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Publication Date
1992

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Reprinted from
Built Environment
Vol. 18, No. 4 (1992), pp. 253-267

UCTC No. 235

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Regional Versus Local Accessibility
Neo-Traditional Development and its Implications for Non-work Travel

Susan L. Handy

How does a more compact form of urban development affect people's travel behaviour? Research reported here does not support the popular view that compact cities reduce non-work travel, although results of the case studies were somewhat ambiguous.

The question of how particular forms of metropolitan development affect travel patterns has long been of concern to planners but has recently been at the centre of a heated debate. Much of this debate has focused on the effects of suburbanization in particular, with some arguing that the decentralization of housing and jobs reduces overall travel (for example Gordon *et al*., 1989; 1991) and most others arguing that the low-density development that is associated with decentralization leads to more automobile travel and gasoline consumption (for example Newman and Kenworthy, 1989; 1992). The debate has taken on a very practical form in proposals that address the problem of growing levels of travel, particularly non-work travel, by changing the way in which individual suburbs are designed. The sprawling, low-density suburban development that has proliferated in recent decades in the United States is defined as the problem and a new approach to design is put forth as the solution. This approach is commonly dubbed 'neo-traditional development'.

Despite the popularity of the neo-traditional concept, the evidence on how effective these developments will be at reducing non-work travel is limited. This paper begins to remedy this situation, by providing both a framework through which these proposals must be evaluated and evidence from case studies of four communities within the San Francisco Bay Area as to the relationship between alternative forms of suburban development and the travel patterns of suburban residents. The question addressed is whether 'traditional' suburban forms engender less non-work travel than alternative forms, and the answer is ambiguous.

Neo-Traditional Development

'Neo-traditional development' (NTD) is a generic term for a set of more specific proposals that go by a variety of names: urban villages, compact cities, compact urban development. Andres Duany's designs for a number of communities on the East Coast of the U.S. have probably received the most attention, but Peter Calthorpe's Pedestrian Pocket designs have been particularly influential in Northern California (Lee, 1991). The adjective 'neo-traditional' fits because many features of these proposals are drawn from suburban communities of the pre-World War II era. They include a mixed-use core, akin to a traditional town centre, within walking distance for most residents. Employment centres are also incorporated into the proposals, so that residents have the opportunity to both live and work within the development. Designers are concerned with creating a sense of community and

thus provide public spaces and civic centres as the focal point of the project. 'Pedestrian-friendly' environments are created with narrower streets, wider sidewalks, and more street trees in order to encourage street life. Designers seek to establish a sense of tradition, despite the newness of these developments; front porches, detached and set-back garages, and 'granny' flats are typical design requirements, for example, and the general layout abandons curvilinear streets and cul-de-sacs in favor of a rectilinear grid.

Proponents of these projects claim that such designs will reduce the need for travel, particularly non-work travel by automobile, in two ways. The first source is a greater internalization of trips. The concentration of activity in the town centre will 'exert a strong attraction on local residents,' so that 'a substantially higher percentage of non work travel, particularly home-to-shopping trips, will remain within the development,' according to Gordon and Peers (1991). Duany states (in Knack, 1989) that 'most of the needs of daily life can be met within a 3000-4000 acre, mixed-use development' so that 'very few automobile trips would ever hit the collector road' in an NTD. In other words, trips lengths will be shorter, regardless of any other impacts.

In addition, there will be a shift away from the use of the automobile, proponents claim. The return to a 'traditional' rectilinear street grid is seen as a way of reducing travel distances for pedestrians and bicyclists and improving the walking and biking environment, as long as traffic speeds are controlled and through-trips by automobiles are minimized (Kulash, 1991; Lerner-Lam, *et al*., 1992). Thus, Pearson (1990) observes that 'the plans are being billed as offering solutions to many of the traffic problems that have become endemic to suburbs developed since the second World War.'

How well this goal is met depends on how these communities relate to the larger settlement pattern. While New Towns were generally planned as just that – new, independent, relatively self-sufficient settlements – NTDs are planned in the context of an existing region. The designers hope both to integrate them into the region and to differentiate them from the region.

On one hand, these proposals differ from both contemporary planned unit developments (PUDs) and from historical new town proposals in that they consciously address the need for links to surrounding development. This is done in a variety of ways. Calthorpe's designs centre around transit stations, a light rail station in the ideal case, that link the development to the region. The use of a rectilinear grid is supposed to offer more route choices and may connect better with surrounding development, in contrast to the curvilinear and cul-de-sac streets popular in recent suburban subdivisions. These physical connections provide for the necessary social and economic connections between the community and the region. The intent, in other words, is to increase access to regional employment, shopping, and service centres.

On the other hand, it is clear that the theory 'is to make new suburbs that are a good deal more than bedroom communities' (Pearson, 1990). These communities are more independent than typical suburban development, where land uses are strictly

segregated and widely separated: land uses are better mixed, connections between residential and commercial areas are more thoughtfully designed, and at least daily needs are provided for within the community itself. Thus, the intent is to increase access to activities within the local area. This point is crucial to the goal of decreasing transportation demand. Only by keeping the activities of residents within the community to a greater degree is this goal achieved. However, the impact of increasing accessibility to both local and regional activity is uncertain.

