Neo-Traditional Town Centers and Residential Travel Behavior: Effect of Retail Composition

By: Sung won Han

Defended on 4/2/15

LATIN HONORS

Program in Environmental Design,
University of Colorado at Boulder

Defense Committee
Stacey Schulte, Program in Environmental Design, Advisor
Dr. Georgia Lindsay, Program in Environmental Design, Honors Council Rep.
Dr. Seth Spielman, Department of Geography

TABLE OF CONTENTS

Abstract

Neo-traditional developments are often comprised of mix-use neighborhoods with a town center that acts as the central commercial district that is easily accessible to the surrounding residents without a car. This paper investigates the reality of walking and biking in two such neo-traditional developments in Colorado. I compared frequency and purpose of non-car trips in two neighborhoods whose local town centers differ in retail composition. The first town center, Belmar, has a higher composition of *comparison* goods and services such as clothing, apparel, and other comparison goods. The second, East 29th Avenue Town Center, has a higher composition of *convenient* goods and services such as the library, dry cleaners, and dog wash store. An analysis of travel behavior surveys from fifty residents of each site reveals no significant difference in the travel behavior between residents of the two neighborhoods. While having a higher percentage of convenience goods was not shown to increase the residents' perception of driving less, my evidence suggests that only specific convenience goods, such as grocery stores and dry cleaners, increases the residents' perception of making less car trips. While the absence of significant findings may have resulted from a small sample size, and the absence of travel diaries, this research can serve as an exploratory study for further research on the relationship between retail composition and travel behavior.

INTRODUCTION & BACKGROUND LITERATURE

In 2009, 90% of vehicles trips in the U.S. were non-work related travel (NHTS, 2009). Given this, attention is needed to understand and change society's non-work travel behavior. This understanding can help decrease society's auto-dependency and promote more sustainable ways of travel such as walking, cycling and riding public transit. Many professionals have acknowledged this fact, and performed research to better understand how the built environment affects non-work travel behavior (Ewing et al., 2010; Cervero et al., 1996; Chin et al., 2008; Forsyth et al., 2007; Greenwald et al., 2001). They have identified distinctive characteristics in our urban environment that encourages non-car travel; the most popular and most agreed upon characteristics include density, diversity, and design (Ewing et al., 2010; Cervero, 1996; Cervero and Kockelman, 1997; Handy, 1996).

New Urbanism and Neo-Traditional Developments

Density, diversity, and design are central to both New Urbanism's ideology and the neo-traditional developments that my research addresses (Grant, 2006). New Urbanism strives to recreate neighborhoods as they were before the car took over- walkable, mixed-use and plenty of access to green space. With these key concepts as the foundation to New Urbanism communities, this movement hoped to facilitate more walking and encourage residents to be less auto-reliant. It also aims to discourage the growth pattern of sprawl and advocates for more compact, mixed-use, walkable, self-contained communities that encourage more sustainable travel behavior (Grant, 2006). These characteristics of the New Urbanism movement have produced strategic developments like transit-oriented development, and neo-traditional development.

The Ds of Travel Behavior and Creating Accessibility

Density of communities is measured by the number of buildings or residents per unit of land (Oakes et al., 2007). Density has been acknowledged for many years as being a distinct characteristic of the urban form that strongly affects travel behavior (Cevero & Kockelman,

1997; Ewing & Cevero, 2010; Handy, 1996; Cervero, 1996). By having higher densities and mixed land use within our built environment, distances to daily resources are often shortened making daily trips more easily accessible by walking or cycling. In addition to walking and cycling, public transit systems are able to run more efficiently in urban areas with high density (Polzin et al., 2000). However, Ewing and Cervero (2010) state that density alone does not play a significant role in encouraging walking or traveling by other alternative modes of transportation. They have suggested that density encourages sustainable travel behavior only if it is supported by other characteristics of the built environment, such as having mixed land use, and walkable streets. For example, if an urban environment were composed of high density but limited amenities within walking distance, the high-density environment would not encourage walking or cycling.

Diversity measures how many different types of land uses are within a given area. Diversity challenges Euclidean Zoning, a framework which creates segregated land use within communities. Instead, diversity promotes mixing of different land uses such as commercial, residential, and open space within communities. Research has also shown that having retail or other non-residential use closer to residents lowers the probability of auto-commuting (Cervero, 1996). By mixing land uses within neighborhoods, walking and cycling may also become a viable option for travel for many residents.

Design for walkability contains three categories, pedestrian right-of-way (PROW), placement of parking, and urban street network. When PROWs have widened sidewalks, street trees, strong connection of pedestrian paths, and parking lots sited in the rear of stores, it provides both an aesthetic appeal and strong sense of safety for pedestrians. These are often accomplished by widening sidewalks, planting street trees, creating strongly connected pedestrian paths, and siting parking lots in the rear of stores. These design implementations can help destinations feel more accessible and walkable. Cervero (1996) found that the design of parking played a critical role in encouraging people to walk to their local neighborhood shop, rather than drive. He found that 56% of people were more likely to drive alone to their local neighborhood shop if all buildings were surrounded

by front and side parking lots, rather than rear parking lots. Hess et al. (1999) also found that having urban design characteristics that support pedestrian travel helped increase the level of walking activity to local neighborhood centers. They studied both urban and suburban neighborhoods with similar land use mix, population density and income levels and compared the volume of pedestrians walking into neighborhood centers. The research found that urban neighborhoods with small blocks and extensive sidewalk systems had up to three times the pedestrian volumes of suburban sites with large blocks and incomplete sidewalk systems.

Accessibility is a result of having the "three Ds" as well as two additional characteristics: the level of incentive a destination has to offer and the cost of the overall trip, which is mostly associated with distance (Hansen, 1959). Thus, a destination that may be further away may have the same or greater accessibility than a destination that is closer to the point of origin. For example, if a person perceives that a shopping center within a 2-mile drive is more accessible (more variety, not too far) compared to a local town center (fewer options, not too far) it is far more likely that this person will drive to the shopping center that is 2-miles away.

Though increasing density and having more mixed land uses within a neighborhood may increase the level of accessibility, the question of whether these neighborhoods reduce auto-dependency and promote more sustainable travel behavior remains unclear. Handy (1992) concluded that while local accessibility strongly encourages walking to destinations of proximity, the question of whether these local trips replace single-occupant vehicle travel is unclear. Research has also shown that residents that have relocated to neighborhoods with higher accessibility lowered their vehicle miles travelled (VMT), but whether it has shifted their mode of travel away from the car remains unclear (Krizek, 2003).

Although the collaboration between these four distinct characteristics has the potential to encourage more sustainable ways of travel, Ewing and Cervero state that these characteristics are most effective at a regional scale rather than a local scale (Ewing and Cervero, 2010). Their meta-analysis shows that distance to downtown had the strongest effect in reducing VMT. This finding aligns with their previous research (Ewing and

Cervero, 2001) that concluded highly accessible areas in urban centers produce substantially lower VMT levels than dense mixed-used areas that are located further away from the core. This raises the question of how vital neo-traditional developments are in changing the travel behavior of their residents, considering the small and local scale of their developments.

Neo-Traditional Town Centers & Travel Behavior

Neo-traditional developments are neighborhood scale developments that follow the principles of New Urbanism. Neo-traditional developments, when compared to the conventional suburb, are denser, and often more mixed-use, have better access to transit, better walkable environments, and streets that are more interconnected with one another (Southworth, 2007). They also contain a variety of housing types, and a town center for residents to utilize. Successful neo-traditional developments have many activities of daily living within walking distance of where people live.

