, collecting resident information on preferences for and attitudes towards neighborhood qualities, and addressing transportation and health outcomes for diverse community designs.

We found no significant differences in residents' reports of neighborhood social capital between neo-traditional and typical suburban neighborhoods. We conclude that, in suburban environments, demographic differences between residents of each neighborhood type, and not the characteristics of the development, account for variation in neighborhood social capital.

We found that residents of NTDs neighborhoods make more trips, more car trips, more non-motorized trips, and more trips internal to their neighborhood than residents of typical suburban neighborhoods. We found no difference in vehicle mileage, and thereby conclude that trips taken by NTD residents tend to be shorter in length than trips taken by their suburban counterparts. Furthermore, we did not find a statistical difference between neighborhood type residents in the frequency of external trips. This suggests that the difference in overall trips detected is the result of greater internal trip capture by the NTDs.

Additionally, we found that there is something unique about NTDs beyond their connectivity to other roads, density, retail access, and commercial land uses that explains the additional trip-making by its residents. It may be that parcel design guidelines (e.g., short setbacks and back alleyways), intersection and roadway design, or sidewalk connectivity contribute to the increase in trip-making in NTDs. For non-motorized trips, however, differences in density and retail access accounted for most of the differences across neighborhoods. A simulation suggested that residents of a neighborhood on the high end of the scale in terms of connectivity, residential density, and commercial activity will make almost four times more non-motorized trips than residents of neighborhoods at the low end of the scale. Developers and planners will take interest in the findings contained in this report. Further research will determine whether these relationships are causal.

I. INTRODUCTION

Unlike typical suburban developments, neo-traditional or new urbanist developments combine design features that are believed to support walking, neighborhood cohesion, and sense of community. Much has been said about the behavioral patterns of neo-traditional developments (NTDs) residents. Among others, studies have focused on NTDs' impact on sense of community (Brown and Cropper, 2001), residents' interaction (Lund, 2003); (Handy et al., 2006), the environment (Berke et al., 2003), physical activity (Rodriguez et al., 2006), obesity (Brown et al., 2008), vehicle ownership (Cao et al., 2007a; Cao et al., 2007b) and travel patterns (Boarnet and Crane, 2001; Cao et al., 2009; Handy et al., 2006; Khattak and Rodriguez, 2005; Lee and Ahn, 2003).

The number of NTDs in the U.S. has grown over the years. Using a national average household size of 2.60 persons from the American Community Survey, Stevens (2008) estimated that approximately 743,000 people reside in NTDs that were completed or under construction, and another 713,000 will occupy projects that are in the planning stage. From 1998-2004, the number of neo-traditional design projects of 15 acres or more, completed or under construction, has increased by at least 20 percent per year (Steuteville 2004). Support for these neighborhoods is also growing, particularly due to the fact that they allow residents to bike and walk to destinations such as shopping, work, and public transportation (Handy, Sallis et al., 2008).

Despite the growing popularity of NTDs, most research examining their impacts is confined to a handful of neighborhoods or a single geographic area. This limits the ability to make general statements about the overall impacts of the NTDs. Similarly, there are unanswered questions about whether specific characteristics of neighborhoods, such as density or street connectivity, are responsible for the behavioral differences observed between residents of neo-traditional and typical suburban neighborhoods, or whether the package of neighborhood characteristics is responsible for the differences. Finally, anecdotal evidence suggests that the siting of neighborhoods vis-à-vis existing development (for example, greenfield development versus infill) is important in explaining residents' perceptions and behavior. Preliminary LEED-ND guidelines support this view even though there is little empirical evidence to support the guidelines.

This report summarizes the findings of a national project to examine the travel behavior and social capital of residents of NTDs relative to residents of typical suburban developments. We use a matched-pair research design of seventeen cities across the US, thereby controlling for differences in local policies, values, and priorities across cities. The study addresses salient themes in the transportation, planning and health literatures: a national study, surveying populations of diverse incomes, collecting resident information on preferences for and attitudes towards neighborhood qualities, and addressing transportation and health outcomes for diverse community designs.

II. PREVIOUS RESEARCH AND STUDY QUESTIONS

We review existing literature of neighborhood studies with respect to our two outcomes of interest: travel behavior and social capital. Although there is a broader literature relating urban form to travel (for recent reviews see Owen et al., 2004; Saelens and Handy, 2008; Wendel-Vos

et al., 2007) we focus here exclusively on neighborhood studies. Because of the paucity of neighborhood studies examining social capital we include other non-neighborhood studies here as well.

Neighborhood studies and travel behavior

A number of studies have compared travel patterns of residents in neighborhoods that support walking and those that do not support walking, while matching the neighborhoods on other characteristics such as regional accessibility and residents' income (for a review see: Ewing and Cervero, 2001; Saelens, Sallis, and Frank, 2003). To the extent that the neighborhoods embody key differences in the built environment, this research design provides whole comparison across neighborhoods, allowing for the interaction among individual built environment elements.

The evidence from other neighborhood-based studies focusing on travel patterns suggests that the share of trips that are taken by pedestrian and bicycle modes for multiple trip purposes, and the raw number of these non-motorized trips, is higher in neighborhoods defined a priori as walkable than those that are not walkable (Cervero and Gorham, 1995; Cervero and Radisch, 1995; Dill, 2004; Friedman et al., 1994; Handy et al., 2006; Handy and Clifton, 2001; Kitamura et al., 1997; Rutherford et al., 1996) but no difference in travel for recreation or leisure was detected in the three studies that examined this (Handy, 1992, 1996; Rodriguez et al., 2006). Consistent with the findings of Saelens et al., (2003), it seems that travel for errands is the source of overall differences in non-motorized transport for travel between high- and low-walkable neighborhoods.

While studies of NTDs indicate that residents of those neighborhoods actually make more total trips per day than residents of typical suburban developments, there is agreement that these trips are shorter and that many auto trips are substituted for walking trips (Cao, 2009; Rodriguez et al., 2006; Khattak & Rodriguez, 2005; Limanond & Niemeier, 2004). Additionally, households in NTDs make fewer external trips (Khattak & Rodriguez, 2005; Limanond & Niemeier, 2004), having a greater ability to stay within the neighborhood to purchase goods and services to meet the majority of their daily needs.

A prominent limitation of prior research is the reliance on cross-sectional data. This restricts the ability to make causal statements about the relationships identified. Paired-neighborhood research designs improve researcher's ability to make causal statements, but questions remain about the extent to which differences in behavior of residents of NTDs relative to residents of typical suburban neighborhoods are the result of a sorting process in the residential land market. In such sorting process, households with preferences for walkable environs and for high local accessibility to varied land uses would be more prone to locate in specific neighborhoods that meet those preferences. To date, most studies conclude that self-selection, as the sorting process is known, is responsible for some of the variation in behavioral differences, but that the built environment still exerts an important influence on behavior (Cao et al., 2006, 2009; Handy et al., 2006; Handy, Cao et al., 2008; Khattak and Rodriguez, 2005; Krizek, 2003). Furthermore, after accounting for self-selection, design concepts present in NTDs, such as concentrated activities and land use mixing, do not increase the substitution of transit for car trips, although they do increase walking substitution for car trips (Cao et al., 2009; Greenwald, 2003).

More importantly, the directionality of the impact of self-selection is ambiguous. It may be that ignoring self-selection results in an underestimate, not an overestimate, of the impacts of the built environment on behavior. Ultimately, the question of whether self-selection biases the relationship between environment and behavior becomes a matter of scientific interest with limited practical relevance. Self-selection concerns should not obscure the fact that it is the way through which many of the desired effects of neighborhood design and behavior take place. Absent the NTD, and given a shortage of neighborhoods with similar characteristics (as suggested by (Levine, 2005; Morrow-Jones et al., 2004), options for those who now choose such neighborhoods would be limited to typical suburban neighborhoods.

Another concern with prior studies is their limited geographic scope. The majority of neighborhood studies examining travel behavior have been conducted in northern California, Texas, or the central area of North Carolina (Cervero and Radisch, 1995; Handy et al., 2006; Handy and Clifton, 2001; Rodriguez et al., 2006). These studies were first to uncover and examine important relationships, but given variations in how NTDs are designed, it is likely that prior results reflect the influence of local factors in addition to neighborhood design factors of more general interest.

Social capital and urban form

The links between physical planning and neighborhood social relations has been the subject of research and debate since the work of the Chicago School in the 1920s and 30s (Park, et al., 1925). For example, Park's dictum stated that "social relations *are* spatial relations" (Massey, 2001, emphasis in original). Freeman (2001) identified two conflicting theoretical perspectives on the relationship between neighborhood form and social relations. The first, which he primarily identified with Jane Jacobs and more recently the New Urbanists, asserts that "mixed land uses and pedestrian-friendly streets [lead] to an enhanced sense of community in a neighborhood" (Freeman, 2001). In contrast, much work in physical planning has focused on the deleterious effects of high densities on social ties among neighbors. For example, the garden cities movement sought to house people at more moderate densities and create a stable social environment.

More recently, the debate on the relationship between space and social processes has focused on the claims of New Urbanists that the design of a neighborhood can engender a sense of community (Katz, 1994). In her description of the social goals of new urbanism, Talen (1999) notes that "New urbanists attempt to build a sense of community, broadly defined, via two avenues: integrating private residential space with surrounding public space; and careful design and placement of public space" (p. 1363). While none of 27 principles in the *Charter of the New Urbanism* focus solely on building community, several of the principles are justified based on their contribution to community (Talen, 2002). For example, Principle 13 emphasizes the importance of diversity to create an "authentic community" and Principle 23 encourages walkable streets to "enable neighbors to know each other and protect their communities" (Talen, 2002).

Empirical investigations of this issue have used many definitions of neighborhood social relations (Lochner, et al., 1999; McNeill, et al., 2006). Most prominent have been qualitative metrics of "sense of community", counts of strong ("confidants") and weak ("acquaintances")

ties within the neighborhood, and measures of interaction among neighbors. For example, Appleyard (1981) analyzed social interactions on three similar San Francisco streets that varied in the level of automobile traffic and found a negative correlation between traffic and social interactions. Other studies have focused more broadly and compared levels of social interaction in cities and suburbs. For example, Freeman (2001) found no relationship between residential population density and neighborhood social ties for residents of Atlanta, Boston, and Los Angeles.

The limited research explicitly looking at differences in social capital between new urbanist and typical suburban communities has focused on qualitative measures of sense of community. Nasar and Julian (1995) developed a 15-item scale measuring neighborhood sense of community with questions such as "My friends in this neighborhood are part of my everyday activities" and "I have no friends in this neighborhood on whom I can depend." Using this scale, Nasar (Nasar, 2003) found no association between sense of community and whether a respondent lived in a traditional town (meant to proxy for a new urbanist community) or typical suburb in Ohio. Brown and Cropper (Brown & Cropper, 2001) used a different sense of community scale and found no differences in sense of community between residents of a new urbanist community and standard suburban subdivisions in Salt Lake City.

Implications and emerging questions

Neighborhood studies on travel behavior and neighborhood type have revealed that residents of NTDs walk more, make more trips overall, but travel shorter distances by car, even after attempts to control for self-selection. Similarly, there is evidence of substitution of walking trips for driving trips, a result also consistent with data from developments that mix land uses. However, small samples and a restricted geographic coverage raises question about the ability to make solid statements useful for planners and developers. For social capital, advocates of new urbanism suggest that levels of social interaction and sense of community should be higher in neo-traditional communities. However, there has been no empirical investigation of differences using national samples. Therefore, the first emerging question is whether travel and social capital patterns identified in local and regional neighborhood studies are replicated in the current national study.

Surprisingly, no neighborhood studies that we know of examine whether specific design attributes are more important than others in explaining travel behavior, or whether it is the collection of attributes embodied in NTDs what explains behavioral differences with residents of typical suburban neighborhoods. In other words, for the travel benefits to materialize, is the entire NTD package required or do developers have latitude in exploring different design options for some neighborhood characteristics? The literature is replete with studies examining specific attributes of the built environment and their relationship to travel patterns. Reviews (e.g., Saelens and Handy, 2008; Wendel-Vos et al., 2007) suggest that density, mixed uses, and pedestrian supports are related to more walking. Recent studies confirm the importance of residential density (Lee & Moudon, 2006a; Lee & Moudon, 2006b; Moudon et al., 2006; Ritsema van Eck et al., 2005; Rodriguez et al, In press), the presence of retail stores (Badland & Schofield, 2005; Rodriguez et al In press, Handy et al 2006 JAPA; Lee & Moudon, 2006a; Moudon et al., 2006), and route directness to schools, daily retail, and groceries (Lee & Moudon, 2006a; Moudon et al., 2006) for walking behavior.

Accordingly, a second emerging question is whether the provision of key attributes *together*, such as high residential density with retail spaces and street connectivity, suffices to support pedestrian activity more than when the attributes are provided independently. In other words, are there synergistic and interactive effects among these attributes that benefit pedestrian activity? A third emerging question is whether these attributes (individually or collectively) suffice for pedestrian supports, or whether other attributes present in NTDs, such as building design and setbacks also contribute to the walkability of the neighborhood.

The limited number of neighborhoods included in previous research might also help explain the paucity of research examining whether greenfield NTDs have different travel (and perhaps social) impacts than infill NTDs. Non-neighborhood studies relying on cross-sectional surveys have found that the location and regional connectivity of the neighborhood with respect to other activity centers in the area is critical in explaining observed travel patterns (Cervero and Kockelman, 1997; Ewing, 1995; Ewing and Cervero, 2001; Kasturi et al., 1998). Buliung and Kanaroglou (2006) found that urban households, which might be expected to have higher levels of accessibility, have less daily travel and smaller activity spaces than suburban households. Similarly, Fan et al (In press) found that households in high density areas with mixed uses tended to have smaller activity spaces than households in low density areas with residential uses. Thus, a fourth emerging question is whether the impacts of NTDs on travel behavior are influenced by whether the neighborhood is infill or greenfield development.

III. HYPOTHESES

Travel behavior and urban form

Building on the literature reviewed and the emerging questions, this section summarizes the hypotheses of our study. We focus on two aspects of travel behavior: vehicle use and trip-making.

Hypothesis 1: Residents of NTDs drive shorter distances, and make more total trips, more automobile trips, more non-motorized trips, and more trips internal to their neighborhood than residents of typical suburban neighborhoods, after controlling for households' socio-demographic characteristics.

Hypothesis 2: Residents of neighborhoods with high supports for walking (measured as having greater street connectivity, larger commercial areas, higher density, and greater accessibility to retail and services), drive shorter distances, and make more trips, more automobile trips, more non-motorized trips, and more trips internal to their neighborhood than residents of neighborhoods with low supports for walking, after controlling for households' socio-demographic characteristics.

Hypothesis 3: Residents of NTDs make more total trips, more automobile trips, more non-motorized trips, and more internal trips than residents of typical suburban neighborhoods, after controlling for households' socio-demographic characteristics and for walking supports (measured has having greater street connectivity, larger commercial areas, higher density, and greater accessibility to retail and services).

Social Capital

This analysis focused on the relationship between neighborhood design and social capital.

Hypothesis 1: Residents of neo-traditional neighborhoods self-report higher levels of neighborhood social capital as measured by social cohesion and intergenerational closure.

IV. METHODOLOGY

To test the hypotheses, we used a quasi-experimental research design (Shadish, Cook, & Campbell, 2002) by matching neo-traditional neighborhood developments (NTD) with conventional suburban neighborhoods throughout the US. Next we review the selection and pairing of neighborhoods, our primary data collection instruments, main measures, secondary data, and statistical methods used.

Selection of NTDs

The majority of the sites for this study were drawn from lists of planned or completed NTDs published by two popular internet organizations, New Urban News (http://www.newurbannews.com) and The Town Paper (http://www.tndtownpaper.com) during 2006. We excluded neighborhoods in cities with populations less than one thousand or greater than one million (based on U.S. Census 2000 population data), leaving us with a list of 389 NTDs in some phase of development. To identify 'typical suburban' neighborhoods to match with our NTDs, we enlisted the help of staff in local planning and/or development offices. We explained the objectives of the study and asked the staff-member to suggest a typical suburban neighborhood to match against the NTD Staff were given the following criteria to use in identifying the typical suburban neighborhoods:

a. be a fair representation of the intended neighborhood type, based on our definitions and the staff's professional judgment,
b. have been platted and approved after 1980 and within about five years of each other,
c. contain approximately the same number of dwelling units, and have contained at least 100 occupied dwelling units as of January 2006
d. have predominantly year-round, full-time residents, and must not be inherently exclusionary
e. have similar demographics and median housing prices, and if applicable, offer similar quantities of below-market-rate housing.
f. have similar regional context and similar access to public transportation services, major highways, and regionally significant destinations and amenities, and
g. be in the same local political jurisdiction.

Finding suitable pairs of neighborhoods proved difficult, and when we exhausted our initial list, we had only found twelve matched pairs, short of our goal of twenty. Experience suggested that rapidly growing cities and towns were most likely to be undergoing the kinds of development we were seeking. Thus, we created a secondary list comprised of the one hundred fastest growing U.S. mid-size cities and the hundred cities with highest relocation interest (based on real estate turnover), using data from the real estate website http://www.city-data.com for 2007. We contacted planning and development staff in each of these cities and requested TND and typical

suburban neighborhood pairs fitting the above criteria. Nine additional neighborhood pairs were identified through this method.

For all proposed matches we verified the suggested neighborhoods by examining ortho-photographic imagery, neighborhood websites, and when available, local real estate data. We asked the local planner to provide background information on both neighborhoods and to help us obtain current GIS data. To confirm the matches, we conducted GIS analyses to verify that the neighborhoods in each pair were compatible and suitable for our study. In several instances, this further examination revealed information about the neighborhoods or the pairings that made them unsuitable for our study, forcing us to reject them. In the end, a total of seventeen suitable neighborhood pairs for our study, in the cities and towns listed below and shown on the map in Figure 1.

Carlsbad CA
Chula Vista CA
Clackamas OR
Colorado Springs CO
Cumming GA
Davidson NC
Fort Collins CO
Franklin TN
Frederick MD
Gaithersburg MD
Grayslake IL
Irvine CA
Jupiter FL
Longmont CO
Mount Pleasant SC
North Richland Hills TX
Pensacola FL

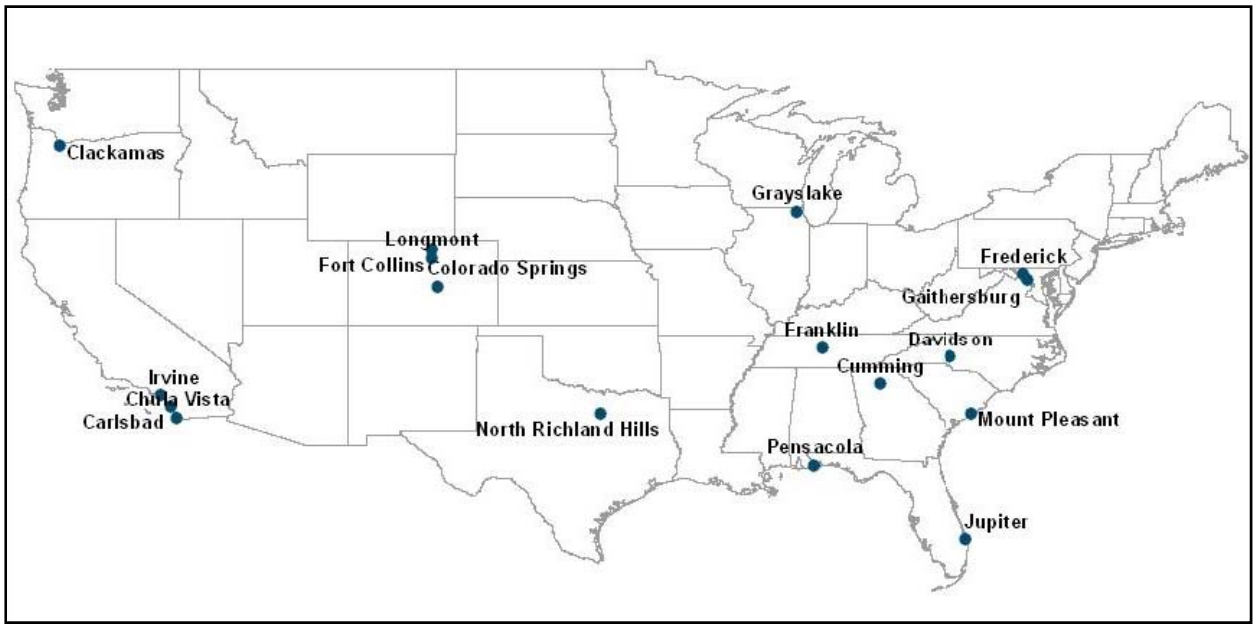

Figure 1. Location of Study Sites

For detailed site plans and descriptive characteristics of each neighborhood pair, see Appendix I.