Research Approach

The fundamental premise of the research presented in this paper is that the amount that a person travels is influenced by both the character of the particular community in which he or she lives and the spatial structure of the region of which that community is a part. In order to test the implications for travel of alternative forms of suburban development, it is thus necessary to characterize both the community and its region and to compare alternative forms in light of this dual-characterization. Further, the structure associated with different types of activity and hence different types of travel – particularly work versus non-work travel – may be vastly different and must thus be separately analyzed. The measures that have typically been used to characterize development – population density, jobs/housing ratio – have proved inadequate for this task.

The concept of accessibility provides an important tool for addressing these issues and exploring the link between the spatial structure a community and its region and the travel patterns of its residents. In its most basic definition, accessibility reflects the 'intensity of the possibility of interaction' (Hansen, 1959). The level of accessibility in a place reflects the distribution of potential destinations around it. It measures not only the ease with which particular activities may be reached, but the magnitude of activity in particular locations. Thus, measures of accessibility consist of two elements: the attractiveness of potential destinations and the cost of reaching them. For the purpose of testing the relationship between spatial structure and travel patterns, accessibility is a more effective measure of spatial structure than either population density or jobs/housing ratios because it reflects *both* these characteristics and because it is based on assumptions about how individuals make travel decisions.

This definition of accessibility suggests that there is a substitutability between the transportation system and the distribution of activities in determining a community's level of accessibility (Morris, *et al*., 1979). A given place may be very far from a few large activity centres or close to several small activity centres and have the same level of accessibility. Yet the implications for travel patterns may be very different. As a result, it is important to distinguish between *types* of accessibility and, in particular, to differentiate between *regional* accessibility and *local* accessibility. By evaluating both the local and the regional accessibility of a community, both the character of the community itself as well as the character of the region and the quality of the links between the community and the region have been accounted for.

A distinction between local and regional accessibility to non-work activity can be based on three variables, as suggested by the shopping behaviour literature (Huff, 1962; Berry, 1967): location, type of activity, and size of activity concentration (table 1). *Local accessibility* is defined as being primarily determined by nearby activity, most of which is oriented to convenience goods, such as supermarkets and drug stores, and located in small centres. The pattern of local accessibility in a community will be closely associated with the pattern of relatively short and frequent *local trips* made by residents. *Regional accessibility* is defined with respect to large regional shopping centres, which tend to be farther away and offer a wide range of comparison goods. The pattern of regional accessibility around a community will be closely associated with the pattern of relatively long and infrequent *regional trips* residents make.

Table 1. Distinction between local and regional accessibility.

	Near Activity			*Far Activity*		
	Large Centres	Small Centres	Non-Centres	Large Centres	Small Centres	Non-Centres
Convenience Goods	LA and/or RA•	LA*	LA*	RA*		
Comparison Goods	LA• and/or RA	LA•	LA•	RA*		

LA = local accessibility
RA = regional accessibility
* primary contribution
• substitution effect

However, there is some overlap in these definitions. First, establishments offering comparison goods may be located nearby, in 'stand alone' locations, small centres, or in regional shopping centres. In this case, this nearby activity might reduce the need for longer trips to more distant regional centres. Second, establishments offering convenience goods may be found in regional centres. In this case, multi-purpose shopping trips might be possible, reducing the frequency of local trips. In other words, there may be some degree of substitutability between local and regional accessibility. The possibility of this substitutability is particularly important in resolving to what degree NTD may reduce non-work travel. The hope is that by enhancing local accessibility, more local trips will be made by walking instead of driving and the number of regional trips taken will be reduced.

Methodology

The case studies presented here were conducted as a part of a larger research project that developed and refined definitions of local and regional accessibility as a way of describing and measuring spatial structure and then used these definitions to test the link between the spatial structure of suburban communities and the travel

patterns of their residents (Handy, 1992). The first phase of this research involved an aggregate analysis for the San Francisco Bay Area, using existing data available from the regional planning agencies. Aggregate measures of local and regional accessibility were calculated for 550 zones in the Bay Area, using an exponential form of a gravity-based accessibility indicator.

The calculated measures were used to select four case study communities within the Bay Area based on their levels of local and regional accessibility, resulting a two-by-two matrix (table 2). First, high and low regional accessibility areas were identified: the Santa Clara Valley (i.e. 'Silicon Valley') at the south end of the San Francisco Peninsula and Santa Rosa to the north of San Francisco, respectively (figure 1). Second, within each of these areas, high and low local accessibility areas were selected. The former, downtown Mountain View in the Santa Clara Valley, and the Junior College neighbourhood in Santa Rosa, are turn-of-the-century towns that have been absorbed into the regional fabric over time, but nevertheless still resemble the traditional towns that NTD proposals hope to emulate. The low local accessibility areas, Sunnyvale in Silicon Valley, and the Rincon Valley area in Santa Rosa, are post World War II suburban developments with many of the characteristics that the proponents of NTDs are reacting against.