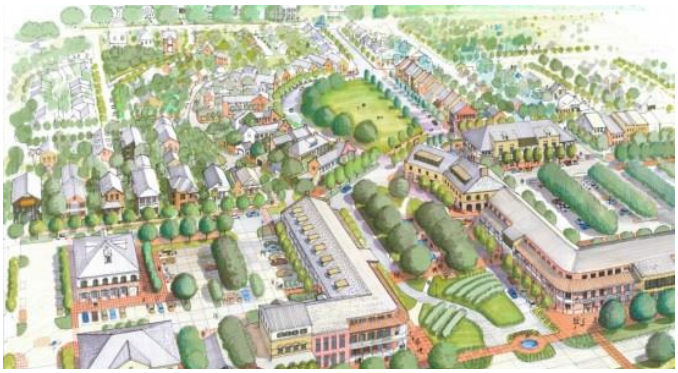


Figure 1: ACD Architects Sugar Mill Ole Town Neo-traditional Development

The impact of neo-traditional developments have on shifting mode choice remains unclear (Crane and Randall, 2000). Controlling for self-selection, Rodriguez & Khattack (2006) found that households in neo-traditional developments traveled fewer vehicle miles and made more walking trips compared to a conventional suburb. Research has shown that neo-traditional developments contribute to increased level of pedestrian travel (Handy, 1992; Lund, 2008).

Rodriguez & Khattak (2005) found that residents living in a neo-traditional neighborhood traveled a total of 11.9 miles fewer everyday compared to residents living in a conventional suburban neighborhood. Neo-traditional developments have also slightly achieved their goal in creating a more self-sufficient community; when compared to a conventional suburb, they had 1.8 fewer external trips per day and 4 times the number of

internal trips (Khattak & Rodriguez, 2006). Despite the increase in walking trips, Handy (1992) could not conclude if these walking trips replaced any vehicle trips.

Neo-traditional developments and its effect on the travel behavior of residents become even more ambiguous when considering the individuals' socio-demographic characteristics. For instance, the result of a specific pedestrian travel behavior may not be directly influenced by the neighborhood design factors that are present, but rather by the self-selection of residents into these neighborhoods. Residents that like to commute by walking and cycling may have chosen to live in areas that are more accessible, so that walking and cycling is a viable option for them. Krizek (2007) found that people do not change their travel behavior when they are located in different urban forms that are more or less auto-dependent. Though the VMT of residents may decrease after re-locating to a more accessible location because the distance to commercial establishments has become shorter, the chance that this shorter distance will result in residents choosing to walk or cycle, rather than drive, is low. These findings suggest that travel behavior is not strongly influenced or changed by our urban form, but is rather controlled by the preference of individuals.

Retail Composition & Travel Behavior

Aa previously mentioned, neo-traditional developments rely on shortening the distance to daily activities, so that they are within walking distance from residents. Not surprisingly, people are only willing to walk to commercial establishments if they are at a close proximity to where they live. Krizek (2006) found that the odds of walking to a retail establishment increased significantly when people lived 200 compared to residents that lived 600 meters away. This is consistent with the findings from Cervero (1996) who found that having retail or other non-residential uses within 92 meters from residential homes lower the probability of auto commuting; where as having a grocery store or drug store beyond 92 meters but within a mile radius reduces it odds, controlling for such factors as residential densities and vehicle ownership levels.

The distance to grocery stores and its influence on residential travel behavior showed valuable findings. In one traditional neighborhood in which 25% of residents lived

within a quarter mile of the local grocery store, only 8% of the residents walked to the grocery store (Handy, 1996). Handy (1996) states that grocery stores are not favorable for walking considering the fact that groceries can be bulky and heavy and is often purchased in large quantities. The preference of the consumers also plays strong factor in how people travel to grocery stores. Hand and Clifton (2001) found that when residents were asked to name their usual food store, what they named was not always the closest one to their homes. "If the closest store is relatively close, residents are more willing to bypass it for a more distant store; if the closest store is relatively far, residents are less willing to bypass it" (Handy and Clifton 2001, 331). Further echoing the dynamic relationship between the car and the grocery store, one study suggests that store sizes of grocery stores in Atlanta is determined by the characteristics of an area within a 5 minute drive (Dunkley et al., 2004). These characteristics include density, percentage of poverty, percentage of people over 65, percentage of people with disabilities, percentage of car ownership, and percentage of new housing.

While much of the research related to urban form and travel has focused on the presence of retail in general and its influence on the travel behavior of surrounding communities (Handy, 1992; Hess et al., 1999; Krizek, 2006; Lund, 2008), less research has been performed on the specific types of retail. Retail can be broken into two different categories, convenience and comparison goods (Holton, 1958). Convenience goods are purchased frequently with a minimum effort. Examples of convenience goods are groceries, dry cleaning, and hardware supplies. Comparison goods, also known as shopping goods are purchased more infrequently, and the process in selecting these goods is thought out more thoroughly. People are more careful about making their purchase often comparing the quality and price between products before making their decision. For these comparison goods, people are more willing to travel at a further distance as well as more than one store to make their purchase. Examples of these goods include electronics, and clothing,

Handy and Clifton (2001) looked at the possibility of local shopping, convenience goods within a close proximity, as a tool to reduce auto-mobile dependence. Neighborhoods that had different urban form were studied to see how the community utilized their local retail and how it influenced their travel behavior. Their research concluded that local retail did not prove to be effective in reducing the auto dependence of

the community. The residents' preferences prompted them to drive to stores that were at further distances, even though they could have utilized their local stores. The importance of distance to retail in encouraging walking was further emphasized in this research. In one neighborhood that had 82% of their respondents living within .5 mile of shopping in their neighborhood, 42% of the respondents said they usually walk to their local store or shop; another neighborhood where 46% of the respondents lived within .5 mile of local shopping, 15% of the respondents said they usually walked to their local store or shop. This research also revealed that residents visited super markets and grocery stores most frequently followed by restaurants.