Survey instrument

We developed and pilot-tested a survey instrument (Appendix II) that collected information on:

- Socio-demographic characteristics
- Vehicle ownership (make, model, and year) and use
- Trip-making behavior
- Physical activity
- Attitudes and preferences towards particular characteristics of neighborhoods

The survey was adapted and expanded from Khattak and Rodriguez (2005). Changes were pilot-tested and final paper surveys were mailed to up to 150 randomly selected single-family households in each study neighborhood.[1] A cover letter explained the purpose of the study and requested that the adult household member with the next birthday complete and return the survey. Respondents that returned completed surveys were entered into a drawing for one of four prizes (winner's choice of either an iPod nano or Roomba 415); this was also explained in the cover letter.

The first one hundred respondents were mailed a follow-up survey, which asked the same information for vehicle ownership and use, physical activity, and selected preferences and attitudes as the first survey (Appendix II). The follow-up survey was used to determine the test-retest reliability of the instrument. In exchange for completing the follow-up survey, respondents were mailed a $10 gift card.

Outcomes

Social Capital

We adapted our measures of social capital from the work of Sampson et al (1997; 1999). Previous research has shown these measures to be significantly associated with rates of neighborhood violence (Sampson, et al., 1997) and low birth weight (Morenoff, 2003). These indices measure an active form of social capital, specifically the likelihood of neighbors to intervene for the common good. This is a more normative approach than is often taken with measures of social interaction.

The first index, "social cohesion and trust," measured the extent of shared values among neighbors and informal social relations among neighbors. Members of a community with high levels of cohesion and trust will be more likely to respond to issues that affect the entire community, such as proposed cuts to public services in a neighborhood (Sampson et al, 1997). Five Likert-scale questions measured social cohesion: "This is a close-knit neighborhood," "People in my neighborhood can be trusted," "People in my neighborhood are willing to help their neighbors," "People in your neighborhood generally do not get along with each other" (reverse coded), and "People in your neighborhood do not share similar values" (reverse coded).

The second index, "intergenerational closure," focuses on connections between children and adults as well as adult interactions that concern children (Sampson et al, 1999, p. 635). High levels of intergenerational closure indicate a supportive environment for families. The intergenerational closure scale combined responses to the following questions: "Parents in my

[1] Our mailing list was compiled by and purchased from CAS (www.cas-online.com). CAS randomly selected 150 single-family households from their database for each of our study areas; in neighborhoods with fewer than 150 mailing addresses available, we mailed surveys to every household.

neighborhood know their children's friends," "You can count on adults in the neighborhood to watch out for kids and keep them safe," "Adults in the neighborhood do not know who the local children are" (reverse coded), "There are adults in the neighborhood that children can look up to," and "Parents in the neighborhood do not know each other" (reverse coded).

Each respondent's score for any index is determined by her or his mean Likert-scale response to each underlying series of questions, with 1 being the lowest response ("not at all important" or "strongly disagree") and 5 the highest ("very important" or "strongly agree"). A score for any index is coded as missing if the respondent did not answer at least three of the corresponding questions.

Travel Behavior

Vehicle use was measured as the sum of the self-reported previous years' mileage for the household's primary and secondary vehicles, if applicable.

To measure trip-making, we asked respondents to report the number of times in a typical 5-day week they make certain types of trips. Questions were designed to determine the trip purpose (e.g., to work or to go shopping), mode (e.g., driver, passenger in a car, foot or bicycle), and the location (i.e., within or outside the neighborhood). Respondents were instructed to indicate whether they make a particular kind of trip (purpose, mode, location) never, once or twice a week, three to five times a week, and six or more times a week. From these responses we estimated trip frequencies for four categories: total trips, automobile trips, non-motorized trips, and trips made within the neighborhood (internal trips).

These four trip categories compose our trip-making outcomes. Because the survey requested ranges of trip frequencies, rather than the exact number of trips taken, we estimated the numbers of trips by taking the upper limit of the ranges, as follows: "never" was recoded to 0, "one to two times" was recoded to 2, "three to five times" was recoded to 5, and "six or more times" was recoded to 7. Sensitivity analyses to the coding of the ranges are reported in the Discussion section of this report.

Built Environment

For each study neighborhood, we obtained data about the built environment in GIS format, including street networks and parcel-level land use information. Typically these data came directly from the local planning agency or county GIS department. The level of detail and accuracy of the land use data varied from agency to agency, so we supplemented and verified the data using a variety of sources, described below.

We standardized the categories of land uses in the various GIS files into primary categories, several of which are further broken down into sub-categories.

- Residential – divided into multi-family residential, single-family residential, town or row houses, live/work and mixed-use multi-family residential
- Institutional – divided into churches, schools, government and other unspecified institutional uses

- Transportation – divided into rights of ways for roads and alleys, greenways
- Open/parks – divided into dedicated open space, parks, and recreational areas (e.g., ball fields, swimming pools, playgrounds)
- Commercial – any commercial land use, including parking lots connected to commercial parcels
- Parking – any parking lot not clearly associated with a commercial parcel
- Agriculture/Farming
- Construction – any parcel under construction where intended land use is not known
- Vacant – any undeveloped parcel clearly not classifiable as open space or parks
- Utilities – includes utility easements and drainage areas
- Interstitial space – un-parcelized space less than .5 acres in size, differentiated by the land use with which it is associated (e.g., SFR-interstitial is un-parcelized land intermingled with single-family development).

In the summer of 2008, we verified the land use data for every parcel in each of our neighborhoods using Google Earth and Google Street View. In many cases, distinguishing between transportation, parking, vacant and other uses was easy. However, distinguishing among other uses (e.g., commercial and institutional) was not easy. Each parcel in our GIS data contains two land use fields: the existing land use as provided by the local planning agency and the actual land use as determined through visual inspection of Google imagery. In our analyses, we have used the verified rather than the provided land uses.

To determine the types of commercial land uses within each neighborhood and the locations of destinations within walking distance of our survey respondents, we downloaded data from *Reference*USA on all commercial businesses located within our sites that fall under the following NAICS codes:

- 44-45 Retail Trade
- 519 Other Information Services
- 52 Finance and Insurance
- 561 Administrative and Support Services
- 61 Educational Services
- 62 Health Care and Social Assistance
- 71 Arts, Entertainment, and Recreation
- 72 Accommodation and Food Services
- 8123 Dry-cleaning and Laundry Services
- 813 Religious, Grantmaking, Civic, Professional, and Similar Organizations

However, we found the *Reference*USA data to be very limited and often flawed, in that it often identified commercial establishments in locations they clearly could not exist (for example, the *Reference*USA data identified a 10,000 s. f. retail store where the Google imagery showed a modest single family home). Among the ten study neighborhoods for which we downloaded data from *Reference*USA, we found commercial data to be inaccurate in eight of them.

Rather than relying on *Reference*USA's data to determine the location of destinations, we opted to use the Walk Score, a walkability index created by www.walkscore.com. As described on Walk Score's website (www.walkscore.com/how-it-works.shtml):

> Walk Score uses a patent-pending system to measure the walkability of an address. The Walk Score algorithm awards points based on the distance to the closest amenity in each category. If the closest amenity in a category is within .25 miles (or .4 km), we assign the maximum number of points. The number of points declines as the distance approaches 1 mile (or 1.6 km)—no points are awarded for amenities further than 1 mile. Each category is weighted equally and the points are summed and normalized to yield a score from 0–100.

We calculated the Walk Score for the street address of each respondent, with the exception of the respondents from our study sites in Davidson, NC. Walk Score uses the Google Maps database to determine the locations of destinations, and we discovered that Google Maps had incorrectly placed a bookstore, a library, and a shoe store in one corner of the conventional suburban neighborhood in Davidson. Close inspection of the Google imagery showed nothing but single-family residences, and our local planning contact in Davidson confirmed that there were no commercial establishments of any kind in the area. This finding invalidated the walk score for both neighborhoods in the Davidson pair, as they are both within a mile of the misplaced businesses, and necessitated estimation of the walk score for Davidson residents by other means. Fortunately, the Davidson neighborhoods closely resembled another study neighborhood (in size and proximity to commercial establishments), so we assigned the mean walk score (2) from that neighborhood to the Davidson respondents.

We also calculated the land area of parcels in commercial use in each of our study areas, using the GIS parcel layers.

Built Environment Derived Variables

In addition to the household-level walkscore, we calculated the neighborhood-level built environment variables shown in Table 1 and summarized in Table 2 for all neighborhoods. Summary statistics for each neighborhood are shown in Appendix I.

Table 1. Neighborhood-level Built Environment Attributes

Attribute	Variable	Description
Neighborhood size	total_area	Total area of tract (acres)
	SFDU_exist	Existing detached single family dwelling units
Street network/connectivity	ext_conn	External connections per 100 existing SFDU
	lnr	Link-to-node ratio
	pct4way	Percent of intersections that are 4-way
	streetdens	Street density, in miles per developable (non-open) acre
Density	SFdens	Net single family unit density (units per acreage in SF dwellings)
Land Use	pctopen	Open space, parks, or fully enclosed water bodies (percent of total area)
	pctvacant	Vacant area (percent of non-open area that is vacant)
	pctresid	Residential area (percent of non-open area that is residential)
	pctSFresid	Single family share (percent of residential area that is SFDUs)
Destinations	commarea	Area of commercial development in the neighborhood, in acres
	mean_walk	Mean walk score for the neighborhood
Regional context	greenfield	Greenfield setting (dummy variable; 1=yes)

Data for mean_walk provided by walkscore.com; all other data provided by local sources and verified by GIS

Table 2. Comparison of Built Environment Attributes by Neighborhood Type

	Typical Suburban				Neo-Traditional			
Attribute	mean/freq	st dev	min	max	mean/freq	st dev	min	max
total_area	352.34	527.4	24.4	2334	290.58	420.51	23.8	1823.6
SFDU_exist	872.18	1596.6	108	6951	599.65	716.12	42	2861
SFDU_permit	826.64	597.69	100	1816	949.07	914.44	100	2968
mean_price	$279,397	177,959	$93,665	$671,468	$286,518	169,470	$95,483	$693,435
year_appr								
before 2000	13				6			
2000-2004	2				8			
2005 or after	2				3			
Transit presence	9				9			
greenfield	76				76			
ext_conn	0.86	0.48	0.1	1.94	1.95	2.26	0.11	10.17
lnr	1.19	0.14	0.92	1.41	1.42	0.16	1.15	1.74
pct4way	9%	5	0%	17%	16%	8	5%	37%
streetdens	0.03	0	0.03	0.04	0.06	0.03	0.03	0.18
SFdens	4.76	1.39	3.1	7.84	7.13	1.92	4.82	10.71
pctopen	14%	13	0%	51%	17%	9	4%	36%
pctvacant	6%	10	0%	31%	6%	11	0%	34%
pctresid	69%	7	55%	80%	56%	13	28%	75%
pctSFresid	93%	13	57%	100%	82%	15	45%	100%
commarea	6.28	19.03	0	77.88	8.57	21.7	0	90.97
mean_walk	29.92	21.12	2	64.42	40.63	18.25	2	76.43

Socio-demographic information

Finally, we asked survey respondents to report socio-demographic information about themselves and their households. The socio-demographic variables derived from this information are shown

in Table 3. We also requested the household's estimated yearly income, but ultimately dropped this variable due to a low response rate.

Table 3. Socio-demographic Attributes

Attribute	Variable	Description
Personal Information	race	Respondent's race (due to low incidence of most categories other than white, the race variable was collapsed to [white/non-white]; 1=white)
	sex	Respondent's sex (female=1)
	education	Respondent's level of education (collapsed to a binary [college graduate/non-college graduate] variable)
	work_status	Respondent's work status (categories include full or part time at home, away from home, student, unemployed, and retired)
Home information	home	Type of structure in which respondent lives (detached single family dwelling, townhouse or duplex, condominium or apartment, or other)
	own	Whether the respondent/respondent's family owns the home (as opposed to renting; 1=yes)
	tenure	Length of time living in the home (in years)
Household size/composition	hhld_size	Number of full-time household members
	num_adults	Number of adults living in the household
	num_drivers	Number of potential drivers (household members seventeen years or older) living in the household
	kids	Whether there are children under the age of 18 living in the household (1=yes)

Statistical analyses

In all of our analyses statistical significance was determined with a 95% level of confidence. All analyses were conducted in Stata (College Station TX, versions 9.2 and 10.1). For all regression analyses, we use robust standard errors with clustering to account for potential correlations among participants within neighborhood pairs.

Social capital

We used three statistical methods to examine differences in social capital and cohesion between neo-traditional and typical suburban neighborhoods. First, t-tests were applied to assess the strength of the relationship between neighborhood type and social capital without controlling for other factors and to identify conforming or contrasting patterns within neighborhood pairs. Next, we developed multivariate models to adjust for demographic variation in the populations. We used Tobit models due to the right-censoring of social capital scores and employed binary logistic regression to determine whether neighborhood type predicts high social capital scores (in this case, a score of at least 4). In each regression analysis, covariates were each respondent's sex, race (white or non-white), age, length of time in the neighborhood, and presence of children under 18 in the home with clustering by neighborhood pair.

Finally, we used matching techniques to compare social capital scores for individuals living in NTDs to what their scores *would have been* if they lived in a typical suburban development (Oakes and Johnson, 2006). This counterfactual, which is by definition unobservable, is

estimated by matching individuals that are demographically similar but live in different types of neighborhoods. Direct matching, as opposed to propensity score matching (Oakes and Johnson, 2006), is used because this method does not rely on appropriate parameterization of the propensity score and is therefore more robust than propensity score methods (Abadie and Imbens, 2007). The nnmatch function in Stata 9.2 was used to conduct the analysis assuming heteroscedastic errors and correcting for bias introduced through non-exact matches (Abadie and Imbens, 2006; Abadie, et al., 2004).

Travel Behavior

Vehicle Mileage

We use ordinary least squares regression to examine the effects of neighborhood type and built environment on vehicle mileage. Because yearly mileage (self-reported mileage in the previous year of households' primary and secondary motor vehicles) was heavily skewed to the right, we applied a square root transformation to normalize the variable.

Trips

For the four trip-related outcomes, we used count regression models to avoid the inefficient and biased estimates that may result from applying ordinary least-squares regression. Unlike Poisson regression, negative binomial models do not assume equivalence of the dependent variable's mean and variance.

V. RESULTS

Summary statistics

We mailed 4837 surveys and received 588 valid responses back, for an overall response rate of 12.2%. As shown in Table 4, the response rate was somewhat higher among neo-traditional neighborhoods (13.8%) than non-NTD neighborhoods (10.5%). The response rate was highest in the south (sites in NC, SC, and GA; 16.8%) and lowest on the west coast (sites in CA and OR; 9.6%) and Midwest (site in IL; 9%).

Table 4. Survey Response Rate

	Sent	Received	Rate
Neighborhood Type			
typical suburban	2426	255	10.5%
Neo-traditional	2411	333	13.8%
Region			
Mid-Atlantic	545	62	11.4%
South	900	151	16.8%
Florida	519	59	11.4%
Tennessee/Texas	600	82	13.7%
Rockies	872	101	11.6%
West Coast	1200	115	9.6%
Mid West	201	18	9.0%
Total	4837	588	12.2%

Given the low response rate, we compared three demographic attributes from our surveys with census block-level data from the 2000 Census to determine whether potential bias existed. Only three of our demographic attributes – household size, percent of households that are owner-occupied, and race) were available at the block level. Table 5 shows how our sample populations compare with the Census data for the three variables. Our study sites have a higher proportion of White residents, higher rates of home ownership, and larger household sizes. This is not entirely surprising given that our single family dwellings dominate our sample. With single-family units and ownership come larger household sizes. Since many of our study sites are in rapidly growing areas that have likely changed substantially since the 2000 Census, we also compare a sub-sample of older, more established neighborhoods and newer neighborhoods in established areas with Census data, with similar results. More recent demographic data (e.g., the 2008 American Community Survey) has data available only at the county level, which cannot be directly compared.

Table 5. Comparison of sample demographics with Census data

Restricted Sample (Neighborhoods completed mostly before 2000; n=8)	area mean	nhood mean
household size	1.986	2.656
pct_owner	70.978	92.065
pct_nonwhite	20.474	16.256

Less-restricted Sample (Restricted sample plus neighborhoods in areas with >500 pop in 2000; n=16)	area mean	nhood mean
household size	2.108	2.616
pct_owner	76.279	95.017
pct_nonwhite	16.471	11.234

All neighborhoods (n=34)	area mean	nhood mean
household size	1.976	2.646
pct_owner	71.083	96.167
pct_nonwhite	12.547	10.215

area mean = average of census blocks containing study households, weighted by the proportion of study households in that census block

nhood mean = average of households within the study area

Reliability

The follow-up survey duplicated questions from several sections of the initial survey. The sections included are: vehicles owned, physical activity and health, trip-making, neighborhood preferences, and attitudes. We received 52 of the 100 follow-up surveys. Responses on the follow-up survey were compared with the respondent's answers to the initial survey. Agreement was determined via kappa statistic (for categorical and variables) and concordance statistic (for continuous variables), which correct for chance agreement (Appendix IV). Concordance and

kappa statistics close to 1 indicate perfect agreement, while statistics close to 0 indicate no agreement beyond what can be achieved by chance. Average kappa/concordance statistics ranged from 0.51 to 0.74, indicating moderate to substantial agreement using Landis & Koch's classification of scores [Landis, 1977 #547]. Survey questions in the 'vehicles owned' section had the highest test-retest reliability agreement (mean kappa/concordance = 0.736), while questions about trip-making behavior had the lowest test-retest reliability (mean kappa/concordance = 0.51).

Built Environment

The study neighborhoods ranged in size from 23.8 acres (the NTD in Pensacola, FL) to 2,334 acres (the typical suburban neighborhood in Irvine, CA). They also varied considerably on all of the built environment attributes we measured, as shown in Table 2. Because of high correlations among the internal connectivity measures (link-node ratio, street density, and percent of 4-way intersections), we opted to keep only the link-node ratio in our analyses.

On average, our neo-traditional neighborhoods had greater internal and external connectivity, greater residential densities, more non-residential land uses, and higher average walk scores than the typical suburban neighborhoods. There was little difference in the two neighborhood types in terms of vacant area and, surprisingly, commercial area. As neighborhoods were matched in part on their regional context, there was an equal number of greenfield developments in each neighborhood type (13 of 17 neighborhoods of each type were greenfields).

Descriptive Statistics of Study Outcomes

Social capital

After elimination of respondents with missing values, the final sample size for the social capital analyses was 561. Internal validity of our social capital measures was high, with Cronbach's alphas of 0.8 for social cohesion and intergenerational closure (see Appendix III-A). The correlation between the two indices was 0.65.

Travel

The travel behavior analyses were limited to observations that had no missing responses in the trip-making section of the survey, reducing the sample size from 588 to 357. The vehicle-miles analysis was further restricted to exclude respondents that had not lived in their current homes for at least one year, as the mileage variable pertains to the entire previous year's mileage. Table 6 below shows summary statistics for the un-transformed vehicle mileage and the four trip categories.