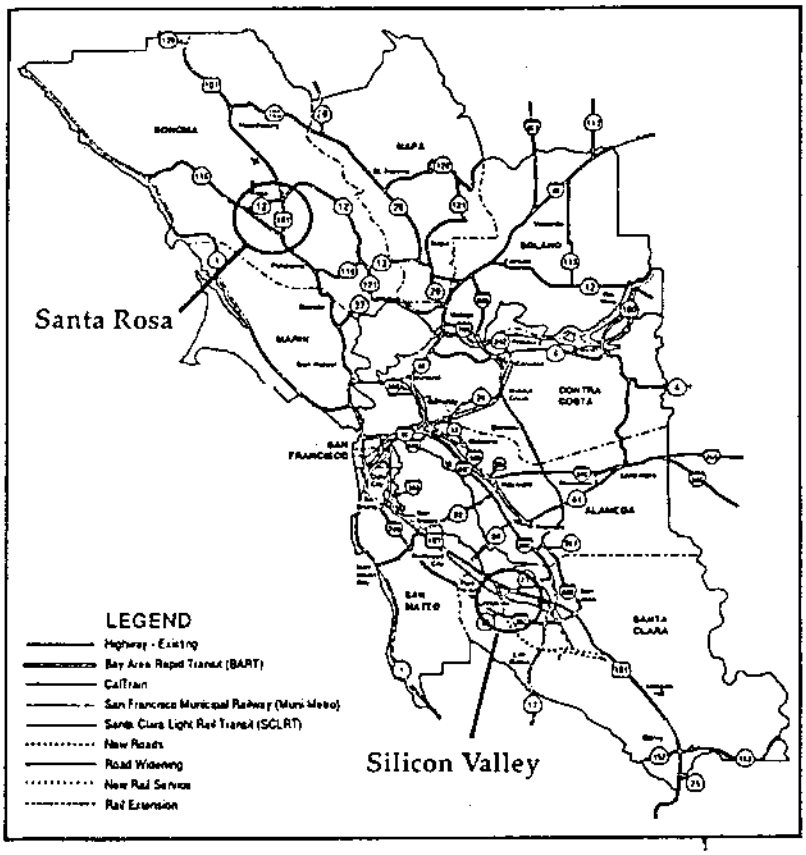

Figure 1. Case study location.

These areas were also selected so as to control as much as possible for differences in the socio-economic characteristics of residents. The characteristics of the residents of

Table 2. Case study selection matrix.

	High Local Accessibility	*Low Local Accessibility*
High Regional Accessibility	Silicon Valley – Mountain View	Silicon Valley – Sunnyvale
Low Regional Accessibility	Santa Rosa – Junior College	Santa Rosa – RinconValley

each case study area are shown in table 3. In general, the characteristics are relatively similar, but there are some differences between the high and low local accessibility areas and between the high and low regional accessibility areas. For example, the high local accessibility areas have smaller households on average, probably due to the fact that a higher percentage of housing units are multi-family. High regional accessibility areas, on the other hand, have higher housing values, due to the overall higher priced real estate market in these more highly developed areas.

Table 3. Case study area characteristics.

		Mountain View	*Sunnyvale*	*Junior College*	*Rincon Valley*
Residents:					
Population		10,726	22,234	8,763	12,455
Average income 1980	*a*	$21,200	$29,200	$24,800	$24,500
Median Age		31.6	35.5	33.5	35.8
Population < 18 years		16.1%	21.5%	19.5%	25.4%
Population > 65 years		8.2%	9.8%	14.6%	15.6%
% Black		4.7%	2.6%	1.7%	1.4%
% Hispanic		22.9%	6.9%	8.1%	5.6%
Households		4,947	8,446	4,198	5,060
Persons/household		2.16	2.61	2.05	2.46
Housing:					
Owner-Occupied		23.3%	59.6%	31.9%	62.9%
SF Detached		28.3%	57.6%	45.4%	33.4%
Median Value		$321,670	$390,384	$183,221	$194,300
Median Rent		$639	$729	$503	$629
Density:					
Population/residential acres	*b*	28.7	20.5	20.8	8.5
Household/residential acres	*b*	13.3	7.9	10.1	3.5
Population/total acres	*c*	15.0	17.4	7.5	5.0
Household/total acres	*c*	6.9	6.7	3.6	2.0

Source: 1990 Census except where noted:
a 1980 Census
b MTC 1980 land use data by Traffic Analysis Zone
c Author's estimates of total acres by census tract

The accessibility characteristics of the case study areas were evaluated in detail, using a variety of available data, planning documents, maps, and extensive field surveys.