Study Summary

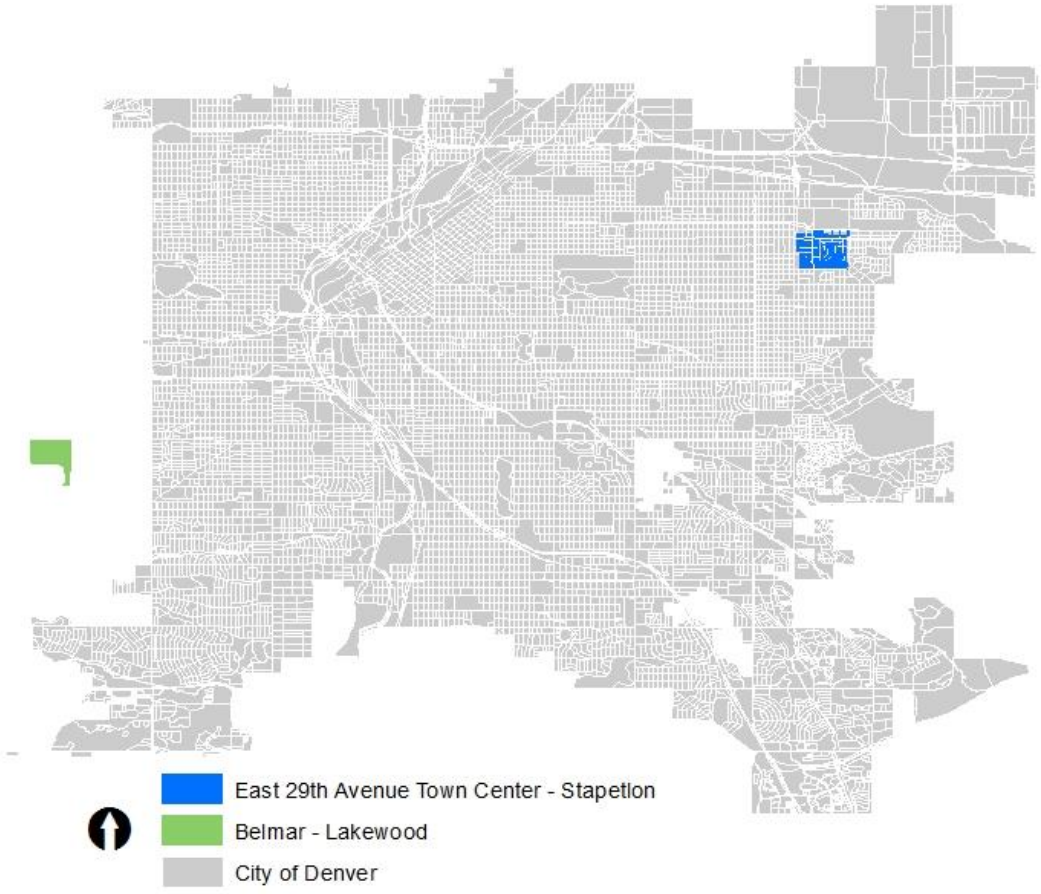
This research aims to better understand how retail composition in town centers affects the travel behavior of local residents**.** While Handy and Clifton (2001) looked at different neighborhoods ranging from traditional, to early modern and modern neighborhoods, I have looked at only two neo-traditional developments that have been created from large infill projects. In comparing two urban forms that were very similar to one another in terms of design, I was able to better explore how retail influences travel behavior. Unlike the neighborhoods Handy and Clifton (2001) studied, these neo-traditional developments have their retail services concentrated in their town centers. Furthermore, I have chosen two town centers, one with a high percentage of convenience goods and one with a high percentage of comparison goods.

My hypothesis was that residents will utilize their retail services more often, and make less car trips, if they are living close to a town center with a high composition of convenience goods, compared to a town center with a high composition of comparison goods.

METHODS

I conducted a match-pair analysis of residential travel behavior in two neo-traditional developments with town centers that differ in retail composition. Both sites are in the metro Denver area (see map 1). East 29th Avenue Town Center has a town center that has a higher percentage of convenience goods and the second site, Belmar, has a town center with a higher percentage of comparison goods.

Figure 1 Map 1: Site Location of East 29th Avenue Town Center and Belmar



Comparing East 29th Avenue Town Center and Belmar

Assessment of Neo-Traditional Site Characteristics

I conducted an assessment of the two neighborhoods to determine if they fit the technical characteristics of neo-traditional developments. East 29th Avenue Town Center is located in Stapleton, Denver, an area of Denver that is going through a large infill redevelopment process to create a transit-oriented development. Belmar is located in Lakewood, Colorado and serves as the city's downtown district. Similarly to the East 29th avenue town center, Belmar is also an infill project Both East 29th Avenue Town Center and Belmar reflect strong characteristics of neo-traditional development such as designing for more mixed use, and walkable environments and having resources for daily living within walking distances. A site analysis assessed the physical and design features of these two neo-traditional developments to further evaluate their walkable designs. A few of these physical features include the measurement of the sidewalk, building height, height to width ratio, presence of street trees, and parking orientation. The brief site analysis showed that both developments had very large sidewalks and buildings that ranged from 3-4 stories. The developments differ, however, in square footage of retail space: Belmar had around 6 times the amount of retail space than East 29th Avenue Town Center, while having an equal amount of office space.

Figure 3: Green Street LTD. Belmar

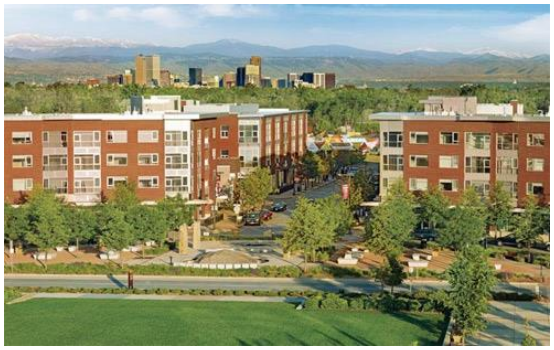


Figure 4: Forest City, East 29th Avenue Town Center

Figure 5: Belmar Pedestrian right-of-way

Figure 6: East 29th Ave Pedestrian right-of-way

Both developments emphasize the idea of urban living, having a higher level of density and mixed use development when compared to the conventional suburb (see maps 2& 3). They are also strategic in creating a more walkable environment, placing their parking lots in the rear of the buildings, designing wide sidewalks, planting street trees, creating public spaces, building a diversity of architecture, and having narrow street widths. Both developments have also won various design awards. East 29th Avenue Town Center has won the 2004 AIA Denver Design Award Citation, while Belmar has received awards for Excellence from the Urban Land Institute and the Charter Awards from the Congress of New Urbanism. Though the scale of these two developments differs, the characteristics of their design are very similar to one another.

Table 1 Site Analysis

Site Attribute	**East 29th Ave**	**Belmar**
Sidewalk Width	10-12 ft.	15-18ft.
Road width	38 ft.	35 ft.
On-side parking	Yes	Yes
Street Trees	Yes	Yes
Building height	33 ft.	40 ft.
Building- to-sidewalk ratio	3:1	4:1
Parking Spaces	937	4,500
Retail Space	139,801 sq. ft.	888,000 sq. ft.
Office Space	206,000 sq. ft.	248,250 sq. ft.