Table 6. Descriptive Statistics - Travel Behavior

Variable	N	Mean	St. dev.	Min	Max
Vehicle-miles in previous year	310	22,446.21	13219	0	92,000
Total trips	357	14.45	6.07	2	38
Automobile trips	357	9.09	4.34	0	28
Non-motorized trips	357	1.51	2.36	0	14
Internal trips	357	5.14	4.37	0	25

Reported differences in trip-making and mode choice are summarized in Figure 2. NTD residents make more internal trips, and of those a high percentage are by non-motorized travel modes. Consistent with prior research, a considerable percentage (33.6 percent) of internal trips in NTDs is by car. For typical suburban neighborhoods, there was a higher-than-expected number of internal trips, and a high percentage of those internal trips were taken by car (83 percent).

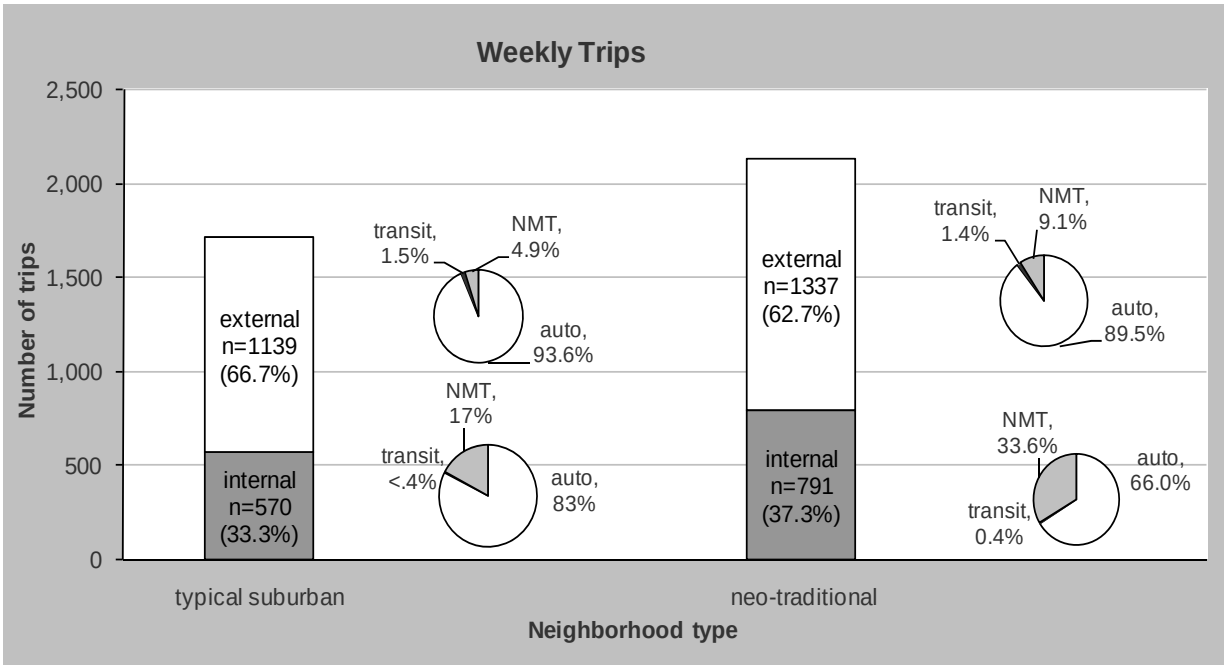

Figure 2. Weekly internal and external trips by mode and neighborhood type

Part of the difference in non-motorized trip-making is the result of variations in each pair. In most cases, residents of neo-traditional neighborhoods made substantially more non-motorized trips than residents of the typical suburban match. But there are several exceptions in which the opposite occurred, as shown in Figure 3.

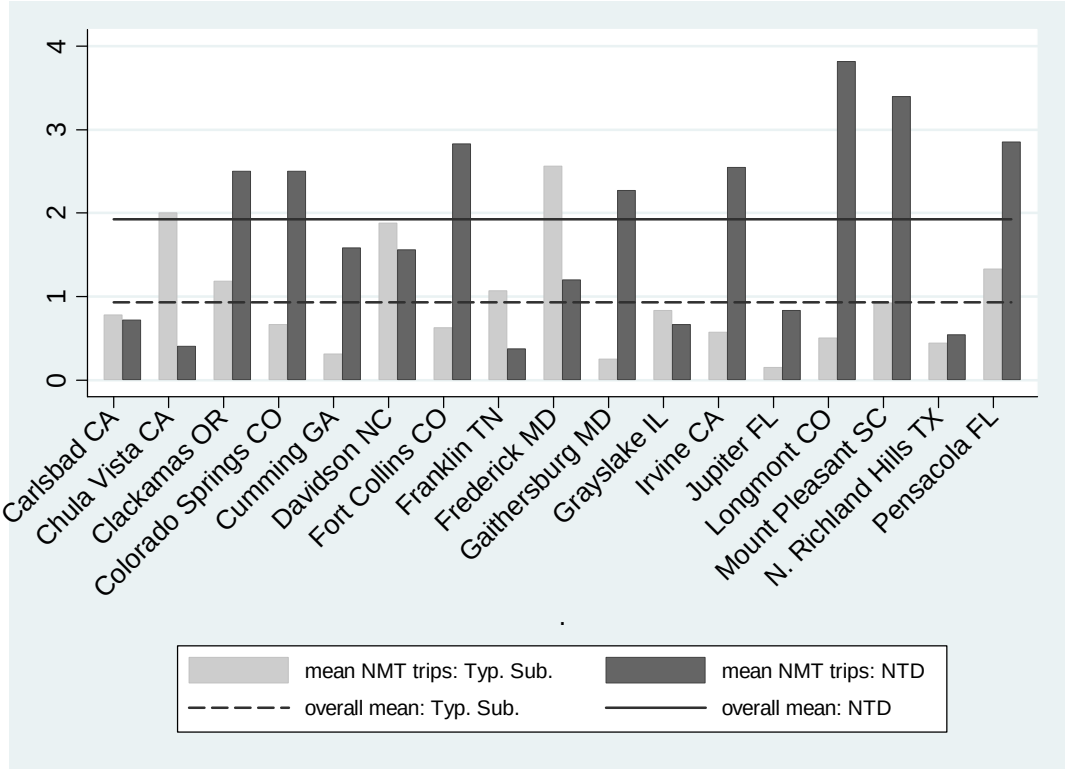

Figure 3. Average weekly non-motorized trips by neighborhood pair

Socio-demographic characteristics of respondents

While we strove to control for socio-demographic factors when selecting our study neighborhoods, socio-demographic differences at the individual level remained, even within pairings. To determine which factors were therefore necessary to control for statistically, we conducted bivariate tests of significant difference between neighborhood types. The following variables were significantly different and therefore likely to confound our subsequent modeling efforts: sex, household size, presence of children, home type (detached single family/townhome vs. multi-family apartment/condo), and tenure in the home. While race (white/non-white) was not significantly different between neighborhood types, in the absence of income race becomes an important covariate to include. Table 7 shows descriptive statistics and differences in socio-demographics by neighborhood type for all respondents.

Table 7. Comparison of socio-demographic attributes by neighborhood type

	typical suburban neighborhood					neo-traditional neighborhood						
variables	n	Mean (% for binary variables)	St. Dev	Min	Max	n	Mean (% for binary variables)	SD	Min	Max	difference statistic	
sex (1=female)	255	39.61				331	49.85				6.0943 [c]	**
race (1=White)	255	88.63				331	92.75				2.975 [c]	
age of respondent (years)	255	49.35	13.84	18	86	330	52.04	13.31	25	85	-2.37 [t]	*
# household occupants	254	2.89	1.23	1	8	331	2.55	1.3	1	7	3.29 [t]	**
# of adults	255	1.93	0.57	1	5	333	1.81	0.6	0	5	2.31 [t]	*
children (1=children present)	255	55.69				330	36.36				21.719 [c]	***
education (1=college graduate)	255	81.18				332	79.82				0.169 [c]	
work status	246	1.78	1.24	1	4	314	1.87	1.28	1	4	1.8 [c]	
work away from home	167	67.89				201	64.01					
work at home	20	8.13				32	10.19					
student	4	1.63				3	0.96					
retired/no job	55	22.36				78	24.84					
home type (1=SFDU)	255	93.73				333	67.57				59.378 [c]	***
ownership (1=own home)	255	100				332	101.2				0.228 [c]	
tenure	254	8.39	7.45	0.25	42.08	329	5.23	4.28	0.25	29.75	6.02 [t]	***

[t] t-statistic from t-tests of continuous variables

[c] chi-square statistic from chi-square tests of binary/categorical variables

*** p<0.01, ** p<0.05, * p<0.1

Associations between neighborhood type and social capital

Bivariate analyses

Unadjusted Differences in Social Capital by Neighborhood Type

The t-test results indicate that social capital and cohesion vary significantly between typical suburban and neo-traditional neighborhoods (Table 8). For the social cohesion and trust index, residents of neo-traditional neighborhoods had scores that were 4% higher on average then residents of typical suburban neighborhoods ($p=0.008$). Residents of neo-traditional neighborhoods also reported higher levels of intergenerational closure. However, the difference between the groups was small and at the edge of statistical significance ($p=0.057$). Overall, neo-traditional neighborhood residents have slightly higher mean social capital scores than residents of typical suburban neighborhoods.

Adjusted Differences in Social Capital by Neighborhood Type

Controlling for the demographic characteristics of respondents eliminated differences in levels of social capital between typical suburban and neo-traditional neighborhoods. This finding was robust to the method of adjusting for demographic differences. For example, Tobit and logit models as well as matching methods all showed no statistically significant difference between the two groups in reported levels of social capital.

In each regression approach, race and age are the most consistently significant covariates. Mean scores in each index are higher for whites and older individuals but lower for one-adult households. Other findings of interest include the lack of a significant relationship between the presence of children in the household and reciprocated exchange scores and the negative relationship between tenure in the neighborhood and social capital scores.

Table 8. Descriptive statistics of social capital by neighborhood type

Index	Overall					Typical suburban neighborhoods					Neo-traditional neighborhoods					T-tests	
	n	mean	st. dev	min	max	n	Mean	st. dev	min	max	n	mean	st. dev	min	max	Difference	
Social cohesion and trust	561	4.06	0.73	1.25	5	249	3.97	0.68	1.80	5	312	4.14	0.75	1.25	5	-0.16	***
Intergenerational closure	561	3.84	0.71	1.00	5	249	3.77	0.66	1.40	5	312	3.89	0.75	1.00	5	-0.12	*

*** p<0.01, ** p<0.05, * p<0.1

Table 9. Tobit & Logit Models of Social Capital Indices

	Tobit				Logit [a]			
	Social cohesion and trust		Intergenerational closure		Social cohesion and trust		Intergenerational closure	
Variables	Coef.		Coef.		Coef.		Coef.	
N_type	0.193		0.120		0.144		0.039	
Controls								
Female	0.059		0.029		0.016		0.011	
White	0.216	*	0.357	***	0.592	**	0.570	**
Age	0.013	***	0.004		0.019	**	0.010	
Kids	0.168		0.038		0.393	*	0.554	**
hhld_size	0.029		0.051					
Tenure	-0.008		-0.004		-0.020		-0.008	
Constant	3.011	***	3.107	***	-1.016	*	-1.172	*
Model Statistics								
R^2/pseudo R^2	0.025		0.015		0.017		0.014	
Log pseudolikelihood	-666.541		-636.472		-356.258		-382.988	
Left-censored obs.	0		0					
Uncensored obs.	493		518					
Right-censored obs. (UL=5)	76		41					

*** p<0.01, ** p<0.05, * p<0.1

[a] Dependent variables are defined such that 1 = score of at least 4 in corresponding index; 0 = score below 4.

Table 10. Average Differences in Social Capital by Neighborhood Type: Matching Methods

	Social cohesion and trust	Intergenerational closure
Adjusted Average Difference	0.102	0.107
p-value	0.169	0.200

Models control for age, tenure, sex, race, and presence of children in the household

Associations between neighborhood type and travel behavior

Bivariate analyses

Vehicle use

Though residents of typical suburban neighborhoods drove more, on average, than NTD residents, t-tests shows no significant difference in previous year's mileage between the two neighborhood types, as shown in Table 10.

Table 10. Vehicle use descriptive statistics by neighborhood type

	typical suburban (n=145)				neo-traditional (n=165)				
Variables	Mean	SD	Min	Max	Mean	SD	Min	Max	t-statistic
Mileage (thousands)	23.78	13.09	0.012	82	21.27	13.26	0	92	1.674 *
transformed mileage (sq. root)	148.43	42.01	3.46	286.36	139.28	43.42	0	303.32	1.884 *

***p<0.01, **p<0.05, *p<0.1

Trip-making

In all four trip categories examined – total trips, auto trips, non-motorized trips, and internal trips – NTD residents made more trips than their counterparts in typical suburban neighborhoods. However, the difference in trip frequencies is only significant for non-motorized and internal trips, with NTD residents making approximately 150 percent and 20 percent more trips, respectively, than residents of typical suburban neighborhoods. Table 11 shows summary statistics for each trip category by neighborhood type and a t-test to identify difference (without adjusting for clustering at neighborhood pair level).

Table 11. Trip-making descriptive statistics by neighborhood type

	typical suburban (n=165)				neo-traditional (n=192)					
Variables	Mean	SD	Min	Max	Mean	SD	Min	Max	t-statistic	
total trips	13.818	5.61	2	38	14.97	6.41	3	37	-1.825	*
auto trips	9.309	4.35	0	28	8.917	4.34	2	24	0.850	
non-motorized trips	0.933	1.63	0	8	1.979	2.72	0	14	-4.474	***
internal trips	4.606	4.08	0	18	5.614	4.57	0	25	-2.168	**

*** p<0.01, ** p<0.05, * p<0.1

Base Models

The first set of multivariate regression models we present are base models, with neighborhood type (N_type) as the primary explanatory variable. In these and all subsequent models, we control for socio-demographic factors race (white), sex (female), and the presence of children in the household (kids).[2] Results for these models are presented in the columns labeled "Base Model" of Tables 12 - 16.

Vehicle use

As in the bivariate model, the difference in vehicle mileage between neighborhood types remains insignificant at the 0.05 level when socio-demographic controls are added to the model (see base model column, Table 12).

Trip-making

The relationships between neighborhood type and total, non-motorized, and internal trip frequency are strengthened once socio-demographic factors are included. NTD residents make approximately 13 percent more trips overall, 27 percent more internal trips, and over twice as many non-motorized trips as residents of typical suburban neighborhoods. As in the bivariate model, there is no statistically significant difference in automobile trip frequency between the two neighborhood types (see base model columns in Table 13 - Table 16).

Built environment regression models

We present two expanded regression models for each of our travel behavior outcome measures. In the first, we replace the N_type variable with seven variables representing different aspects of the built environment; in the second, we include the N_type variable along with the built environment variables. The purpose of these two models is to determine whether any apparent relationships between neighborhood type and travel behavior can be explained by differences in the built environment, or if neighborhood type itself has an intrinsic relationship with travel behavior. The built environment variables we examine are external connection density (ext_conn), link-to-node ratio (lnr; multiplied by ten to improve interpretability), net single family residential density (SFdens), percent of the neighborhood's developable area that is

[2] The other socio-demographic factors that differed significantly between neighborhood types were household size, home type, and tenure in the home. However, these variables were insignificant in all of our travel behavior models, and Wald tests indicated that they did not add sufficient explanatory power to the models to justify their inclusion. In the interest of parsimony, we leave them out of the travel behavior models presented here.

vacant (pctvacant; divided by ten to improve interpretability), acres of commercial area in the neighborhood (commarea; divided by ten), and regional setting (greenfield), all measured at the neighborhood level. We also include our one household-level built environment variable, the walk score.

Vehicle use

Only one built environment variable – walkscore – is a significant predictor of vehicle use, and its effect is very weak. Far and away the best predictor of vehicle use is the presence of children in the household (households with children drove approximately 500 more miles in the previous year than households without children), followed by the respondent's sex (women reported about 60 fewer miles than men). The neighborhood type variable is not significant (Table 12, model 1 column).

Table 12. OLS regression models of vehicle mileage

Variables	Base Model		Model 1		Model 2	
N_type	-3.498				8.339	
Controls						
White	3.114		-4.928		-6.585	
Female	-7.363	**	-7.678	**	-7.708	**
Kids	23.48	***	22.76	***	23.54	***
Built Environment Attributes						
ext_conn			-0.582		-0.839	
Lnr			-14.74		-26.77	
SFdens			1.222		0.275	
pctvacant			0.243		0.250	
commarea			-0.214	*	-0.262	***
walkscore			-0.333	***	-0.312	***
greenfield			5.233		5.559	
Constant	134	***	160.7	***	178.6	***
Model Statistics						
Observations	310		310		310	
R-squared	0.095		0.150		0.154	

*** p<0.01, ** p<0.05, * p<0.1

Trip-making

Total trips

In the models with built environment factors only (neighborhood type not included as an explanatory variable), three features of the built environment are significant predictors of total trips, though their effects are small: external connection density, commercial area, and walkscore. The direction of the relationships between total trips and external connectivity and total trips and commercial area is negative, opposite of what we hypothesized.

Adding the neighborhood type variable back into the model does not substantially affect the coefficients on the built environment variables, though neighborhood type is itself significant: holding built environment and socio-demographic factors constant, neo-traditional residents still

make approximately 24 percent more total trips than residents of typical suburban neighborhoods.

Table 13. Count regression models of Total Trips

	Base Model			Model 1			Model 2		
Variables	Coef.		IRR	Coef.		IRR	Coef.		IRR
N_type	0.122	***	1.130				0.217	***	1.242
Controls									
White	-0.299	***	0.742	-0.281	**	0.755	-0.299	***	0.742
Female	0.087	***	1.090	0.101	***	1.106	0.099	***	1.104
Kids	0.156	***	1.169	0.147	***	1.158	0.162	***	1.176
Built Environment Attributes									
ext_conn				-0.044	***	0.957	-0.049	***	0.953
Lnr				0.009		1.009	-0.021		0.979
SFdens				0.011		1.011	-0.015		0.985
pctvacant				0.002		1.002	0.002		1.002
commarea				-0.014	***	0.986	0.026	***	1.026
walkscore				0.030	**	1.030	0.035	***	1.036
greenfield				-0.003		0.997	0.007		1.007
Constant	2.753	***		2.577	***		3.007	***	
Model Statistics									
Observations	357			357			357		
Log pseudo-likelihood	1105.146			1103.366			1098.505		
P (alpha)~=0	0.000			0.000			0.000		

*** p<0.01, ** p<0.05, * p<0.1

Auto trips

Like in the total trips models, external connection density, commercial area, and walkscore are significant, though relatively weak, predictors of auto trip frequency. Again, the signs on external connection density and commercial area are negative, opposite of what we hypothesized. In addition, the coefficient on percent of the neighborhood that is vacant (not including open space or parks) is also significant and positive, but small.

When we include the neighborhood type variable along with the built environment features, the coefficient on neighborhood becomes significant, but in the opposite direction of what we found in the bivariate analyses: controlling for built environment variables and socio-demographics, neo-traditional neighborhood residents make 17 percent *more* auto trips than residents of typical suburban neighborhoods.

Interestingly, when neighborhood type is included in the auto trip frequency model, an additional built environment variable becomes significant (single family residential density), though the effects of all the built environment factors remain relatively weak compared to the effect of neighborhood type.