Factors that directly influence accessibility, the transportation system and the scale and distribution of activities, were analysed, as well as factors that may indirectly and qualitatively influence accessibility, such as the design of residential and commercial areas. In order to test the relationship between these factors and the travel patterns of residents, a phone survey of 100 residents in each area was conducted. Rather than a full travel-diary survey, the case study survey focused on particular types of trips: trips to supermarkets and other food stores, to local commercial areas, to regional shopping centres, and walking trips. Questions addressed the frequency of these trips, the range of destinations visited, and the mode of travel. Respondents were also asked a series of questions as to their socio-economic characteristics and those of their household. This survey was supplemented with estimates of travel times between residential areas and destinations based on computerized transportation networks developed for each area.

Differences between Case Study Areas

Before presenting the findings with respect to travel patterns, it is important to describe the physical character of the case study areas in more detail. The two high local accessibility areas, Mountain View and Junior College, differ significantly from the two low local accessibility areas, Sunnyvale and Rincon Valley, with respect to both the character of their transportation networks and the location and design of commercial land uses. The transportation networks in both Mountain View and Junior College are traditional rectilinear grids, for the most part, with very few curves and irregularities in comparison to the networks in Sunnyvale and Rincon Valley (figures 2 to 5). Several statistics calculated for these networks quantify these differences (table 4). The high local accessibility areas have significantly smaller blocks (as indicated by the higher number of blocks per square mile of area), more intersections, particularly four-way rather than three-way 'T' intersections, fewer culs-de-sac, and generally more road miles per square mile of area. In addition, the residential streets in the Sunnyvale and Rincon Valley areas have very few connections to the arterial streets that bound the residential areas. These differences suggest that residents of the high local accessibility areas have more direct routes and a greater choice of routes to destinations inside and outside the residential area.

The location and distribution of commercial activity also differs greatly between these areas. Both the Mountain View (figure 2) and Junior College (figure 4) areas encompass the traditional downtown commercial area of these cities (the Cities of Mountain View and Santa Rosa, respectively). Although their importance declined due to competition from regional shopping malls beginning in the 1950s, both of these downtown areas have been revived in recent years, redesigned so as to enhance the pedestrian environment and provide more of a focus for the community. In both cases, the downtown is bordered by residential areas, so that walking from home to a local store or restaurant is a possibility. In addition, neighbourhood commercial centres and stand-alone 'mom and pop' grocery stores are located within residential areas. In Sunnyvale (figure 3) and Rincon Valley (figure 5), commercial activity is concentrated in automobile-oriented commercial

Table 4. Statistics on network characteristics

	Mountain View	*Sunnyvale*	*Junior College*	*Rincon Valley*
Area (sq miles)	1.12	2.00	1.51	3.91
Road miles	21.0	33.8	27.2	38.5
Road miles/area	18.8	16.9	18.0	9.9
TOTAL:				
Blocks	109	96	128	66
Intersections	163	255	183	208
T	70	222	58	188
4-way	93	35	125	20
Culs-de-sac	18	91	16	86
Per sq mile:				
Blocks	97.76	48.00	84.71	16.87
Intersections	146.19	127.50	121.10	53.18
T	62.78	111.00	38.38	48.07
4-way	83.41	17.50	82.72	5.11
Culs-de-sac	16.14	45.50	10.59	21.99
Per road mile:				
Blocks	5.19	2.84	4.71	1.71
Intersections	7.76	7.54	6.73	5.40
T	3.33	6.57	2.13	4.88
4-way	4.43	1.04	4.60	0.52
Culs-de-sac	0.86	2.69	0.59	2.23
Intersections:				
Percent T	42.9%	87.1%	31.7%	90.4%
Percent 4-way	57.1%	13.7%	68.3%	9.6%

centres located at the intersections of the arterials that bound the residential areas. Very few residents in these areas are within walking distance of commercial activity, and those who are must generally walk along high speed arterials to reach the centre, then cross several rows of parking to reach the stores.

Regional accessibility also differs greatly between the Silicon Valley case study areas, Mountain View and Sunnyvale, and the Santa Rosa case study areas, Junior College and Rincon Valley. The Silicon Valley case study areas are within 15 miles and 20 minutes of five regional shopping centres, containing 17 department stores, 507 smaller stores, and 92 food establishments (table 5). The Santa Rosa case study areas, on the other hand, are within a relatively short distance – 2 miles for Junior College and 5 miles for Rincon Valley – of two regional shopping centres but are 30 miles away from the next nearest centre. As a result, residents in these areas are as close to regional activity as residents in the Silicon Valley areas, but have a much more limited amount and range of regional activity within a reasonable driving distance.

