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Determinants of Recent Mover Non-work Travel Mode Choice

Arlie Steven Adkins
Portland State University

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by

Arlie Steven Adkins

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Dissertation Committee:
Jennifer Dill, Chair
Kelly Clifton
James Strathman
Cynthia Mohr

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Abstract

Active transportation modes of walking and bicycling have the potential to help mitigate environmental and health concerns ranging from growing greenhouse gas emissions to increasing rates of obesity. This dissertation investigates how new movers make decisions about active transportation, particularly non-work utilitarian walking, in the context of a new home and neighborhood. New movers are an important, yet often overlooked, population in travel behavior research because they provide an opportunity to observe behavior adoption in new contexts, but also because the roughly one-in-ten Americans who move each year are more likely to consider changes to daily routines, including travel behavior, making them prime targets for voluntary travel behavior change programs. Using data from a two-wave survey of recent movers in six U.S. cities, psychological and social mechanisms essential to the built environment travel behavior relationship. The research is divided into three stand-alone papers (chapters 4, 5 and 6). First, to isolate the built environment effect on active travel mode adoption, the relative influence of the built environment and a robust set of self-selection variables is quantified. Second, the psychological constructs that facilitate the built environment travel behavior relationship are identified. And in light of increasing market demand for housing in walkable urban neighborhoods and the observed importance of self-selection, the final paper quantifies the extent to which low-income households face are able to realize preferences for walkable housing locations.

The key findings of this dissertation are that 1) the built environment plays a key role in determining recent mover adoption of utilitarian walking even after controlling for self-selection; 2) the influence of the built environment on post-move adoption of utilitarian walking largely mediated by perceived behavior control, as expected, and, unexpectedly, by descriptive social norms; and 3) low-income movers who prioritized moving to a walkable place were about half as likely as higher-income movers to be able to realize this preference. These findings have practical and theoretical implications, which are discussed in each paper and in the final chapter.

Dedication

To my grandfather, John Kent. For 100 years you never stopped exploring, inventing and thinking of ways to make the world a better place. You were and always will be an inspiration.

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I would like to thank my dissertation committee for their expertise, encouragement and patience as I made my way toward the finish line. In particular, my chair and mentor, Jennifer Dill deserves recognition for sharing her enthusiasm and curiosity while providing just the right amount of supervision to let me explore my own without getting lost along the way.

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To Jonathan, my parents, and the rest of my wonderful family: I could not have made it to this point without you. Thank you.

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Chapter 1: Introduction

The near universal reliance on car travel in many parts of the United States has been linked to environment and health problems ranging from greenhouse gas emissions and global climate change (Chapman, 2007) to physical activity, obesity (Frank, Andresen, & Schmid, 2004) and cardiovascular disease (Gordon-Larsen et al., 2009). Active transportation modes of walking and biking have the potential to mitigate some of these concerns by replacing passenger vehicle trips with modes that pollute less and increase rates of physical activity (Frank et al., 2010). Many studies of active transportation have focused on the role of the built environment in accommodating or hindering active travel modes. While the general consensus is that built environment characteristics do influence travel behavior travel behavior, the magnitude of the impact is often quite small and is typically secondary to demographic characteristics and attitudinal predispositions (Ewing & Cervero, 2010; Transportation Research Board, 2009). Efforts to supplement supportive built environments with voluntary travel behavior change programs, such as TravelSmart™, are one way that practitioners have attempted to shift mode shares beyond the relatively small effects observed in empirical studies (Bamberg et al, 2011). Increasing the effectiveness of these programs requires a better understanding of the psychological mechanisms of behavior adoption and change.

One explanation for why travel mode shifts are difficult to achieve, even in neighborhoods with supportive built environments or in places where new active transportation infrastructure has been added, is that travel mode "choices" are in fact

often habitual or automatic, meaning that they are performed with little to no deliberation (Bamberg, 2006). Behaviors repeated in a static environment are likely to become habitual and may not be reevaluated until normal environmental cues are disrupted by a major life event such as a move (Wood, Tam, & Witt, 2005). Behaviors that have become habitual have also been shown to be especially resistant to behavioral interventions employing information-based appeals (Bas Verplanken & Wood, 2006). Built environment changes and supplemental messaging may, therefore, be of limited use in static residential contexts. Because they are more likely to consider mode shifts, the roughly one in ten Americans who move each year should be considered a top priority in efforts to promote active travel modes. Yet a recent evaluation of voluntary travel behavior change programs in the United States showed that a majority relied almost entirely on information-based appeals and rarely targeted recent movers (Adkins & Goddard, 2012).

Market researchers have long recognized recent movers as an important market segment due to their willingness to reconsider long held practices (Bell, 1969). Theories of behavior, behavior change and influence from the field of social psychology provide a framework for better understanding how the built environment influences post-move travel mode adoption. The theoretical framework used for much of this dissertation is Ajzen's (1985) theory of planned behavior (TPB), which explains behavioral intention and, subsequently, behavior, as resulting from the combined influence of attitudes, subjective norms and perceived behavioral control (PBC). Understanding how exposure

to new post-move built environments shifts in attitudes, subjective norms and PBC is an important step toward better understanding facilitating adoption of active travel modes.

Study overview

In this dissertation I explored how recent movers adopt active transportation modes—specifically walking—for non-work utilitarian travel in the context of a new neighborhood. The period just after a move, when routines are still being established, presents an excellent opportunity to study how exposure to different built environments interacts with psychosocial constructs such as attitudes, social norms and perceived behavioral to control to influence active travel mode adoption.

To explore these internal and external influences as well as the underlying processes of post-move travel behavior adoption, I conducted a two-wave survey of recent movers during the period of reevaluation immediately following the moves of 211 movers in six U.S. cities. Respondents received questionnaires within days or weeks of a move and a follow up questionnaire six months later. This data set, combined with built environment measures from Walk Score™ and the Environmental Protection Agency (EPA) provides a unique glimpse into the travel behavior adoption of an important, yet understudied, group over the critical period in the months following a move.

Research Questions and Hypotheses

This dissertation consists of three investigations of distinct, yet related research questions. My overall research aim was to better understand the psychological processes and contributions of internal and external stimuli, particularly the built environment, in new mover's adoption of active travel modes for daily, non-commute travel. This broad

research aim was subdivided into a set of more specific research questions, which are explored in three standalone papers that make up chapters 4, 5 and 6. The questions and hypotheses are as follows:

Chapter 4 (Paper 1):

1. Controlling for past behavior and attitudes, does exposure to a supportive built environment for active travel result in higher propensities for non-work utilitarian walking?
2. What are the relative strengths of self-selection and built environment variables on post-move propensities for non-work utilitarian walking?

Chapter 5 (Paper 2)

3. What are the relative strengths of attitudes, perceived behavioral control, subjective norms, and built environment on walking mode adoption of recent movers?
4. Which built environment variables influence non-work utilitarian walking propensity directly and which are mediated through psychological constructs?
5. Do walking related attitudes, perceived behavioral control, and subjective norms change over time with exposure to a built environment supportive of utilitarian walking?

Chapter 6 (Paper 3)

6. Given the importance of self-selection and the increasing market demand for walkable housing locations, to what degree are low-income movers able to realize their preferences for walkable housing locations?

For the analysis presented in Chapter 4, I hypothesize that the built environment will have a significant effect on post-move adoption of non-work utilitarian walking, even after controlling for self-selection. Consistent with previous research, however, I expect the effect of built environment variables to be secondary to self-selection. Based on previous research I also expect, despite a significant built environment effect, that post-move walking adoption will be inelastic with regard to any individual built environment variables. My hypotheses for Chapter 5 are that PBC and attitudes will have a larger influence on post-move walking adoptions than either descriptive or injunctive social norms; that the built environment will primarily be mediated by PBC due to the important role of the built environment in facilitating opportunities for walking; and that exposure to walkable post-move built environments will result in shifts in TPB constructs, particularly PBC and attitudes. And for Chapter 6, my hypothesis is that low-income movers will be significantly less likely to realize preferences for walkable housing locations.

Organization

This dissertation is written as a series of three stand-alone research papers. Chapter 2 includes a summary of the relevant literature pertaining to the built environment travel behavior relationship, psychological theories of behavior change, and the handful of existing new mover travel behavior studies. Chapter 3 provides an overview of the research methodology with an emphasis on the data collection. Chapter 4 examines the relative strength of residential self-selection, past behavior, and built environment influences on new mover active travel mode adoption. Chapter 5 explores

how the built environment influences psychological constructs of attitude, perceived behavioral control, and subjective norms that together determine behavior. And Chapter 6 examines the extent to which low-income movers are able to self-select into walkable neighborhoods. Finally, chapter 7 concludes with a discussion of how the findings from chapters 4, 5 and 6 contribute to the travel behavior built environment literature and to practice. The research questions, data, analysis and findings from this dissertation are summarized in (Table 1).

Contributions

There are theoretical and practical contributions from this research. From a theoretical perspective, this dissertation provides evidence of how well TPB constructs explain the built environment travel behavior relationship for new movers. By examining the effect of built environment exposure on these psychological antecedents of behavior, I build on past efforts to conceptualize the processes underlying the built environment travel behavior relationship (Ewing and Handy, 2009; Alfonzo, 2005; Schneider, 2013).

From a practical perspective, understanding how the built environment interacts with psychological antecedents of behavior helps inform efforts to promote active transportation. Despite mounting evidence that the built environment influences travel behavior, private vehicle trips are still the norm in many places with supportive built environments for active transportation. Research from Europe, Australia, Japan and, to a lesser extent, the U.S., provides evidence that "soft" interventions, such as public information campaigns, individualized marketing, social marketing, and travel feedback programs, can increase rates of active travel modes and reduce reliance on private

vehicles (Bamberg, Fujii, Friman, & Gärling, 2011). One of the practical goals of this dissertation is to help guide the development of more theoretically grounded marketing of active transportation in U.S. cities.

Table 1: Summary

	Chapter 4	Chapter 5	Chapter 6
Research Questions	1. Controlling for past behavior and attitudes, does exposure to a supportive built environment for active travel result in higher propensities for non-work utilitarian walking? 2. What are the relative strengths of self-selection and built environment variables on post-move propensities for non-work utilitarian walking?	3. What are the relative strengths of attitudes, perceived behavioral control, subjective norms, and built environment on walking mode choice recent movers? 4. Which built environment variables influence non-work utilitarian walking propensity directly and which are mediated through psychological constructs? 5. Do walking related attitudes, perceived behavioral control, and subjective norms change over time with exposure to a built environment supportive of utilitarian walking?	6. Given the importance of self-selection and the increasing market demand for walkable housing locations, to what degree are low-income movers able to self-select into walkable neighborhoods
Data	Self-selection: attitudes (T2), location preference (T1), past-behavior (T1), Walk Score; pedestrian network; residential density	PBC (T2); attitudes (T2) subjective norms (T2); walk propensity (T2); land use entropy; pedestrian network; residential density	Location preference (T1); income; Walk Score; expected change in transportation expenditures; expected post-move walking
Analysis	Negative binomial regression; log likelihood comparison;	MANOVA; t-tests; structural equation modeling (SEM); lagged regression	T-tests; ANOVA; logistic regression
Key findings	1. Built environment variables have a significant positive effect on post-move walk propensity after controlling for self-selection. (walk propensity elasticity with respect to Walk Score is .46) 2. Built environment variables account for about 25% of the predictive power of the negative binomial model, with the remainder being explained by self-selection and past-behavior	1. PBC, descriptive norm, and injunctive norm shifts were consistent with neighborhood built environment change; attitudes remained stable. 2. Built environment characteristics mediated through descriptive norms and PBC, but not attitudes or injunctive norms. 3. Descriptive norms play a more important role than expected in facilitating the built environment effect on post-move walking	1. Low-income movers who prioritize walkable housing locations are about half as likely as higher income movers to realize this preference with their move 2. Low-income movers are more likely to expect increases in transportation expenses while higher-income movers are more likely to expect a decrease 3. Income effect also seen for previous moves, but not prior to 2008

Chapter 2: Literature Review

In this section I review the relevant empirical and theoretical research on which the research questions, hypotheses, and methods are based. I begin with an overview of built environment travel behavior research followed by a discussion of TPB and its constructs and how they have been incorporated into travel behavior studies. I conclude the section with an overview of the small handful of studies that have specifically examined recent mover travel behavior. Because Chapters 4, 5 and 6 are written as stand-alone papers, each also includes a brief, more focused background section that discusses relevant literature.

Built environment influences on travel behavior

Like most behaviors, travel behavior is a product of both internal and external stimuli. One broad category of external stimulus, particularly in urban places, is the human made built environment. Built environment is defined by a Transportation Research Board report as "land use patterns, the transportation system, and design features that together provide opportunities for travel and physical activity" (Transportation Research Board, 2009, p. xiii). Cervero and Kockelman (1997) famously operationalized built environment influences on travel behavior as the "three Ds" of density, diversity and design. After they were confirmed through factor analysis, these categories of the built environment features were included in a predictive model of mode choice for non-work trips that showed land use intensity, walking quality factors, and average sidewalk width predicting mode choice. With the caveat that cross-sectional

analysis cannot prove causality, Cervero and Kockelman concluded that the built environment had "modest to moderate" effects on travel demand. In addition, they found that their conceptualization of a built environment consisting of density, diversity and design was supported by the empirical results.

By the late 2000s, hundreds of studies had been published investigating the built environment travel behavior relationship. In a review of 50 of the more than 200 empirical studies identified in their meta-analysis of built environment influences on travel behavior, Ewing & Cervero (2010) calculated elasticities for built environment variables influence on vehicle miles traveled (VMT), walking and transit use. VMT was most strongly associated with accessibility to destinations. Walking was most strongly associated with land use diversity, intersection density, and destinations within walking distance. Walking was inelastic with respect to most built environment, however, ranging from .17 for land use mix to .25 for distance to a store and .39 for intersection/street density. Still, Ewing & Cervero conclude that due to the additive nature of these elasticities the combined influence of an accessible, pedestrian friendly neighborhood could still be substantial.

Saelens & Handy (2008) reviewed a narrower subset of empirical studies focusing on built environment influences on walking. A total of 29 studies were identified that examined both recreational and utilitarian walk trips. Utilitarian trips were found to be correlated with population density, distance to non-residential destinations, and land use mix. About half of the studies found positive correlations between walking and measures of connectivity, parks and perceived personal safety. Correlations between utilitarian

walk trips and sidewalk/path condition, traffic levels and aesthetic characteristics were not significant. Together, these two review studies suggest that the built environment has a significant, but modest, effect on travel behavior across geographic settings and methodological approaches.

Self-selection

One problem with many studies of the built environment influence on travel behavior, particularly those conducted prior to the early 2000s, is that self-selection is not adequately controlled for (Saelens & Handy, 2008; Ewing & Cervero, 2010). Most of the studies reviewed included demographic control variables, but few were detailed enough in the measurement of attitude and psycho-social controls necessary to adequately account for self-selection in a cross-sectional analysis. Higher levels of walking in higher density neighborhoods, for example, could be attributed to a causal relationship between the two (i.e. higher densities lead to more walking). However, this claim of causality would be false—or at least exaggerated—if residents who were predisposed to walking were choosing higher density neighborhoods conducive to walking. In such an instance, the built environment accommodates, but does not necessarily lead to the behavior. In contrast, an independent built environment effect after adequately controlling for self-selection suggests that exposure to built environment characteristics is not simply accommodating, but actually influencing behavior.

From their review of 38 empirical studies, Cao et al. (2009) identified several strategies for addressing self-selection in built environment travel behavior research. Hammond (2005) asked participants to describe their sequence of decision making and

found that 18% of movers selected a commute mode prior to selection and home and 39% made commuting and location decisions simultaneously (as cited in Cao et al., 2009). Many more studies rely instead on statistical control, typically by incorporating attitudes and preferences into predictive models. Specifically, simultaneous models such as joint discrete choice models and structural equation models can better account for the self-selection effect of residential location preference and attitudes on travel behavior outcomes. Regardless of the statistical method, longitudinal study designs are ideally suited for addressing residential self-selection because they allow for measurement of self-selection prior to exposure to a new built environment. This is true for both new infrastructure interventions and recent mover studies. In the context of studying recent mover travel mode adoption, self-selection is not simply a confounding influence to be controlled for, but rather a key part of the inquiry. Specifically, comparing the effects of self-selection and built environment influences has been identified as a gap in current built environment travel behavior literature (Cao & Moktarian, 2008; Bohte, 2010).

Theory of Planned Behavior

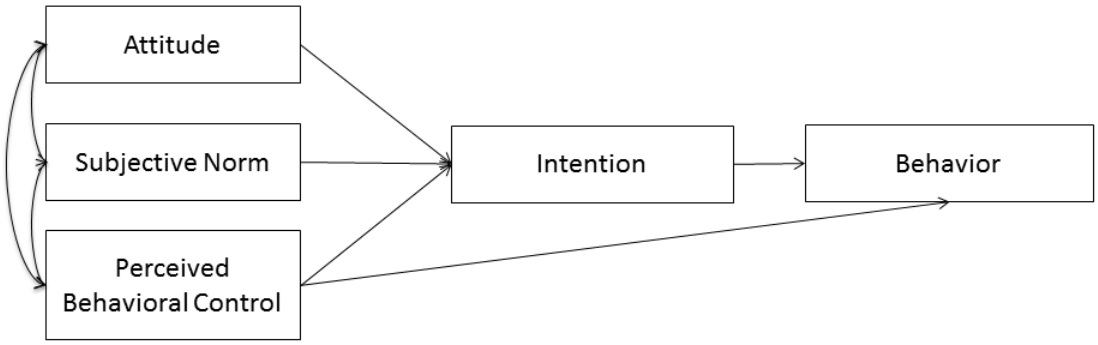
Beginning with James Foerster in the 1970s, transportation researchers have looked beyond traditional economic models to explain travel behavior. "In contrast [to transportation researchers]," Foerster wrote in 1979, "psychologists and marketing researchers have conducted a number of studies with the explicit purpose of identifying the behavioral mechanisms which are involved in human decision-making" (p. 17). In his comparison of utility-based compensatory (i.e. tradeoff) models to non-compensatory models developed by psychologists and market researchers, Foerster found that the

alternative models outperformed the compensatory models, predicting mode choice with 70% accuracy versus 62%.