Figure 7 Map 2: East 29th Ave Town Center Land Use

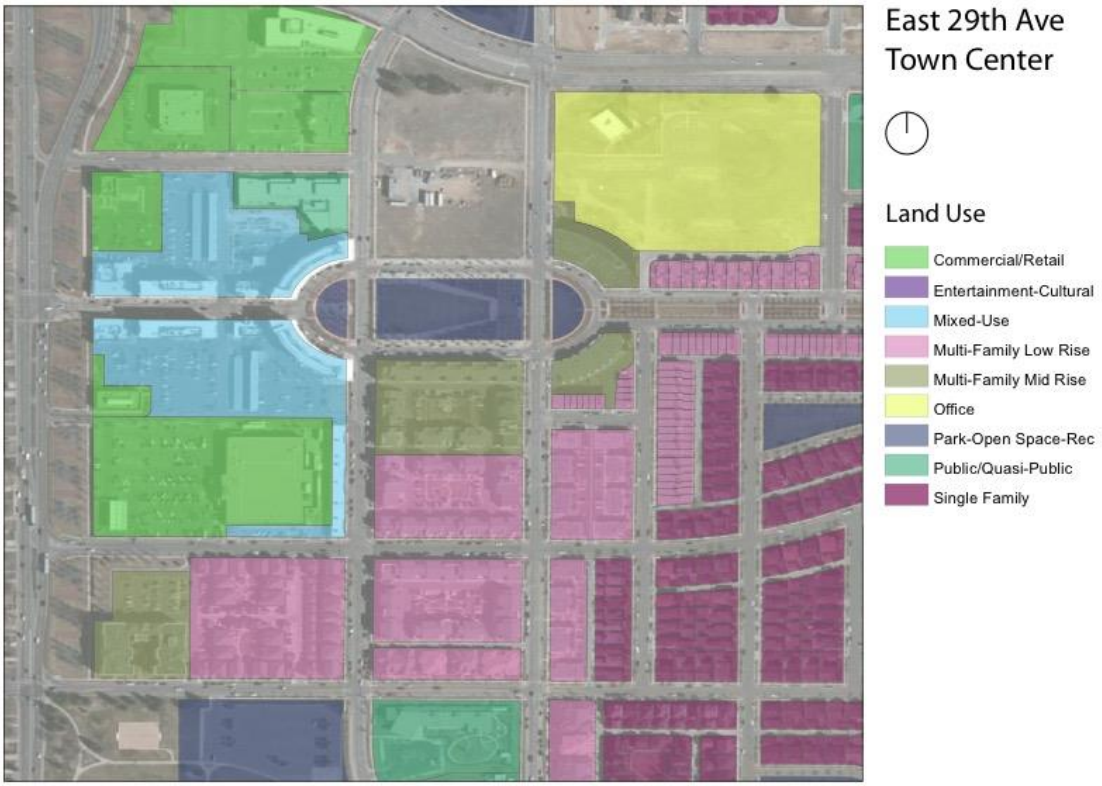
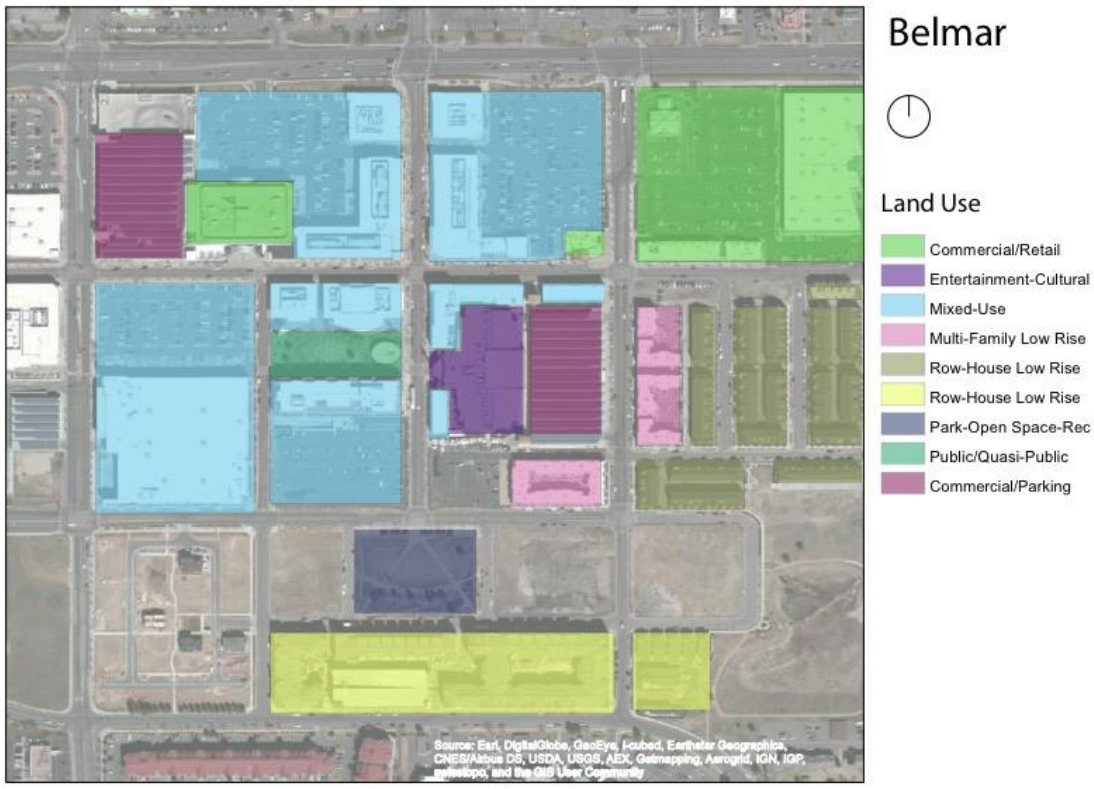


Figure 8 Map 3: Belmar Land Use

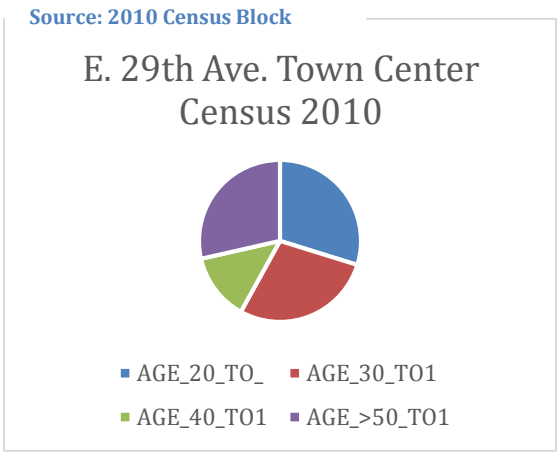


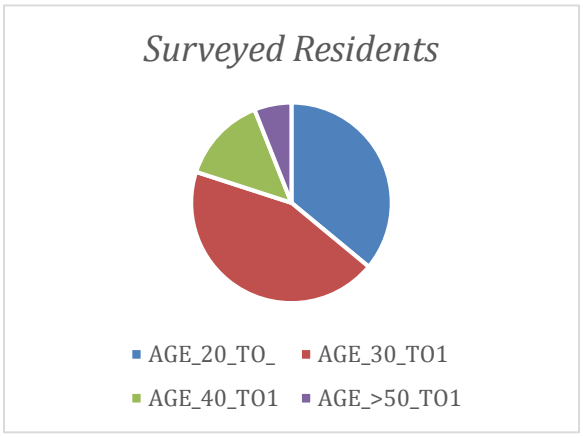
Demographics

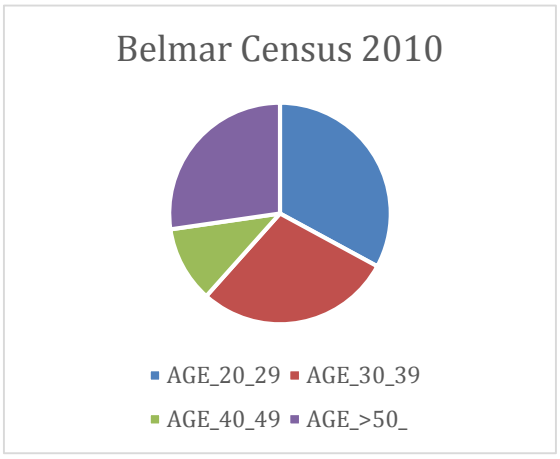
Age was compared in order to address the various demographic factors that may influence the travel behavior of residents. The survey also asked for the respondents' age and gender to see how well the demographic of the sample size represented the current residents of these two developments.