A comparison of the types of commercial uses found in the downtown areas of Mountain View and Santa Rosa to the those found in the regional shopping centres suggests some overlap between the functions they serve. This overlap is especially apparent for food establishments. Both downtown areas have a large number of restaurants (33 and 18, respectively), and a number of take-away places, delis, and cafes (10 and 6, respectively). The downtowns also contain a number of the service-

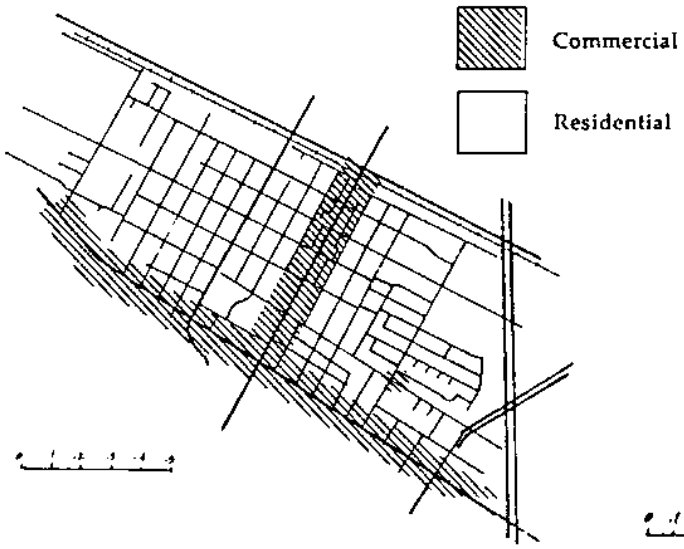

Figure 2. Mountain View street network and land-use distribution.

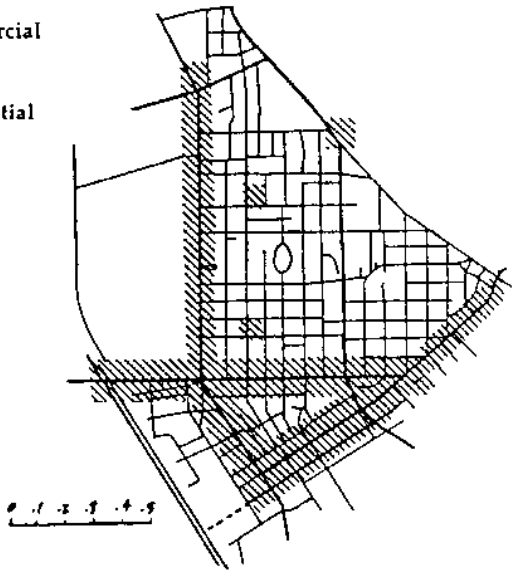

Figure 4. Junior College street network and land-use distribution.

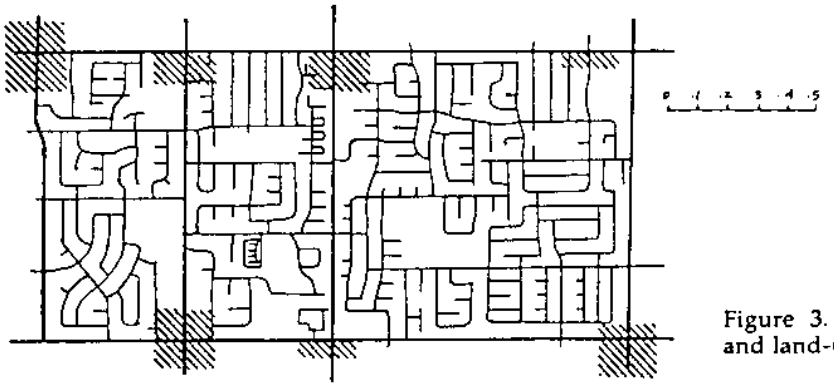

Figure 3. Sunnyvale street network and land-use distribution.

oriented establishments found in regional shopping malls, such as photo-processing, beauty salons, banks, florists, and drug stores. Although a number of small clothing stores are found in the downtown areas, they lack the large department stores characteristic of regional centres (Santa Rosa's one downtown department store closed over a decade ago and remains vacant to this day). In other words, these downtown areas probably cannot serve as *complete* substitutes for regional centres, at least with respect to shopping. What is uncertain is the degree to which downtowns and regional centres each serve the less tangible purpose of providing a central public space.

Differences in Travel Patterns

Two questions with respect to the link between suburban form and travel patterns are addressed here that are at the heart of the premise that neo-traditional development will reduce non-work travel. First, are higher levels of local accessibility associated with more walking rather than driving trips? Second, are higher levels of local accessibility associated with fewer trips to regional centres?

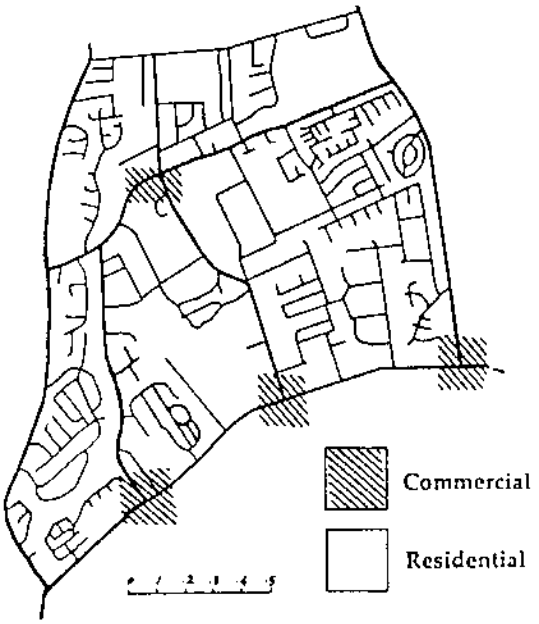

Figure 5. Rincorn Valley street network and land-use distribution.