The conclusion Foerster drew from his experimentation with alternative modeling techniques is that compensatory, utility-based models may perform well enough to fulfill their large scale aggregate forecasting duties, but they do not necessarily reflect the complex processes through which people make decisions. "The planner," Foerster writes, "should consider the very real possibility that mode choice decisions are not made in a compensatory manner" (p. 26). Understanding travel behavior and the ways it can be influenced, Foerster concludes, requires moving beyond traditional utility-based models. And, according to Fujii & Gärling (2003), forecasters must also engage with these behavioral processes in order to understand how stated intentions will differ from actual behavior and how shifts in environment, policy, and user costs may impact behavior.

The theory of planned behavior is one of the most widely used psychological theories of behavior (Ajzen, 1985) and has been applied frequently to transportation contexts. TPB was developed in response to mounting evidence that attitudes alone were not good predictors of behavior. Instead, within the TPB model, attitudes are one of a handful of behavioral antecedents mediated by behavioral intention. These antecedents are: attitude, subjective norm, and perceived behavioral control (PBC). Attitude and subjective norms have indirect effects on behavior through intention and PBC has both direct and indirect effects (Figure 1).

Figure 1: Theory of Planned Behavior



TPB provides the framework for the investigation of the psychological mediators of the built environment travel behavior relationship presented in Chapter 5. Attitudes, as described below, are also used as variables in the analysis for Chapters 4 and 6.

Attitudes

Within the TPB framework, attitudes are one of three predictors of intention and behavior. Attitude is defined by Eagly and Chaiken (1993) as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor." The key operational component of attitude is its bi-polar evaluative nature (e.g. from good to bad or difficult to easy). The basic components of attitudes are beliefs about expected outcomes and values placed on those outcomes. Many attitude measures, however, ignore this dual-component structure. This is problematic because a person might think bicycling to work is inexpensive compared to driving, but place such little value on having an affordable commute that the high expectancy alone would be misleading. A recent study of cycling to work in The Netherlands by Heinen et al. (2011) is a good example of combining measures of both expectancy and value into an attitude variable. The expectancy portion included a series of agree-disagree semantic differential

items such as “cycling work has environmental benefits” and “cycling to work is mentally relaxing.” Many attitude measurement tools stop at that. Respondents were also asked how important each of these items was to them and the summed products of expectancy and value responses were combined into the attitude variable.

There is strong evidence that attitudes are one of the best predictors of travel behavior outcomes. Kitamura, Mokhtarian, & Laidet (1997) found that attitudes were the best predictor of travel behavior in a model including built environment, accessibility and demographic characteristics. Including attitudes is also a key method for addressing residential self-selection problems in place-based travel behavior research methodologies (Cao, Handy, & Mokhtarian, 2006).

Subjective Norm

In TPB, normative outcomes are represented by the subjective norm. Subjective norms are a product of the likelihood that other people or groups will support a particular behavior and a person’s desire to conform to the wishes of these other people (Ajzen & Fishbein, 1980; Conner & Armitage, 1998; Eagly & Chaiken, 1993). Cialdini, Reno, & Kallgren (1990) made a distinction between two different types of social norms: descriptive and injunctive. Injunctive norms are more explicit and take the form described by Fishbein & Ajzen (1988): what others think one ought to do. Descriptive norms are based instead on what people observe and perceive around them. For example, a person might feel more comfortable or even pressured to ride a bike if they see many other people in their neighborhood riding a bike or if many of their friends ride bikes. Empirical evidence indicates that descriptive norms, and especially perceived behavior of

those in shared space, can greatly increase participation in environmentally friendly behaviors (Cialdini et al., 1990; Goldstein, Cialdini, & Griskevicius, 2008). Numerous examples of descriptive norms can be found in health-behavior and environmental-behavior research, such as those included in Montano and Kasprzyk's (2008) Integrated Behavior Model.

In travel behavior research, social norms have typically focused on injunctive rather than descriptive norms. Bamberg et al. (2002) used the following language for a subjective norm item on rated on a 10-point graphic scale: "most people who are important to me would support my using public transport/car/bicycle for daily travel from my current place of residence." An alternative item was designed by Klöckner and Matthies (2004) and attempted to increase the salience of the important other people by giving them names. Respondents were first asked to identify "three people that you are especially close with" and label them A, B and C. They were then given a disagree-agree scale for the statement: "Individual A/B/C thinks I should use public transport instead of the car for my regular trips." Klöckner and Matthies' approach is better suited to a phone administered survey because names could be read back to the respondent as prompts and was therefore not used in my questionnaire design.

Descriptive norms have been less frequently used in travel behavior research. Heath and Gifford (2002) included a descriptive norm item in a study of student transit use. They asked respondents to estimate the percentage of their friends who rode transit to school. Kormos, Gifford and Brown (2014) used a measure that asked university-based study participants to estimate the percentage of students who took a form of "sustainable

commuting" to campus and the percentage who commuted using a single occupant vehicle. Items measuring both injunctive and descriptive norms were collected for this dissertation and included in analysis for Chapter 5.

Perceived behavioral control

PBC is a measure of a person's perception of whether or not they have control over performing a behavior. PBC influences behavior indirectly through intention, but unlike attitude and subjective norm, it also influences behavior independently. Ajzen recognized that actual control would be a better indicator of behavior, but PBC was used because it could be more easily measured and was thought to be mostly accurate (Eagly & Chaiken, 1993). My hypothesis that built environment has a direct influence on PBC stems largely from this relationship between actual behavioral control and PBC. Aspects of the built environment, such as a lack of bus service or lack of destinations within walking distance, would greatly diminish a person's ability to meet travel needs through active modes.

Additional components

Conner and Armitage (1998) reviewed efforts to extend TPB by adding additional components. They found that while TPB does appear to have strong predictive validity (explaining upwards of 40% of variation in intention and 30% of variation in behavior), additional components could contribute to a better understanding of the process by which components influence behavior. The additional variables they reviewed are: belief salience; past behavior/habit; self-efficacy; moral norms; self-identity; and affective

beliefs. Of these, habit and affective beliefs showed the most potential for increasing the strength of models and seem most appropriate for answering my research questions.

Affective beliefs

Affective beliefs are beliefs or attitudes relating to feelings or emotions about a behavior or object. Affective attitudes are often examined in contrast to instrumental attitudes, which focus on the practical considerations of an experience such as time efficiency, safety, or comfort. Conner and Armitage's review of studies testing a unique effect of affective beliefs within the TPB framework concluded that there is sufficient evidence to recommend incorporating such measures into future studies. Steg (2005) conducted an experiment to test the affective and instrumental motivations for driving and found that affective motives were a stronger predictor of car use than instrumental beliefs.

Past behavior and habit

A rich literature has been developed on the role of past behavior and habit in travel behavior. This is a critical topic in discussions of mode choice because, as the research summarized below suggest, in many instances "choice" is only a part of the process. Instead, behaviors are acted upon in a non-deliberative, or automatic manner. Evidence that habits are 'broken' and that a window of reevaluation forms when people are put into a new decision context is a key justification for my focus on recent movers.

Habit is often measured using a measure of the frequency of past behavior. This approach is based on the assumption that repeated past behavior will result in automatic activation of that behavior in the future. This approach has been criticized on two fronts:

First, due to its non-deliberative nature, habitual behavior may not be easily recalled (Eagly & Chaiken, 1993; Gärling & Axhausen, 2003; Klöckner & Matthies, 2004; Verplanken, Aarts, & Van Knippenberg, 1997); and second, frequency of past behavior does not indicate the degree of automaticity of that behavior, which is necessary for habitual behaviors (Verplanken et al., 1997). That is, it is conceivable that a behavior is both regularly repeated and deliberative. To address these concerns with using frequency of past-behavior to indicate habit, Verplanken et al. (1994) developed a response frequency measure of habitual behavior. Rather than asking about past behavior, this method asks respondents to indicate how they would behave given a series of hypothetical situations. Ideally, respondents would complete the exercise without extensive deliberations. For this reason, Verplanken has suggested that the response-frequency measure might be better suited to telephone or face to face applications rather than pen and paper questionnaires.

Garvill, Marell, and Nordlund (2003) used both frequency of past behavior and the response frequency measure and found that survey respondents' past-car use was the better indicator of behavior. The authors concluded that the lack of improvement with the response frequency approach echoes the warning of Verplanken et al. (1994) that the tool may be better suited to questionnaires administered face to face or over the phone, rather than a mail survey. It is also important to note that this study measured people at two points in time in a stable context (only the survey instrument changed). It is likely that frequency of past behavior would be less accurate in predicting behavior in a new decision context such as a new residential location.

Garvill et al. (2003) empirically tested the theory that deliberative travel choice would result in greater influence of participant attitude. The sample was 60 households in Sweden. Participants were given an initial questionnaire that measured attitudes using various 5-point bipolar scales for trips by various modes (i.e. "driving a car at the present time of year is expensive vs. cheap"). Habit measure using both self-reported past travel and the response frequency measure of habit. Finally, travel diaries were collected in two phases. During phase two, participants in the experimental group were given slightly different travel diaries that included questions about planning for trips that required more deliberative weighing of travel choices (i.e. consideration of alternative modes). Of the two measures of habit, past car use was more highly correlated with behavior, echoing Verplanken et al.'s (1994) suggestion that the response frequency measure is best used in a supervised data collection scenario such as face to face or phone interviews. Attitudes were not found to be more influential for the experimental group, but the correlation between car habit and car use did decrease, as was expected. Those with a strong car habit in the experimental group decreased car use while others (control group and weak habit experimental group) did not.

Bamberg, Rölle, and Weber (2003) attempted to address the contradiction with TPB that “if behavior is always reasoned, then frequency of prior behavior should only have an indirect link to behavior since its effect would be mediated by intention and perceived behavioral control." They set up an experiment to test whether a new "decision context" would allow recent movers to process new information, thus breaking the habitual script-base pattern. Their analysis used both past travel and the response-

frequency measure for habit strength. Data were analyzed using SEM. Interventions were effective and increased transit use significantly. Influence from past car use was entirely mediated by intention and perceived behavioral control, suggesting that in the case of new decision contexts, habit may be less.

For the present study, I decided to forego a direct measure of habit, such as the response frequency measure because my survey was administered through the mail and because of evidence that habit may be less important following a move. Instead, I used a measure of past behavior, which is described in Chapter 3.

Empirical studies of recent movers

Only a handful of studies have investigated the travel mode adoption of recent movers. Beginning with Bell (1969), new movers were recognized as being important to firms trying to attract customers to certain products. Bell's investigation of shopping patterns following a move found that movers' shopping habits were re-established between four and nine weeks following a move, depending on the product. This provides a rare insight into the re-establishment of daily patterns following a move and nearly 50 years later new movers remain an under-studied population.

Within the travel behavior literature, there have been a number of studies specifically exploring the impact of new neighborhoods on movers. Most of these studies have been cross-sectional research designs that compared recent movers to non-movers or quasi-longitudinal designs that ask respondents to recall behaviors and perceptions from a previous home. Bina and Kockelman (2006) surveyed recent home buyers in Austin, Texas for a study of residential preferences. The sample of home buyers over a

one year period was purchased from a commercial mailing list provider. Survey results of recent home buyers were compared to those of a door to door survey of apartment dwellers. The authors confirmed their hypothesis that home buyers were less concerned with travel related characteristics such as commute time and access to transit than were apartment dwellers (25% versus 40% average overall importance for accessibility characteristics).

Verplanken, Walker, Davis, and Jurasek (2008) used a cross-sectional two-by-two factorial design to show that among employees at an English university, recent movers with strong environmental beliefs used cars for commuting less than non-movers with strong environmental beliefs. The authors conclude from this that the context change of a new residential location allowed recent movers' environmental values to manifest in a consonant mode choice. The authors acknowledge that only a longitudinal study would allow for conclusions about actual behavior change.

Handy, Cao, and Mokhtarian (2005) used a quasi-longitudinal approach to investigate how travel behaviors changed for recent movers and non-mover residents in four pairs of Bay Area neighborhoods. Neighborhoods were matched in pairs of suburban and traditional. Lists of residents who had moved to the study areas within the previous year were purchased from a commercial service and used along with a random sample of residents who had lived in the study areas longer than a year. Recent movers were asked to describe changes in travel behavior since their move and others were asked to describe changes in travel behavior from one year prior. Using an ordered probit model that controlled for attitudes, residential preference, and demographics, differences between

new movers in each neighborhood type were tested. Increases in a composite accessibility factor were the strongest predictor of decrease in driving. A safety factor was also significant, as were the number of grocery stores, pharmacies and theaters within 1600 meters. These results led to the authors' conclusion that the built environment influences travel behavior changes for recent movers even when self-selection and attitudes are controlled for.

Krizek (2003) used Puget Sound Transportation Panel data to conduct one of the only truly longitudinal studies of recent movers and travel behavior. From an initial sample of 6,144 households, Krizek selected the 430 that relocated (but remained within the metropolitan area) during the 7 year panel study. Regression analysis tested the influence of fine-grained built environment variables, neighborhood accessibility, and regional accessibility on VMT and number of trips. Households relocating to neighborhoods with higher accessibility reduced VMT and total distance traveled. Total number of trips increased for households relocating to neighborhoods with higher accessibility. For mode split, Krizek did not find evidence that the built environment of the new neighborhood had a significant influence.

Bamberg (2006) used TPB to test the effectiveness of a bus-ticket incentive delivered to the experimental group approximately six weeks after a move to Stuttgart, Germany. Participants were recruited prior to moving using advertisements in real estate listings and not told that the intervention was linked to the research. The initial survey contained a one-day travel mobility diary and questions assessing TPB components. About three months following the move, residents were surveyed about their travel

behavior. MANOVA was used to test differences between the control and experimental groups at T1 and T2 and showed that attitudes toward public transport and PBC over public transport use were significantly higher in the experimental group. Furthermore, a TPB-based structural model showed a good fit and indicated that the intervention had a significant impact on intention at wave 2. Car availability and past travel habit, as measured by the response frequency measure (Verplanken et al., 1994), were also included as an influence on intention.

Giles-Corti et al. (2013) have conducted perhaps the only before-after residential relocation study. Their longitudinal survey of participants building homes in a new housing development in Perth, Australia found that an increase in neighborhood destinations was associated with a significant increase in minutes of utilitarian walking. The same was true for recreational trips. The effect of built environment variables on recreational walking was mediated through shifts in attitudes toward walking.

Comparing my research method to those described above, there are some clear distinctions. First, only Bamberg's (2006) intervention study, Krizek's (2003) analysis of pre-existing panel data, and Giles-Corti's (2013) are truly longitudinal, allowing for analysis of change over time. And second, most define recent movers as anyone who moved in the preceding year. Such a broad window misses a key period during which routines are being reevaluated and new ones formed. By focusing on changes in the six months immediately following a move, my research design aimed to better isolate the shifts in behavior and the psychological constructs that influence mode choice adoption.

Chapter 3: Data collection, sample and measures

My research is designed to capture a post-move baseline of residential location preferences, attitudes, social norms, and perceived behavioral control (PBC) with a survey administered as close to a move as possible followed by another survey six months later. This two-wave approach allows me to examine how the built environment of a new home leads to shifts in a variety of behavioral and psycho-social variables. In addition, travel behavior will be measured using a travel mode propensity score for both pre-move travel recollected at T1 and post-move travel measured at T2. Socio-demographic variables such as income, age, race/ethnicity, and car ownership were also collected for use as control variables, particularly for the analysis in Chapters 4 and 6. This section describes the general procedures for data collection and the measures used. More detailed explanation of specific analysis techniques can be found in chapters 4, 5 and 6.

Data collection

I used a two-wave panel design to collect data. The first questionnaire was delivered to households within one to two weeks of a move in order to get as close to a baseline measure of each variable as possible and to reduce the risk that respondents might inaccurately recall past (pre-move) travel behavior and perceptions of the built environment. After a period of six months, I sent a follow up questionnaire to each respondent from wave 1. I chose a six-month follow up because for both logistic and theoretical reasons. A six month interval is common in intervention-based studies of behavior change, suggesting that it is an appropriate window for behaviors to shift in

response to an external stimuli (Prochaska, Redding, & Evers, 2008). Six months was also outside the four to eight week window during which market researchers show new shopping patterns form following a move (Bell, 1969). Shopping and travel are very different activities, but it is likely that many non-work trips reported by respondents in my study are for shopping. A six-month window also made it possible to survey in fall and spring when weather patterns are similar and schools are in session.

City selection

Cities meeting certain size and transportation criteria were included in the study. Criteria were selected to identify cities where there would be a mix of walkable and more car dependent locations and where there is a reasonable chance that participants could choose walking, bicycling or transit for non-work trips. The criteria were that each city had to have a population greater than 150,000; bus and rail transit; 2% or greater bicycle commute share according to 2011 ACS data; and not be in a Metro area with more than 5 million. The bottom limit of population was arbitrary and the top limit was intended to exclude cities within metropolitan areas with overlapping housing markets (e.g. San Francisco and Oakland in California). Only cities in the San Francisco and Washington, DC metro areas were excluded based on the metro area population criterion. The combined criteria resulted in 6 cities: Denver, Minneapolis/St. Paul, Portland, Sacramento, Salt Lake City, and Seattle.

Sampling

The sample for the survey was all households in the study cities identified by InfoUSA as having moved within the wave 1 study window of September and October, 2012. InfoUSA is a commercial mailing list compiler that gets its information from the U.S. post office and private firms such as utility companies that are notified of moves. I purchased weekly updates of new movers from InfoUSA and sent questionnaires out on a rolling basis each week. I acknowledge that this list is unlikely to contain all moves occurring in these cities during the study window. It is possible that some moves such as moving in with parents or roommates would not result in a new utility hookup or change of address form that would flag someone as a recent mover.

Procedure

I followed Dillman's (2008) recommended procedures. Respondents were sent a pre-letter notifying them that they were being included in a study of recent movers. The pre-letter was followed within days by the Wave 1 cover letter and questionnaire, a reminder post-card, and, after a two weeks, a second questionnaire and a second reminder post-card. The questionnaire for Wave 2 was sent six months after the first questionnaire was completed following the same procedure. The only difference in administration of Wave 2 was that the wave 1 questionnaire gave respondents an option of requesting a web-based Wave 2 questionnaire be emailed to them. Those opting for the web-based survey for wave 2 received two email reminders before being sent a hard copy and one reminder post-card. Participation was incentivized through $5 gift cards for participation

in Wave 1 and a drawing for an Apple iPad and $50 gift cards for completion of both waves.