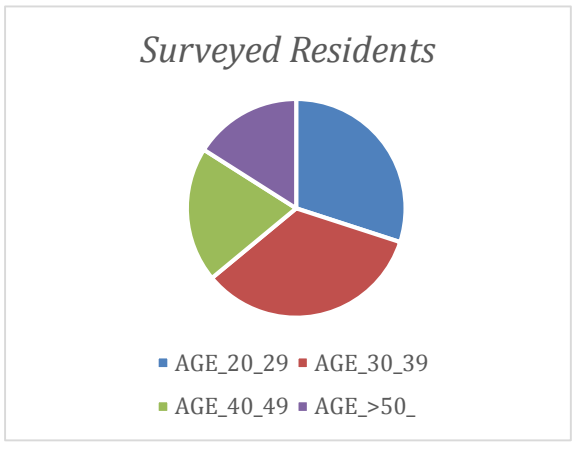
Age

The age between the residents of Belmar and East 29th Avenue town center were very similar to one another. When comparing the demographics from the census data and the residents that have been surveyed, this research has surveyed fewer people in their 50s.









Retail Composition

The retail activity for both East 29th Avenue Town Center and Belmar was broken down into four categories: convenience goods, comparison goods, dining, and health. While both sites had comparison goods, and convenience goods, the composition of retail differed from one another. The percentage of convenience goods in East 29th Avenue Town center was significantly higher than its comparison goods, while Belmar's percentage of comparison goods was significantly higher than its convenient goods.

Table 2: Retail Composition of East 29th Avenue Town Center

Types of Retail/Service	***Num. of Stores***	***Per. Of Overall Retail Comp.***	***Per of Convenience and Comparison Composition***
Convenience (King Soopers*, Walgreens*, Public* Library*)	20	*36%*	*87%*
Comparison (Art and Framing*, Bike store*,	3	*5%*	*13%*
Dining	15	*27%*	
Health	18	*32%*	

Table 3: Retail Composition of Belmar

Types of Retail/Service	***Num. of Stores***	***Per. Of Overall Retail Comp.***	***Per of Convenience and Comparison Composition***
Convenience (Balley Total Fitness*, Hobby Lobby*, Target*	16	*16%*	*23%*
Comparison (Express*, Guess*, Aeropostale*	53	*54%*	*77%*
Dining	18	*18%*	
Health	11	*22%*	

Sampling and Survey Instrument

To compare the travel activity between these residents of these two developments, I conducted door-to-door surveys within .25 mile of the central point of the town center. I chose this distance based on past research that suggests people are more inclined to walk to retail activity when they live .25-mile away (Cervero, 1996; Krizek, 2003). A total of 100 residents were surveyed, 50 from East 29th Avenue and 50 from Belmar.

The survey was composed of 6 questions. See survey form in appendix A.

1. How often do you walk to your town center on a weekly basis?
2. What is your most popular reasoning for visiting the town center?
3. Do you drive there sometimes? If yes, why?
4. Do you think living close to your town center reduces the number of trips you might take with a car? To what extent?
5. What is your age, and gender?

A random sampling was used for this study. I collected responses from residents who were home on multiple attempts. Surveying was done during weekday evenings and weekend afternoons; the total survey process went from mid-January till the end of February. Households were revisited for surveying if residents were not present at their homes on the first and second attempts.

East 29th Ave Town Center

Central Point of Town Center

Residential location targeted for surveying (within .25 mile away from central point)

Belmar

Central Point of Town Center

Residential location targeted for surveying (within .25 mile away from central point)

Data Analysis

The data collected from the surveys was then analyzed descriptively to accomplish four objectives:

1) Calculate the average number of walking trips to the town center on a weekly basis

2) Determine the most popular reasoning for why residents are visiting their town center

3) Calculate the how often people drive to the town center

4) Calculate the average number of car trips that residents perceived to be reduced from living close to their town centers.

In addition, I ran two multi-regressions using SPSS to further analyze the relationship between the dependent and independent variables that have been collected from the survey. The first regression model explores the relationship between the residents' perception of car trips that are reduced from living at a close proximity to their local town center (dependent variable), and the following four independent variables: reason why people walk to the town center, distinction between East 29th Avenue Town Center or Belmar, and finally the age and gender of the resident. Through this regression, I was able to further explore how these independent variables collectively and individually correlate with the residents' perceived reduction of car trips.

The second model consists of a different dependent variable, the average walking trips to the town center on a weekly basis; the independent variables will remain the same. Similarly to the first regression, this model looks at the independent variables collectively and individually to observe its correlation with the walking/ visiting frequency to the town centers on a weekly basis.

RESULTS

Descriptive Statistics: Different Retail Composition, Similar Travel Behavior

Despite the different retail composition of these two town centers, the travel behaviors of residents from both sites were very similar to one another. The walking frequency to the town center of residents in East 29th Avenue Town Center was slightly higher and the driving frequency to the town center was slightly lower, when compared to Belmar.

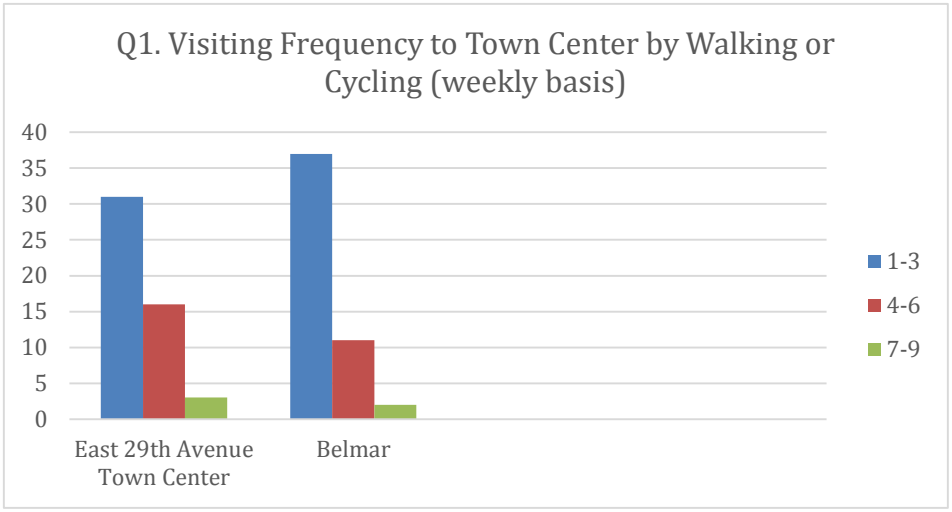
For both Belmar and East 29th Avenue Town Center, the most popular reasons for walking to the town center are groceries and dining. This result is very similar to the response of Austin residents (Handy and Clifton, 2001). Grocery shopping is not only one of the most popular reasons for walking to the town center, but also the most popular reason in why residents drive to the town center from their homes. Similarly to the finding of (Handy) 1996, the residents I have surveyed indicated that they are more inclined to walk to the grocery store when they are shopping for small quantities and drive when shopping for large quantities. Also, from conversing with the residents, I found that many residents stop by their local grocery store when driving back home from work. The majority of the residents also chose to walk to their town center as opposed to driving, further supporting the past research that have found people that people are more inclined to walk to retail activity when they are only within a quarter mile (Cervero, 1996).