Table 14. Count regression models of Automobile Trips

	Base Model			Model 1			Model 2		
Variables	Coef.		IRR	Coef.		IRR	Coef.		IRR
N_type	0.009		1.009				0.159	**	1.172
Controls									
White	-0.319	**	0.727	-0.315	***	0.730	-0.326	***	0.722
Female	0.113	***	1.120	0.135	***	1.145	0.133	***	1.142
Kids	0.224	***	1.251	0.217	***	1.242	0.229	***	1.257
Built Environment Attributes									
ext_conn				-0.068	***	0.934	-0.071	***	0.932
Lnr				-0.001		0.999	-0.023		0.977
SFdens				-0.006		0.994	-0.025	**	0.975
pctvacant				0.004	**	1.004	0.004	**	1.004
commarea				-0.031	***	1.031	-0.039	***	0.962
walkscore				0.033	***	0.968	0.037	***	1.038
greenfield				-0.056	*	0.946	-0.048		0.953
Constant	2.320	***		2.385	***		2.700	***	
Model Statistics									
Observations	357			357			357		
Log pseudo-likelihood	-980.549			-973.389			-971.298		
P (alpha)~=0	0.000			0.000			0.000		

*** p<0.01, ** p<0.05, * p<0.1

Non-motorized trips

Five of our built environment factors are significant predictors of non-motorized trips: external connection density, internal connectivity (link-node ratio), percent vacant area, commercial area, and whether or not the neighborhood is in a greenfield setting. The effects of the first four are substantial, and the directions are consistent with our hypotheses. The effect of being in a greenfield is positive; holding all other built environment factors and socio-demographic factors constant, greenfield residents make over two and a half times more non-motorized trips than residents of infill neighborhoods, perhaps due to the limited presence of destinations outside the neighborhood that can be accessed by walking or bicycling. Interestingly, the coefficient on walkscore, a measure intended to capture access to destinations within walking distance, is not significant in this model.

When the neighborhood type variable is added into the model, it is not significant when controlling for built environment factors, in contrast to what we hypothesized. With the exception of internal connectivity (which becomes insignificant with the addition of the neighborhood type variable), the coefficients on the built environment variables are unchanged.

Table 15. Count regression models of Non-motorized Trips

	Base Model			Model 1			Model 2		
Variables	Coef.		IRR	Coef.		IRR	Coef.		IRR
N_type	0.785	***	2.192				0.245		1.278
Controls									
White	-0.220		0.803	-0.082		0.921	-0.125		0.882
Female	0.065		1.067	0.0185		1.019	0.019		1.019
Kids	0.082		1.085	-0.003		0.997	0.018		1.018
Built Environment Attributes									
ext_conn				0.205	***	1.228	0.200	***	1.221
Lnr				0.139	***	1.149	0.108		1.114
SFdens				0.000		1.000	-0.026		0.974
pctvacant				-0.021	***	0.979	-0.021	***	0.979
commarea				0.162	***	1.176	0.143	***	1.154
walkscore				0.065		1.067	0.065		1.067
greenfield				0.956	***	2.601	0.957	***	2.604
Constant	0.0397			-2.791	***		-2.303	**	
Model Statistics									
Observations	357			357			357		
Log pseudo-likelihood	-566.804			-558.608			-558.318		
P (alpha)~=0	0.000			0.000			0.000		

*** p<0.01, ** p<0.05, * p<0.1

Internal trips

For internal trips, we expect to find that larger commercial areas are strongly associated with greater internal trip-capture. Unexpectedly, none of the built environment factors is significant *unless* neighborhood type is included as a covariate. Furthermore, the built environment variables that we expected to find significant – external connectivity and commercial area – are not significant. Only internal connectivity and walkscore are significant: an increase of 0.1 on the link-to-node ratio yields a 9 percent decrease in internal trips and a ten-point increase in the walkscore yields a 10 percent increase in internal trips. Meanwhile, the effect of neighborhood type on internal trips, controlling for the built environment and socio-demographics, is quite large: neo-traditional neighborhood residents make nearly 80 percent more internal trips than residents of typical suburban neighborhoods.

Table 16. Count regression models of Internal Trips

	Base Model			Model 1			Model 2		
Variables	Coef.		IRR	Coef.		IRR	Coef.		IRR
N_type	0.245	***	1.278				0.575	***	1.777
Controls									
White	-0.579	***	0.560	-0.543	**	0.581	-0.579	***	0.560
Female	0.127		1.135	0.170		1.185	0.163		1.177
Kids	0.132		1.141	0.058		1.060	0.075		1.078
Built Environment Attributes									
ext_conn				-0.070		0.932	-0.0764		0.926
Lnr				-0.011		0.989	-0.092	***	0.912
SFdens				0.009		1.009	-0.064		0.938
pctvacant				0.000		1.000	-0.001		0.999
commarea				0.022		1.022	-0.013		0.987
walkscore				0.085	*	1.089	0.101	**	1.106
greenfield				0.038		1.039	0.073		1.076
Constant	1.885	***		1.910	***		3.075	***	
Model Statistics									
Observations	357			357			357		
Log pseudo-likelihood	-961.646			-983.506			-979.238		
P (alpha)~=0	0.000			0.000			0.000		

*** p<0.01, ** p<0.05, * p<0.1

VI. DISCUSSION

This study has examined the social capital and travel behavioral consequences of living in neo-traditional developments. Using a matched pair, quasi-experimental research design, we surveyed residents of seventeen pairs of neighborhoods throughout the US. For social capital we found no difference in social capital for residents of NTDs relative to residents of typical suburban neighborhoods after controlling for demographics. This finding contradicts our original hypothesis and the rhetoric of advocates of new urbanism. However, it does match the results of the single existing study that looked at this question using a new urbanist and suburban neighborhood in Salt Lake City (Brown & Cropper, 2001).

This finding should not suggest that new urbanist neighborhoods are unsuccessful at creating social bonds among neighbors. Rather this is evidence that typical suburban developments are equally successful. Why might this be the case? Talen (1999) identified a large body of research from urban sociology that emphasizes the importance of individual demographic characteristics such as social class in the formation of relationships within the neighborhoods. This literature suggests that as neighborhood homogeneity increases social connections within the neighborhood will also increase. In this study, both the new urbanists and typical suburban neighborhoods were relatively homogenous at least along racial lines.

For hypothesis 1 regarding travel behavior, we found that NTD residents make more total trips, more auto trips, and more non-motorized trips than their typical suburban counterparts.

However, there were no significant differences in overall miles driven, suggesting NTD dwellers make more, but shorter, auto trips. In other models (not shown), we tested other explanations of the apparent increased trip-making among NTD residents – controlling for other socio-demographic characteristics, vehicle ownership, and so on – but the relationship between neighborhood type and total trip-making held. This finding is consistent with hypothesized relationships by others (Boarnet and Crane, 2001; Crane and Crepeau, 1998), who suggest that by bringing origins and destinations closer together, trip costs are reduced, and therefore total trip consumption may increase, not decrease.

Internal trips hold the key to understanding the travel behavior differences uncovered by our results. After controlling for confounders, NTD residents made more internal trips than residents of typical suburban neighborhoods in our sample. Yet there is no statistical difference between NTD and typical suburban residents in the number of external trips made after adjusting for other covariates (models not shown). Thus, the greater overall trip-making by NTD residents is explained at least in part by increased internal trip-making. This explanation also applies to car trips: overall car trips are higher for NTD dwellers in part because they make more internal car trips (external car trips are similar for residents of both types of neighborhoods). This is consistent with the results of Khattak and Rodriguez (2005) in North Carolina. They found that a higher number of internal trips in new urbanist neighborhood were made by private cars relative to conventional suburban neighborhoods.

For hypothesis 2, regarding the role of the built environment features of NTDs in predicting travel behavior, we found mixed results. On one hand, the built environment features examined do not appear to be very good predictors of total trip-making: the single-most consistent predictor of total trip making was neighborhood type, even when controlling for the built environment. On the other hand, built environment features were significant predictors of car and non-motorized trips. As walking and cycling becomes easier (through greater internal and external connectivity) and the size of the commercial area in the neighborhood increases, non-motorized trip-making increases substantially.

The NTD dummy variable was not significant for non-motorized trips when the built environment variables were included in the model (hypothesis 3). Thus, while the base models indicated that NTD residents make considerably more non-motorized trips than residents of typical suburban neighborhoods, this appears to be explained in large part by the more supportive walking and bicycling environments found in our sample of NTDs than in any intrinsic ‘new urbanist’ quality. We might have expected otherwise – that neighborhood type indeed has a strong effect on non-motorized trip-making after controlling for the built environment attributes in the study – given that our models neglected to measure the pedestrian-friendly design features commonly associated with ‘new urbanism’, such as shorter setbacks, more interesting building facades, and better sidewalk connectivity. Based on our models, it appears that, regardless of neighborhood type, walking and cycling trips might be promoted through improved street connectivity and increased commercial activity.

By contrast, the NTD variable was significant along with the built environment variables for internal trips, total trips, and car trips. In these models a subset of the seven built environment variables (ranging from two to five variables) was significant. This suggests that some of the intrinsic qualities of neo-traditional design that we did not measure appear to have an impact on

these trips, beyond the features measured by our built environment variables. Recall from Figure 2 that the difference in internal trips appears to explain much of the difference in total and auto trip-making between the two neighborhood types; therefore the effect of the un-measured intrinsic characteristics of neo-traditional design seem to carry over to overall trips and auto trips through their relationship with internal trips.

Figures 4 and 5 reflect simulations performed with the estimated results for non-motorized trips and for auto travel. They show the predicted number of trips for residents in the NTD and typical suburban neighborhoods, while at the same time varying the built environment variables from values of the bottom 10th percentile of the data to the top 10th percentile (in terms of the extent to which the built environment features reflect the characteristics of neo-traditional neighborhood design). In figure 3, the small offset between the black (NTD) and grey (typical suburban) neighborhood reflects the statistically insignificant difference identified in our models. No matter the neighborhood type, however, a resident of a neighborhood with built environment features in the 90th percentile are expected to make three to four times as many non-motorized trips as a resident of a neighborhood with built environment features in the 10th percentile. In figure 4, the difference between the two lines is statistically significant, and suggests that at all levels of the built environment, NTD residents are expected to make more auto trips than residents of typical neighborhoods. However, as the values of the built environment variables become closer to what is expected in neo-traditional design, predicted auto trips decrease for both neighborhood types.

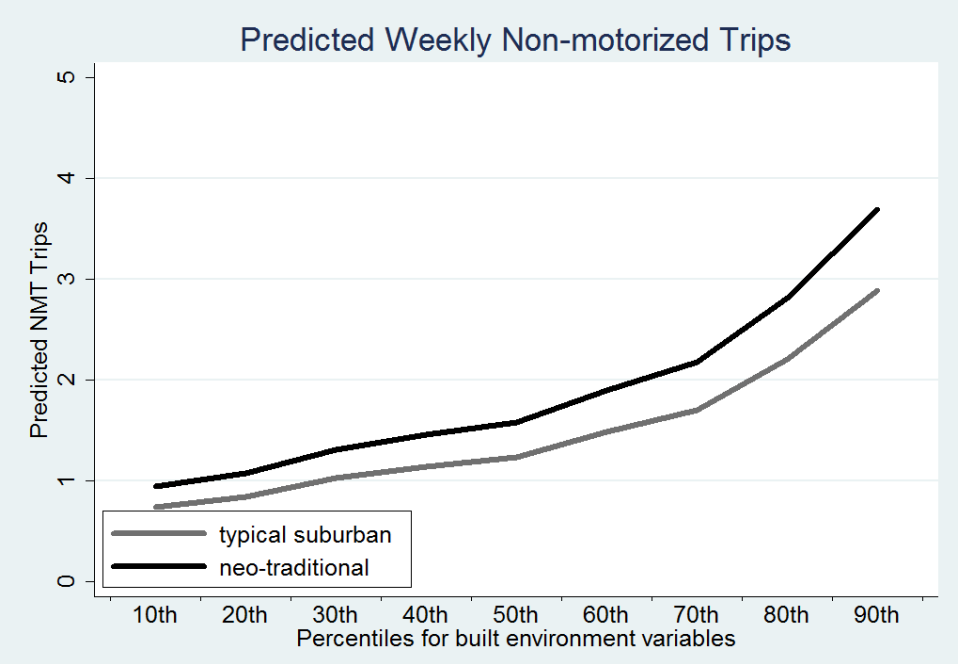

Figure 4. Predicted weekly non-motorized trips by built environment variables' percentile in the data

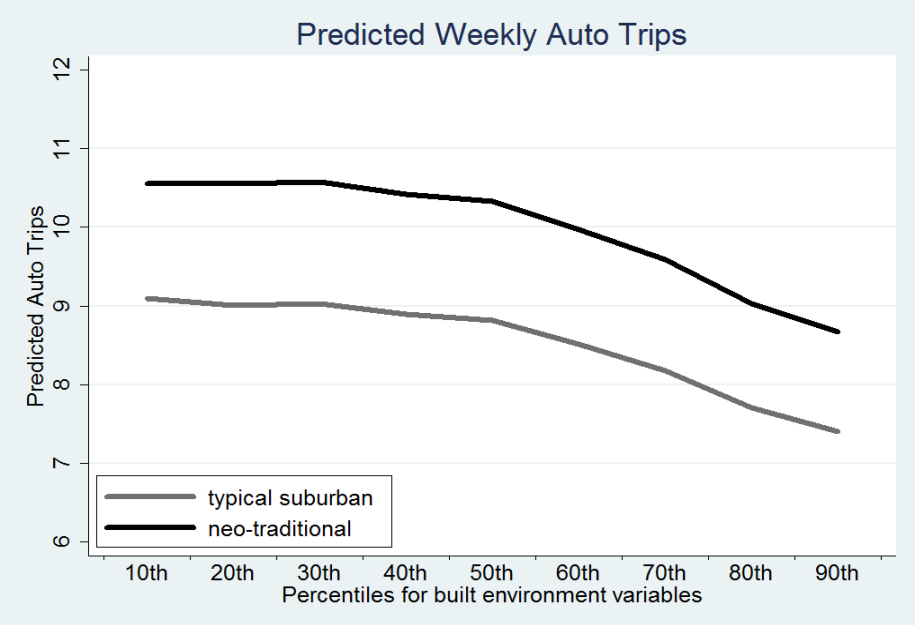

Figure 5. Predicted weekly car trips by built environment variables' percentile in the data

A lesson for developers and planners is the importance of accounting for increased auto use for internal trips in NTDs. When the potential for higher auto use within the neighborhood raises concerns about air quality or local safety, developers should consider ways of minimizing the impacts, for example by limiting parking or by using traffic calming measures that detract from using cars for internal trips.

The role of context (greenfield vs. infill neighborhoods) was relevant only for non-motorized travel. Greenfield neighborhood residents made more non-motorized trips, regardless of the neighborhood type, connectivity, and commercial activity. It could be that the greenfield location "traps" trips, whereas in an infill location trips (regardless of mode) may be attracted to neighboring areas. Alternatively it may be that the results are measuring recreational trip-making (e.g., walking/jogging for exercise/socializing), which may be more prevalent in greenfields than infill settings. The survey did not establish *a priori* the definition of trip.

Our study is not without limitations. Our response rate is very low, and we have indication of some response bias – homeowners and white residents are overrepresented in our sample – although more up-to-date census data would be required to assess the degree of bias. Another limitation is that the survey had value ranges for respondents to report trip patterns. We relied on the upper end of the range. To ensure that this recoding was not introducing bias, we examined alternative ways of coding the reported ranges (results not shown), but the findings were very similar to what was presented above.

VII. CONCLUSIONS

The study extends the growing literature on the built environment-behavior relationship by focusing on residents of NTDs using a nationwide sample of matched pairs, and relying on original, reliable data to measure micro-scale features of the built environment. Our findings for social capital suggest that typical suburban and new urbanist developments have similar levels of

social cohesion and intergenerational closure. The limited differences observed between the two design types were removed after controlling for demographic differences. It is also interesting to note that residents of both types of communities self-reported very high levels of social capital. Contrary to the assertions of many new urbanists, typical suburbs do not appear to induce feelings of alienation among their residents.

For travel behavior, we found that residents of TND neighborhoods make more trips, more car trips, more non-motorized trips, and more trips internal to their neighborhood than residents of typical suburban neighborhoods. Because we did not find a difference in vehicle use, we conclude that trips taken by NTD residents tend to be shorter in length than trips taken by their suburban counterparts. Furthermore, the NTD variable remained significant for all outcomes except non-motorized travel after accounting explicitly for built environment characteristics such as connectivity, density, vacant land, access to commercial areas, the walkscore, and whether the neighborhood was a greenfield or infill development. A simulation of predicted counts suggests that an area with built environment characteristics taking on values at the 90^{th} percentile of the data collected will have almost four times the non-motorized trips than areas with built environment characteristics taking on values at the 10^{th} percentile of the data collected. Further research will determine whether these relationships are causal.

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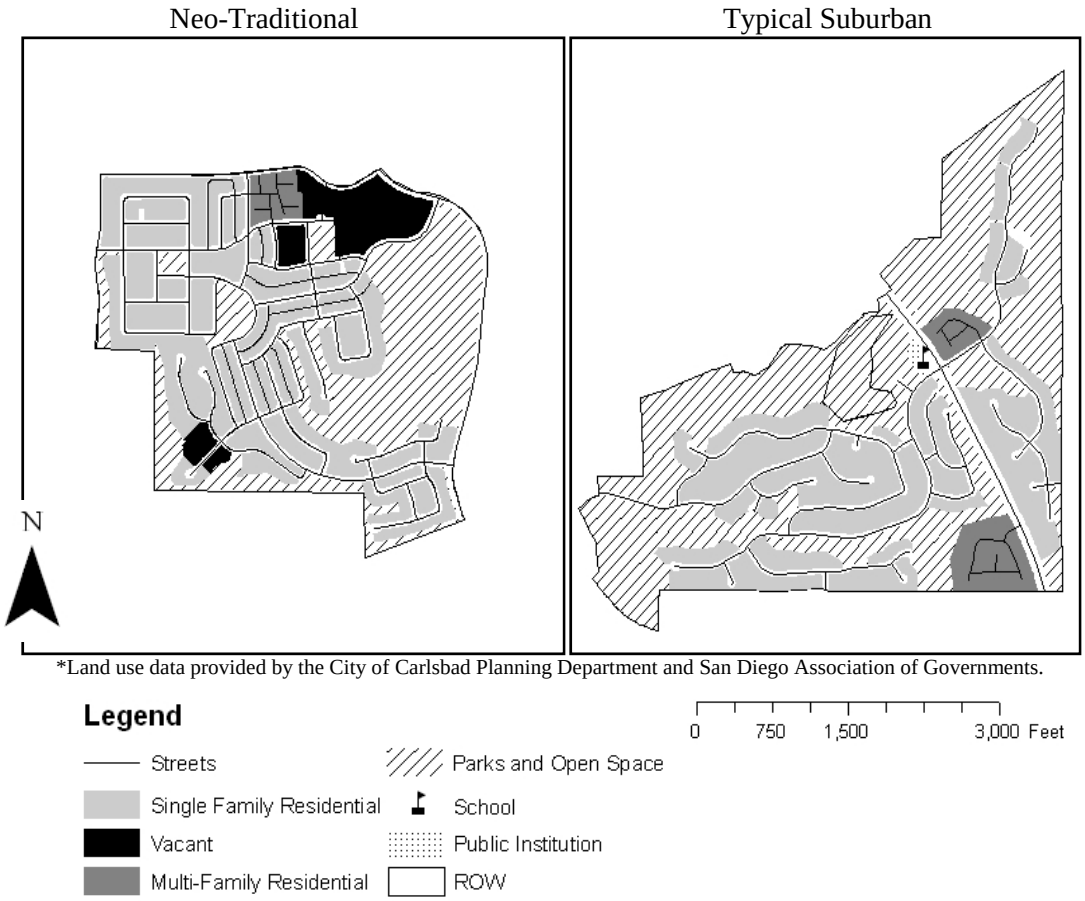
IX. APPENDICES

Appendix I. Maps of study sites

Carlsbad, CA

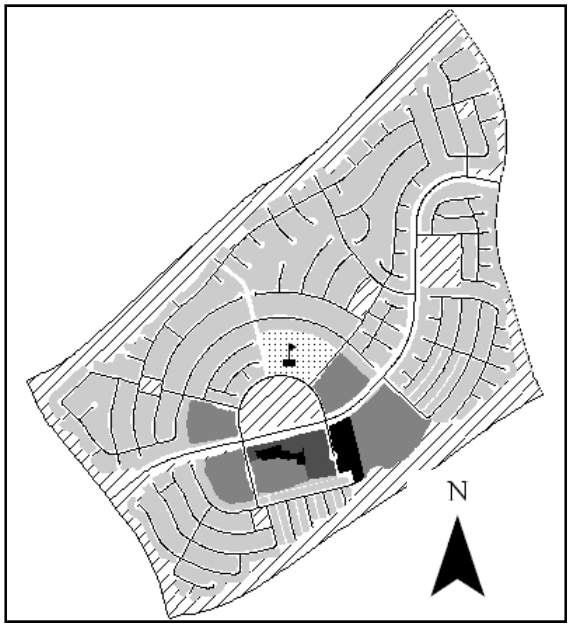


*Land use data provided by the City of Carlsbad Planning Department and San Diego Association of Governments.