Response

Of the 1,823 questionnaires mailed, 264 were returned undeliverable, 377 were returned completed and 33 fell outside of the 8-week recent mover window for a wave 1 response rate of 24%. 61% of Wave 1 respondents completed Wave 2 for a total of 212. The analysis for the studies described in chapters four and five are based on Wave 1 and Wave 2 data while the analysis described in chapter six is based on only the baseline Wave 1 data. The sample was representative in most characteristics of the study cities, but in general respondents were older, slightly more likely to be low-income or in poverty, and more likely to be female (Table 2). Seattle respondents had higher mean post-move Walk Scores than the rest of the sample, which is in line with Seattle's higher overall Walk Score average.

Table 2: Respondent characteristics Wave 1

	Total sample		Denver		Minneapolis		Portland		Sacramento		Salt Lake City		Seattle	
	Sample	Pop	Sample	Pop	Sample	Pop	Sample	Pop	Sample	Pop	Sample	Pop	Sample	Pop
Mean Walk Score	51	59	56	56	45	65	59	63	40	43	46	55	70	71
Female (%)	65	50	74	50	64	50	62	51	76	52	52	49	60	50
White (%)	77	59	87	52	80	62	83	72	60	35	78	67	63	67
Hispanic/Latino (%)	8	17	9	32	4	10	9	9	16	26	17	21	7	6
Black (%)	8	10	4	10	9	17	5	6	8	13	0	3	50	8
Asian (%)	6	9	4	3	7	6	2	7	8	19	9	4	7	14
Mean age	50	34	41	34	50	32	52	36	48	33	50	31	53	36
Own (%)	50	50	42	50	61	50	38	54	28	49	64	49	20	47
Poverty (%)	19	17	8	17	15	20	22	17	33	18	18	19	25	13
N	344		23		141		64		38		23		30	

Because nearly 40% of wave 1 respondents did not complete wave 2, there is the risk that attrition was not randomly distributed across the sample.

Table 3 shows how respondents who only complete wave 1 differed from those who completed both waves. Respondents who dropped out between waves were more likely to be renters, lower-income, younger and transit riders. Some of this difference can be attributed to wave 1 respondents who did not stay in the same home during the six month window. This is consistent with frequent movers' tendency to be lower-income, renters, and young families (Colton, Theodos, & Turner, 2012). This presents potential problems of non-response bias for analyses based on both waves of data. This is less of a problem for the analysis presented in chapter 6, which is based only on wave 1 data.

Table 3: Comparison of sample characteristics between those who completed only wave 1 and those completing both waves

Variable	Both Waves	W1 Only
Mean post-move Walk Score	52	50
Mean pre-move Walk Score	51	52
Own	53%*	38%
Mean income	$83,356*	$55,908
Mean pre-move walking	16%	18%
Mean pre-move driving	77%	70%
Mean pre-move transit	6%	11%
Mean pre-move bicycling	5%	3%
Mean accessibility preference	29.31	28.91
Mean age	52*	46

In general, reported post-move travel behavior, in terms of mode share, was not different from reported pre-move travel behavior (Table 4). On average, about three quarters of pre and post-move non-work travel was done by car, 15% by walking, and about 5% by transit and bicycle.

Table 4: Pre and post-move reported mode splits

	Pre-move	Post-move
Car	75%	73%
Walk	15%	15%
Transit	5%	6%
Bicycle	4%	5%

Measures

This section describes the various measures collected through questionnaires or from secondary sources that is used in the analysis.

Travel behavior, past behavior, and intention

In travel behavior research, travel diaries are the standard method for collecting data about travel mode choice. Researchers use travel diaries to collect detailed information about each trip over a period of time ranging from one day to one week (and in rarer cases, longer). Because they focus on specific trips, diaries have the advantage of being less prone to inflation of socially desirable behavior than methods requiring respondents to recall the frequency of past travel (Bonsall, 2009). Due to the level of detail and time commitments required of respondents in multi-day travel diaries, however, most researchers use single-day diaries, which are known to overestimate the stability of modal preference (Axhausen, Löchl, Schlich, Buhl, & Widmer, 2007).

For this study I developed a new travel mode propensity measure designed to be less cumbersome than a multi-day travel diary while capturing a higher degree of variability than one-day travel diaries. The new measure combines three previously used types of travel survey items of mode choice into a single continuous measures of travel mode propensity. The goal of the measure is to find an accurate representation of mode

choice by triangulating recent past mode choices with specific destination types, typical mode choice to those destination types, recent mode choice frequency, and an estimated mode split by percentage. First, respondents were asked to indicate the travel mode (car, walk, transit, bicycle) they would typically use to travel to each of a list of 13 common destination categories (e.g. grocery story, restaurant, home of friend or relative, or post office). Respondents could also list two additional destinations and indicate their primary travel mode associated with that destination. Next, respondents were asked to recall the most recent trip to each of the 13 (and possibly 2 unique destinations) and what their travel mode was on that trip. This item captured specific recent past behavior, which should be easy for respondents to accurately recall. Additionally, in order to include contributions from less commonly used modes and capture variability that might otherwise be missed, respondents were asked how frequently they use each travel mode for any non-work travel on a scale of never, less than once per week, once or twice per week, 3-5 times per week, and nearly every day. And finally, respondents were asked to indicate approximately what percentage of their non-work trips were by each travel mode.

The two destination-based items were normalized as percentages (e.g. percent of visited destinations for each mode) and numerical values were assigned to each categorical frequency (0, 5, 10, 20 and 50). The four components had high internal consistency ($\alpha = .883$) suggesting that together these variables are measuring the underlying construct of travel mode propensity. Pre-move travel behavior was measured in a similar manner, but due to the difficulty with recall of specific trips prior to a move

the most recent trip component was left out. Similarly, intention was based on the same items measuring intended travel patterns six months in the future when respondents were more settled in the routines of their new home and neighborhood. Because TPB constructs of attitudes, PBC, and subjective norms changed during those six months, however, it was not plausible to use intention measured at T1 as a mediator of TPB constructs and behavior.

Built environment variables

Built environment variables were taken from two sources: Walk Score and the Environmental Protection Agency's Smart Location Database (2013). Walk Scores were determined for each respondent's pre and post-move address using WalkScore.com. Walk Scores range from 0 to 100 and are based on distances to nearby services. Scores between 50 and 69 indicate a place that is somewhat walkable according to Walk Score, while scores of 70 and above are considered very walkable places where "most errands can be accomplished on foot." Scores below 50 indicate a car dependent location. Walk Scores were used in chapters four and six. Walk Score has become a common tool for research on the effect of walkability on travel behavior and has been validated in several studies (Carr, Dunsiger, & Marcus, 2010; Duncan, Aldstadt, Whalen, Melly, & Gortmaker, 2011)

Measures of residential density, pedestrian network connectivity, and land use mix (entropy) were taken from the EPA's Smart Location Database. Pre and post-move addresses were mapped using GIS in order to match each address to a census block group and matched with the EPA data.

Housing location preference

The housing location preference variables were derived from survey items adapted from Handy et al. (2005). The location preference item consisted of 20 housing location characteristics that respondents rated on a 6-point scale between "not at all important" and "extremely important" in their decision of where to move. To isolate the relative importance of accessibility characteristics, the total preference expressed for the six accessibility related features (36 maximum) was divided by the total amount of expressed preference for any of the 20 features (120 maximum). The selection of pedestrian accessibility characteristics was confirmed through factor analysis, with each variable having a factor loading greater than .50 (Table 5).

Table 5: Pedestrian-accessibility related housing location characteristics with factor loadings

Survey item	Factor loading
Shops within walking distance	0.79
Nearby public transit	0.82
Good sidewalk network	0.58
Nearby parks	0.56
Low transportation costs	0.53
Restaurants, coffee shops and bars within walking distance	0.78
Access to downtown	0.63

Theory of planned behavior constructs

Attitudes

The survey measured expectancies (beliefs) for non-work utilitarian walking for the following characteristics: convenience, safety, time efficiency, cost, environmental impact, comfort, health impact, enjoyment and reliability. Expectancy and value were measured separately. Expectancy was assessed using a series of semantic differential

items, which prompted respondents to select a point on 6-point scale between two descriptors with opposite meanings (e.g. “good for my health” “bad for my health”). I used a 6-point scale instead of a 7-point scale to prevent neutral responses. Using a 7-point scale, I then asked respondents to rate the importance of each characteristic for choosing a transportation mode for non-work utilitarian travel. To evenly weight each component and increase interpretability, both were converted to a score from one to ten. Finally, to calculate respondents’ overall attitude toward non-work utilitarian walking, I summed the products of expectancy and value for each characteristic.

Perceived behavioral control

Perceived behavioral control is the extent to which a person feels control over performing a particular behavior. The construct included three measures, including a semantic differential item asking whether walking for non-work utilitarian trips was possible or impossible and easy or difficult and agreement with the statement “I could walk for some of my non-work trips if I wanted to” on a six-point scale.

Subjective norms

The subjective norm construct of TPB takes the form of an injunctive norm (i.e. the extent to which a person thinks important others in their life would support performing a behavior). Consistently weak relationships between subjective norms and intention led researchers to test the addition of a second normative construct, the descriptive norm, which means what a person observes or thinks others around them doing (Cialdini, 2007). Rivis and Sheeran’s (2003) meta-analysis showed that across 21 analyses the inclusion of descriptive norms improved prediction of behavioral intention

by 5%. Both descriptive and injunctive subjective norms were measured and included in analysis. Descriptive norms were measured based on agreement with the following on a six-point scale:

"I often see people walking in my neighborhood."
"Many of my friends and family walk for at least some of their transportation needs."

Injunctive norms were measured in three ways. First, by asking respondents how supportive (on a 7-point scale) friends and family would be about them walking for non-work travel. And second, by agreement with the following statements on a 6-point scale:

"I feel pressure from friends and family to limit my car driving."
"I feel general social pressure to limit my car driving"

The data used in this dissertation are a unique resource that provides the opportunity to explore the determinants of travel mode adoption at a critical moment just after a move. The data collection effort was designed specifically for this purpose, so psychological constructs and other self-selection related measures are far more detailed than previous most previous studies on this topic, particularly those that have used proxies within existing data. The expense and difficulty of reaching this hard to reach population—which could be a paper topic of its own—make clear one of the reasons new movers remain under-studied.

Chapters 4, 5 and 6 each use combination of the data described in this chapter to answer the research questions described in Chapter 1. Table 1 at the end of Chapter 1 summarizes the research questions, data, analysis, and key findings of each chapter.

Chapter 4: Built environment and self-selection influences on recent mover adoption of non-work utilitarian walking

According to the 2009 National Household Travel Survey, 60% of trips of one mile or less are made by motor vehicles. Replacing some of these short vehicle trips with walking is one strategy planners have embraced for reducing the negative environmental impacts of driving while increasing rates of physical activity. These high rates of personal vehicle trips have proven difficult to shift, in part because what we consider mode "choices" are often habitual actions performed automatically with little to no deliberation, and behaviors that have become habitual are resistant to behavioral interventions (Verplanken & Wood, 2006). Recent movers provide an opportunity to observe the relationship between built environment and travel behavior at a time when previously automatic behaviors are being reevaluated (Wood et al., 2005). Better understanding how the one in ten Americans who move each year make travel behavior decisions following a move can help inform efforts to promote active transportation among those most likely to shift travel behaviors. But more importantly to broader discussions of travel behavior, the window of reevaluation immediately following a move is a key moment for investigating the fundamentals of mode choice unclouded by the automaticity of daily routine.

Many studies aimed at better understanding travel behavior and mode choice have focused on the role of the built environment (e.g. street connectivity, sidewalks, nearby destinations) in influencing travel mode choice. Over 200 such studies were identified as of 2010 (Ewing & Cervero, 2010). One shortcoming of many early studies of built environment effects on travel behavior was a failure to adequately control for self-

selection (Cao, Mokhtarian, & Handy, 2010). Without such controls, it is impossible to determine if the relationship between the built environment and travel behavior is causal or if the relationship can instead be explained by people seeking housing locations that allow them to perform their preferred travel behavior. Those studies that have controlled for self-selection show that built environment remains significant (Cao, Mokhtarian, & Handy, 2010), but the relative strength of built environment and self-selection variables is rarely reported (Mokhtarian & Cao, 2008).

This study uses data from a two-wave survey of recent movers in six U.S. cities to explore the relative influence of exposure to post-move neighborhood built environments and a robust set of self-selection variables, including attitudes, residential location preference, and pre-move travel behavior on adoption of post-move utilitarian walking. The paper makes two unique contributions to the field of built environment travel behavior research. First, by surveying movers immediately following a move and again after six months of exposure to a new neighborhood built environment, I was able to explore causality in ways that a cross-sectional design would not allow. And second, by comparing a series of nested regression models I was able to parse out the unique effects of socio-demographic, self-selection, and built environment characteristics.

Background

After decades of widespread investigation of the relationship between the built environment and travel behavior, questions remain about the strength of built environment influences relative to socio-demographic and attitudinal factors (Cao et al., 2009). Ewing and Cervero (2010) included 50 empirical studies in their meta-analysis of

built environment and travel behavior studies and found that walking is most strongly related to land use diversity, intersection density and destinations within walking distance. This meta-analysis showed that elasticities related to the built environment were quite small. Saelens & Handy (2008) reviewed 29 empirical studies focusing on built environment influences on walking. Utilitarian trips were found to be correlated with population density, distance to non-residential destinations, and land use mix. Additionally, about half of the studies reviewed by Saelens and Handy (2008) found positive correlations between walking and measures of connectivity, parks and perceived personal safety. Correlations between utilitarian walk trips and sidewalk/path condition, traffic levels and aesthetic characteristics were not significant.

Despite evidence of correlation, more explicit examination of causality is needed. Most studies prior to 2010 included demographic control variables, but few were detailed enough in the measurement of attitudes and psycho-social controls necessary to adequately account for self-selection (Ewing & Cervero, 2010; Saelens & Handy, 2008). Cao, Mokhtarian, & Handy (2009) reviewed 38 empirical studies of built environment influences on travel behavior (all but two published since 2000) that addressed self-selection and found that while variation in travel behavior can be partially explained by residential self-selection, most studies showed a statistically significant unique effect of one or more built environment variables.

Experimental longitudinal research of recent movers is one way to address the confounding influence of self-selection (Cao et al., 2009). Not only does targeting recent movers allow researchers to measure self-selection controls when they are most salient,

but the context of a new residential location is ideal for observing travel mode decisions relatively unclouded by established daily routines. Market researchers have long recognized recent movers as an important market segment due to their willingness to reconsider long held practices. Bell (1969) dubbed the term "mobiles" to refer new mover households, which in the 1960s accounted for nearly 20% of all U.S. consumers. Bell investigated how long it took after a move for shopping patterns to settle into predictable routines. Bell found that new mover brand and product selection was disrupted by a move to a new home and settled into new patterns after approximately two months.

This window of time just after a move is an important moment for travel behavior research because it allows researchers to observe travel choices at a time when behavioral patterns are reevaluated. Behaviors repeated in a static environment are likely to become habitual (i.e. automatically repeated without deliberation), and may not be reevaluated until normal environmental cues are disrupted by a major life even such as a move (Wood et al., 2005). Behaviors that have become habitual are resistant to behavioral interventions employing information-based appeals (Bas Verplanken & Wood, 2006). The habitual nature of travel behavior has implications for efforts to promote active transportation in the United States. The fact the information-based appeals are one of the key components of most voluntary travel behavior change programs could help explain why such programs often have limited success shifting behavior..

From a research design perspective new mover households present a rare opportunity to observe behavior adoption in the context of a new physical environment. As noted by Cao et al. (2009), evaluating travel behavior changes of recent movers using

longitudinal or quasi-longitudinal study designs can be an effective way to isolate the built environment influences on travel behavior from the potentially confounding influence of residential self-selection. Despite the theoretical and practical benefits of recent mover travel behavior studies, only a handful have been published. Krizek (2000, 2003) and Meurs and Haaijer (2001) studied recent movers using large panel data sets that did not allow for explicit controls of attitude related variables. Handy, Cao and Mokhtarian addressed this shortcoming by collecting attitudinal and residential location preference data from a survey of recent movers. Using a quasi-longitudinal approach that compared reported changes in behavior between respondents who had moved in the last year and those who had not, recent movers were asked to report their travel behavior prior to their move and non-movers were asked to report their travel behavior from one year prior.

Methodology

My research design improves on previous recent mover studies by using a narrower definition of recent movers (8 weeks instead of one year) and by measuring self-selection and travel behavior variables six months apart. While not a before and after research design (which would require the difficult task of identifying movers prior to a move), this longitudinal approach allowed for the measurement of key attitudinal and preference variables as close to the point of residential self-selection as possible. This is important because the same built environment variables shown to influence travel behaviors likely also influence attitudes and preferences in ways that could confound interpretation of causality if measured at the same point as travel behavior. My research

design does not eliminate this possibility, but rather lessens it. Surveying within days or weeks of a move is also important because the accuracy of pre-move travel behavior recall likely diminishes with the passage of time.

The six cities in the study were selected based on the criteria of having both bus and rail transit, having a bike commute share of 2% or higher, having population of at least 150,000 and being in a metro area of fewer than 5 million. These are cities where there is a reasonable expectation that a person could find a neighborhood that is not car dependent. These cities also have a variety of neighborhoods within them ranging from high density urban to relatively low-density single family neighborhoods. Surveys were sent to all movers identified by InfoUSA in the six cities in September and October, 2012.

A propensity score was calculated for each respondent based on four walking-related variables. The first item asked respondents to estimate the proportion of their non-work utilitarian travel completed by driving, walking, bicycling, or taking transit. The second item asked respondents to select a primary or regular mode of travel to 12 common destinations (plus two additional write in options). The percentage of visited destinations for which walking was the primary mode became the second component of the propensity score. To correct for error due to biased recollection, a similar item asked respondents to select the mode for their most recent trip to the same list of destinations. Finally, in order to capture the influence of less frequently used travel modes, respondents were asked to select the frequency of their use of each travel mode for non-work travel on a five-point unipolar scale from “never” to “nearly every day.” Numerical

values were assigned to each categorical frequency that ranged from zero for "never" to 50% for "nearly every day." The four components have high internal consistency (α = .883), suggesting together these variables are measuring the underlying construct of travel mode propensity. Pre-move travel behavior was measured in a similar manner to the dependent variable, but due to difficulty with recall of specific trips prior to a move the most recent trip component was left out.