Walking Trips

In the travel survey of residents in the case study areas, respondents were asked how many times in the previous month they had walked to a local shopping area, and how many times in the last month they had taken a walk or a stroll around their neighbourhood. The high local accessibility areas, Mountain View and Junior College, had significantly higher average trip frequencies than the low local accessibility areas for walking trips to local commercial areas (table 6). Mountain View's mean of 4.85 trips per month is 76 per cent higher than Sunnyvale's mean of 2.75 trips; the *t*-statistic for the difference of means is a significant 2.34. The mean frequency for Junior College residents, on the other hand, is over 5.5 times that of Rincon Valley, with a *t*-statistic for this difference of means of 5.72. Of Junior College respondents, 64 per cent said they had made at least one walking trip to a local commercial area within the last month, versus only 23.8 per cent of Rincon Valley respondents.

An easy explanation for this difference would be differences in the propensity of residents of different case study areas to walk. However, the question as to frequency of walking or strolling around the neighbourhood does not show statistically significant differences between case study areas. Mountain View has the lowest average frequency, at 10.14 walking trips in the last month, perhaps because so many residents in this area already take walking trips to shopping areas; Junior College, where the frequency of walking trips to shopping areas is also high, has the highest frequency of strolling trips, at 12.56 on average. The lack of significant differences on this question suggests that factors other than the character of a place influence the amount of strolling that residents do.

Table 5. Regional shopping centres by case study area.

	Distance	Time	Number of establishments: Dept stores	Stores	Food estabts	Department Stores
Mountain View:						
San Antonio	1.2	2.0	3	19	2	Sears, J.C. Penney's, Mervyns's
Sunnyvale TC	2.1	3.0	2	85	16	Macy's, Montgomery Ward
Stanford	5.1	11.0	5	102	26	Emporium, I Magnin, Macy's, Neiman Marcus, Nordstrom, Saks
Vallco	7.9	10.0	3	150	24	Emporium, J.C. Penney's, Sears
Valley Fair	10.8	13.0	4	151	24	Emporium, I Magnin, Macy's, Nordstrom
Total			17	507	92	10 different department stores
Sunnyvale:						
Vallco	1.0	2.0	3	150	24	Emporium, J.C. Penney's, Sears
Sunnyvale TC	2.8	6.0	2	85	16	Macy's, Montgomery Ward
Valley Fair	4.7	7.0	4	151	24	Emporium, I Magnin, Macy's, Nordstrom
San Antonio	6.6	13.0	3	19	2	Sears, J.C. Penney's, Mervyn's
Stanford	13.8	19	5	102	26	Emporium, I Magnin, Macy's, Neiman Marcus, Nordstrom, Saks
Total			17	507	92	10 different department stores
Junior College:						
Santa Rosa Plaza	1.0	1.1	3	96	19	Macy's, Mervyn's, Sears
Coddington	1.2	3.0	3	86	20	Emporium, J.C. Penny's, Macy's
Total			6	182	39	5 different department stores
Rincon Valley:						
Santa Rosa Plaza	3.5	8.0	3	96	19	Macy's, Mervyn's, Sears
Coddington	4.5	9.0	3	86	20	Emporium, J.C. Penny's, Macy's
Total			6	182	39	5 different department stores

Few significant correlations were found, however, between the frequency of either type of walking trips and the socio-economic characteristics of the respondents (table 7). For walking trips to local stores, age, home ownership, and length of residence were negatively correlated with frequency. However, these characteristics are also closely associated with case study area; survey respondents in the Rincon Valley area in particular were older, more likely to own their homes, and had lived in the area longer than respondents in other areas. None of the socio-economic characteristics was significantly correlated with strolling frequency, suggesting that characteristics of the individual other than those captured by these variables influence an individual's propensity to stroll.

The findings in this section strongly support the proposition that appropriately designed and well-integrated local commercial areas will in fact be used by local residents, who will walk rather than drive there for the most part. The question remains as to whether such trips are substitutes for trips that would otherwise be made to more distant destinations by car, or whether they are simply additional trips induced by the possibility and attractiveness of making such trips, or further, that people who value the option to walk to commercial areas have intentionally chosen to live in such areas where that option is available. These questions must be answered before the potential effectiveness, in terms of reducing travel, of a policy of providing good local accessibility can be predicted. Nevertheless, areas with high local accessibility clearly offer options to residents – namely, the possibility of

walking to commercial areas – that are not often available to residents in areas with low local accessibility.

Table 6. Walking trip frequency by case study area.