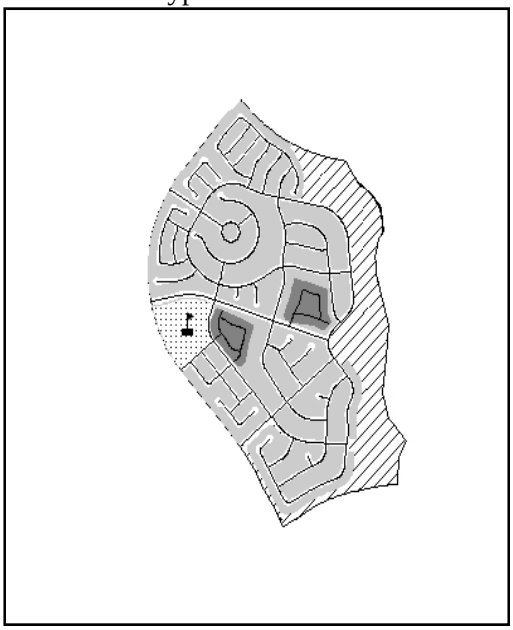
	Neo-Traditional (Carrillo Ranch)	Typical Suburban (Bressi Ranch)
Total area of tract (acres)	267.00	349.40
Existing dwelling units	534	383
Permitted dwelling units	623	1816
Mean single family home price	$693,000	$671,00
Year approved	2002	1998
Year completed	2006	2002
Public Transit Access	No	No
Greenfield	Yes	Yes
Vacant area (pct of total area)	8%	0%
Parks/open space (pct of total area)	29%	51%
Residential area (pct of total built area)	52%	73%
Commercial area (acres)	0	0
Net single family density (units per acre)	5.56	3.61
Street density (miles per 100 acres)	5.58	3.67
Link-node ratio	1.47	1.10
External connections	5	3
Mean walkscore	37	16.75

Chula Vista, CA

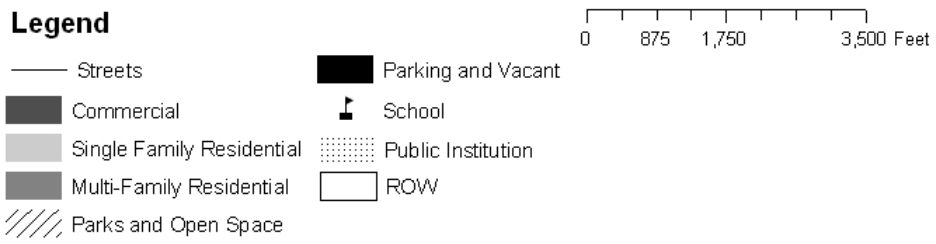
Neo-Traditional



Typical Suburban



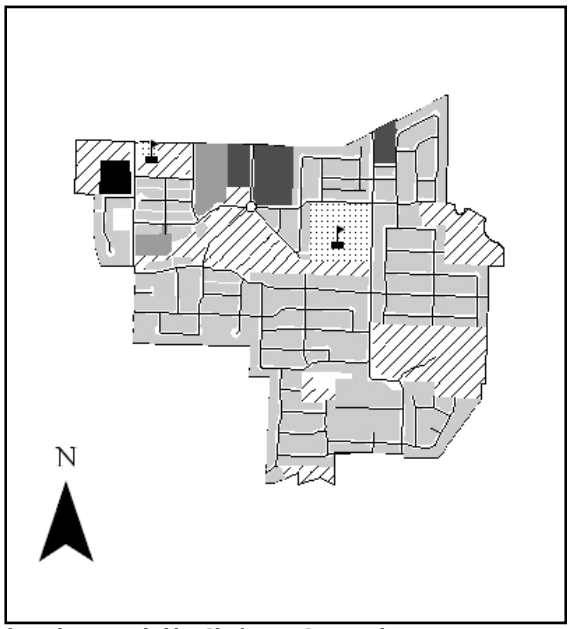
*Land use data provided by the City of Chula Vista Planning and Building Department and San Diego Association of Governments



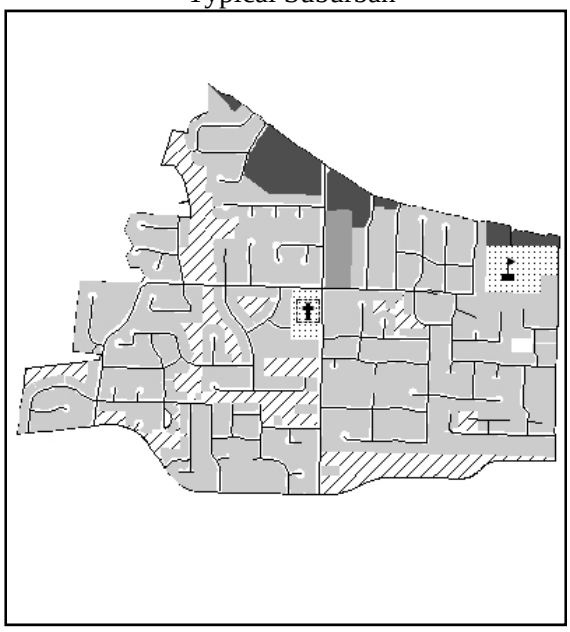
	Neo-Traditional (Otay Ranch)	Typical Suburban (Eastlake Trials)
Total area of tract (acres)	585.60	292.30
Existing dwelling units	1789	956
Permitted dwelling units	2968	1143
Mean single family home price	$276,000	$451,000
Year approved	1996	1996
Year completed	1999	2002
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	1%	0%
Parks/open space (pct of total area)	22%	18%
Residential area (pct of total built area)	65%	59%
Commercial area (acres)	6.74	0
Net single family density (units per acre)	7.13	7.49
Street density (miles per 100 acres)	3.41	3.87
Link-node ratio	1.15	1.31
External connections	2	3
Mean walkscore	35	14.71

Clackamas, OR

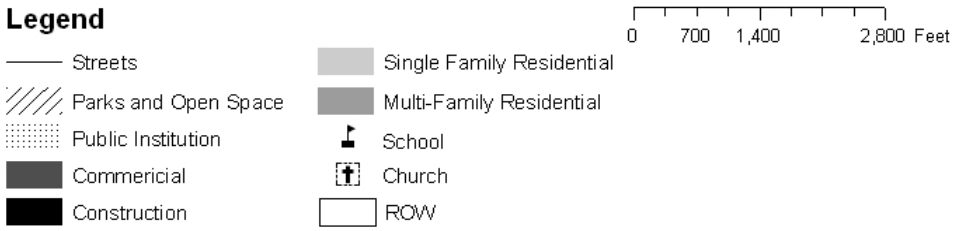
Neo-Traditional



Typical Suburban



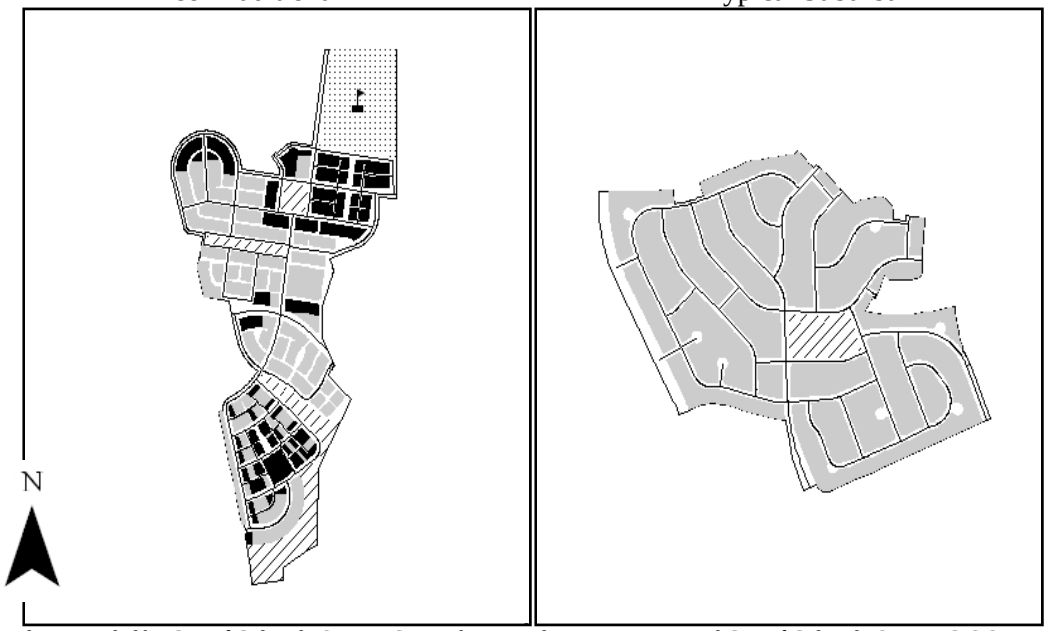
*Land use data provided by Clackamas County Planning Department and Clackamas County Department of Transportation and Development.



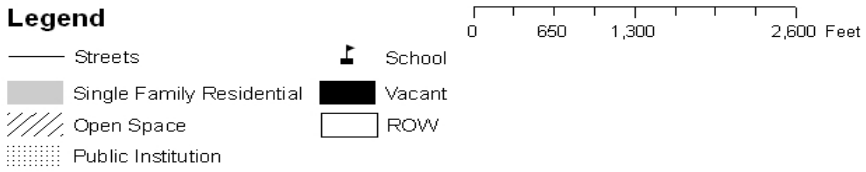
	Neo-Traditional (Sunnyside Village)	Typical Suburban (122nd Ave area)
Total area of tract (acres)	290.40	394.70
Existing dwelling units	1016	1109
Permitted dwelling units	~	~
Mean single family home price	~	~
Year approved	~	1993
Year completed	~	~
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	21%	13%
Residential area (pct of total built area)	64%	72%
Commercial area (acres)	9.29	18.56
Net single family density (units per acre)	6.69	4.56
Street density (miles per 100 acres)	4.00	2.92
Link-node ratio	1.35	1.09
External connections	11	14
Mean walkscore	37.9	39.92

Colorado Springs, CO

Neo-Traditional | Typical Suburban



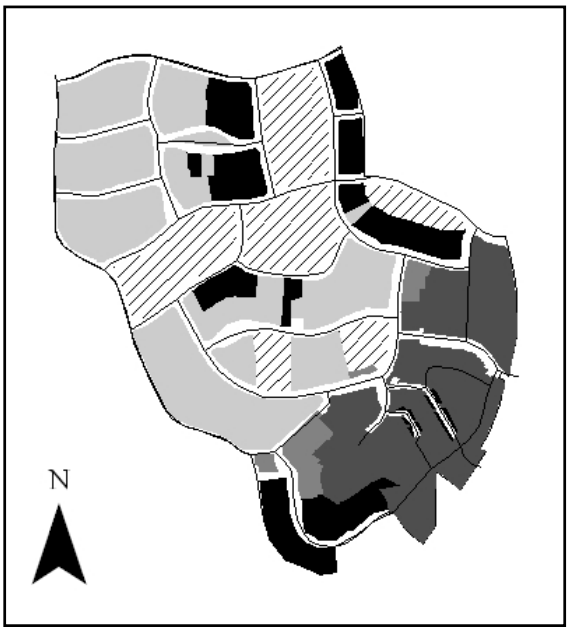
*Land use data provided by City of Colorado Springs Comprehensive Planning Division and City of Colorado Springs GIS Services Division



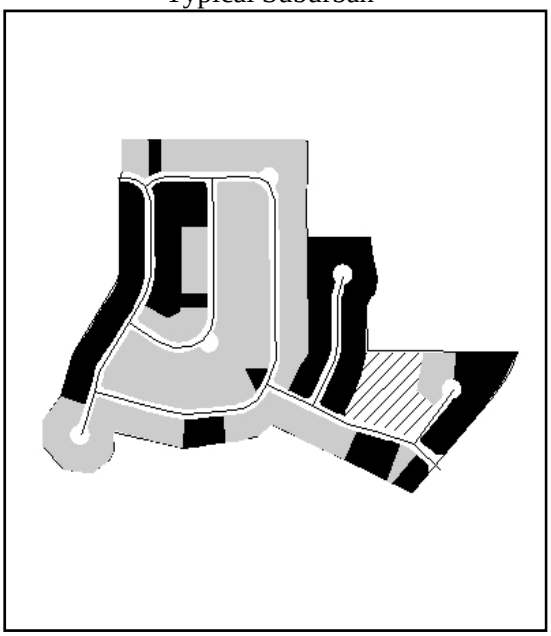
	Neo-Traditional	Typical Suburban
Total area of tract (acres)	97.75	130.90
Existing dwelling units	339	567
Permitted dwelling units	608	430
Mean single family home price	~	~
Year approved	2003	1998
Year completed	2005	2001
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	10%	4%
Residential area (pct of total built area)	28%	70%
Commercial area (acres)	0	0
Net single family density (units per acre)	10.37	6.39
Street density (miles per 100 acres)	5.61	3.76
Link-node ratio	1.41	1.29
External connections	4	11
Mean walkscore	33.22	51.6

Cumming, GA

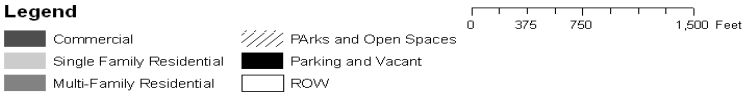
Neo-Traditional



Typical Suburban



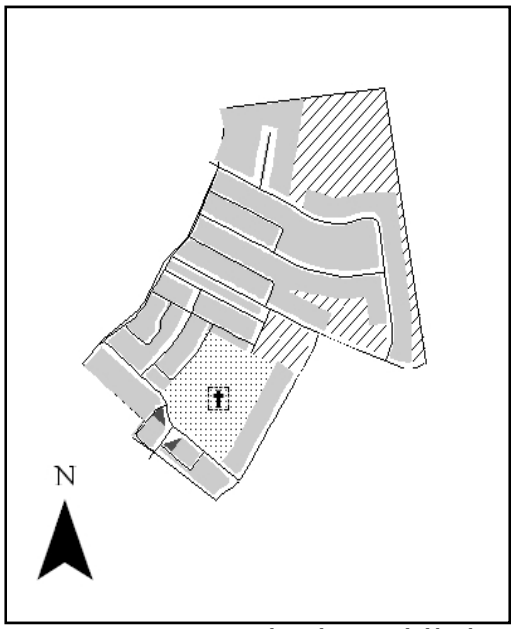
*Land use data provided by Forsyth County Department of Planning and Development and Forsyth County Geographic Information Services Department.



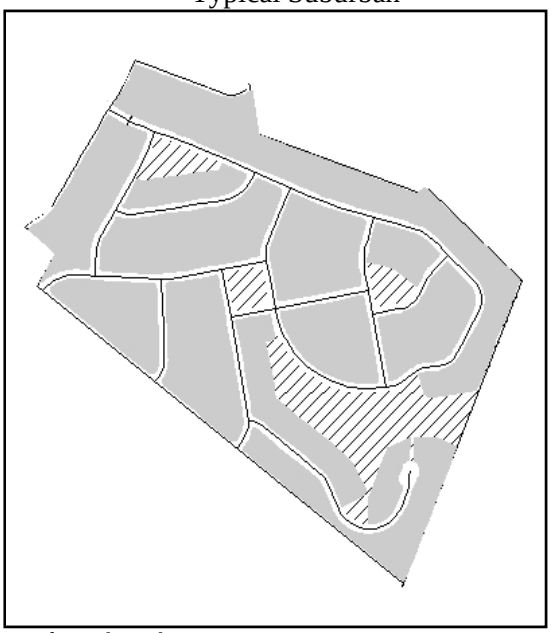
	Neo-Traditional (Vickery Village)	Typical Suburban (Wild Meadows)
Total area of tract (acres)	88.90	54.10
Existing dwelling units	149	108
Permitted dwelling units	431	400
Mean single family home price	~	~
Year approved	2000	1996
Year completed	~	~
Public Transit Access	No	No
Greenfield	Yes	Yes
Vacant area (pct of total area)	11%	31%
Parks/open space (pct of total area)	17%	5%
Residential area (pct of total built area)	43%	74%
Commercial area (acres)	10.83	0
Net single family density (units per acre)	5.88	4.22
Street density (miles per 100 acres)	5.41	2.62
Link-node ratio	1.44	1
External connections	3	1
Mean walkscore	29.77	3

Davidson, NC

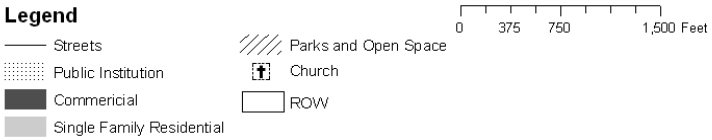
Neo-Traditional



Typical Suburban



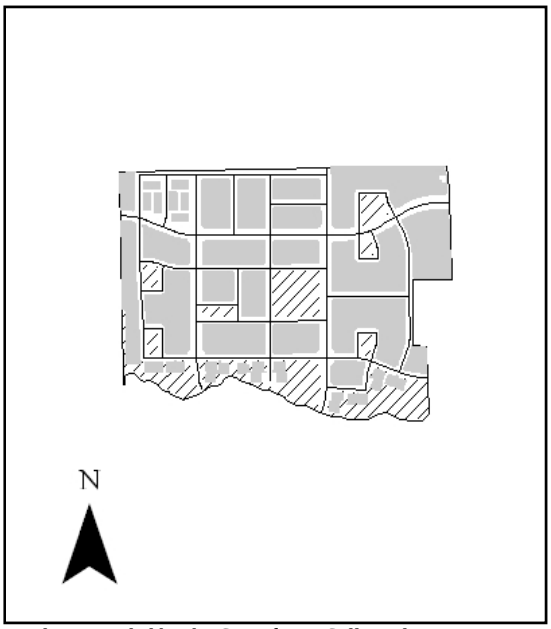
*Land use data provided by the Town of Davidson Planning Department



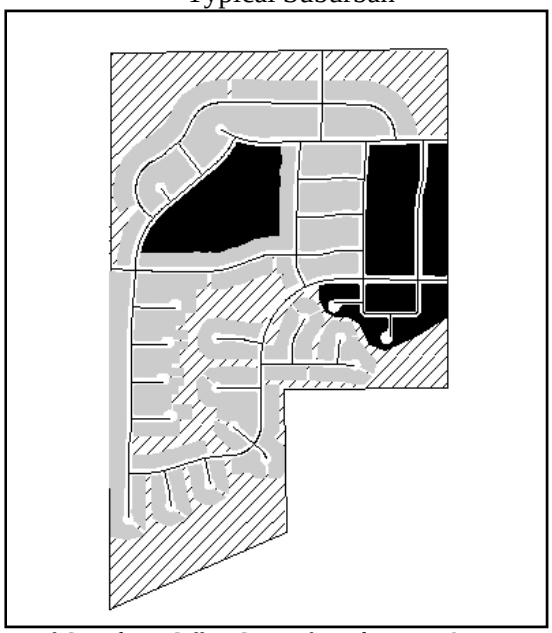
	Neo-Traditional (A New Neighborhood in Old Davidson)	Typical Suburban (McConnell)
Total area of tract (acres)	66.40	94.50
Existing dwelling units	257	202
Permitted dwelling units	253	201
Mean single family home price	$241,000	$230,00
Year approved	2000	1998
Year completed	2005	2000
Public Transit Access	No	No
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	19%	14%
Residential area (pct of total built area)	71%	70%
Commercial area (acres)	<1	0
Net single family density (units per acre)	5.52	3.10
Street density (miles per 100 acres)	5.15	3.10
Link-node ratio	1.37	1.40
External connections	3	2
Mean walkscore	2	2

Fort Collins, CO

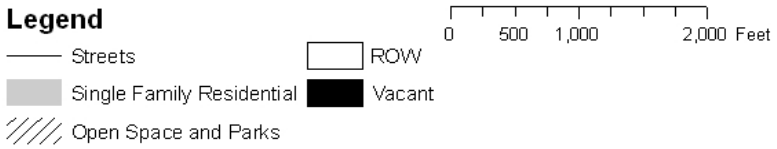
Neo-Traditional



Typical Suburban



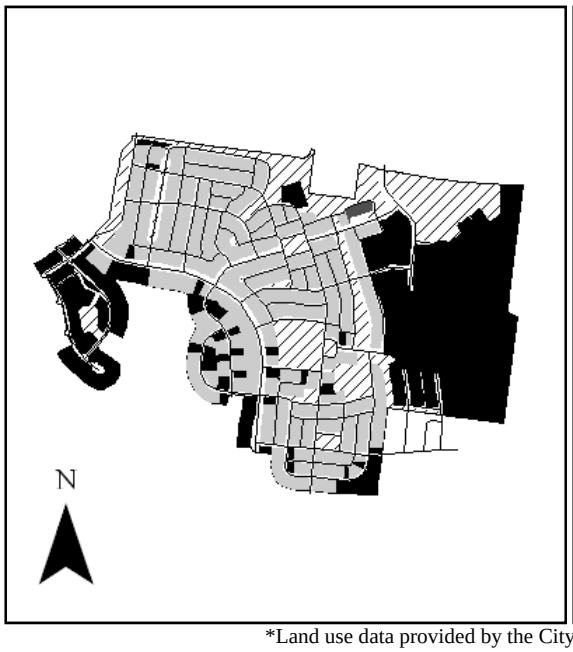
*Land use data provided by the City of Fort Collins Planning Department and City of Fort Collins Geographic Information Services Division.