Built environment variables were taken from two sources: Walk Score and the Environmental Protection Agency's Smart Location Database (2013). Walk Scores were determined for each respondent's address from WalkScore.com. Walk Scores range between 0 and 100 and are based on distances to nearby services. Scores between 50 and 69 indicate a "somewhat walkable place," according to Walk Score, while scores of 70 and above are considered "very walkable" places where "most errands can be accomplished on foot." Scores below 50 indicate a car dependent location. Network density and residential density variables were calculated for census block groups using the EPA's Smart Location Database.

Self-selection: attitudes

According to psychological theories of attitudes and behavior, attitudes toward a behavior are made up of two distinct components: expectancy and value (Eagly and Chaiken, 1993; Fishbein, 1975). Expectancy is what a person believes the result of performing a behavior will be. And value is the importance placed on that outcome (good or bad). For example, a person could expect walking to the store to be good for the environment relative to driving, but the significance of that expectancy on behavioral

outcomes will be mitigated by how much value they place on lessening their environmental impact. Both components are necessary to understand the relationship between attitudes and behavior.

The survey measured expectancies (beliefs) for non-work utilitarian walking for the following characteristics: convenience, safety, time efficiency, cost, environmental impact, comfort, health impact, enjoyment and reliability. Expectancy and value were measured separately. Expectancy was assessed using a series of semantic differential items, which prompted respondents to select a point on 6-point scale between two descriptors with opposite meanings (e.g. "good for my health" "bad for my health"). I used a 6-point scale instead of a 7-point scale to prevent neutral responses. I then asked respondents to rate the importance of each characteristic for choosing a transportation mode for non-work utilitarian travel on a 7-point scale. To evenly weight each component and increase interpretability, both were converted to a score from one to ten. Finally, to calculate respondents' overall attitude toward non-work utilitarian walking, I summed the products of expectancy and value for each characteristic.

An example of why including both components of attitude is critical to modeling the relationship between attitude and behavior is illustrated by the fact that respondents' relatively strong beliefs that walking is good for the environment are tempered by environmental impact not being rated as an important decision in choosing a transportation mode (Table 6).

Table 6: Expectancy and value components of attitude for non-work utilitarian walking

	Expectancy		Value	
Semantic differential item	Mean	Std. Dev.	Mean	Std. Dev.
Inconvenient – Convenient	5.96	3.08	8.38	1.63
Unsafe – Safe	7.43	2.37	7.72	2.07
An inefficient use of time - An efficient use of time	6.74	2.77	8.45	1.77
Expensive - Inexpensive	9.19	1.66	6.65	2.33
Bad for the environment - Good for the environment	8.99	2.06	5.93	2.29
Uncomfortable - Comfortable	6.61	2.90	7.55	1.92
Bad for my health - Good for my health	8.57	2.47	6.48	2.48
Unenjoyably - Enjoyable	6.61	3.04	6.57	2.25
Unreliable - Reliable	7.10	2.70	8.53	1.58

Self-selection: housing location preference

The housing location preference variables were derived from survey items adapted from Handy et al. (2005). The location preference item consisted of 20 housing location characteristics that respondents rated on a 6-point scale between "not at all important" and "extremely important" in their decision of where to move. To isolate the relative importance of accessibility characteristics, the total preference expressed for the six accessibility related features (36 maximum) was divided by the total amount of expressed preference for any of the 20 features (120 maximum). The selection of pedestrian accessibility characteristics was confirmed through factor analysis, with each variable having a factor loading greater than .50 (Table 5).

Analysis

Because propensity scores start at zero, and are therefore not normally distributed, alternatives to ordinary least squares regression had to be used. Over dispersion of the dependent variable suggested a negative binomial distribution rather than a Poisson

distribution, which assumes that means and variance are equal. By comparing two nested negative binomial models I was able to calculate the contribution of each grouping of variables by comparing the log likelihoods of each model to calculate the additional contribution from each group. Due to high correlation between Walk Score and residential density, residential density was not included in the model.

Table 7: Negative binomial regression models predicting non-work utilitarian walking propensity

	Model 1				Model 2				Model 3		
Variables	Coeff.	Wald χ^2	Elast-icity	Sig.	Coeff.	Wald χ^2	Elast-icity	Sig.	Coeff.	Elast-icity	Sig.
Self-selection											
Attitude	0.02	23.38	1.14	< .01	0.02	14.20	1.14	< .01	-	-	-
Location preference	0.04	12.18	1.21	< .01	0.03	4.09	0.76	0.04	-	-	-
Pre-move walking	0.01	11.48	0.21	< .01	0.01	7.63	0.17	< .01	-	-	-
Built environment											
Walk Score	-	-	-	-	0.01	5.66	0.46	0.02	0.02	0.83	< .01
Ped network density	-	-	-	-	0.03	3.27	0.46	0.07	0.03	0.50	0.03
Residential density	-	-	-	-	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Model summary											
Log likelihood	-545				-537				-554		
Pseudo R2	0.05				0.08				0.05		
Contribution of each variable group to Model 2 based on log likelihood comparisons											
Self-selection	79%										
Built environment	21%										

[a] Excluded due to high correlation with Walk Score

Findings

The model indicates that controlling for self-selection, built environment variables made a significant contribution to the prediction of post-move walk propensity (Table 7).

As expected, post-move Walk Score was the strongest built environment predictor (β = .01, Wald χ^2 = 5.66, p. < .01). Pedestrian network density was positive, but only marginally significant (β = .03, Wald χ^2 = 3.27, p. = .07). Consistent with previous research, self-selection variables are by far the strongest group of predictors and contribute nearly 80% of the explanatory power of the model, with attitude toward walking (β = .02, Wald χ^2 = 14.20, p. < .01), location preference (β = .004, Wald χ^2 = 4.09, p. = .04), and pre-move walking rate (β = .01, Wald χ^2 = 7.63, p. < .01) as the three strongest predictors in the model.

Unit elasticities were calculated from the coefficients using the suggested $\beta * \bar{x}$ formula for converting negative binomial regression coefficients to elasticities (Milton & Mannering, 1998; Ewing & Cervero, 2010). Elasticities allow for easier interpretation and comparison to other studies. Walk propensity was elastic (elasticity > 1) with regards to only one variable in the model: attitudes toward walking (1.14). This indicated that a one unit increase in attitudes toward walking was associated with a 1.14 unit increase in walk propensity. Other self-selection variables were inelastic, with location preference at .76 and pre-move walking at .17. The two built environment variables remaining in the model were inelastic. Post-move walk propensity had an elasticity of .46 with respect to both Walk Score and pedestrian network density.

Holding other variables constant, this model indicates that a 20 point increase in Walk Score would result in an approximately 9 point increase in post-move walk propensity. To illustrate the importance of controlling for self-selection, when a similar model was tested without self-selection variables the Walk Score elasticity of walk propensity increased to .86. Use of this model would lead to an exaggerated 17.2 point increase in walk propensity for a hypothetical 20 point increase in Walk Score.

Discussion and conclusions

The findings of this paper help shed light on the relative influence of built environment and self-selection effects on post-move utilitarian walking. Consistent with previous empirical studies of non-recent movers, the built environment remained significant after controlling for self-selection. Furthermore, exploration of the relative contributions of each to the overall model shows that built environment variables provide approximately 20% of the model's predictive power. There is little previous quantification of the relative strength of self-selection and built environment effects to compare with these findings. Targa and Clifton (2005), using a similar analytical approach, found that built environment variables explained 13.5% of variation in walking trips. However, because their data was from the 2001 NHTS they included proxies for attitudes toward travel modes and no location preference measure. The data in the present study more explicitly controls for the psycho-social components of self-selection. While not directly comparable to the built environment variables of the present study, the elasticities reported by Ewing and Cervero (2010) are similar. Fewer than half of the studies incorporated into that meta-analysis, however, controlled for self-selection, which

likely leads to overstated built environment effects compared to the present findings. To illustrate the importance of adequately controlling for self-selection, I tested a final model that included only built environment variables. Without self-selection variables, walk propensity elasticity with respect to Walk Score increased to .86.

Knowing that Walk Score appears to have an effect on post-move walk propensity even after controlling for self-selection is an important finding. Because new movers have—by definition—recently made a location decision, one could expect self-selection to have the strongest association with travel behaviors immediately following a move. The fact that the built environment still had a significant unique effect is strong confirmation that supportive environments for walking, particularly destinations, have a causal effect on travel behavior. The built environment effect on post-move walk propensity also provides further evidence that movers shift travel behaviors after a move and are influenced by cues from their new neighborhood environments.

Chapter 5: The role of psychological factors in facilitating the built environment travel behavior relationship

Facilitating shifts toward active travel modes of walking and bicycling has the potential to reduce the negative environmental impacts of urban transport systems while improving population health through increased rates of physical activity. One barrier to widespread active transportation, particularly in the United States, is a legacy of low-density single land use development patterns that have resulted in neighborhood built forms unfriendly to these modes, particularly walking. To better facilitate shifts toward active travel modes, urban planners have focused on built environment interventions that address these barriers. As justification for these interventions, practitioners point to hundreds of studies from the past decade that have showed a relationship between the built environment and travel behavior. Multiple reviews and meta-analyses have concluded that the built environment has significant, though often quite small, impact on travel behavior outcomes such as reductions in passenger vehicle miles traveled and higher rates of walking, bicycling, and transit (Cao et al., 2009; Ewing & Cervero, 2010; Saelens & Handy, 2008). In particular, Saelens and Handy's (2008) review of studies that focused only on built environment influences on walking indicated that utilitarian walking trips were correlated with population density, street connectivity, distance to destinations and land use mix.

The generally small effect sizes of built environment influences have led to efforts to develop and test “soft” interventions to supplement infrastructure-based “hard”

interventions and bring about greater behavioral shifts through social marketing and other persuasive techniques (Bamberg et al., 2011; Möser & Bamberg, 2008). Well-known programs such as TravelSmart and other voluntary travel behavior change and social marketing programs are widely used in Europe and Australia and are growing in popularity in U.S. cities. These programs work in four key ways: filling information gaps; providing incentives for participation; shifting social norms; and asking participants to set goals or make commitments and providing feedback on progress (Adkins & Goddard, 2012). In addition, because automatic (i.e. habitual) behaviors are difficult to shift through information-based appeals (Verplanken & Wood, 2006), a handful of programs target new movers to take advantage the post-move window in which habitual daily behaviors are most likely to be reassessed (Bamberg, 2006).

Psychological theories of behavior have been applied to questions of travel mode choice since at least the 1970s when Foerester (1979) found that psychological models of travel behavior outperformed more commonly used utility-based models in predicting behavior. More recently, researchers have applied a range of psychological theories and concepts to travel mode choice contexts, most notably the theory of planned behavior (TPB). Despite the introduction of psychological theories such as TPB into travel behavior research, surprisingly little published research has aimed at better understanding the psychological process underlying the built environment–travel behavior relationship. A New Zealand study of 12-17 year olds used SEM to test the relationship between perceived built environment, measured built environment, TPB constructs and physical activity (Maddison et al., 2009). Findings indicated that TPB constructs were better

predictors of physical activity than perceived built environment and that the built environment physical activity relationship was not mediated by TPB constructs. Similarly, a Canadian study of adults tested the mediation effect TPB constructs on the relationship between perceived built environment measures of land-use mix and neighborhood aesthetics and recreational walking (Rhodes, Brown, & McIntyre, 2006). The authors of that study found that land use mix and neighborhood aesthetics were fully mediated by attitudes, subjective norms and PBC, but cited the need for additional research to further test the agents that lead to shifts in TPB constructs.

This paper uses structural equation modeling and path analysis to explore the extent to which built environment effects on post-move utilitarian walking are mediated through changes in TPB constructs of attitude, injunctive and descriptive social norms, and perceived behavioral control. By focusing on new movers, the paper makes a unique contribution to existing literature on the topic by examining travel behavior adoption in an unstable context. Further, it improves upon studies that have exclusively used perceived built environment measures, which are likely already shaped to some degree by attitudes, perceived behavioral control and PBC. This paper also makes a contribution to efforts to promote active transportation through voluntary travel behavior change programs and other social marketing efforts. Persuasive techniques can be targeted toward different TPB constructs in ways that may enhance the travel behavior impacts of neighborhood built environments supportive of active transportation.

Method

Participants and procedure

A total of 212 recent movers in six U.S. cities completed both parts of a two-wave questionnaire. Questionnaires were sent to a list of households identified by InfoUSA, a commercial mailing list compiler, as having recently moved. Each identified recent mover household in the six study cities was contacted for the months of September and October 2012. The wave 1 questionnaire was mailed to arrive as close after a move as possible. On average, questionnaires were completed 3.4 weeks from the move date. Questionnaires completed longer than 6 weeks after the move were excluded from analysis. Of the 1,823 questionnaires mailed, 264 were returned undeliverable, 377 were returned completed and 33 fell outside of the 8-week recent mover window for a wave 1 response rate of 24%. 61% of Wave 1 respondents completed Wave 2 for a total of 211. Respondents were sent a pre-letter notifying them that they were being included in a study of recent movers. The pre-letter was followed within days by the Wave 1 cover letter and questionnaire, a reminder post-card, and, after a two weeks, a second questionnaire and a second reminder post-card. The questionnaire for Wave 2 was sent six months after the first questionnaire was completed following the same procedure. The only difference in administration of Wave 2 was that the wave 1 questionnaire gave respondents an option of requesting a web-based Wave 2 questionnaire be emailed to them. 18% of Wave 2 respondents completed the online questionnaire. Those opting for the web-based survey for wave 2 received two email reminders before being sent a hard copy and one reminder post-card. Participation was incentivized through $5 gift cards for

participation in Wave 1 and a drawing for an Apple iPad and $50 gift cards for completion of both waves.

Measures

Attitudes

Two attitude measures were used in the analysis. The first was modeled after Heinen et al. (2011) and based on an expectancy-value framework. Expectancies (beliefs) for non-work utilitarian walking for the following characteristics were measured using semantic differential scales: convenience; safety; time efficiency; cost; environmental impact; comfort; health impact; enjoyment; and reliability (Table 8). In addition, respondents were asked to rate how important (value) each of the characteristics was in their non-work travel mode selection. The products of expectancy and value were then summed for an overall attitude score, though in the SEM mediation model each individual component of attitude loaded onto a latent variable. Expectancy-value products were also tested using exploratory factor analysis (EFA). EFA showed that two distinct constructs were being measured (Table 9). One included convenience, time efficiency, comfort, enjoyment, and reliability and appears to represent instrumental attitudes. The other included cost, health impacts and environmental impacts and appear to represent affective attitudes. Both factors were tested in the analysis.

Table 8: Expectancy and value components of attitude for non-work utilitarian walking (1-10)

	Expectancy		Value	
Items	Mean	Std. Dev.	Mean	Std. Dev.
Inconvenient – Convenient	5.96	3.08	8.38	1.63
Unsafe – Safe	7.43	2.37	7.72	2.07
An inefficient use of time - An efficient use of time	6.74	2.77	8.45	1.77
Expensive - Inexpensive	9.19	1.66	6.65	2.33
Bad for the environment - Good for the environment	8.99	2.06	5.93	2.29
Uncomfortable - Comfortable	6.61	2.90	7.55	1.92
Bad for my health - Good for my health	8.57	2.47	6.48	2.48
Unenjoyably - Enjoyable	6.61	3.04	6.57	2.25
Unreliable - Reliable	7.10	2.70	8.53	1.58

Table 9: Factor loadings for experiential and impact attitude factors (loadings < .4 have been suppressed)

	Instrumental Attitude Factor Loading	Affective Attitude Factor Loading
Convenience	0.77	-
Safety	0.56	-
Time efficiency	0.64	-
Cost	-	0.74
Environmental impact	-	0.88
Comfort	0.83	-
Health impact	-	0.72
Enjoyment	0.59	-
Reliability	0.69	-

Perceived behavioral control

Perceived behavioral control is the extent to which a person feels control over performing a particular behavior (Ajzen, 1985). The construct included three measures, including. The first two were semantic differential items asking whether walking for non-work utilitarian trips was possible or impossible and easy or difficult. And the third was

an item asking respondents the extent to which they agreed with the statement "I could walk for some of my non-work trips if I wanted to" on a six-point scale.

Subjective norms

The subjective norm construct of TPB takes the form of an injunctive norm (i.e. the extent to which a person thinks important others in their life would support performing a behavior). Consistently weak relationships between subjective norms and intention led researchers to test the addition of a second normative construct, the descriptive norm, which means what a person observes or thinks others around them doing (Cialdini, 2007). Rivis and Sheeran's (2003) meta-analysis showed that across 21 analyses the inclusion of descriptive norms improved prediction of behavioral intention by 5%. Both descriptive and injunctive subjective norms were measured and included in the analysis. Descriptive norms were measured based on agreement with the following on a six-point scale:

"I often see people walking in my neighborhood."

"Many of my friends and family walk for at least some of their transportation needs."

Injunctive norms were measured in three ways. First, by asking respondents how supportive (on a 7-point scale) friends and family would be about them walking for non-work travel. And then by agreement with the following two statements on a 6-point scale:

"I feel pressure from friends and family to limit my car driving."

"I feel general social pressure to limit my car driving"

Post-move walk propensity

A propensity score was calculated for each respondent based on four walking-related variables. The first item asked respondents to estimate the proportion of their non-work utilitarian travel completed by driving, walking, bicycling, or taking transit. The second item asked respondents to select a primary or regular mode of travel to 12 common destinations (plus two additional write in options). The percentage of visited destinations for which walking was the primary mode became the second component of the propensity score. To correct for biases in recollection, a similar item asked respondents to select the mode for their most recent trip to the same list of destinations. Finally, in order to capture the influence of less frequently used travel modes, respondents were asked to select the frequency of their use of each travel mode for non-work travel on a five-point unipolar scale from "never" to "nearly every day." Numerical values were assigned to each categorical frequency (0%, 5%, 10%, 20% and 50%). The four components have high internal consistency ($\alpha = .883$), suggesting together these variables are measuring the underlying construct of travel mode propensity.