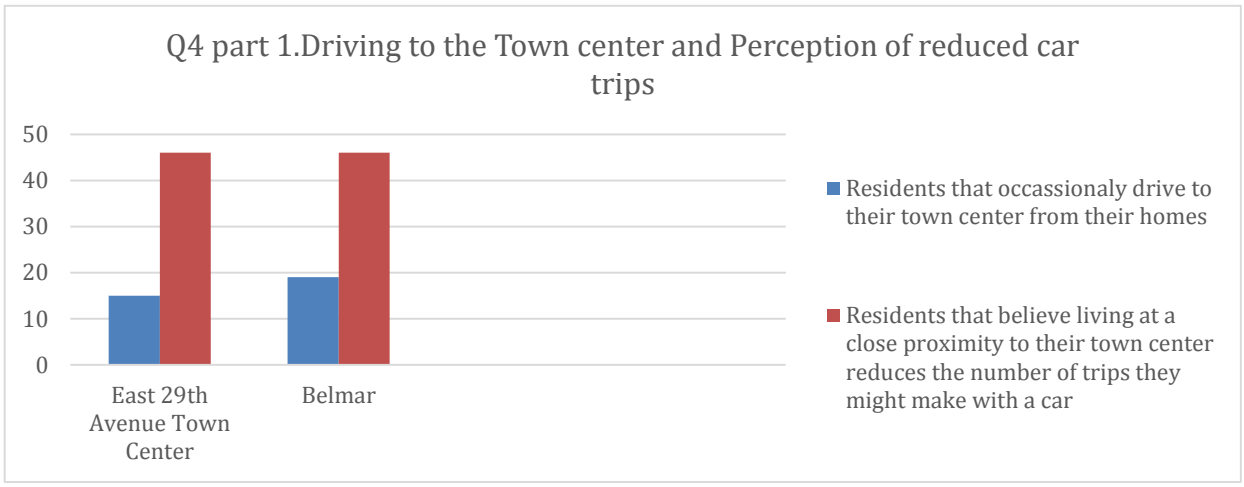
The vast majority of survey respondents, 96 out of 100, believed that living in close proximity to these town centers reduces their car dependency. Both residents in Belmar and East 29th Avenue Town Center perceived themselves to be less dependent on their cars because they live in walking distance to their town centers.

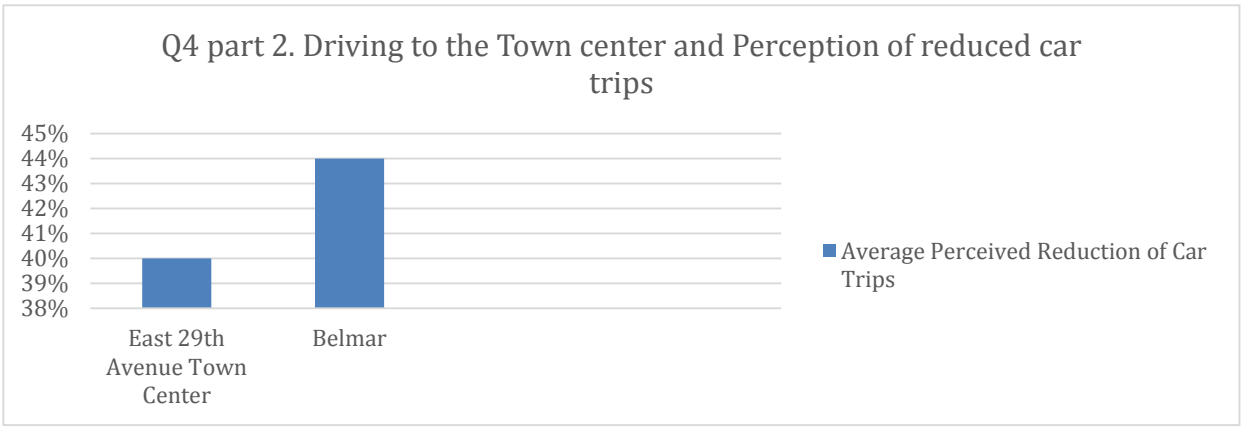
Descriptive Summary				
	Town Center	**1-3**	**4-6**	**7-9**
Q1. How often do you visit your town center by walking or cycling on a weekly basis	East 29th Ave	31	16	3
	Belmar	37	11	2
Q2. What is your most popular reasoning for walking to your town center?	Refer to Table 4 & 5			
	Town Center	**Yes**	**No**	
Q3. Do you drive there occasionally?	East 29th Ave.	15	35	
	Belmar	19	31	
	Town Center	**Yes**	**No**	**Avg. Percentage of Reduction of Car Trips (perceived)**
Q4. Do you think living at a close proximity to your town center reduces your overall car trips?	East 29th Ave.	46	4	40%
	Belmar	50	0	44%
	Town Center	**Female**	**Male**	**Age**
Q5. What is your Age and Gender	East 29th Ave	19	31	Refer to page 17 under the section "Age"
	Belmar	15	35	

Belmar Most Popular Reasoning for Visit (Table 4)	
Town Center Activity	**Residents Most Popular Choice**
Grocery	25
Dining	30
Coffee	4
Liquor Store	3
Clothing/retail	9
Drop off Rent	0
Walking Dog	2
Stroll	3
Bars	6
Work	1

East 29th Most Popular Reasoning for Visit (Table 5)	
Town Center Activity	**Residents Most Popular choice**
Grocery	33
Dining	23
Coffee	4
Gym	2
Dry Cleaners	2
Liquor Store	3
Library	2
Drop off Rent	1
Walking Dog	1
Work	1
Park	1


Q1. Visiting Frequency to Town Center by Walking or Cycling (weekly basis)
40
35
30
25
20
15
10
5
0
East 29th Avenue Town Center
Belmar
1-3
4-6
7-9


Q4 part 1.Driving to the Town center and Perception of reduced car trips
50
40
30
20
10
0
East 29th Avenue Town Center
Belmar
Residents that occassionaly drive to their town center from their homes
Residents that believe living at a close proximity to their town center reduces the number of trips they might make with a car


Q4 part 2. Driving to the Town center and Perception of reduced car trips
45%
44%
43%
42%
41%
40%
39%
38%
East 29th Avenue Town Center
Belmar
Average Perceived Reduction of Car Trips

Multi-Regression Equations

Model 1: Reduced Car Trips

Percentage of Car Replacement = .325-.045(BelmarorEast29th)+.104(Grocery)+.073(Dining)+.161(Clothing)+.12(Bars)-.078(Coffee)+.024(Liquor Store)-.202(Stroll)-.04(Walking the dog)+.144(Work)-.23(Gym)+.297(DryCleaners)-.124(Library)+.141(Park)+.84(Gender)-.001(Age)

Model 2: Walking Frequency to Town Center

Walking Frequency to Town Center = 3.166-.25(BelmarorEast29th)+.587 (Grocery)-.023(Dining)-.201(Clothing)-.062(Bars)-.316(Coffee)+.89(Liquor Store)-.499(Stroll)+3.577(Walking the dog)+2.112(Work)+.347(Gym)+1.633(DryCleaners)-.798(Library)-.984(Drop off Rent)-1.411(Park)-.169(Gender)-.016(Age)

Model 1: Car Trip Replacement

In the first multi-linear regression model, the dependent variable is the percentage of car trips that are reduced from living next to the town center. This percentage was collected with the use of question number 5 on the survey which asked, "Does living near next to your town center reduce the number of trips you might take with a car? And to what extent?" This regression model helped identify whether the following independent variables- certain retail activity, gender, age, or composition of retail increases the residents' perception of making less car trips. The overall regression model showed to be significant having a P value of .036 and an R-squared value of 0.28. This means that 28% of the total variability of reduced car dependency perceived by residents can be explained by all of these independent variables.