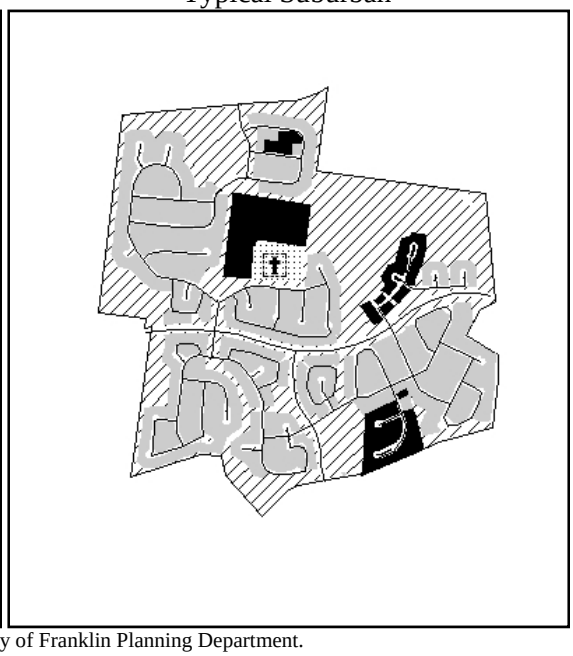
	Neo-Traditional (Harvest Park)	Typical Suburban (Registry Ridge)
Total area of tract (acres)	102.10	203
Existing dwelling units	490	416
Permitted dwelling units	470	543
Mean single family home price	$238,000	$290,000
Year approved	2000	2001
Year completed	2005	2008
Public Transit Access	No	No
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	16%
Parks/open space (pct of total area)	12%	27%
Residential area (pct of total built area)	48%	66%
Commercial area (acres)	0	0
Net single family density (units per acre)	8.63	5.49
Street density (miles per 100 acres)	4.76	3.11
Link-node ratio	1.49	1.17
External connections	5	4
Mean walkscore	47.65	6.60

Franklin, TN

Neo-Traditional



Typical Suburban

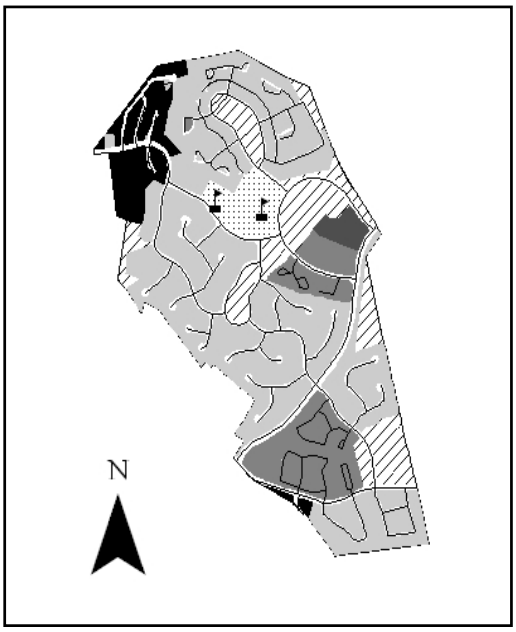


*Land use data provided by the City of Franklin Planning Department.

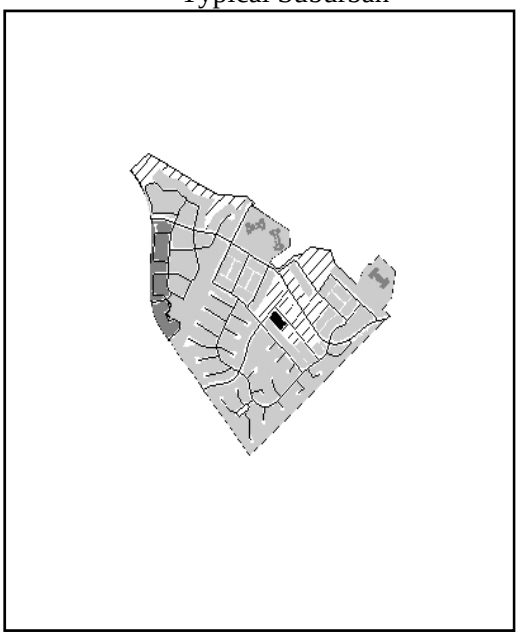
	Neo-Traditional (Westhaven)	Typical Suburban (McKay's Mill)
Total area of tract (acres)	342.1	380.60
Existing dwelling units	631	621
Permitted dwelling units	2750	1378
Mean single family home price	$301,000	$217,000
Year approved	2001	1997
Year completed	~	~
Public Transit Access	No	No
Greenfield	Yes	Yes
Vacant area (pct of total area)	34%	8%
Parks/open space (pct of total area)	10%	30%
Residential area (pct of total built area)	60%	65%
Commercial area (acres)	1.01	0.00
Net single family density (units per acre)	5.24	4.05
Street density (miles per 100 acres)	3.46	3.26
Link-node ratio	1.53	1.22
External connections	2	3
Mean walkscore	12.23	8.61

Frederick, MD

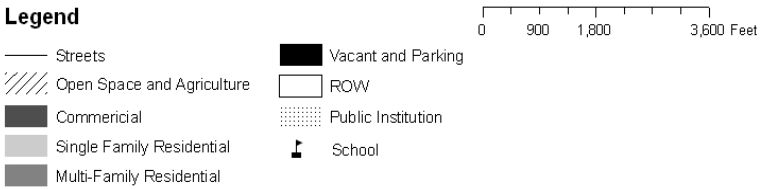
Neo-Traditional



Typical Suburban



*Land use data provided by the City of Frederick Department of Planning and City of Frederick GIS.

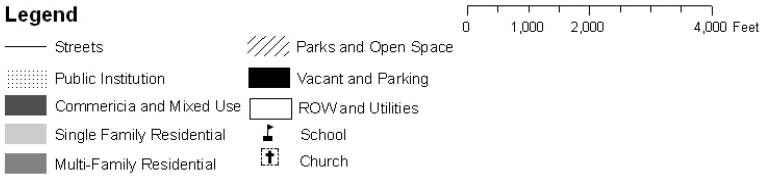


	Neo-Traditional (Worman's Mill)	Typical Suburban (Whittier)
Total area of tract (acres)	144.60	349.50
Existing dwelling units	731	875
Permitted dwelling units	1397	1590
Mean single family home price	~	~
Year approved	1992	1988
Year completed	2010	2008
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	3%
Parks/open space (pct of total area)	9%	11%
Residential area (pct of total built area)	46%	59%
Commercial area (acres)	0.00	5.14
Net single family density (units per acre)	9.77	3.25
Street density (miles per 100 acres)	4.49	3.34
Link-node ratio	1.25	1.29
External connections	6	3
Mean walkscore	43.2	33.42

Gaithersburg, MD

Neo-Traditional | Typical Suburban

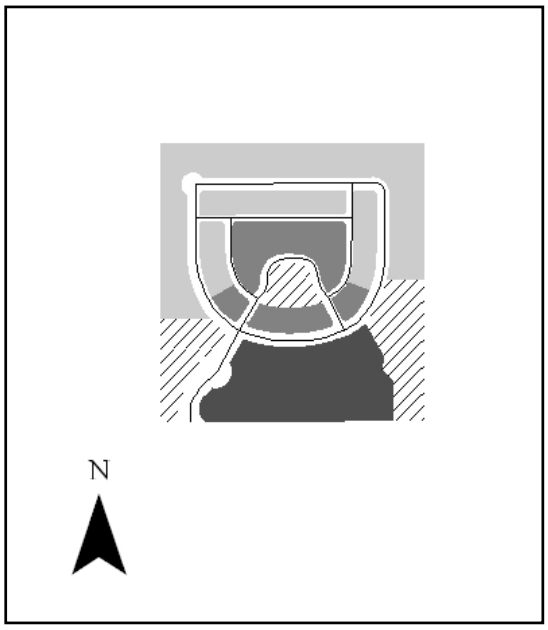
*Land use data provided by City of Gaithersburg Department of Planning and Code Administration and Montgomery County Department of Technology Services.



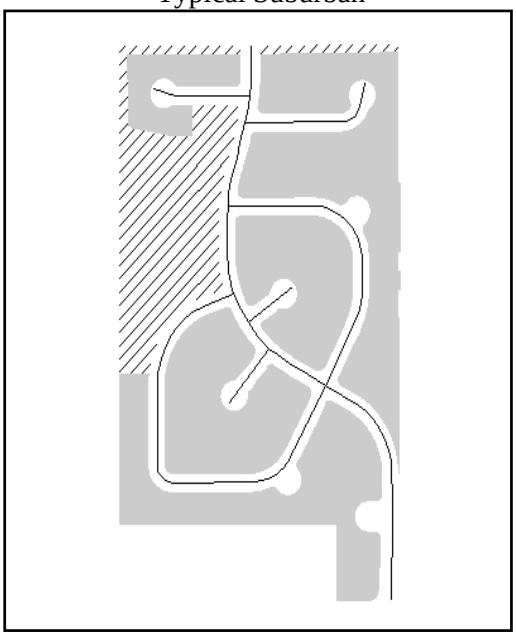
	Neo-Traditional (Lakelands)	Typical Suburban (Fernshire)
Total area of tract (acres)	332.10	343.50
Existing dwelling units	941	1083
Permitted dwelling units	1624	1601
Mean single family home price	~	~
Year approved	2000	1980
Year completed	2004	1990
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	1%	0%
Parks/open space (pct of total area)	36%	16%
Residential area (pct of total built area)	53%	67%
Commercial area (acres)	0	0
Net single family density (units per acre)	8.26	4.22
Street density (miles per 100 acres)	5.45	2.78
Link-node ratio	1.55	1.14
External connections	10	6
Mean walkscore	65.62	41.38

Grayslake, IL

Neo-Traditional



Typical Suburban

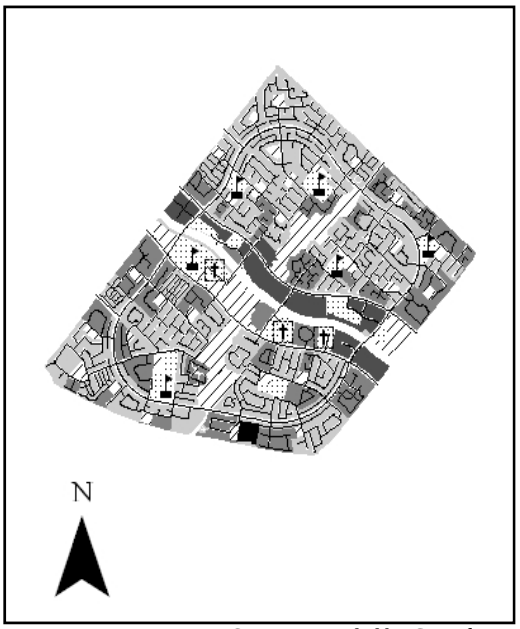


*Land use data provided by Village of Grayslake Building Department and Lake County Department of Information Technology, GIS/Mapping Division.

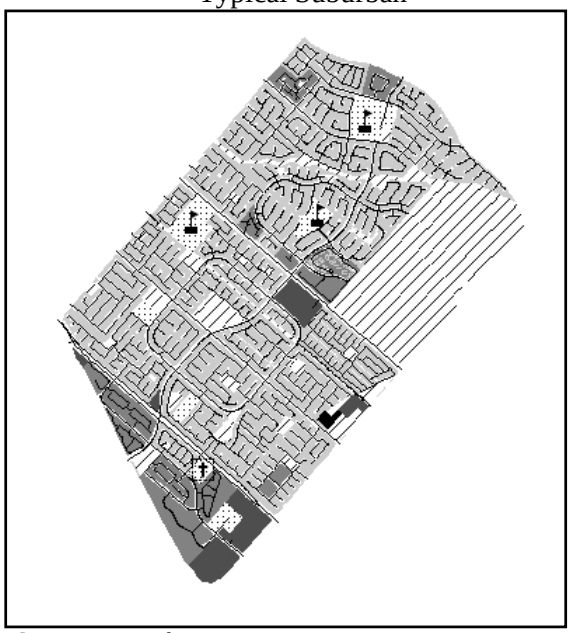
	Neo-Traditional (Washington Village)	Typical Suburban (Hunter's Ridge)
Total area of tract (acres)	24.40	48.90
Existing dwelling units	42	126
Permitted dwelling units	100	125
Mean single family home price	$95,483	$93,665
Year approved	1993	1992
Year completed	~	~
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	16%	18%
Residential area (pct of total built area)	55%	73%
Commercial area (acres)	4.52	0.00
Net single family density (units per acre)	5.17	4.33
Street density (miles per 100 acres)	4.53	3.15
Link-node ratio	1.63	1.27
External connections	1	2
Mean walkscore	30	61.13

Irvine,CA

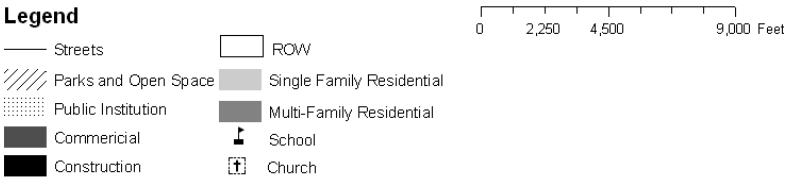
Neo-Traditional



Typical Suburban



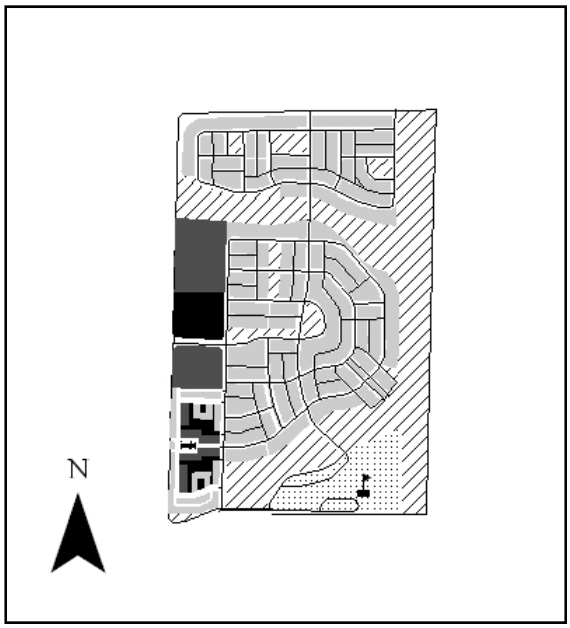
*Sources provided by City of Irvine Community Development Department.



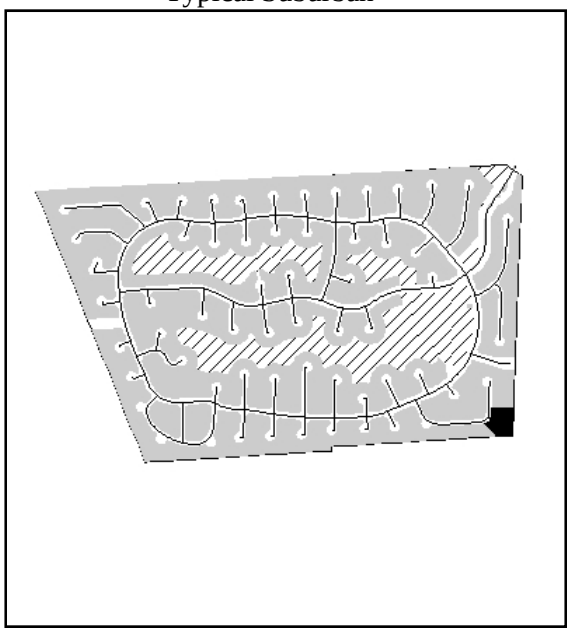
	Neo-Traditional (Woodbridge)	Typical Suburban (Northwood)
Total area of tract (acres)	1823.60	2334.00
Existing dwelling units	2861	7188
Permitted dwelling units	~	~
Mean single family home price	~	~
Year approved	~	~
Year completed	~	~
Public Transit Access	Yes	Yes
Greenfield	No	No
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	6%	2%
Residential area (pct of total built area)	75%	55%
Commercial area (acres)	90.97	77.88
Net single family density (units per acre)	4.82	7.84
Street density (miles per 100 acres)	3.60	3.64
Link-node ratio	1.18	1.20
External connections	8	13
Mean walkscore	49.05	64.43

Jupiter, FL

Neo-Traditional



Typical Suburban

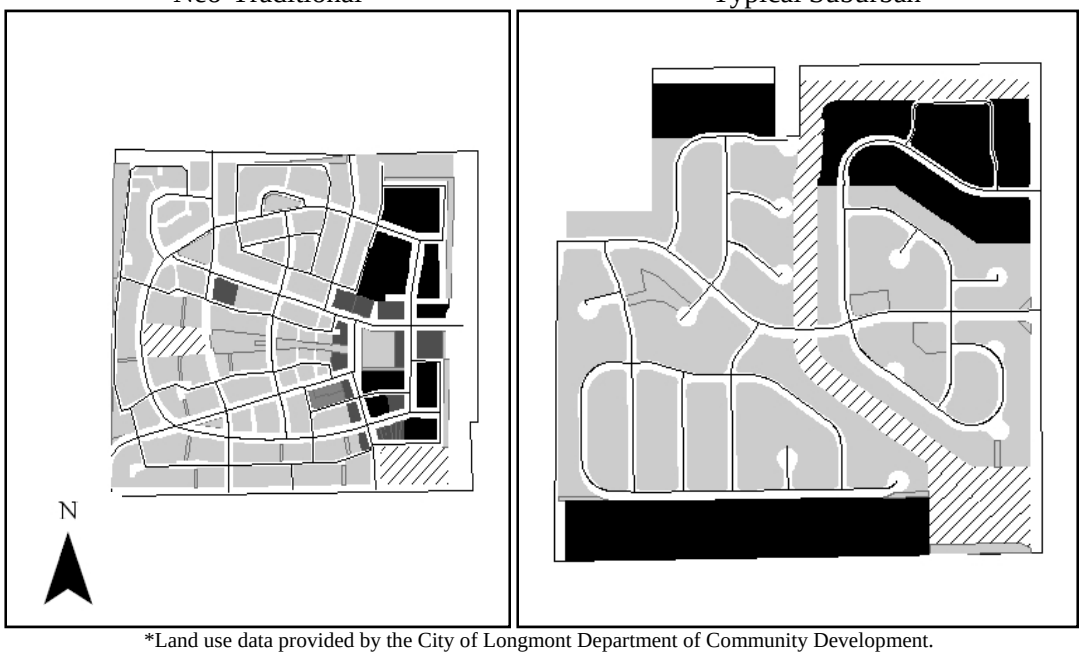


*Land use data provided by the Town of Jupiter Department of Planning and Zoning.