Built environment

The built environment variables included in the analysis roughly correspond with Cervero and Kockelman's "density, diversity and design" (Cervero & Kockelman, 1997). For the t-test group comparisons of behavior and TPB construct changes, Walk Score was used as the built environment variable. Walk Scores were determined for each

respondent's address from WalkScore.com. Walk Scores range between 0 and 100 and are based on distances to nearby services. Scores between 50 and 69 indicate a "somewhat walkable place," according to Walk Score, while scores of 70 and above are considered "very walkable" places where "most errands can be accomplished on foot." Scores below 50 indicate a car dependent location. For the SEM analysis, built environment variables were based on the Environmental Protection Agency's Smart Location Database (2013). Network density is the total number of street segments within a census block group. Higher street network density generally indicates better connectivity from a pedestrian perspective because routes can be less circuitous. Land use entropy is standard measure of land use diversity or entropy, with higher numbers indicating a better mix of land uses thought to be conducive to neighborhood walking trips. The third built environment variable in the SEM analysis is residential density. In general higher density areas tend to be more walkable because they have a greater concentration of both commercial and non-commercial destinations closer together.

Analysis

Three distinct analytical approaches were taken. First, comparisons were made between respondents who met or did not meet a series of Walk Score increase thresholds to see how behavior and TPB constructs change corresponded with different Walk Score increases. Respondents were divided into two groups for each Walk Score increase threshold: those whose move resulted in a Walk Score increase of 5 or more, 10 or more, 15 or more and 20 or more. For each Walk Score increase level I then tested differences

between groups' mean change in pre and post-move walk propensity and shifts in each TPB construct between T1 and T1.

Next, a series of lagged regression models was tested to determine the effect of post-move built environment on changes in each TPB construct. As described by Newsom (2011), lagged regression can be interpreted as the influence of a variable of interest (in this case built environment) on the instability (i.e. change) of a psychological construct measured at two time points. Finally, two more comprehensive mediation models were tested using SEM to see which T2 TPB constructs mediated the relationship between walkability and post-move walk propensity. The models were specified to test the direct and indirect predictive paths of built environment and walk propensity. The second model excluded the TPB constructs that did not significantly mediate the built environment influence in the first model.

Results

Walk propensity and built environment change

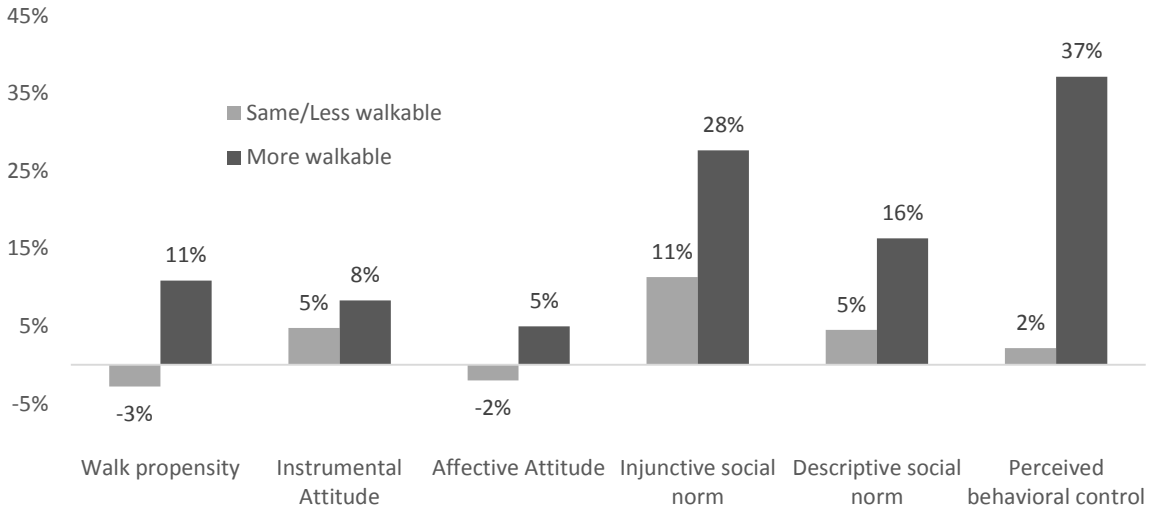
Significant differences were observed for the improved walkability group in shifts in walk propensity and PBC beginning with a 5 point Walk Score increase. Descriptive norm and injunctive norm changes did not vary significantly until a 20 point increase, suggesting that these constructs are less sensitive to smaller Walk Score changes resulting from a move. Differences are shown in both absolute change (Table 10) and percentage change (

Figure 2) for the 20 point increase analysis. Walk propensity increased by 10.88% for the 20 point Walk Score increase group and decreased by 2.77% for everyone else. Injunctive social norms increased by 27.67% for the 20 point Walk Score increase group versus an increase 11.33% for others. Descriptive norms increased by 16.33% for the 20 point Walk Score increase group and 4.5% for others. Neither attitude measure changed significantly between T1 and T2 at any tested Walk Score increase. Differences were tested using MANOVA, which confirmed differences in changes of the constructs between the two groups. Follow up t-tests confirmed significant differences between the two groups.

Table 10: Difference in changes of TPB constructs between those who increased Walk Score by 20 points or more and those who did not

	Walk Score change ≥ +20		Walk Score change < +20			
	Mean	SD	Mean	SD	Mean diff.	p-value
Walk propensity	10.88	20.53	-2.77	23.35	13.65	< .01
Attitude (1-100)	7.44	44.69	2.38	22.61	5.06	0.42
Injunctive social norm (1-6)	1.66	2.97	0.68	2.80	0.98	0.05
Descriptive social norm (1-6)	0.98	1.69	0.27	1.96	0.71	0.03
Perceived behavioral control (1-6)	2.23	3.41	0.13	3.90	2.1	< .01

Figure 2: Changes in TPB constructs between those who increased Walk Score by 20 points or more and those who did not



Lagged regression models

The lagged regression models indicate that controlling for baseline measures, post-move built environments have a significant effect on shifts in walk propensity (standardized coefficient **=** .31, p. < .01) and perceived behavioral control (standardized coefficient **=** .13, p. = .04). The effect of walkability on shifts in descriptive norms (standardized coefficient **=** .11, p. = .08) and injunctive norms (standardized coefficient **=** .11, p. = .08) were only significant with 90% confidence. The effect of built environment on shifts in affective and instrumental attitude change was not significant. Taken together with the shifts seen in

Figure 2, these lagged regression models confirm the association between the built environment and PBC. However, these simple lagged regression models do not account for correlation with other TPB constructs, which can only be done with a more complex structural equation model testing the effects of multiple TPB constructs simultaneously.

Figure 3: Lagged regression model of post-move walkability on shifts in walking propensity

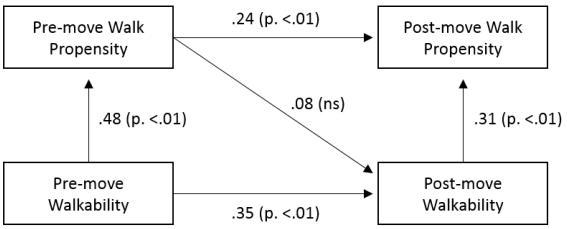


Figure 4: Lagged regression model of post-move walkability influence on shifts in descriptive norms

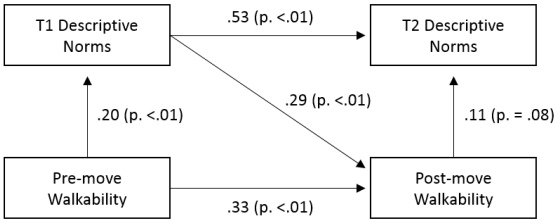


Figure 5: Lagged regression model of post-move walkability influence on shifts in PBC

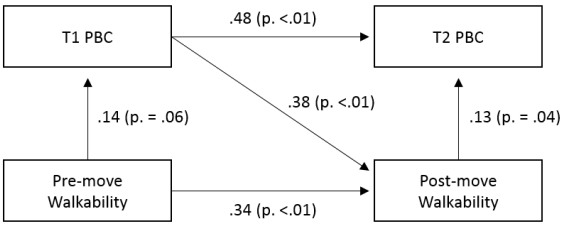


Figure 6: Lagged regression model of post-move walkability influence on shifts in injunctive norms

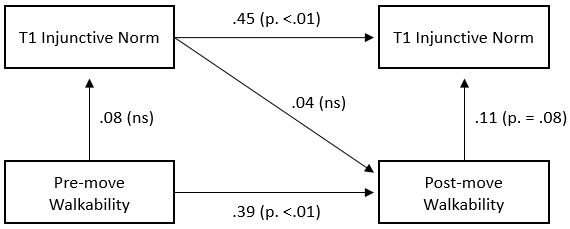


Figure 7: Lagged regression model of post-move walkability influence on shifts in affective attitudes

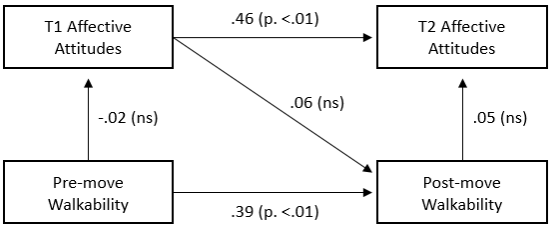
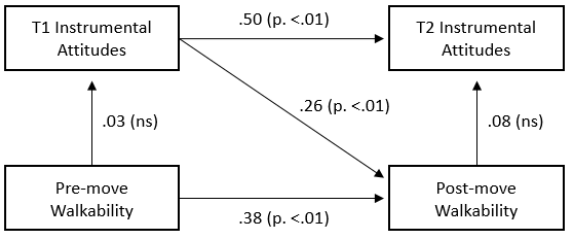


Figure 8: Lagged regression model of post-move walkability influence on shifts in instrumental attitudes



Full mediation model

Two structural equation models were used to test whether the effect of the built environment on walking propensity can be explained via indirect causal paths through TPB constructs. One PBC item loaded onto both PBC and Instrumental Attitude and was therefore excluded from the first model. The first mediation model tested all TPB constructs as mediators of the effect of a built environment latent variable on post-move walk propensity. That model fit reasonably well based on conventional cutoff criteria (χ^2 = 189.16, p. = < .01; CFI = .948; RMSEA = .051) (Hu & Bentler, 1999). A squared

multiple correlation of .57 indicates that 57% of variance in post-move walking propensity is explained by the model. Results of the full mediation model indicate that exposure to post-move built environment influences post-move walk propensity both directly (standardized coefficient **=** 316, p. < .001) and indirectly through descriptive social norms and perceived behavioral control. The built environment was a significant predictor of descriptive social norms (standardized coefficient **=** .557, p. < .01), instrumental attitude (standardized coefficient **=** .389, p. < .01), and perceived behavioral control (standardized coefficient **=** .487, p. = .01). Walk propensity was predicted by descriptive social norms (standardized coefficient **=** .282, p. = .02), affective attitude (standardized coefficient **=** .246, p. = .05), PBC (standardized coefficient = .704, p. = .03), and the built environment (standardized coefficient = .316, p. < .01).

Unexpectedly, attitudes did not mediate the effect of the built environment on walk propensity. But the model tells an interesting story about why this was the case. The separate latent constructs of instrumental and affective attitudes performed quite differently in the model. Instrumental attitudes were predicted by the built environment but did not predict walk propensity. Affective attitudes, on the other hand, were not predicted by the built environment but did predict walk propensity. This result, while unexpected, makes intuitive sense. Instrumental evaluations like safety, comfort, reliability, convenience and enjoyment are going to depend on how walkable a place is but may not be motivating factors. Conversely, it does not make sense that affective attitudes comprised of beliefs and values about the impact of walking on the environment, personal health, and cost would be dependent on the nearby physical

environment. But these affective attitudes appear to be motivating factors, as indicated by the significant association with walk propensity. This finding suggests that in the absence of strong beliefs about the benefits of walking, it may not be enough for people to feel that their neighborhood built environment supports walking. The statistical significance of the indirect effect of built environment on walk propensity was tested using a bias corrected bootstrap approximation and determined to be significant (standardized coefficient = .292, p. = .017), confirming partial mediation.

I also tested a simpler model that excluded attitudes and injunctive norms due to their lack of significance as mediators (attitudes) or predictors (injunctive) in the first model. The simpler model had a better model fit than the first (χ^2 = 29.6 (17), p. = .03; CFI = .969; RMSEA = .066). The effect of residential density on post-move walk propensity was partially mediated by descriptive norms and PBC. The effect of the pedestrian network on post-move walk propensity was fully mediated by descriptive social norms and perceived behavioral control. Land use entropy had a significant direct effect (standardized coefficient = .19, p. = .03), but no influence on descriptive social norms or PBC. Again, the statistical significance of the indirect effect of each built environment variable on walk propensity was tested using a bias corrected bootstrap approximation, which confirmed significant indirect effects. Residential density and pedestrian network density both had significant direct effects, but land use entropy did not.

Figure 9: Diagram of structural equation model showing TPB constructs mediating built environment effects on walk propensity

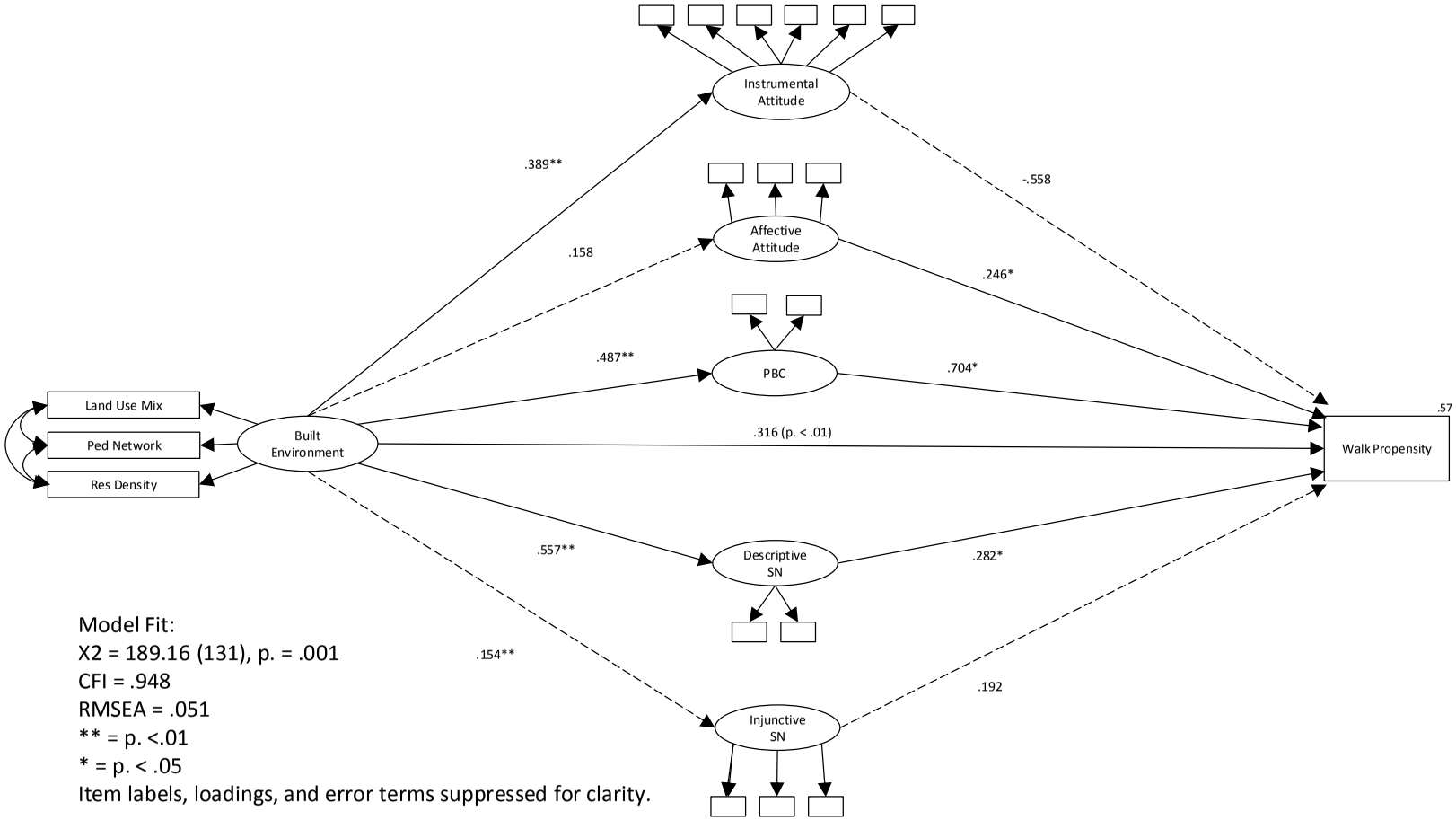
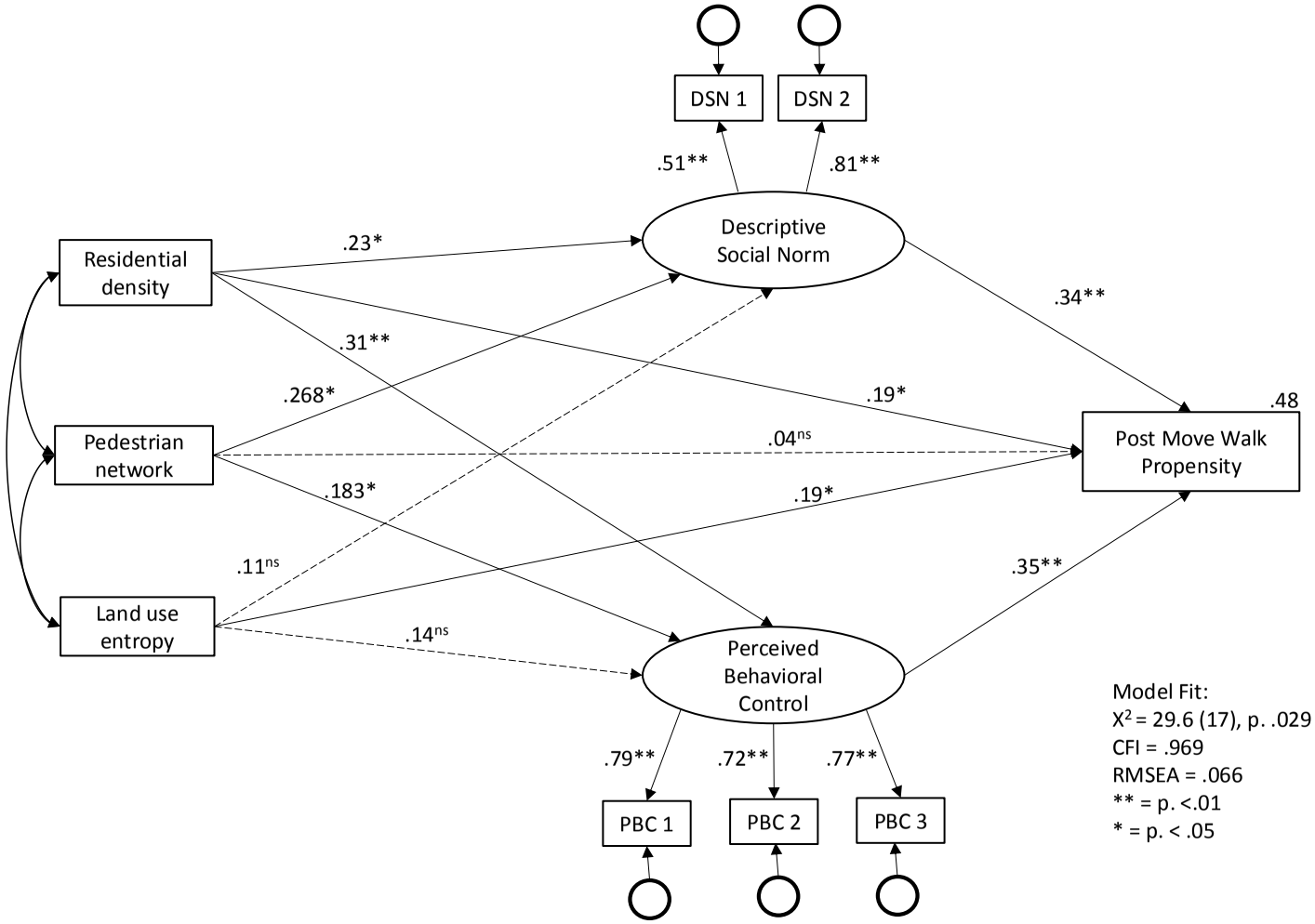


Figure 10: SEM mediation model showing the relationships between built environment and post-move walk propensity as mediated by descriptive social norms and PBC



Discussion and Conclusion

This paper used data from a two-wave survey of recent movers in six U.S. cities to explore the role of attitudes, social norms, and PBC in facilitating the effect of post-move built environment on non-work utilitarian walking. First, differences between respondents who increased walkability with their move and those who did not were investigated. Walking propensity and PBC shifted with as little as a five point increase in Walk Score, but descriptive and injunctive social norms were only associated with Walk Score increases of 20 or more. Next a series of lagged regression models showed that built environment change had a significant effect on the stability of walk propensity and PBC. And finally, two structural equation models were tested that showed that the built environment effect on walk propensity is mediated by descriptive social norms and PBC.