The two significant independent variables (.05< P Value) are *grocery stores* and *dry cleaners*. Both East 29th Avenue and Belmar had *grocery stores,* while the *dry cleaner* was only located in East 29th Avenue. These two variables are positively correlated with the decrease in car dependency. The model shows that walking to the grocery store as well as walking to the dry cleaners, has a direct relationship with the increase in residents' perception that their car trips is reduced. However, the small coefficient of these two independent variables indicates that these variables have a small influence in increasing the residents' perception that their total number of car trips is reduced.

The regression model does not support the hypothesis that having a higher composition of convenience goods in a town center will result in residents making less car

trips. The P Value for the distinction between East 29th Avenue Town Center and Belmar was .402, showing the insignificance of the relationship between retail composition of the town centers and increasing the residents' perception that their total car trips is being reduced.

Multi-Regression Analysis

Variables	Dependent Variables	Independent
Model 1	1. Average percentage of car trips that is perceived to be reduced from living at a close proximity to the town center.	1. Residents' most popular reasoning for visiting town center (Grocery, Dining, Clothing, etc.) 2. Distinction between East 29th Ave (High Composition of Local Retail), and Belmar (High Composition of Regional Retail) 3. Gender 4. Age
Model 2	**1.** Residents' visiting frequency to their town center by walking or cycling on a weekly basis	1. Residents' most popular reasoning for visiting town center (Grocery, Dining, Clothing, etc.) 2. Distinction between East 29th Ave (High Composition of Local Retail), and Belmar (High Composition of Regional Retail) 3. Gender 4. Age

Model 1: Summary for Percentage of Replacement of Car Trips Perceived by residents

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.527[a]	**0.278**	0.13	0.1979639

ANOVA[a]

Summary for Percentage of Replacement of Car Trips Perceived by residents		Sum of Squares	df	Mean Square	F	Sig. (P_Value)
1	Regression	1.176	16	0.074	1.876	**.036[b]**
	Residual	3.057	78	0.039		
	Total	4.233	94			

Summary for Percentage of Replacement of Car Trips Perceived by residents	Unstandardized Coefficients		Sig (P_Value)
	B	Std. Error	
(Constant)	0.325	0.119	0.008
East 29th Ave. or Belmar (Composition of Retail)	-0.04	0.047	**0.402**
Grocery	0.104	0.052	**0.047**
Dining	0.073	0.048	0.135
Clothing	0.161	0.103	0.12
Bars	0.12	0.104	0.25
Coffee	-0.078	0.089	0.384
Liquor	0.024	0.089	0.786
Stroll	-0.202	0.124	0.107
Walking the Dog	-0.04	0.159	0.801
Work	0.144	0.235	0.54
Gym	-0.23	0.148	0.124
Dry Cleaners	0.297	0.146	**0.045**
Library	-0.124	0.15	0.412
Park	0.141	0.203	0.489
Gender	0.084	0.047	0.079
Age	-0.001	0.002	0.735

Model 2: Walking Frequency to Town Center

In the second multi-linear regression model, the walking frequency to the town center is the dependent variable, and the independent variables are again the town centers themselves, the most popular reasoning for why residents walk to their local town center, residents' age and their gender. The walking frequency to the town center on a weekly basis was collected from Question 1 that asked, "How often do you visit your town center by walking or cycling on a weekly basis?" This regression model helped identify whether the following independent variables- certain retail activity, gender, age or composition of retail-predicted how often someone might walk to the town center. The overall regression model is insignificant, having an overall P value of .206. This indicates that there is an insignificant relationship between the frequency of walking trips made to the town centers and the collective independent variables.

Looking specifically at the individual independent variables, the only significant variable (.05 < P Value) is *dog walking*. Though it was only mentioned a total of three times, *Dog walking* showed to be the largest predicting factor in increasing the walking frequency to the town center. One explanation for this finding may be that for some residents, walking the dog is a daily activity, and the town center may be part of the fixed route they take when walking their dog. Interestingly enough, there was not a single retail activity that seemed to predict how often people might walk to their town center. The composition of the town center also did not play a strong factor in predicting walking frequency. The hypothesis that having a high composition of convenience goods in a town center will result in more frequency of walking trips was not supported.

Though *grocery stores* remained as the most popular reasoning for why residents visit their town center, it did not play a significant factor in predicting the walking frequency to the town center. The insignificant P value of *grocery stores* can possibly be explained by the different preferences residents have about grocery shopping discussed earlier. The frequency of visits to the *grocery store* may vary between residents. For instance, some of the residents I surveyed expressed joy in having a grocery store within walking distance because they enjoy their frequent grocery shopping to cook with fresh produce. Contrarily, some residents may care less about having the most fresh produce and

would rather shop in larger quantities, with infrequent visits. Other residents may have a strong preference on where they get their groceries. For example, residents in Belmar live within two grocery stores that are within .5 mile from their residential location, Target and Whole Foods. While shopping at Target compared to Whole Foods makes walking a more viable option because of its close proximity to the residential homes, residents may enjoy shopping at Whole Foods more than Target. In result of this, residents may choose to drive and shop at Whole Foods, substantially lowering the frequency of walking trips to Target.

Consumer preference may be one reason why the overall regression model is insignificant. Residents live different lifestyles and have their own unique preferences, which in turn lead to the disorder, or the lack of pattern of the residents' walking frequency to the town center. For example, some residents of Belmar voiced that they visit their town center for almost everything it has to offer such as shopping for clothes, drinking coffee, dining and groceries. Other residents of Belmar were less interested in the various commercial activities that exist in Belmar and expressed their interest only in grocery shopping.

Model 2: Summary for Walking Frequency to Town Center

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.462[a]	**0.214**	0.051	1.6954

ANOVA[a]

Summary for Walking Activity to Town Center (weekly basis)		Sum of Squares	df	Mean Square	F	Sig. (P_Value)
2	Regression	64.09	17	3.77	1.312	**.206[b]**
	Residual	235.7	82	2.874		
	Total	299.79	99			

Summary for Walking Activity to Town Center (weekly basis)	Unstandardized Coefficients		Sig. (P_Value)
	B	Std. Error	
(Constant)	3.166	1.001	0.002
East 29th Ave. or Belmar	0.25	0.393	**0.526**

Grocery	0.587	0.422	0.168
Dining	-0.023	0.406	0.955
Clothing	-0.201	0.831	0.809
Bars	-0.062	0.863	0.943
Coffee	-0.316	0.761	0.679
Liquor	0.89	0.761	0.246
Stroll	-0.499	1.058	0.638
Walking the Dog	3.577	1.346	**0.009**
Work	2.112	1.331	0.116
Gym	0.347	1.266	0.785
Dry Cleaners	1.633	1.249	0.195
Library	-0.798	1.281	0.535
Drop off Rent	-0.984	1.799	0.586
Park	-1.411	1.737	0.419
Gender	-0.169	0.388	0.664
Age	-0.016	0.021	0.445

DISCUSSION AND CONCLUSION

Does Retail Composition Matter?