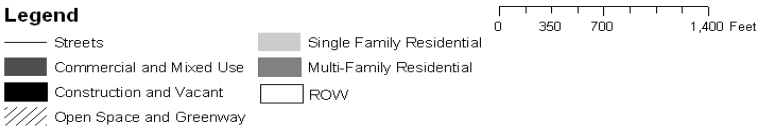
	Neo-Traditional (New Haven)	Typical Suburban (Egret Landing)
Total area of tract (acres)	219.60	247.80
Existing dwelling units	605	669
Permitted dwelling units	505	648
Mean single family home price	$305,000	$231,000
Year approved	1997	1989
Year completed	1999	1997
Public Transit Access	No	No
Greenfield	No	No
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	29%	12%
Residential area (pct of total built area)	42%	71%
Commercial area (acres)	14.70	0.00
Net single family density (units per acre)	7.17	4.35
Street density (miles per 100 acres)	5.52	2.91
Link-node ratio	1.49	1.04
External connections	5	3
Mean walkscore	39.80	19.47

Longmont, CO

Neo-Traditional | Typical Suburban



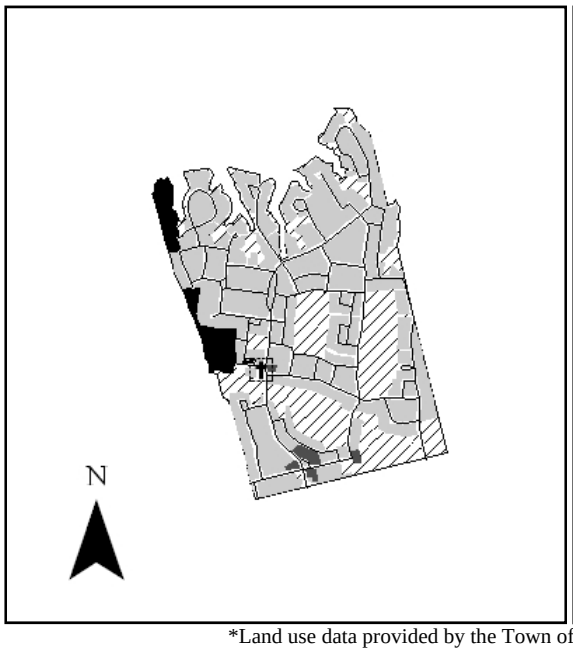
*Land use data provided by the City of Longmont Department of Community Development.



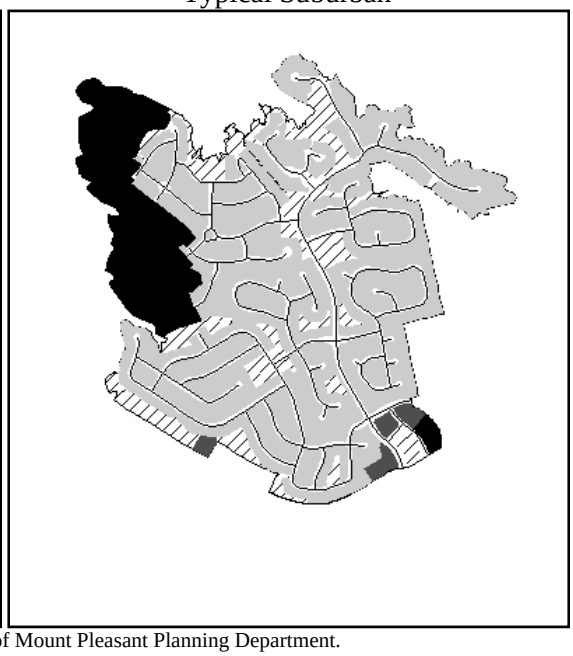
	Neo-Traditional (Prospect)	Typical Suburban (Pleasant View)
Total area of tract (acres)	73.50	143.00
Existing dwelling units	268	320
Permitted dwelling units	656	472
Mean single family home price	$292,000	$191,000
Year approved	1996	1995
Year completed	~	~
Public Transit Access	Yes	Yes
Greenfield	Yes	Yes
Vacant area (pct of total area)	6%	23%
Parks/open space (pct of total area)	4%	3%
Residential area (pct of total built area)	47%	63%
Commercial area (acres)	3	0.00
Net single family density (units per acre)	8.65	4.73
Street density (miles per 100 acres)	5.90	2.72
Link-node ratio	1.74	1.41
External connections	5	3
Mean walkscore	52.67	19.75

Mount Pleasant, SC

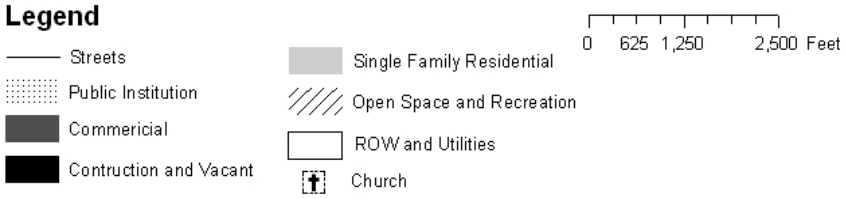
Neo-Traditional



Typical Suburban



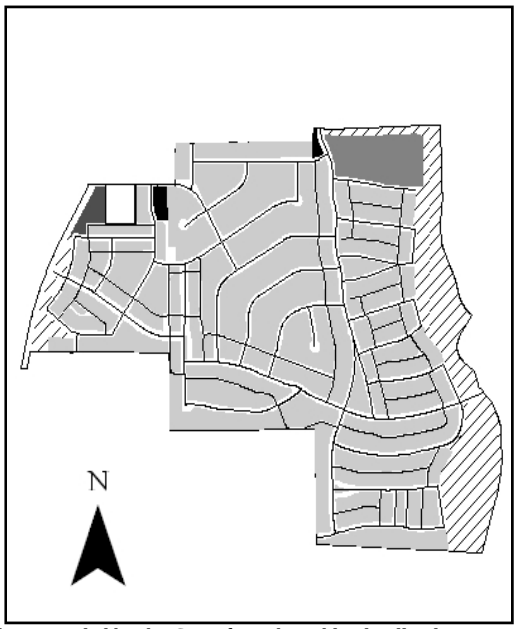
*Land use data provided by the Town of Mount Pleasant Planning Department.



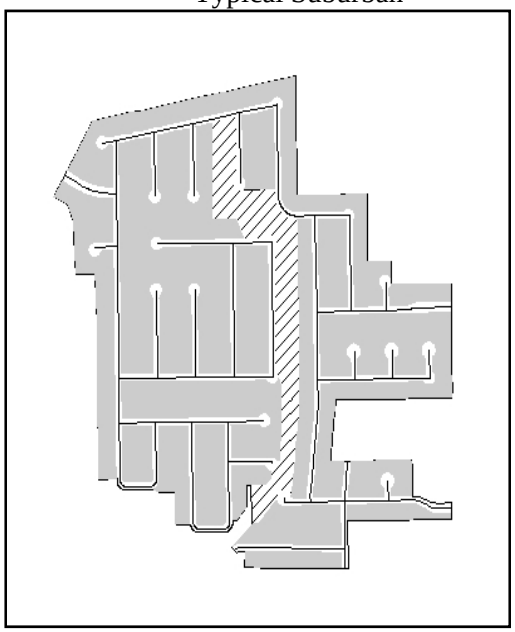
	Neo-Traditional (I'On)	Typical Suburban (Belle Hall)
Total area of tract (acres)	243.10	422.90
Existing dwelling units	729	984
Permitted dwelling units	759	11.26
Mean single family home price	~	~
Year approved	1997	1998
Year completed	2010	2015
Public Transit Access	No	No
Greenfield	Yes	Yes
Vacant area (pct of total area)	0%	15%
Parks/open space (pct of total area)	24%	10%
Residential area (pct of total built area)	62%	71%
Commercial area (acres)	2.62	5.25
Net single family density (units per acre)	6.28	4.39
Street density (miles per 100 acres)	4.21	2.57
Link-node ratio	1.38	1.17
External connections	3	1
Mean walkscore	62.84	26.96

North Richland Hills, TX

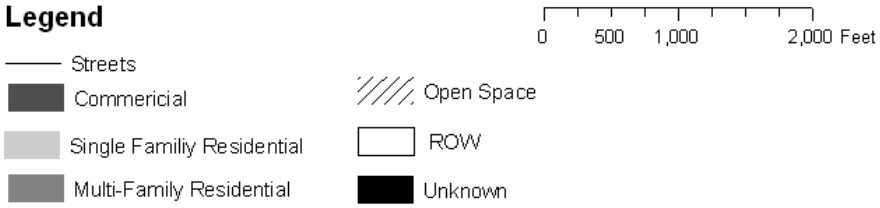
Neo-Traditional



Typical Suburban



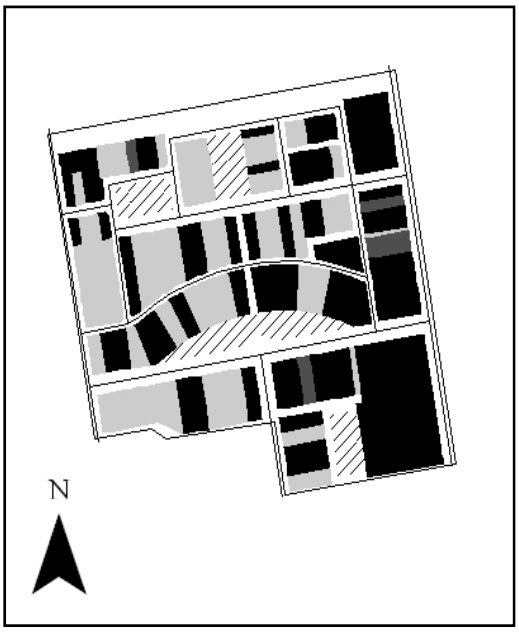
*Land use data provided by the City of North Richland Hills Planning and Zoning Department and the City of North Richland Hills Information Services.



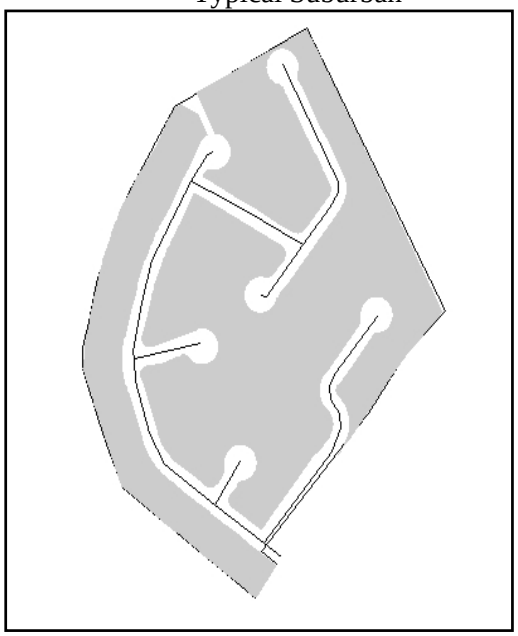
	Neo-Traditional (Home Town)	Typical Suburban (Thornbridge)
Total area of tract (acres)	214.90	176.30
Existing dwelling units	716	422
Permitted dwelling units	~	~
Mean single family home price	~	~
Year approved	~	~
Year completed	~	~
Public Transit Access	No	No
Greenfield	No	No
Vacant area (pct of total area)	0%	0%
Parks/open space (pct of total area)	13%	9%
Residential area (pct of total built area)	67%	80
Commercial area (acres)	1.50	0.00
Net single family density (units per acre)	5.43	3.28
Street density (miles per 100 acres)	5.78	3.09
Link-node ratio	1.57	1.24
External connections	8	3
Mean walkscore	36.27	35.75

Pensacola, FL

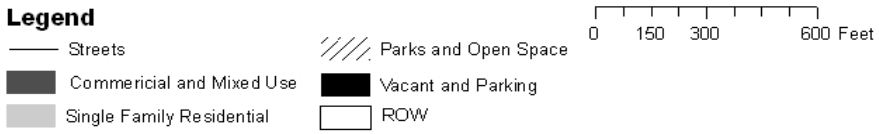
Neo-Traditional



Typical Suburban



*Land use data provided by the City of Pensacola Community Redevelopment Agency.



	Neo-Traditional (Aragon)	Typical Suburban (The Whispers)
Total area of tract (acres)	23.8	24.4
Existing dwelling units	62	109
Permitted dwelling units	143	100
Mean single family home price	$136,000	$141,000
Year approved	2000	2000
Year completed	~	~
Public Transit Access	Yes	Yes
Greenfield	No	No
Vacant area (pct of total area)	34%	0%
Parks/open space (pct of total area)	8%	0%
Residential area (pct of total built area)	73%	79%
Commercial area (acres)	0.45	0.00
Net single family density (units per acre)	10.71	5.64
Street density (miles per 100 acres)	6.47	2.91
Link-node ratio	1.19	0.92
External connections	6	1
Mean walkscore	76.53	63

Appendix II. Survey instruments
Initial survey

ALL RESPONSES WILL BE KEPT STRICTLY **CONFIDENTIAL**.
If you get to a question you cannot or choose not to answer, please skip to the next one.

1. **Can you walk unassisted for 20 minutes or more?**

   No __ [please Stop and send in empty survey]
   Yes ___

2. **What best describes your race/ethnicity?** [check all that apply]

   a ☐ African American
   b ☐ Asian/Pacific Islander
   c ☐ Latino/a
   d ☐ Native American
   e ☐ White
   f ☐ Other
   g ☐ Don't know

3. **What is your gender?**

   a ☐ Female
   b ☐ Male

4. **What type of home do you currently live in?**

   a ☐ Detached single house
   b ☐ Duplex, townhouse, or rowhouse
   c ☐ Apartment or condominium
   d ☐ Other [Specify]_____
   e ☐ Don't know

5. **Do you rent or own your current home?**

   a ☐ Own
   b ☐ Rent
   c ☐ Other [Specify]_____
   d ☐ Don't know

6. **What year and month did you move into your current neighborhood?**

   a _____Year d_____ Month

7. **How many people live in your household?** [Please do not include anyone who usually lives somewhere else or is just visiting]

   a _____ Number

8. **Including yourself, please list the age in years of each member of your household.**

   a _____**Your** age d_____
   b _____ e_____
   c _____ f_____

9. **How many, if any, cars are available in your household?** [Include leased, vanpool, or company-owned motorized vehicles if they are used by household members on a regular basis]

   a _____Number

10. **For the two most used cars in your household, please list the make, model, year, miles driven last year, and number of years your household has owned or leased them.**

    Primary Vehicle
    a _____Make (e.g., Honda, Ford)
    b _____Model (e.g., Civic, Fusion)
    c _____Model year
    d _____Miles driven last year
    e _____Years you have owned/leased this vehicle

    Secondary Vehicle
    f _____Make (e.g., Honda, Ford)
    g _____Model (e.g., Civic, Fusion)
    h _____Model year
    i _____Miles driven last year
    j _____Years you have owned/leased this vehicle

11. **What is the highest level of education you have completed?**

    a ☐ Less than High School
    b ☐ High School or GED
    c ☐ Vocational/Technical Degree/ Some College
    d ☐ Bachelor's Degree (BA,BS)
    e ☐ Some graduate school, no degree
    g ☐ Graduate or Professional School

12. **If you work, what is your approximate household income before taxes?** [information is strictly confidential]

    a ☐ Under $20,000 f ☐ $60,001-$80,000
    b ☐ $20,000-$30,000 g ☐ $80,001-$100,000
    c ☐ $30,001-$40,000 h ☐ $100,001-$150,000
    d ☐ $40,001-$50,000 i ☐ $150,001-$200,000
    e ☐ $50,001-$60,000 j ☐ Over $200,000

13. **My ideal commuting time to work or school is:**

    a ___Less than 5 minutes
    b ___Between 5 and 15 minutes
    c ___Between 15 and 30 minutes
    d ___More than 30 minutes

14. **If the cost of gasoline increased 50% in the next year, I would** [check all that apply]

    a _____Drive less
    b _____Move to a different location
    c _____Purchase an alternative fuel vehicle [hybrid, electric, E-85, etc.]
    d _____Do nothing
    e _____Other [Specify]_____

1. What best describes your employment status? [Please check only one and answer the following questions accordingly]

a ☐ Work full-time outside the home
b ☐ Work part-time outside the home
→ Please continue to question 2

c ☐ Student → Please skip to question 3

d ☐ Work full-time at home
e ☐ Work part-time at home
f ☐ Unemployed (non-student)
g ☐ Retired
h ☐ Other [Specify]_____
→ Please skip to question 5

2. Do you ever telecommute/telework to work? If so, how many times per week?

a☐ No b☐ Yes, times per week _____

3. How long does it typically take to get to your main place of work or school from your home?

a _____hours b _____minutes

4. How much do you typically spend on traveling to work or to school per week? [Include all gas, parking, or transit fares]

a $_____

5. About how many miles per week do you travel by car?

a _____Miles

6. In a typical week, Monday through Friday, how often do you travel to the following places?

	never	1-2 times	3-5 times	6+ times
To your work or school as the driver				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To your work or school driven by someone else				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To your work or school using public transportation				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To your work or school by walking or bicycle				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
Transporting someone (for example pickup someone, take and wait for someone, drop off someone)				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To go shopping or run an errand as a driver or driven by someone else				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To go shopping or run an errand by walking or bicycle				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To go out for recreation, entertainment, or meals (watch/play sports, movie, museum, restaurant/bar, visit friends/relatives) as a driver or driven by someone else				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐

QUESTIONS ABOUT YOUR ACTIVITIES

Please consider moderate and vigorous physical activities. Moderate activities cause *small* increases in breathing or heart rate, while vigorous activities cause *large* increases in breathing or heart rate.

1. In a usual week, do you do MODERATE physical activities for at least 10 minutes at a time, such as brisk walks, bicycling, vacuuming, gardening, or anything else that causes SMALL INCREASES in breathing or heart rate?

No a__ {skip to **Question 5**} Yes b___

2. How many days per week do you do these MODERATE activities for at least 10 minutes at a time? a_____

3. On days when you do MODERATE activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities**?**

a _____hours b _____minutes

4. What percentage of the total time that you spend on MODERATE activities do you spend:

a____% At home
b____% Outside my home but in my neighborhood
c____% Outside of my neighborhood

Now consider vigorous activities that cause *large* increases in breathing or heart rate such as jogging, swimming, or aerobics

5. In a usual week, do you do VIGOROUS physical activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes LARGE INCREASES in breathing or heart rate?