There is key limitation of the study design worth mentioning. Because I was not able to survey respondents prior to their move, it was not possible to rule out the possibility that attitudes, which did not change during the six month study window, shifted just before or during a move. Such shifts would not be reflected in my data and could explain the stability of attitude measures during the study window. Another possible explanation for why attitudes did not change significantly and were not mediators of the built environment relationship is that attitudes—especially affective attitudes—were quite high (Table 8). So it is possible that shifts in attitudes were not observed due to a ceiling effect. If so, this may be even more pronounced for respondents with high attitudes who move to more walkable places because there is little room for increase in their attitude score.

The unexpected insignificance of attitudes—further illustrated by the affective/instrumental split, suggests that messaging aimed at strengthening positive instrumental beliefs about walking may have little to no impact on behavior. Conversely, messaging aimed at increasing positive affective attitudes may be useful in shifting behavior, but will not be aided by the built environment effect observed in new movers. This is consistent with previous studies showing that affective motives were more important than instrumental motives in car use (Steg, 2005).

The finding that some TPB constructs did change in the period immediately following a move and in the direction expected based on walkability increases illustrates why new movers are a good target for behavior change messages. Instability in social norms and perceived behavioral control provides an opportunity for voluntary travel behavior change programs to supplement the observed built environment effect with messaging focused on descriptive norms.

PBC was expected to be more important than descriptive norms in explaining the effect of the built environment on post-move walk propensity, so the finding that descriptive social norms had a similar effect size to PBC was surprising. It does, however, echo evidence from studies of other pro-environmental behaviors (Cialdini, 2007; Goldstein et al., 2008). From a practical perspective, this suggest that messages aimed at supplementing the observed built environment effect should focus on descriptive social norms and not just PBC. For example, norm-based messaging about neighborhood active travel rates or increased visibility of walking should be incorporated into messaging strategies.

Chapter 6: Low-income movers and opportunities for self-selection into walkable neighborhoods (Paper 3)

In 2011 U.S. cities grew at a faster rate than suburban areas for the first time since the 1920s (Frey, 2012). While some of this shift can be attributed to the collapse of the housing market, which hit suburban areas particularly hard, there is growing evidence that shifting preferences and demographics are helping to slow, if not reverse, a nearly century-long trend of suburbanization (Ehrenhalt, 2013). Citing evidence of this historic shift, Leinberger (2008) describes a "new American Dream" where consumers can choose between car-dependent and pedestrian-oriented housing locations. The resurgence in popularity of pedestrian-accessible urban neighborhoods is a success story for planning efforts that have resulted in billions of dollars of reinvestment in the form of transportation infrastructure and incentives for infill multi-family and commercial development. But as demand for pedestrian-accessible urban housing locations has increased, many low-income households have been priced out.

In this paper I use survey data from a sample of recent movers in six U.S. cities to examine and quantify the extent to which movers of different economic means were able to realize preferences for pedestrian-accessible housing locations and whether differences could be seen in expected transportation budgets or post-move walking. I find that among those who expressed a preference for pedestrian-accessible housing locations, low-income households were half as likely as higher-income households to realize this preference with their move. This discrepancy was also apparent in findings that low-income households were twice as likely to report an expected increase in transportation

costs at their new homes and that low-income households expected a decrease in their share of walking trips after their move while higher-income respondents expected to walk more often in their new location. Finally, similar analysis of survey respondents' previous moves showed no income-based disparities in pedestrian-accessibility realization, suggesting that these inequities are a recent phenomenon.

Pedestrian-accessibility vs. walkability

Pedestrian-accessibility is similar to, but distinct from, walkability. The pedestrian-accessibility of a home location is determined by the availability of destinations within reasonable walking distances. It is similar to Handy's (1993) definition of local accessibility in terms of the types of trips ("short and relatively frequent") and destinations ("convenience establishments"), but with a scale specific to walking trips. Walk Score is a good proxy for pedestrian-accessibility because it only includes destinations within one mile and weights closer destinations more heavily (Manaugh & El-Geneidy, 2012; Pivo & Fisher, 2011). Definitions of walkability, however, typically also include characteristics of the built and social environment along a route that can facilitate or hinder walking (Alfonzo, 2005; Day, Boarnet, Alfonzo, & Forsyth, 2006; Forsyth & Southworth, 2008; Moudon et al., 2006; Southworth, 2005). By this definition, Walk Score is primarily a measure of accessibility and not walkability because it does not take into account characteristics that contribute to the comfort and safety of pedestrians, such as the presence of sidewalks, marked crosswalks, or adequate separation from auto traffic.

I define pedestrian-accessibility in terms of utilitarian non-work destinations for two reasons. First, non-work travel accounts for a majority of trips for most Americans. Even during peak PM commuting times, 69% of trips are not work related (Federal Highway Administration, 2007). Second, a key objective of this research is to explore the implications of recent findings that neighborhood-scale walkability and pedestrian-accessibility result in price premiums. At the neighborhood scale, the transportation benefits from living in a pedestrian-accessible place come largely from the availability of nearby non-work related services and not from employment locations, which are more likely to be accessed by car or transit.

Background

A number of recent studies have shown that walkability and pedestrian-accessibility are correlated with higher property values, homes prices and rents. Cortright's (2008) analysis of U.S. home sales data showed that each additional Walk Score point increased home values by between $300 and $3,000, depending on the housing market. Similarly, a study of residential property values in Washington, D.C. by Alfonzo and Leinberger (2012) showed that a 20 point increase in their more complex measure of walkability, which included accessibility, was associated with an $81.54 per square foot premium for residential sales prices and a $300 monthly increase in residential rents. Increased housing costs and property values contribute to the economic performance of a city, but the downside, as both Cortright and Alfonzo and Leinberger acknowledge, is that those unable to pay the pedestrian-accessibility premium for rents and mortgages must locate elsewhere. For low-income households this is doubly

problematic because they already spend a larger share of their household income on transportation than higher earning households (Litman, 2013). Furthermore, many health related problems that active transportation may help to mitigate (e.g. obesity and cardiovascular disease) are concentrated in lower-income populations (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Ogden, Lamb, Carroll, & Flegal, 2010). In short, it is those who have the most to gain from living in pedestrian-accessible urban neighborhoods who are the first to be priced out as more affluent homebuyers and renters move to take advantage of the benefits these pedestrian-accessible locations provide. In this paper I explore the extent to which these price premiums are negatively impacting low-income households' opportunities to locate in neighborhoods that match their preference for pedestrian-accessibility.

Most previous research investigating income-based accessibility discrepancies has focused on access to employment. Spatial mismatch, a theory dating back to the 1960s, holds that high rates of inner city unemployment, particularly among low-income black workers, could be explained by the movement of low-wage jobs to suburban locations that were no longer accessible to inner city populations (Kain, 1992). Evidence of the mismatch between affordable housing and employment opportunities prompted policies aimed at increasing employment accessibility through improvements to public transport links to employment centers, such as the Jobs Access and Reverse Commute program, efforts to entice employers back to central cities through programs, such as the New Markets Tax Credit Program, and efforts to deconcentrate poverty through changes in federal affordable housing policy (Chapple, 2006).

Paradoxically, changes to federal affordable housing policy aimed at promoting choice for low-income movers may have contributed to low-income movers' difficulties overcoming market-driven barriers to pedestrian-accessible central city housing. Beginning in the 1970s and accelerating in the 1990s, federal affordable housing policy shifted from a model of providing public housing to one built around voucher-based subsidies to help low-income families compete in the open rental market (Goetz, 2003). As part of this larger shift, HUD's HOPE VI program resulted in the net loss of as many as 260,000 public housing units as high density public housing was replaced by lower density mixed-income housing with vouchers making up the difference (Goetz, 2012). Many of these redevelopment projects, such as Valencia Gardens in San Francisco and Capper/Carrolsburg in Washington, D.C., were in neighborhoods now sought after for their high levels of pedestrian-accessibility. Illustrating why this shift is important in terms of the pedestrian-accessibility of affordable housing, Talen and Koschinsky (2011) showed that in Chicago, voucher holders tended to reside in less pedestrian-accessible locations than their counterparts who remained in subsidized housing.

Choice has been a key justification for the shift from unit-based to tenant-based housing assistance. In a 1996 interview, HUD Secretary Henry Cisneros described the Clinton Administration's proposed changes, emphasizing the value of choice:

> "We have proposed eliminating public housing as it exists and supplanting it with a system of vouchers where people can use their own judgment and choice and the discipline of the market place. Instead of funding housing authorities, funding buildings, we have proposed funding families, who can then make choices, including the choice to leave public housing (PBS Newshour, 1996)."

The shift to tenant-based assistance leaves low-income households more vulnerable to increased market demand for close in urban neighborhoods unless payment standards can keep pace with rising rents. This is particularly unlikely in light of recent federal spending cuts related to sequestration, which may result in many cash-strapped housing authorities having to reduce payment standards and cut an estimated 140,000 Housing Choice Vouchers (Center on Budget and Policy Priorities, 2013).

Choice has also been central to discussions of improved integration between transportation and land use planning. Levine (2005; 2004) argued that after decades of a pro-suburban regulatory environment, the development of housing in a variety of neighborhood types, including pedestrian-accessible urban ones, would allow more people who want to choose a less auto-oriented lifestyle to do so. Similarly, Cervero (2007) wrote of the "importance of removing barriers to residential mobility so that households are able to sort themselves, via the marketplace, to locations well served by transit." These ideas are echoed in Leinberger's book *The Option of Urbanism* (2009). A market-based argument for increasing housing options beyond car-centered suburban development remains valid and necessary. But as market demand for pedestrian-accessible urban housing moves from an aspirational planning objective to a reality in many American cities, planners need to understand that the choice of walkable urbanism is increasingly out of reach for many low-income households.

Krumholz (1982) provides an alternative conception of choice that is relevant to this challenge. Writing about his experience as planning director in Cleveland, Ohio in the 1970s, he stated that a key goal of the office he oversaw was "providing more choices

to those who have few, if any choices (p. 166)."[1] Far from being fringe or outdated, this sentiment is echoed in the recently updated code of ethics for the accrediting body of planning professionals in the United States, the American Institute of Certified Planners:

> We shall seek social justice by working to expand choice and opportunity for all persons, recognizing a special responsibility to plan for the needs of the disadvantaged and to promote racial and economic integration. We shall urge the alteration of policies, institutions, and decisions that oppose such needs (AICP 2009).

Housing choice remains an important goal for planners. But the way these choices have been framed within the context of the housing marketplace largely overlooks the inequities explored in this paper.

Research Design

To determine what effect income has on the realization of preference for pedestrian-accessible housing locations, I compared a measure of pre and post-move pedestrian-accessibility between high and low-income households while controlling for the relative strength of respondents' stated preference for pedestrian-accessible housing locations. I sent surveys to a sample of recent movers in six cities, Denver, Minneapolis/St. Paul, Portland, Sacramento, Salt Lake City and Seattle, where reasonable alternatives to driving exist. These cities were selected based on the criteria of having populations greater than 150,000, transit systems with both bus and rail, and a bike

[1] Krumholz advocated for tenant-based voucher programs but made an important distinction between cities (like Cleveland in the 1970s) suffering from insufficient demand and tighter housing markets where vouchers would do little to address the lack of affordable housing (Krumholz & Forester, 1990, p. 53).

commute share of at least 2%. I did not survey residents of cities in metropolitan areas with populations over 4 million to avoid the added complexity of location decisions in multi-city regions such as the San Francisco Bay Area.

Key survey variables for this analysis are household income, age, homeownership, and housing location preference. I based income groups on the federal definition of low-income as $45,000 or less for a family of four and poverty as $23,050 or less. Additionally, a subset of low-income households indicated that they received a public housing subsidy. I derived housing location preference from survey items adapted from Handy et al. (2005). The location preference item consisted of 20 items that respondents rated on a 6-point scale between "not at all important" and "extremely important" in their decision to choose their home. To isolate the relative importance of accessibility characteristics, the total preference expressed for the six accessibility related features (36 maximum) was divided by the total amount of expressed preference for any of the 20 features (120 maximum). The grouping of pedestrian accessibility characteristics was confirmed through factor analysis, with each variable having a factor loading greater than .50 (Table 11). I also asked respondents whether they thought their transportation costs at their new home would decrease, increase, or stay about the same and about their travel mode share at their previous and new home. Because many households were surveyed within days of a move, I asked about expected post-move transportation expenditures and expected travel modes once they were settled in their new home and neighborhood. This avoided the problem of collecting travel data during a relocation when it is reasonable to expect that day-to-day schedules and budgets to be in

flux, but came with the tradeoff of potential measurement error in the reported estimates.

Table 11: Pedestrian-accessibility related housing location characteristics with factor loadings

Survey item	Factor loading
Shops within walking distance	0.792
Nearby public transit	0.816
Good sidewalk network	0.579
Nearby parks	0.556
Low transportation costs	0.534
Restaurants, coffee shops and bars within walking distance	0.779
Access to downtown	0.625

The pedestrian accessibility variable is based on Walk Scores of respondents' previous and new homes. Walk Score is a web-based tool for determining the walking-related accessibility of a location based on distances to nearby services. Scores range between 0 and 100. According to Walk Score, scores between 50 and 69 indicate a "somewhat walkable place" where "some errands can be accomplished on foot." Scores of 70 and above are considered "very walkable" places where "most errands can be accomplished on foot." Scores below 50 indicate a car dependent location.

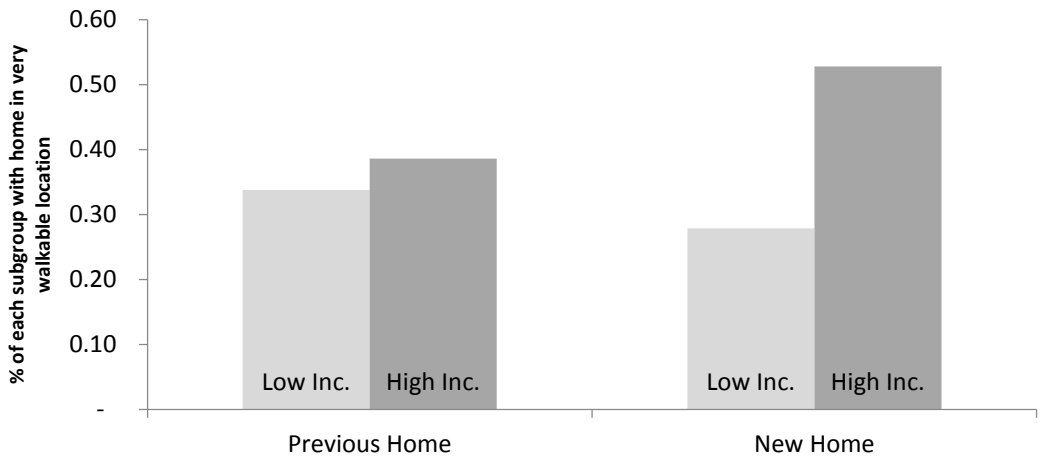
Findings

In order to determine whether low-income households have less opportunity to locate in highly pedestrian-accessible places, I first looked to determine whether there were underlying differences in preference that might explain any discrepancies in post-move pedestrian accessibility. To do this, I compared relative pedestrian accessibility preference across groups. On average, 29% of the preferences respondents expressed were for items related to pedestrian accessibility, such as having a network of sidewalks

in the neighborhood, in comparison to preferences for items that would not directly impact pedestrian accessibility, such quality schools, large yards and easy access to freeways. I found no significant difference between the pedestrian accessibility preferences of the high-income group (29%) and low-income group (30%).

To adequately answer the primary research question—do opportunities for moving to pedestrian-accessible locations differ by income—I took two analytical approaches. First, I examined the differences in post-move pedestrian accessibility between high and low-income respondents who expressed a strong preference for accessibility using a chi-square test of proportions. Because it isolates only the respondents who prioritized pedestrian-accessibility, this approach clearly showed differences in opportunity rather than in preference. Low-income households who had a strong preference for pedestrian-accessible locations were half as likely as high-income households to have moved to a highly pedestrian-accessible location (Figure 11).