	Mountain View	*Sunnyvale*	*Junior College*	*Rincon Valley*	*F-Ratio***
Average Number of Walk Trips to Local Shopping Last Month	4.85	2.75	5.69	1.00	16.07*
Percent of Respondents Walking to Local Shopping	56.4%	48.0%	64.0%	23.8%	
Average Number of Walks or Strolls Last Month	10.14	11.58	12.56	10.84	0.75
Percent of Respondents Walking or Strolling	78.2%	78.0%	85.0%	78.2%	

* significant at the 10% level.
**ratio of between group variance to within group variance.

Regional Trips

Two types of comparisons will be made to test the degree to which the downtown commercial areas in Mountain View and Junior College influence the frequency of trips to regional shopping centres. First, high local accessibility areas will be compared, while regional accessibility is varied. In this case, the frequency and purpose of trips to downtown in Mountain View (with high regional accessibility) and Junior College (with low regional accessibility) will be compared. Second, regional accessibility will be held constant, and areas with different levels of local accessibility will be compared. The frequency of trips to downtown versus the frequency of trips to regional centres in Junior College and Rincon Valley, both with low regional accessibility, will be compared, then the frequency of trips to regional centres in Mountain View and Sunnyvale, both with high regional accessibility, will be compared.

Table 7. Correlation between walking trips and socio-economic variables.

	Walk to Store Frequency	*Stroll Frequency*
Age	−0.19**	0.01
Worker	−0.02	−0.12
College educated	0.10	0.07
Number of adults	0.01	0.07
Presence of kids < 12	0.10	0.05
Income	0.01	0.05
Home owner	−0.20**	0.05
Single-family DU	0.03	0.09
Vehicles per adult	−0.07	−0.04
Length of residence	−0.12*	−0.05

** One-tailed significance = 0.01.
* One-tailed significance = 0.001.

Although the downtown areas in Mountain View and Junior College are similar in character, respondents in Mountain View made significantly more trips to their downtown than Junior College residents made to theirs (table 8). The difference between Mountain View's mean of 8.84 trips and Junior College's mean of 5.09 has a *t*-statistic of 2.82. A somewhat higher percentage of Mountain View respondents said they made at least one trip in the last month to downtown – 86.1 per cent versus 76.0 per cent for Junior College. Mode choice also shows significant differences. In Mountain View, 46 per cent of respondents said they usually walk to downtown, versus only 20 per cent in Junior College. Thus, Mountain View's downtown appears to be much more successful as a centre of activity for local residents than is Santa Rosa's. This success can be attributed to the specific establishments located there, differences in the design of pedestrian areas, but primarily to the better integration of Mountain View's downtown into residential areas.

However, the higher frequency of trips to downtown for Mountain View respondents is not associated with a lower frequency of trips to regional centres. In fact, Mountain View respondents made significantly more trips to regional centres than Junior College respondents – 15.92 trips versus 11.01 trips on average in a four month period, respectively ($t = 1.96$). This suggests that trips to downtown do not substitute for trips to regional centres, at least for Mountain View residents. This result may be driven by the fact that regional accessibility is significantly higher in Mountain View: residents in this area have significantly more options and may make more regional trips as a result.

Interestingly, the types of establishments that respondents indicated they had visited on their last trip to downtown did not differ significantly between Mountain View and Junior College (table 9). Mountain View residents more frequently went to a restaurant (which is consistent with a very large concentration of restaurants in the downtown Mountain View area), while Junior College residents were somewhat more likely to visit a bookstore or a bank. Over 11 per cent of the Mountain View residents who had gone downtown indicated that they had gone solely to the post office, which thus seems to be a significant attraction for the downtown area. The similarity between case study areas in terms of the types of establishments visited suggests that they do not greatly differ in the function they serve for local residents, rather that Mountain View residents simply make greater use of this function. However, the findings also suggest that residents in both areas visit types of establishments in downtown other than those they are likely to visit in a regional shopping centre; note that very few respondents shopped in a clothing store on their last visit.

Another way to approach this question is to compare the frequency of visits to downtown (i.e. downtown Santa Rosa) for respondents in Junior College and Rincon Valley, areas with low regional accessibility but high and low local accessibility, respectively. Junior College residents, who are much closer to downtown than Rincon Valley residents, visited downtown five times per month, on average, twice the average of 2.5 times per month for Rincon Valley residents (table 8; $t = 3.04$). At the same time, Rincon Valley residents visited regional centres

Table 8. Frequency and mode of trips to downtown and regional centers by case study area.

	Mountain View	*Sunny vale*	*Junior College*	*Rincon Valley*	*F-Ratio***
Downtown Trips:					
Average Downtown Trips Last Month	8.84	–	5.09	2.5	14.96*
Percent of Respondents With One or More Trips Last Month	86.1%	–	76.0%		
Percent Automobile to Downtown	38%	–	43%		
Percent Walk to Downtown	46%	–	20%		
Regional Centre Trips:					
Average Regional Centre Trips in 4 Months	15.92	13.97	11.01	12.16	1.43
Percent Automobile to Regional Centre	92%	89%	82%	94%	
Percent Walk to Regional Centre	2%	3%	9%	1%	

* significant at the 10% level
** ratio of between group variance to within group variance

slightly more frequently on average than Junior College residents – 12.16 trips versus 11.01 trips on average in a four month period. Given this statistically insignificant difference ($t = 0.78$), it appears that trips to downtown may replace trips to regional centres to some small degree, but that trips to downtown are probably taken in addition to trips to regional centres to a large degree.