No __ {skip to **Question 9**} Yes ___

6. How many days per week do you do these VIGOROUS activities for at least 10 minutes at a time? a _____

7. On days when you do VIGOROUS activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

a _____hours b _____minutes

8. What percentage of the total time that you spend on VIGOROUS activities do you spend:

a____% At home
b____% Outside my home but in my neighborhood
c____% Outside of my neighborhood

9. What is your weight? a_____ pounds

10. What is your height a_____ feet b_____inches

11. How often have you used the Internet in the past 6 months at home?

a ☐ Everyday
b ☐ Almost everyday
c ☐ Once a week
d ☐ Once a month
e ☐ Never

On a scale of 1 to 5, please rate how important each of the following reasons was in your decision to move to your neighborhood. 1= not at all important…. 5= very important [Circle a number for each statement]

Affordability/value of my home
1 2 3 4 5
not at all important somewhat important very important

Closeness to open space, such as parks
1 2 3 4 5
not at all important somewhat important very important

Closeness to a job or school
1 2 3 4 5
not at all important somewhat important very important

Closeness to public transportation
1 2 3 4 5
not at all important somewhat important very important

Desire for nearby shops and services
1 2 3 4 5
not at all important somewhat important very important

Ease of walking
1 2 3 4 5
not at all important somewhat important very important

Sense of community
1 2 3 4 5
not at all important somewhat important very important

Safety from crime
1 2 3 4 5
not at all important somewhat important very important

Quality of schools
1 2 3 4 5
not at all important somewhat important very important

Closeness to recreational facilities
1 2 3 4 5
not at all important somewhat important very important

Access to freeways
1 2 3 4 5
not at all important somewhat important very important

The design and atmosphere of the neighborhood
1 2 3 4 5
not at all important somewhat important very important

Quality of my home (overall design & construction)
1 2 3 4 5
not at all important somewhat important very important

Size of the lot or the house
1 2 3 4 5
not at all important somewhat important very important

On a scale of 1 to 5, express your level of agreement with the following statements. 1= strongly disagree…. 5= strongly agree [Circle a number for each statement]

I enjoy walking or bicycling

1 2 3 4 5
strongly disagree neutral strongly agree

I am comfortable riding a bus

1 2 3 4 5
strongly disagree neutral strongly agree

It's important for children to have a large backyard for playing

1 2 3 4 5
strongly disagree neutral strongly agree

Environmental protection is an important issue

1 2 3 4 5
strongly disagree neutral strongly agree

I enjoy a house close to the sidewalk so that I can see and interact with passersby

1 2 3 4 5
strongly disagree neutral strongly agree

Too much land is consumed for new housing, stores, and offices

1 2 3 4 5
strongly disagree neutral strongly agree

I can be comfortable living in close proximity to my neighbors

1 2 3 4 5
strongly disagree neutral strongly agree

I prefer lots of space between my home and the street

1 2 3 4 5
strongly disagree neutral strongly agree

Children should have a large public play space within safe walking distance of their home

1 2 3 4 5
strongly disagree neutral strongly agree

Having shops and services close by is important to me

1 2 3 4 5
strongly disagree neutral strongly agree

Household energy consumption in the US is a major contributor to global climate change

1 2 3 4 5
strongly disagree neutral strongly agree

The government should put more emphasis on encouraging places that makes people less dependent on automobiles

1 2 3 4 5
strongly disagree neutral strongly agree

As an individual, I can make a difference when it comes to conserving energy and protecting the environment

1 2 3 4 5
strongly disagree neutral strongly agree

This is a close-knit neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

People in my neighborhood can be trusted

1 2 3 4 5
strongly disagree neutral strongly agree

There are sidewalks on most of the streets in my neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

People in my neighborhood are willing to help their neighbors

1 2 3 4 5
strongly disagree neutral strongly agree

Considering road and traffic conditions, it is safe to ride a bicycle in or near my neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

My neighborhood is safe enough for a 10 year old child to walk around the block alone during daytime

1 2 3 4 5
strongly disagree neutral strongly agree

There are many places to go within easy walking distance of my home

1 2 3 4 5
strongly disagree neutral strongly agree

People in my neighborhood generally do not get along with each other

1 2 3 4 5
strongly disagree neutral strongly agree

People in this neighborhood do not share similar values

1 2 3 4 5
strongly disagree neutral strongly agree

Parents in this neighborhood know their children's friends

1 2 3 4 5
strongly disagree neutral strongly agree

Most of my kids' friends live in this neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

You can count on adults in this neighborhood to watch out for kids and keep them safe

1 2 3 4 5
strongly disagree neutral strongly agree

Adults in this neighborhood do not know who the local children are

1 2 3 4 5
strongly disagree neutral strongly agree

There are adults in this neighborhood that children can look up to

1 2 3 4 5
strongly disagree neutral strongly agree

Parents in this neighborhood generally do not know each other

1 2 3 4 5
strongly disagree neutral strongly agree

It is easy to find good housing in this area in places where I do not need to rely on a car for everything

1 2 3 4 5
strongly disagree neutral strongly agree

Follow-up survey

ALL RESPONSES WILL BE KEPT STRICTLY **CONFIDENTIAL**.

How many, if any, cars are available in your household? [Include leased, vanpool, or company-owned motorized vehicles if they are used by household members on a regular basis]

a _____Number

For the two most used cars in your household, please list the make, model, year, miles driven last year, and number of years your household has owned or leased them.

Primary Vehicle

a _____Make (e.g., Honda, Ford)

b _____Model (e.g., Civic, Fusion)

c _____Model year

d _____Miles driven last year

e _____Years you have owned/leased this vehicle

Secondary Vehicle

f _____Make (e.g., Honda, Ford)

g _____Model (e.g., Civic, Fusion)

c _____Model year

d _____Miles driven last year

e _____Years you have owned/leased this vehicle

	never	1-2 times	3-5 times	6+ times
To your work or school as the driver				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To your work or school driven by someone else				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To your work or school using public transportation				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To your work or school by walking or bicycle				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
Transporting someone (for example pickup someone, take and wait for someone, drop off someone)				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To go shopping or run an errand as a driver or driven by someone else				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To go shopping or run an errand by walking or bicycle				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐
To go out for recreation, entertainment, or meals (watch/play sports, movie, museum, restaurant/bar, visit friends/relatives) as a driver or driven by someone else				
Outside your neighborhood	☐	☐	☐	☐
Within your neighborhood	☐	☐	☐	☐

QUESTIONS ABOUT YOUR ACTIVITIES

Please consider moderate and vigorous physical activities. Moderate activities cause *small* increases in breathing or heart rate, while vigorous activities cause *large* increases in breathing or heart rate.

In a usual week, do you do MODERATE physical activities for at least 10 minutes at a time, such as brisk walks, bicycling, vacuuming, gardening, or anything else that causes SMALL INCREASES in breathing or heart rate?
No a __ {skip to **Question 5**} Yes b ___
How many days per week do you do these MODERATE activities for at least 10 minutes at a time? a_____

On days when you do MODERATE activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities**?**
a _____hours b _____minutes
What percentage of the total time that you spend on MODERATE activities do you spend:
a____% At home
b____% Outside my home but in my neighborhood
c____% Outside of my neighborhood

Now consider vigorous activities that cause *large* increases in breathing or heart rate such as jogging, swimming, or aerobics.

In a usual week, do you do VIGOROUS physical activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes LARGE INCREASES in breathing or heart rate?
No __ {skip to the next section} Yes ___
How many days per week do you do these VIGOROUS activities for at least 10 minutes at a time? a _____

On days when you do VIGOROUS activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?
a _____hours b _____minutes
What percentage of the total time that you spend on VIGOROUS activities do you spend:
a____% At home
b____% Outside my home but in my neighborhood
c____% Outside of my neighborhood

On a scale of 1 to 5, please rate how important each of the following reasons was in your decision to move to your neighborhood. 1= not at all important…. 5= very important [Circle a number for each statement]

Affordability/value of my home
1 2 3 4 5
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1 2 3 4 5
not at all important somewhat important very important

Closeness to public transportation
1 2 3 4 5
not at all important somewhat important very important

Desire for nearby shops and services
1 2 3 4 5
not at all important somewhat important very important

Ease of walking
1 2 3 4 5
not at all important somewhat important very important

Sense of community
1 2 3 4 5
not at all important somewhat important very important

Safety from crime
1 2 3 4 5
not at all important somewhat important very important

Quality of schools
1 2 3 4 5
not at all important somewhat important very important

Closeness to recreational facilities
1 2 3 4 5
not at all important somewhat important very important

Access to freeways
1 2 3 4 5
not at all important somewhat important very important

The design and atmosphere of the neighborhood
1 2 3 4 5
not at all important somewhat important very important

Quality of my home (overall design & construction)
1 2 3 4 5
not at all important somewhat important very important

Size of the lot or the house
1 2 3 4 5
not at all important somewhat important very important

On a scale of 1 to 5, express your level of agreement with the following statements. 1= strongly disagree…. 5= strongly agree [Circle a number for each statement]

I enjoy walking or bicycling

1 2 3 4 5
strongly disagree neutral strongly agree

I am comfortable riding a bus

1 2 3 4 5
strongly disagree neutral strongly agree

It's important for children to have a large backyard for playing

1 2 3 4 5
strongly disagree neutral strongly agree

Environmental protection is an important issue

1 2 3 4 5
strongly disagree neutral strongly agree

I enjoy a house close to the sidewalk so that I can see and interact with passersby

1 2 3 4 5
strongly disagree neutral strongly agree

Too much land is consumed for new housing, stores, and offices

1 2 3 4 5
strongly disagree neutral strongly agree

I can be comfortable living in close proximity to my neighbors

1 2 3 4 5
strongly disagree neutral strongly agree

I prefer lots of space between my home and the street

1 2 3 4 5
strongly disagree neutral strongly agree

Children should have a large public play space within safe walking distance of their home

1 2 3 4 5
strongly disagree neutral strongly agree

Having shops and services close by is important to me

1 2 3 4 5
strongly disagree neutral strongly agree

Household energy consumption in the US is a major contributor to global climate change

1 2 3 4 5
strongly disagree neutral strongly agree

The government should put more emphasis on encouraging places that makes people less dependent on automobiles

1 2 3 4 5
strongly disagree neutral strongly agree

As an individual, I can make a difference when it comes to conserving energy and protecting the environment

1 2 3 4 5
strongly disagree neutral strongly agree

This is a close-knit neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

People in my neighborhood can be trusted

1 2 3 4 5
strongly disagree neutral strongly agree

There are sidewalks on most of the streets in my neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

People in my neighborhood are willing to help their neighbors

1 2 3 4 5
strongly disagree neutral strongly agree

Considering road and traffic conditions, it is safe to ride a bicycle in or near my neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

My neighborhood is safe enough for a 10 year old child to walk around the block alone during daytime

1 2 3 4 5
strongly disagree neutral strongly agree

There are many places to go within easy walking distance of my home

1 2 3 4 5
strongly disagree neutral strongly agree

People in my neighborhood generally do not get along with each other

1 2 3 4 5
strongly disagree neutral strongly agree

People in this neighborhood do not share similar values

1 2 3 4 5
strongly disagree neutral strongly agree

Parents in this neighborhood know their children's friends

1 2 3 4 5
strongly disagree neutral strongly agree

Most of my kids' friends live in this neighborhood

1 2 3 4 5
strongly disagree neutral strongly agree

You can count on adults in this neighborhood to watch out for kids and keep them safe

1 2 3 4 5
strongly disagree neutral strongly agree

Adults in this neighborhood do not know who the local children are

1 2 3 4 5
strongly disagree neutral strongly agree

There are adults in this neighborhood that children can look up to

1 2 3 4 5
strongly disagree neutral strongly agree

Parents in this neighborhood generally do not know each other

1 2 3 4 5
strongly disagree neutral strongly agree

It is easy to find good housing in this area in places where I do not need to rely on a car for everything

1 2 3 4 5
strongly disagree neutral strongly agree

Appendix III. Mean social capital responses

		Mean	Std. dev.	Alpha - within index
"Social cohesion and trust" questions				**0.80**
att14	This is a close-knit neighborhood	3.75	1.04	0.75
att15	People in my neighborhood can be trusted	3.93	0.85	0.73
att17	People in my neighborhood are willing to help their neighbors	4.21	0.84	0.74
r_att21	People in your neighborhood generally DO get along with each other (reverse coded)	4.51	0.77	0.80
r_att22	People in your neighborhood DO share similar values (reverse coded)	4.29	0.91	0.78
"Intergenerational closure" questions				**0.81**
att23	Parents in my neighborhood know their children's friends	3.80	0.86	0.77
att25	You can count on adults in the neighborhood to watch out for kids and keep them safe	3.85	0.89	0.75
att26	Adults in the neighborhood DO know who the local children are (reverse coded)	3.97	1.07	0.77
att27	There are adults in the neighborhood that children can look up to	3.93	0.85	0.77
att28	Parents in the neighborhood generally DO know each other (reverse coded)	3.89	1.15	0.78

Appendix IV. Reliability

Table 17. Reliability

Question	N	Kappa/ Concordance Statistic	%. Agreement	CI lower bound	CI upper bound
VEHICLES					
Kappa/Concordance mean= .74; range= .40 - .95					
How many cars are available in your household	50	0.949	98.667	0.905	0.992
What is the model year of your primary vehicle	51	0.828*	n/a	0.739	0.917
How many miles was your primary vehicle driven last year	47	0.569*	n/a	0.416	0.721
How many years have you owned/leased your primary vehicle	49	0.796*	n/a	0.692	0.899
What is the model year of your secondary vehicle	37	0.865*	n/a	0.78	0.949
How many miles was your secondary vehicle driven last year	31	0.403*	n/a	0.114	0.693
How many years have you owned/leased your secondary vehicle	35	0.742*	n/a	0.589	0.895
TRAVEL BEHAVIOR: "How often do you…"					
Kappa/Concordance mean= .51; range= -.02 - 1.0					
travel to work or school outside your neighborhood as driver	45	0.789	91.852	0.635	0.943
travel to work or school inside your neighborhood as driver	34	0.495	86.275	-0.164	1.154
travel to work or school outside your neighborhood as passenger	45	0.549	94.074	0.141	0.956
travel to work or school inside your neighborhood as passenger	35	-0.019	94.286	-0.250^	0.211^
travel to work or school outside your neighborhood on public transit	45	1	100	1.000^	1.000^
travel to work or school inside your neighborhood on public transit		no variation in responses			
travel to work or school outside your neighborhood on bike or foot	45	0.534	95.556	-0.052	1.121
travel to work or school inside your neighborhood on bike or fo	37	0.582	95.496	-0.075	1.24
transport someone outside your neighborhood	46	0.435	84.058	0.141	0.728
transport someone inside your neighborhood	37	0.499	90.09	0.193	0.806
go shopping as driver or passenger outside your neighborhood	46	0.501	84.058	0.233	0.77
go shopping as driver or passenger inside your neighborhood	41	0.522	82.927	0.118	0.927
go shopping on bike or foot outside your neighborhood	43	0.493	90.698	0.296	0.691
go shopping on bike or foot inside your neighborhood	45	0.468	88.148	0.091	0.845
go out for recreation, entertainment or meals outside your neighborhood	47	0.398	83.688	0.274	0.521
go out for recreation, entertainment or meals inside your neighborhood	41	0.458	83.74	0.253	0.662
PHYSICAL ACTIVITY					
Kappa/Concordance mean= .60; range= .26 - .84					
In a usual week, do you do moderate exercise	52	0.297	92.308	-0.199	0.794^

How many days per week do you do moderate exercise	43	0.537	86.047	0.32	0.754
How many minutes do you do moderate exercise	40	0.490*	n/a	0.257	0.723
What % of moderate exercise is at home	39	0.682*	n/a	0.511	0.854
What % of moderate exercise is outside of home but in the neighborhood	39	0.835*	n/a	0.737	0.932
What % of moderate exercise is outside the neighborhood	39	0.738*	n/a	0.591	0.884
In a usual week, do you do vigorous exercise	51	0.749	88.235	0.561^	0.937^
How many days per week do you do vigorous exercise	27	0.488	83.796	-0.135	1.11
How many minutes do you do vigorous exercise	27	0.255*	n/a	-0.012	0.522
What % of vigorous exercise is at home	25	0.685*	n/a	0.472	0.898
What % of vigorous exercise is outside, but within the neighborhood	25	0.711*	n/a	0.513	0.91
What % of vigorous exercise is outside of the neighborhood	25	0.702*	n/a	0.5	0.904
PREFERENCES: "On a scale of one to five, how important is…"					
Kappa/Concordance mean= .52; range= .36 - .76					
affordability/value of your home	52	0.474	87.5	-0.055	1.003
closeness to open space, such as parks	52	0.557	86.058	0.349	0.765
is closeness to a job or school	51	0.478	78.431	0.355	0.601
closness to public transportation	52	0.409	85.577	0.069	0.749
desire for nearby shops and services	52	0.365	81.25	0.073	0.657
ease of walking	52	0.441	83.173	0.175	0.707
sense of community	52	0.687	90.865	0.598	0.776
safety from crime	52	0.582	90.865	0.25	0.913
quality of schools	51	0.761	89.216	0.624	0.898
closeness to recreational facilities	52	0.365	77.885	0.153	0.576
access to freeways	52	0.549	85.096	0.392	0.706
design and atmosphere of the neighborhood	52	0.555	89.744	0.283	0.827
the quality of your home	52	0.644	93.59	0.264	1.024
the size of the lot or the house	52	0.447	83.173	0.09	0.805
ATTITUDES					
Kappa/Concordance mean= .60; range= .41 - .85					
I enjoy walking or bicycling	52	0.591	91.827	0.315	0.868
I am comfortable riding a bus	52	0.672	87.5	0.458	0.887
It is important for children to have a large backyard for playing	52	0.583	86.538	0.38	0.786
Environmental protection is an important issue	52	0.61	90.865	0.31	0.91
I enjoy a house close to the sidewalk so that you can see and interact with passersby	52	0.703	91.346	0.488	0.919
Too much land is consumed for new housing, stores, and offices	52	0.431	81.41	0.124	0.737
I can be comfortable living in close proximity to your neighbors	52	0.7	91.827	0.358	1.042

I prefer lots of space between your home and the street	52	0.575	87.981	0.422	0.727
Children should have a large public play space within safe walking distance of their home	52	0.528	88.942	0.343	0.712
Having shops and services close by is important to me	52	0.556	87.821	0.428	0.683
Household energy consumption in the US is a major contributor to global climate change	52	0.62	87.019	0.442	0.799
The government should put more emphasis on encouraging places that make people less dependent driving	52	0.505	87.019	0.19	0.821
As an individual, you can make a difference when it comes to conserving energy and protecting the environment	52	0.626	91.026	0.173	1.078
This is a close-knit neighborhood	52	0.715	91.827	0.571	0.859
People in my neighborhood can be trusted	52	0.716	91.667	0.424	1.008
There are sidewalks on most of the streets in your neighborhood	52	0.853	97.596	0.632	1.074
People in my neighborhood are willing to help their neighbors	52	0.584	90.385	0.52	0.648
Considering road and traffic conditions, it is safe to ride a bicycle in or near my neighborhood	52	0.557	88.462	0.484	0.63
My neighborhood is safe enough for a ten-year-old child to walk around the block alone	52	0.539	89.904	0.376	0.701
How strongly do you agree that there are many places to go within easy walking distance	52	0.773	92.308	0.641	0.905
People in your neighborhood generally do not get along with each other	52	0.582	90.385	0.317	0.846
People in your neighborhood do not share similar values	52	0.538	85.897	0.389	0.687
Parents in my neighborhood know their children's friends	51	0.562	85.621	0.392	0.731
Most of my kids' friends live in the neighborhood	46	0.496	83.152	0.172	0.82
You can count on adults in the neighborhood to watch out for kids and keep them safe	50	0.411	85	0.083	0.739
Adults in the neighborhood do not know who the local children are	52	0.507	83.333	0.228	0.786
There are adults in the neighborhood that children can look up to	52	0.611	87.821	0.408	0.814
Parents in the neighborhood generally do not know each other	51	0.674	90.686	0.569	0.778
It is easy to find good housing in your area in places where one does not need to own a car	52	0.561	83.173	0.268	0.855

*=concordance presented instead of kappa

^=analytical confidence intervals. CI's are normal for continuous variables, asymptotic for categorical except where noted.

kappa scores weighted as follows: 1-|i-j|/(k-1), where i and j index the rows and columns of the responses for the original & follow-up questions, and k is the maximum number of possible responses