Figure 11: Comparison of pre and post-move pedestrian-accessibility realization for high preference subgroup by income (n = 148)



Second, I analyzed all cases using binary logistic regression to allow for a more complete model, including controlling variables of age, home ownership, city, and a continuous measure of relative accessibility preference. The model tested for the influence of income on the likelihood of a respondent moving to a highly accessible place, while controlling for the previously mentioned variables. The overall model explained between one quarter and one third of the variance in post-move accessibility (Cox & Snell R^2 = .25; Nagelkerke R^2 = .36) and had an overall good model fit, as indicated by an insignificant Hosmer and Lemeshow Test (sig. = .70). Household income remained a strong predictor of post-move accessibility, second only to relative accessibility preference (Table 12). The model indicates that for every increase in household income of $10,000, the chances of having moved to a highly accessible location increased by approximately 12%. In other words, controlling for other characteristics, a household making $20,000 was half as likely to have moved to a highly accessible location as a household making $60,000.

Table 12: Logistic regression model predicting likelihood of moving to "very walkable" location (n = 300)

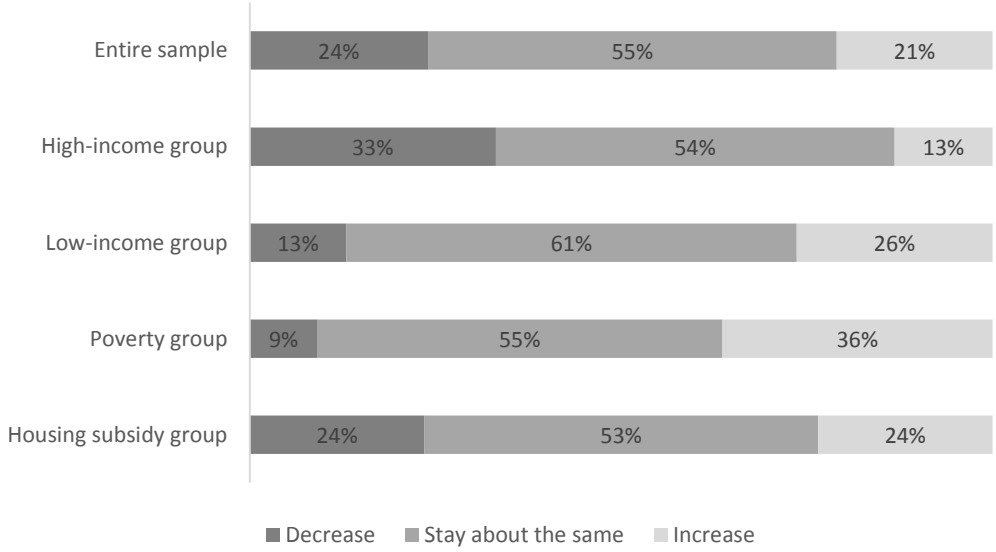
Variable	Sig.	Odds Ratio
Household income (in $10,000s)	<.01	1.12
Relative accessibility preference	<.01	1.13
Own	<.01	0.33
Year born	0.60	-
Cities (dummy coded)		
Denver	0.16	-
Portland	0.21	-
Seattle	0.59	-
Sacramento	0.13	-
Salt Lake City	0.99	-
Cox & Snell R^2	0.25	
Nagelkerke R^2	0.36	
Hosmer and Lemeshow Test of model fit	$\chi 2$ =5.55	Sig. = .70

I also explored differences between cities using interaction terms of cities (dummy coded) and household income. None of these interaction terms was significant when placed in the logistic regression model, however, which indicates that the relationship between income and opportunities to locate in pedestrian-accessible locations is not significantly different in any of the six cities.

The impact of the discrepancy between income groups was seen in movers' expected post-move transportation budget and rates of walking for non-work travel. Overall, the number of respondents expecting their move to result in increased transportation costs were about equal to the number anticipating their costs to decrease (Figure 12). Respondents in the low-income group, however, were twice as likely as the high-income group to expect a transportation cost increase (26% versus 13%). For

households at or below the federal poverty level, a subset of the low-income group, the results were even more striking, showing that 36% expected their transportation costs to increase, while only 9% expected a decrease. These differences illustrate how the lack of opportunity for low-income households to choose accessible locations are translating into the expectation of increased financial burdens related to transportation.

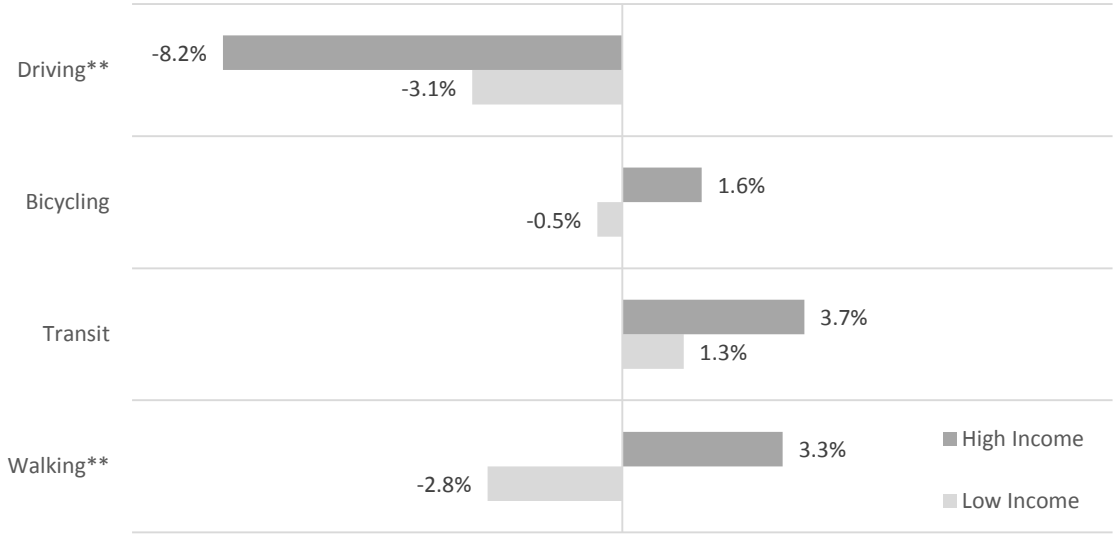
Figure 12: Percentage in each income group expecting their transportation costs to decrease, increase, or stay about the same as a result of their move



Interestingly, transportation cost expectations for those receiving public housing subsidies were not significantly different from the overall sample, suggesting that these subsidies may help low-income households better realize their preferences for pedestrian-accessibility. The results should be interpreted with caution, however, due to the small sample size of this subgroup (n=22). Furthermore, all but three of those receiving public housing assistance were in the Housing Choice Voucher program, preventing an analysis of how movers in that program fared compared to those receiving unit-based assistance. The impact of housing subsidies on low-income household's ability to locate in

pedestrian-accessible neighborhoods is an important topic for future investigation.

Figure 13: Mean difference in expected travel mode shares for non-work travel by income (= sig. < .01)**



I also observed significant differences between expected changes in travel modes for non-work travel (Figure 13). Both high and low-income groups expected to drive less at their new home, but the low-income group's expected decrease of 3.1 percentage points was significantly smaller than the high-income group's 8.2 percentage point decrease (p. < .1). The difference in expected share of non-work trips completed on foot was more striking. On average, the high-income group expected their share of total walking trips to increase by 3.3 percentage points while the low-income group expected their walking trips to decrease by 2.8 percentage points. To put this in perspective, the

mean share of pre-move walking trips was 20% for low-income respondents and 15% for high-income respondents, so shifts of around 3 percentage points are not trivial.

Unlike the significant differences between the pedestrian-access of high and low-income groups' new home, there was no significant difference in the pedestrian-accessibility of the previous home (Figure 11). By including the year of respondents' previous move in the analysis I was able to show that there were no income-based differences in pre-move pedestrian-accessibility realization for those who had moved into their previous residence prior to 2008 ($\chi 2$= 1.76, sig. = .26). For those who moved into their previous residence more recently, however, there was a significant difference between income groups ($\chi 2$= 7.08, sig. = .01). This timing roughly corresponds with the spike in gasoline prices that Leinberger and others point to as a catalyst for renewed market demand for pedestrian-accessible housing (2009) and suggests that barriers to low-income movers' realization of pedestrian-accessible housing locations are a relatively new phenomenon.

Limitations and Future Directions

There are several limitations of this research that are worth mentioning. First, Walk Score, the basis for my dependent variable, is far from a perfect measure of pedestrian accessibility, let alone walkability. Walk Score likely has a middle-class bias due to its weighting of non-essential services like coffee shops and its inability to distinguish between affordable and unaffordable options for services such as grocery stores. Nonetheless, it is a powerful tool for comparisons across cities. And because this analysis is based on Walk Score ranges rather than continuous scores, precision is less

critical. Also, residential location choice decisions are immensely complex. Every effort was made to capture detailed information about respondents' preferences, but there are no doubt nuances of individual decisions that were missed. Furthermore, with this data set there is no way to test whether low-income movers were better able to realize other groups of housing location preferences such as neighborhood appearance, school quality, and diversity. Future work in this area could incorporate qualitative methods that allow movers to discuss, in their own words, location preferences, barriers and post-move satisfaction.

Discussion and Conclusions

There is a critical role for planners to play in addressing the inequities quantified in this paper. Over the last decade, billions of dollars have been invested in urban transit systems and smaller but sizable amounts in pedestrian and bicycle infrastructure. These investments have improved accessibility by supporting the combination of multi-family housing (trips origins) and commercial development (trip destinations) necessary for pedestrian-accessible neighborhoods. Since the 1990s, the Federal Transit Administration (FTA) has given transit agencies increasing leeway to spend federal transit dollars on transit supportive land uses, including affordable housing. And recent findings from Talen's (2013) survey of affordable housing developers highlight additional policies— density bonuses, tax credit programs, land contribution, accelerated permit review and zoning changes— that would encourage affordable housing options in pedestrian-accessible urban locations. Many of these policies could be implemented in conjunction with transportation infrastructure investments, particularly projects such as streetcars,

which are designed specifically to spur mixed-use infill development. Stronger coordination between the U.S. Department of Transportation (USDOT), FTA, the Department of Housing and Urban Development (HUD) and their local partners was a goal of the 2008 interagency Partnership for Sustainable Communities, but difficulties aligning policies and procedures (Wise, 2010), as well as lingering economic and political challenges have limited the Partnership's impact on providing and preserving affordable housing in pedestrian-accessible urban locations.

This research has shown that, in the cities sampled, the choice of housing in pedestrian-accessible urban locations is increasingly unavailable to precisely those who could benefit from it the most: low-income households. As a result, low-income respondents expected higher post-move transportation costs and lower rates of walking while higher-income respondents expected a decrease in transportation costs and an increase in walking. These findings are not surprising given the mounting evidence of price premiums for walkable urban locations and the fact that low-income households are generally less able to compete for desirable amenities in the housing market. But quantifiable evidence of the magnitude of the inequities resulting from recent shifts in market demand can contribute to a larger conversation within the planning field about expanding the concept of choice that has driven efforts to improve transportation-land use integration over the last two decades. Choice remains a reasonable justification for policies and infrastructure investment that support increased housing options in higher density, mixed-use urban settings. But planners must, in the spirit of Krumholz, also plan

for those who are increasingly unable to afford the choice of pedestrian-accessible housing locations.

Chapter 7: Discussion and Conclusions

Introduction

This dissertation used data from a two-wave survey of recent movers to explore the influence of the built environment on post-move adoption of non-work utilitarian walking. By focusing on new movers and surveying at two time points, this data allows for a more thorough investigation of the relative influence of self-selection and built environment on travel behavior than with cross-sectional or non-recent mover data.

Overview of the Results

In this section, the key results of each stand-alone paper are discussed.

1. *Moves to more walkable places are associated with higher propensities for utilitarian walking, even after controlling for self-selection in the form of past behavior, residential preference and attitudes toward walking*.

This is consistent with previous research showing a positive effect of supportive built environments on active transportation. The main contribution from this finding is that the relationship appears to hold true for recent movers.

2. *The built environment explained about 21% of variation in post-move walk propensity after controlling for self-selection*.

This supports the argument that supportive built environments for active transportation influence travel behavior beyond simply allowing those predisposed to active transportation to self-select into supportive environments. This finding also supports the argument that new movers are an appropriate target for voluntary travel

behavior change programs and other social marketing related to alternative transportation.

3. *Theory of planned behavior constructs were not stable in the six months following a move, with the exception of attitudes, which remained stable*.

These shifts confirm that new movers are a good target for behavioral interventions, particularly those that supplement the effect of a supportive built environment for active transportation through descriptive norms.

4. *The relationship between pedestrian network connectivity and post-move walk propensity was fully mediated by PBC and descriptive norms*.
5. *The relationship between residential density and post-move walk propensity was partially mediated by descriptive social norms and perceived behavioral control*.
6. *Land use diversity (entropy) was not mediated by descriptive social norms or PBC*.

Evidence that the built environment travel behavior relationship works through PBC and descriptive social norms suggests that those working to influence travel behavior of new movers have an opportunity to supplement the built environment effect through messaging that target these same psychological constructs as they are in flux.

7. *Low-income movers who want to move to a highly walkable place are about half as likely to be able to do so compared to higher income movers*.
8. *Income-based differences in realization of post-move walkability were reflected in an increased likelihood that lower-income movers expected transportation costs to increase and walking to decrease following a move*.

9. *It appears that the significant income-based discrepancies in opportunity for self-selection into walkable neighborhoods were not present for moves prior to 2008*.

In the cities sampled, the choice of housing in pedestrian-accessible urban locations is increasingly unavailable to precisely those who could benefit from it the most: low-income households. As a result, low-income respondents expected higher post-move transportation costs and lower rates of walking while higher-income respondents expected a decrease in transportation costs and an increase in walking. Quantifiable evidence of the magnitude of the inequities resulting from recent shifts in market demand can contribute to a larger conversation within the planning field about expanding the concept of choice that has driven efforts to improve transportation-land use integration over the last two decades.

Limitations

This research has some notable limitations. First, it is not a before and after study, but rather a two-wave study that included a baseline measure as close to a move as possible and a follow-up after six months of additional exposure to the post-move built environment. So it is difficult to know for sure how much influence the post-move built environment had on my measure baseline psychological constructs at T1. Still, the fact that most TPB constructs shifted from T1 to T2 in ways consistent with the expected effect of post-move built environment suggests that the study window did pick on exposure related changes. There is limited current empirical evidence available on the timing of behavior adoption and habit formation following a major life change.

The low occurrence of transit and bicycling for non-work trips severely limited the analysis I could do on those modes. So what began as a study of active transportation became a study about walking. When I repeated my analyses with a combined active transportation propensity score as the dependent variable the results were very similar to those presented in this paper, but the effects appeared largely driven by walking. To make conclusions about the other modes seemed misleading.

The strength of this study as an investigation of recent movers also leads to limits on the conclusions that can be drawn from the sample. For example, it is tempting to extrapolate from my finding that the influence of the built environment on walking propensity is mediated by PBC and descriptive norms to conclude that these psychological constructs would play a similar role in built environment changes resulting from changes to a neighborhood rather than from a move. That may be the case, but there is no evidence for it from my findings. There was no non-mover control group, which would have made it possible to draw conclusions about the relative effect of the built environment on movers versus non-movers. Data and analysis designed to make this comparison would be a useful follow-up to the present study.

And lastly, due to my sampling in six not necessarily representative cities, there are limits to the applicability of my findings to other places such as large cities, small towns, or more uniformly suburban areas. But the cities selected are somewhat representative of the many medium size cities in the U.S. that have made a goal to provide more viable transportation alternatives for residents who want them.

Future research needs

The literature review, data collection and analysis presented in this dissertation leave many unanswered questions that should be addressed in future studies of travel behavior change and adoption of new movers. First, there is a general need for more research on recent movers. This dissertation has highlighted some of the potential opportunities for achieving pro-environmental behavior change within this group, but more study is needed on how behaviors are adopted in new decision contexts across a variety of behaviors.

Second, there appears to be scant evidence of the timing of travel mode adoption following a move. My data showed evidence that travel behavior and some TPB constructs shifted during the study window, but an explicit investigation of the timing within (and ideally just before) that window is warranted. Using technology such as wearable or smartphone-based GPS it might be possible to explore fine-grained details of daily travel in order to identify patterns and possible habit formation in the period following a move.

And finally, location decisions and travel mode choice and adoption are based on a complex set of factors. To better address the qualitative nature of some of these factors, qualitative interview-based research may be necessary to further explore some of the shifts observed in the data used for the present study, particularly in the area of descriptive social norms.

Implications for practice

There are two key takeaways for practice from this dissertation. First, the findings suggest that the built environment influences behavior through shifts in descriptive norms and PBC. The instability of behavior and TPB constructs following a move confirm that new movers are a good target for voluntary travel behavior change programs and that messages should focus more on affective attitudes and social norms that the current emphasis on instrumental attitudes. And second, planners and others working to increase supportive built environments for active transportation need to address the equity implications of continued reliance on market based rationales for increasing active transportation through neighborhood built environment improvements. These have helped lead to a situation in which those who could most benefit from the positives associated with active transportation are those least able to self-select into neighborhoods with built environments supporting those behaviors.

Conclusions

Together the findings in this dissertation tell a story that confirms the importance of self-selection, identifies the specific psychological constructs central to the built environment travel behavior relationship, and calls out important equity implications of the continued focus on market-based conceptions of residential self-selection within the larger conversation about transportation and built environment. These findings add to existing evidence that the effect of neighborhood built environment extends beyond the effect of self-selection. Showing this among a sample of new movers while using robust controls for self-selection—including attitudes toward walking, preferences for walkable

housing locations, and pre-move walking behavior—provides some of the clearest evidence yet of a direct built environment effect on travel behavior. Further investigation of the psychological processes underlying this built environment effect showed that descriptive social norms should be better incorporated into messaging aimed at facilitating shifts toward active transportation.

Despite the key findings of this dissertation with regard to the importance of the built environment, self-selection remains the strongest predictor of post-move walking. So better understanding processes of self-selection is also important. The last of the three papers in this dissertation found evidence that self-selection and conceptions of choice that have been at the heart of many planning related efforts to increase walkability are leaving behind low-income movers who stand to benefit from them the most.