Table 9. Purpose of downtown trips.

	Mountain View	*Junior College*
Clothing store	4.6%	5.3%
Bookstore	24.1%	29.3%
Bank	16.1%	18.7%
Restaurant	46.0%	36.0%
Other	32.8%	37.3%

The fact that Mountain View and Sunnyvale have higher average frequencies than Junior College and Rincon Valley is consistent with the Silicon Valley area's higher regional accessibility; more trips are made because they are more easily made and the range of potential destinations is greater. The fact that Mountain View, with high local accessibility, has a higher average frequency than Sunnyvale – 15.92 versus 13.97 trips on average in a four month period – is consistent with the slightly better regional accessibility of Mountain View, in terms of shorter distances to malls. However, this finding is inconsistent with the hypothesis that activity in downtown

Mountain View would substitute for regional shopping centres to some degree; Mountain View residents make as many trips to regional malls on average as Sunnyvale residents, despite the large number of trips they make to downtown.

To summarize, downtown Mountain View does not seem to reduce the number of trips to regional malls that residents there will make, despite the very high number of trips that residents actually make to downtown. In Santa Rosa, a different relationship is suggested. In Junior College, an area with much higher local accessibility, as well as better regional accessibility than Rincon Valley, respondents made slightly fewer trips to regional malls on average than in Rincon Valley. In this case, findings support the hypothesis that local accessibility can substitute for regional accessibility to some degree. The difference may lie in the fact that Mountain View has a much higher level of accessibility to regional centres than Junior College, in terms of the range of potential destinations available to residents.

However, a test of the correlation between the frequency of trips to regional malls and the frequency of trips to downtown for individual respondents demonstrates the danger of drawing conclusions from average travel characteristics for an area. The correlation between the frequency of these two types of trips is positive for respondents in both Mountain View and Junior College ($r = +0.15$). In other words, those respondents who made frequent trips to downtown also made frequent trips to regional centres. At first glance, this result seems to suggest that downtown trips do not substitute for trips to regional centres. At second glance, it is apparent that the meaning of this finding is unclear. Those respondents who make frequent trips to downtown and to regional centres may have made even more trips to regional malls had they not lived near downtown. As was the case for walking trips to commercial areas, high local accessibility, in the form of a nearby downtown, clearly adds to the options available to residents, but it is not yet clear whether it reduces the amount of travel to regional centres.

Conclusions

The evidence presented in this paper does not support the popular belief that neo-traditional style development will help to reduce levels of non-work travel. In the two case study areas which most closely resemble neo-traditional proposals, residents were significantly more likely to make walking trips to commercial areas. However, it could not be determined whether these walking trips replace or are in addition to driving trips. The evidence on whether or not trips to downtown commercial areas replace trips to regional shopping centres was also mixed. In the high regional accessibility area, downtown trips did not seem to replace trips to regional shopping centres; in the low regional accessibility area, they may have to some degree. Again, it could not be determined to what degree trips to downtown replaced or were made in addition to trips to regional centres.

These ambiguous results point to two methodological issues. First, a consideration of the development that surrounds a community when evaluating the link between the structure of the community and the travel patterns of its residents was of some importance. In the framework described here, it is necessary to consider both the

character of the community, as measured by local accessibility, and the character of the surrounding region, as measured by regional accessibility, in order to fully characterize spatial structure. This dual characterization must be made in further research on the potential impact of neo-traditional development on travel patterns, whether existing traditional communities or new neo-traditional communities are studied.

Second, the results point to the importance of disaggregate analysis and the danger of drawing conclusions based on averages. The relationships seen at the aggregate level, between case study areas, were not necessarily consistent with the relationships seen at the disaggregate level, between individuals. More fundamentally, the results demonstrate the difficulty researchers face in determining the degree of substitution between types of trips. Even a full travel diary survey would not have revealed whether an individual would have made more automobile trips to regional centres had he or she not had the option of walking to a nearby downtown. Instead, a more exploratory and qualitative approach is needed, wherein residents are interviewed in some depth with respect to the motivations for their travel choices and the trade-offs that they make.

Although the results presented here with respect to the impact of local accessibility on *total* travel were not conclusive, the findings clearly showed that local accessibility has an impact on travel patterns. In those areas with high levels of local accessibility, residents have the option to make trips, such as walking trips to downtown, that are simply infeasible in areas without good access to local activity. And residents take advantage of this possibility, as evidenced by the high frequency of such trips in these areas. By increasing the range of options available to residents, a community with a high level of local accessibility thus enhances the quality of life for its residents. Regardless of the impact on total travel, this finding argues in favor of such communities, including neo-traditional developments.

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