Even though residents living in East 29th Avenue Town Center have access to more convenience goods and services than residents in Belmar do, residents in East 29th did not highly prioritize many of these stores or services. Instead, the two types of retail that are used more frequently by residents from both sites are the grocery stores and dining services.

Though having a high composition of convenience goods does not seem like an effective strategy to reduce car dependency, this research has shown that specific convenience goods, including grocery stores and dry cleaners, have the most significant and positive correlation in reducing car dependency based on the resident's perception (refer to model 1). These results suggest that it is not the composition of retail that matters, but rather the presence of specific retails like *grocery stores* or *dry cleaners* that will reduce the residents' total number of car trips. However, the small coefficient of these two independent variables indicates that they have a limited amount of power in decreasing the residents' car trips.

This study has also shown that retail composition and even retail itself does not play a significant factor in predicting how often someone might walk to their town center. Instead, the only activity that did play a significant factor in predicting the frequency of walking trips to the town center was *dog walking*.

Study Limitations and Recommendations for Further Research

One major drawback that has prevented this research from providing a more accurate representation of the actual travel behavior of residents is the fact that much of data was based on people's own perception of their travel behavior. Instead of keeping track of people's travel behavior through travel diaries and the use of technology, this study had to be more reliant on peoples' memory, which may produce data that is unreliable. The use of travel diaries can be a powerful tool to keep track of how residents travel to the town centers, as well as how it influences their overall travel behavior, such as the residents' vehicles mile traveled, and physical activity.

Also, the survey itself was designed to capture as many responses as possible in a short time, making it harder to truly explore the travel relationship between the residents and the town center more in-depth. The survey only took account for the residents' "most popular reasoning" for walking to the town center, leaving out the other possible ways people interacts with retail stores.

How retail composition of town centers in Neo-traditional developments affects the travel behavior of residents that live at varying distances from their town center may also be interesting to study. This study has shown that residents living approximately within .25 mile from grocery stores and dry cleaners have a strong correlation with perceived reduction in car dependency; however, this may dramatically change as distance to these amenities become longer.

Other recommendations for future research may include comparing the travel behavior of residents that are living next to a town center with just convenience goods, and residents living next to a town center with just comparison goods, to see if there is a difference in the travel behavior of these residents. While this research has shown that the composition of retail in town centers does not change the travel behavior of residents, it does not show that residents that only have access to comparison goods have a different travel behavior of residents that only have access to convenience goods.

Though the sample size and the depth of the survey limit the research findings, this study serves as a pilot study for future studies that desire to explore the relationship of retail composition and travel behavior.

WORK CITED

Cervero, Robert. 1996. "Mixed Land-Uses and Commuting: Evidence from the American Housing Survey." *Transportation Research Part A: Policy and Practice* 30 (5): 361–77. doi:10.1016/0965-8564(95)00033-X.

Cervero, Robert, and K. Kockelman. 1997. "TRAVEL DEMAND AND THE 3DS: DENSITY, DIVERSITY, AND DESIGN." *World Transit Research*, January. http://www.worldtransitresearch.info/research/2186.

Chin, Gary K. W., Kimberly P. Van Niel, Billie Giles-Corti, and Mathew Knuiman. 2008. "Accessibility and Connectivity in Physical Activity Studies: The Impact of Missing Pedestrian Data." *Preventive Medicine* 46 (1): 41–45. doi:10.1016/j.ypmed.2007.08.004.

Crane, Randall. "The influence of urban form on travel: an interpretive review."*Journal of Planning Literature* 15, no. 1 (2000): 3-23.

Dunkley, Bill, Amy Helling, and David S. Sawicki. "Accessibility Versus Scale Examining the Tradeoffs in Grocery Stores." *Journal of Planning Education and Research* 23, no. 4 (2004): 387-401.

Ewing, Reid, and Robert Cervero. 2010. "Travel and the Built Environment." *Journal of the American Planning Association* 76 (3): 265–94. doi:10.1080/01944361003766766.

Forsyth, Ann, J. Michael Oakes, Kathryn H. Schmitz, and Mary Hearst. 2007. "Does Residential Density Increase Walking and Other Physical Activity?" *Urban Studies* 44 (4): 679–97. doi:10.1080/00420980601184729.

Greenwald, Michael J., and Marlon G. Boarnet. 2001. "The Built Environment as a Determinant of Walking Behavior: Analyzing Non-Work Pedestrian Travel in Portland, Oregon." *Center for Activity Systems Analysis*, July. http://escholarship.org/uc/item/9gn7265f.

Handy, Susan L. 1996. "Understanding the Link Between Urban Form and Nonwork Travel Behavior." *Journal of Planning Education and Research* 15 (3): 183–98. doi:10.1177/0739456X9601500303.

Handy, Susan L., and Kelly J. Clifton. "Evaluating neighborhood accessibility: Possibilities and practicalities." *Journal of Transportation and Statistics* 4, no. 2/3 (2001): 67-78.

Hansen, Walter G. "How accessibility shapes land use." *Journal of the American Institute of Planners* 25, no. 2 (1959): 73-76.

Hess, Paul M., Anne Vernez Moudon, Mary Catherine Snyder, and Kiril Stanilov. "Site design and pedestrian travel." *Transportation Research Record: Journal of the Transportation Research Board* 1674, no. 1 (1999): 9-19.

Krizek, Kevin J. 2003. "Operationalizing Neighborhood Accessibility for Land Use-Travel Behavior Research and Regional Modeling." *Journal of Planning Education and Research* 22 (3): 270–87. doi:10.1177/0739456X02250315.

Krizek, Kevin J**,** and Pamela Jo Johnson (2006). Proximity to Trails and Retail: Effects on Urban Cycling and Walking, *Journal of the American Planning Association,* Winter, Vol. 72, No. 1, p. 33-42.

Krizek, Kevin J. "Residential relocation and changes in urban travel: does neighborhood-scale urban form matter?." *Journal of the American Planning Association* 69, no. 3 (2003): 265-281.

Lund, Hollie. "Testing the claims of new urbanism: Local access, pedestrian travel, and

neighboring behaviors." *Journal of the American Planning Association* 69, no. 4 (2003): 414-429.

Polzin, Steve E., Xuehao Chu, and Joel R. Rey. "Density and captivity in public transit success: observations from the 1995 nationwide personal transportation study." *Transportation Research Record: Journal of the Transportation Research Board* 1735, no. 1 (2000): 10-18.

Oakes, J. Michael, Ann Forsyth, and Kathryn H. Schmitz. 2007. "The Effects of Neighborhood Density and Street Connectivity on Walking Behavior: The Twin Cities Walking Study." *Epidemiologic Perspectives & Innovations* 4 (1): 1–9. doi:10.1186/1742-5573-4-16.

Khattak, Asad J., and Daniel Rodriguez. "Travel behavior in neo-traditional neighborhood developments: A case study in USA." *Transportation Research Part A: Policy and Practice* 39.6 (2005): 481-500.

Rodríguez, Daniel A., Asad J. Khattak, and Kelly R. Evenson. 2006. "Can New Urbanism Encourage Physical Activity?" *American Planning Association. Journal of the American Planning Association* 72 (1): 43–54.

Southworth, Michael. 1997. "Walkable Suburbs?: An Evaluation of Neotraditional Communities at the Urban Edge." *Journal of the American Planning Association* 63 (1): 28–44. doi:10.1080/01944369708975722.