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Appendix: Survey Instruments

Recent Mover Survey

Instructions: The following questions are about your recent move, your previous and new neighborhoods, and your thoughts about different types of transportation. Many questions are specifically about your *non-work travel*. Non-work travel simply means any transportation that is not to your place of work (or school if you are a student) or part of your job. Examples could be going to the store, meeting a friend at a coffee shop, visiting a friend's home, or going to a movie.

Let's get started:

1. What is today's date? _____

2. Have you moved within the last month?

   Yes ☐ → *If yes, about how many days ago did you move?* _____

   No ☐ → *If no, do you plan to move in the next month?*

   ☐ Yes → *If yes, please continue to question 3*
   ☐ No → *If no, please stop and return the survey in the postage paid envelope*

Questions 3 – 10 are about your previous home.

3. How long did you live at your previous home?
   - ☐1 Less than 3 months
   - ☐2 3 months to 6 months
   - ☐3 6 months to 1 year
   - ☐4 1 year to 5 years
   - ☐5 More than 5 years

4. What was the address of your previous home?

   Street Address: _____

   City: _____ State: _____ ZIP: _____

   This address will only be used to compare your previous neighborhood to your new one in our analysis.

5. Which best describes your living situation at your previous home?
   - ☐1 I/we owned or were buying this home
   - ☐2 I/we rented this home
   - ☐3 I/we were living rent free with family or friends
   - ☐4 Other: _____

6. How would you rate <u>your previous neighborhood</u> as a place for each of the following?

	Poor	Fair	Good	Very Good	Excellent
Walking	☐1	☐2	☐3	☐4	☐5
Driving a car (including parking)	☐1	☐2	☐3	☐4	☐5
Taking transit (bus or rail)	☐1	☐2	☐3	☐4	☐5
Riding a bicycle	☐1	☐2	☐3	☐4	☐5

7. From your previous home, what was your typical or most common travel mode for getting to each of the following destinations? Please check only 1 for each row. If there are other places you normally go, you can enter them as "other."

	Walk	Bus/ Train	Car	Bicycle	I did not go here
Restaurant	☐1	☐2	☐3	☐4	☐N/A
Bar	☐1	☐2	☐3	☐4	☐N/A
Coffee shop	☐1	☐2	☐3	☐4	☐N/A
A grocery store	☐1	☐2	☐3	☐4	☐N/A
Store or shop (non-grocery)	☐1	☐2	☐3	☐4	☐N/A
A park	☐1	☐2	☐3	☐4	☐N/A
Children's school	☐1	☐2	☐3	☐4	☐N/A
Home of a friend	☐1	☐2	☐3	☐4	☐N/A
Library	☐1	☐2	☐3	☐4	☐N/A
Movie theater	☐1	☐2	☐3	☐4	☐N/A
Post office	☐1	☐2	☐3	☐4	☐N/A
My place of work	☐1	☐2	☐3	☐4	☐N/A
Downtown for weekend or evening shopping or entertainment	☐1	☐2	☐3	☐4	☐N/A
Other 1:_____	☐1	☐2	☐3	☐4	☐N/A
Other 2:_____	☐1	☐2	☐3	☐4	☐N/A

8. At your previous home, about how frequently would you use each of the following travel modes for any non-work travel? Remember, non-work travel is any transportation to a destination that is not your place of work or work related.

	Never	Less than once/week	Once or twice/week	3-5 times/ week	Nearly every day
Car	☐0	☐1	☐2	☐3	☐4
Transit (bus or rail)	☐0	☐1	☐2	☐3	☐4
Walk	☐0	☐1	☐2	☐3	☐4
Bicycle	☐0	☐1	☐2	☐3	☐4

9. From your previous home, approximately what percentage of your non-work travel in a typical week was by each of the following travel modes? These should add up to 100%, but this isn't a math test so don't worry too much about being exact.

Car	Transit	Walking	Bicycling	
☐	☐	☐	☐	= 100%

10. To what extent do you agree or disagree with the following statements about your previous home and neighborhood?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
There were many places to go within easy walking distance of my previous home	☐1	☐2	☐3	☐4	☐5	☐6
It would have been easy to walk to a transit stop (bus or rail) from my previous home.	☐1	☐2	☐3	☐4	☐5	☐6

Questions 11 and 12 are about your recent move.

11. What were your reasons for deciding to move? Check all that apply.

☐1 New job or job transfer
☐2 Moved in with partner/spouse
☐3 Loss of job
☐4 Separation/Divorce
☐5 Downsizing
☐6 Wanted change
☐7 Increase in household income
☐8 Decrease in household income
☐17 Other (please list):
☐9 Rent increase at previous home
☐10 Child(ren) born or expected
☐11 Moving out of parents' home
☐12 Needed/wanted larger house
☐13 Wanted a nicer house
☐14 Rent increase at previous home
☐15 Problem with previous living situation
☐16 To be closer to my (or household member's) work

12. Please indicate how important each of the following factors was when you were choosing your new home.

	Not at all important	A little bit important	Moderately important	Quite important	Very important	Extremely important
Shops and stores within walking distance	☐1	☐2	☐3	☐4	☐5	☐6
Quiet neighborhood	☐1	☐2	☐3	☐4	☐5	☐6
Diverse neighbors in terms of ethnicity, race and age	☐1	☐2	☐3	☐4	☐5	☐6
Good public transit service (bus or rail)	☐1	☐2	☐3	☐4	☐5	☐6
Sidewalks throughout the neighborhood	☐1	☐2	☐3	☐4	☐5	☐6
Nearby parks and open space	☐1	☐2	☐3	☐4	☐5	☐6
High quality schools	☐1	☐2	☐3	☐4	☐5	☐6
Low transportation costs	☐1	☐2	☐3	☐4	☐5	☐6
Low crime rate	☐1	☐2	☐3	☐4	☐5	☐6
Well-maintained homes & yards	☐1	☐2	☐3	☐4	☐5	☐6
Restaurants, cafes, or bars within easy walking distance	☐1	☐2	☐3	☐4	☐5	☐6
Attractive appearance of neighborhood	☐1	☐2	☐3	☐4	☐5	☐6
Easy access to a freeway	☐1	☐2	☐3	☐4	☐5	☐6
Access to bike route network	☐1	☐2	☐3	☐4	☐5	☐6
Attractive appearance of neighborhood	☐1	☐2	☐3	☐4	☐5	☐6
Easy access to downtown	☐1	☐2	☐3	☐4	☐5	☐6
Large yards	☐1	☐2	☐3	☐4	☐5	☐6
Low traffic on neighborhood streets	☐1	☐2	☐3	☐4	☐5	☐6
Lots of interaction among neighbors	☐1	☐2	☐3	☐4	☐5	☐6
Resale/Investment potential ☐N/A, renting	☐1	☐2	☐3	☐4	☐5	☐6
Lots of people out and about in the neighborhood	☐1	☐2	☐3	☐4	☐5	☐6
Good public transit service (bus or rail)	☐1	☐2	☐3	☐4	☐5	☐6
Plenty of off-street parking (driveway and/or garages)	☐1	☐2	☐3	☐4	☐5	☐6
Close to my work	☐1	☐2	☐3	☐4	☐5	☐6

Questions 13 and 14 ask you to share your thoughts on several characteristics of walking, bicycling, taking transit and driving from your new home. Please check a box for each characteristic and travel mode whether or not you use that type of transportation.

13. To what extent do you agree or disagree with the following statements?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
Walking can sometimes be easier for me than driving.	☐1	☐2	☐3	☐4	☐5	☐6
Traveling by car is safer overall than walking.	☐1	☐2	☐3	☐4	☐5	☐6
I prefer to walk rather than driving whenever possible.	☐1	☐2	☐3	☐4	☐5	☐6
I like walking.	☐1	☐2	☐3	☐4	☐5	☐6
Biking can sometimes be easier for me than driving.	☐1	☐2	☐3	☐4	☐5	☐6
I like riding a bike.	☐1	☐2	☐3	☐4	☐5	☐6
I like driving a car.	☐1	☐2	☐3	☐4	☐5	☐6
Traveling by car is safer overall than riding a bike.	☐1	☐2	☐3	☐4	☐5	☐6
Taking transit can sometimes be easier for me than driving.	☐1	☐2	☐3	☐4	☐5	☐6
I prefer to take transit rather than drive whenever possible.	☐1	☐2	☐3	☐4	☐5	☐6
I like taking transit.	☐1	☐2	☐3	☐4	☐5	☐6
Traveling by car is safer overall than taking transit.	☐1	☐2	☐3	☐4	☐5	☐6
I need a car to do many of the things I like to do.	☐1	☐2	☐3	☐4	☐5	☐6
It would be nice to live in a place where I could get by without a car for many of my day to day activities.	☐1	☐2	☐3	☐4	☐5	☐6

14. To what extent do you agree or disagree with the following statements?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
Many people I know ride bicycles for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6
Many people I know drive for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6
Many people I know take transit for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6
Many people I know walk for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6

For each pair of opposites listed in questions 15-18, please select the point between them that best completes each statement.

15. In general, walking for non-work travel from my new home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

16. In general, taking transit for daily non-work travel from my new home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

17. In general, bicycling for daily non-work travel from my new home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

18. In general, driving for daily non-work travel from my new home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

19. How important is each of the following considerations to you when selecting a transportation mode?

	Not at all important	**A little bit important**	**Moderately important**	**Quite important**	**Very important**	**Extremely important**
Safety	☐1	☐2	☐3	☐4	☐5	☐6
Convenience	☐1	☐2	☐3	☐4	☐5	☐6
Reliability	☐1	☐2	☐3	☐4	☐5	☐6
Comfort	☐1	☐2	☐3	☐4	☐5	☐6
Impact on my health	☐1	☐2	☐3	☐4	☐5	☐6
Time efficiency	☐1	☐2	☐3	☐4	☐5	☐6
Enjoyment	☐1	☐2	☐3	☐4	☐5	☐6
Environmental impact	☐1	☐2	☐3	☐4	☐5	☐6
Cost	☐1	☐2	☐3	☐4	☐5	☐6

Questions 20 through 25 are about your new home and neighborhood.

20. How would you rate your new neighborhood as a place for each of the following? Answer even if you don't use that travel mode

	Poor	**Fair**	**Good**	**Very Good**	**Excellent**	**Don't know**
Walking	☐1	☐2	☐3	☐4	☐5	☐6
Driving a car (including parking)	☐1	☐2	☐3	☐4	☐5	☐6
Taking transit (bus or rail)	☐1	☐2	☐3	☐4	☐5	☐6
Riding a bicycle	☐1	☐2	☐3	☐4	☐5	☐6

21. Compared to your previous home, do you expect housing costs at your new home to increase, decrease, or stay about the same (including mortgage or rent, utilities, and other costs)?

☐1 Increase ☐2 Decrease ☐3 Stay about the same

22. Compared to your previous home, do you expect transportation costs at your new home to increase, decrease, or stay about the same (including car payments, insurance, fares, gas, and other costs)?

☐1 Increase ☐2 Decrease ☐3 Stay about the same

23. Thinking about your new home and neighborhood, to what extent do you agree with each statement?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
I feel settled in my new home.	☐1	☐2	☐3	☐4	☐5	☐6
I feel settled in my new neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I could bicycle for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6
I could take transit for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6
I could drive for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6
I could walk for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6

24. Thinking about your new home and neighborhood, to what extent do you agree with each statement?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
I often see people taking transit or waiting at a transit stop in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I often see people walking in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I often see people bicycling in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I often see people driving in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
There are many places to go within easy walking distance of my new home.	☐1	☐2	☐3	☐4	☐5	☐6
It would be easy to walk to a transit stop (bus or rail) from my new home.	☐1	☐2	☐3	☐4	☐5	☐6
I feel pressure from friends and family to limit my car driving.	☐1	☐2	☐3	☐4	☐5	☐6
I feel general social pressure to limit my car driving.	☐1	☐2	☐3	☐4	☐5	☐6

25. To what extent would people who are important to you, such as your friends and family, approve or disapprove of you doing the following for non-work travel from your new home?

	Strongly approve	Approve	Somewhat approve	Neither	Somewhat disapprove	Disapprove	Strongly Disapprove
Riding a bicycle	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Walking	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Taking transit	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Driving a car	☐1	☐2	☐3	☐4	☐5	☐6	☐7

For this page of questions, please try to imagine yourself in about six months when you are completely moved in and feeling more settled in your new home and neighborhood.

26. In about six months when you are completely moved into your new home and feeling more settled in your routines, how often do you intend to use each of the following for your daily non-work travel?

	Never	Less than once/week	Once or twice/week	3-5 times/ week	Nearly every day
Walk	☐0	☐1	☐2	☐3	☐4
Transit (bus or rail)	☐0	☐1	☐2	☐3	☐4
Car	☐0	☐1	☐2	☐3	☐4
Bicycle	☐0	☐1	☐2	☐3	☐4

27. In about six months when you are completely moved into your new home and feeling more settled in your routine, what do you intend to be your primary travel mode to be for each of the following destinations? Please check just one for each destination.

	Walk	Bus/ Train	Car	Bicycle	I will not go here
Restaurant	☐1	☐2	☐3	☐4	☐N/A
Bar	☐1	☐2	☐3	☐4	☐N/A
Coffee shop	☐1	☐2	☐3	☐4	☐N/A
A grocery store	☐1	☐2	☐3	☐4	☐N/A
Store or shop (non-grocery)	☐1	☐2	☐3	☐4	☐N/A
A park	☐1	☐2	☐3	☐4	☐N/A
Children's school	☐1	☐2	☐3	☐4	☐N/A
Home of a friend	☐1	☐2	☐3	☐4	☐N/A
Library	☐1	☐2	☐3	☐4	☐N/A
Movie theater	☐1	☐2	☐3	☐4	☐N/A
Post office	☐1	☐2	☐3	☐4	☐N/A
My place of work	☐1	☐2	☐3	☐4	☐N/A
Downtown for weekend or evening shopping or entertainment	☐1	☐2	☐3	☐4	☐N/A
Other 1:_____	☐1	☐2	☐3	☐4	☐N/A
Other 2:_____	☐1	☐2	☐3	☐4	☐N/A

28. In about six months when you are completely moved into your new home and feeling more settled in your routine, approximately what percentage of your non-work trips to or from your home do you think will be by each of the following travel modes? These should add up to 100%.

Car	Transit	Walking	Bicycling	
☐	☐	☐	☐	= 100%

29. Which best describes your living situation at your new home?

☐1 I/we own or are buying this home
☐2 I/we rent this home (or part of this home)
☐3 I/we are living rent free with family or friends
☐4 Other: _____

30. Are you:

☐1 Male ☐2 Female

31. In what year were you born? _____

32. Do you currently have a valid driver's license?

☐1 Yes
☐0 No

33. How many cars, trucks, or vans are owned or leased by members of your household? _____

34. Is one of these cars, trucks or vans available for your use most days?

☐1 Yes
☐0 No

35. Do you have access to a working bicycle on most days?

☐1 Yes
☐0 No

36. In addition to you, how many other people live in your household?

☐0 None, just me
☐ 1
☐ 2
☐ 3
☐ 4
☐ 5+

36b. How many are children between the ages of zero and 15? _____
36c. How many are children between the ages of 16 and 18? _____

37. Do you consider yourself either Hispanic or Latino/a?

☐0 No, not Hispanic or Latino
☐1 Yes, Hispanic or Latino

38. Do you consider yourself:

☐1 White or Caucasian
☐2 Black or African American
☐3 American Indian or Alaska Native
☐4 Asian
☐5 Native Hawaiian or Other Pacific Islander
☐6 Multi-racial
☐7 Other (please specify): _____

39. Are you currently employed in a job outside your home?

☐0 Yes → If yes, *continue to question 37*
☐1 No → *If no, skip to question 39*

40. What is the address of your work? *This will only be used to analyze characteristics of your commute distance*.

Street Address: _____

City: _____ State: _____ ZIP: _____

41. Which best describes the parking situation at your workplace?

☐1 I must pay to park at/near my work
☐2 I can park for free at/near my work

42. What is the highest level of education that you have completed? (Please check just one box.)

☐1 Less than high school
☐2 High school (or GED)
☐3 Some college
☐3 College degree
☐3 Graduate degree

43. What is your annual household income? (Please check just one box.)

☐1 Less than $10,000
☐2 $10,000 to $19,999
☐3 $20,000 to $29,999
☐4 $30,000 to $44,999
☐5 $45,000 to $59,999
☐6 $60,000 to $74,999
☐7 $75,000 to $99,000
☐8 $100,000 to $149,999
☐9 $150,000 to $200,000
☐10 More than $200,000

44. Which one of the following four statements best describes your ability to get by on your income? (Please check just one box.)

☐1 I/we can't make ends meet
☐2 I/we have just enough, no more
☐3 I/we have enough, with a little extra sometimes
☐4 I/we always have money left over

One last very important thing:

In order to address your six-month follow up survey and drawing entry forms to the correct person, please provide your name below. As described in the attached letter, this information will be kept strictly confidential.

First Name: _____ Last Name: _____

If you would prefer to have the follow up survey and drawing entry form e-mailed to you so that it can be completed online, please provide an e-mail address that you check regularly. Your e-mail address will only be used to send you the follow up survey. By providing an e-mail address, you will be helping us keep our postage and printing costs down.

E-mail address: _____

Thank you for your time! Now please return the survey using the stamped envelope provided.

Portland State UNIVERSITY

Recent Mover Follow-up Survey



Instructions: About six months ago you completed a survey about your recent move. This is a follow-up to that survey. The following questions are about your current neighborhood and your thoughts about different types of transportation. Many questions are specifically about your non-work travel. Non-work travel simply means any transportation that is not to your place of work (or school if you are a student) or part of your job. Examples could be going to the store, meeting a friend at a coffee shop, visiting a friend's home, or going to a movie.

You might recognize some questions from the first survey. It's important that you complete these questions again because this study is looking at changes that might have occurred in the time since your move.

Remember that by completing both the initial survey and this follow up survey you will be entered into a drawing to win a new Apple iPad (worth $500) or one of 10 $25 gift cards. The drawing will be held by July 15, so get your survey in right away.

1. As a thank you for completing the initial survey and this follow up survey you will be entered into a drawing to win an Apple iPad or one of 10 $25 gift cards. If your name is drawn for one of the gift cards, which retailer would you prefer?

   ☐1 Target
   ☐2 Amazon.com
   ☐3 Starbucks
   ☐4 Fandango.com (movie tickets)

2. What is today's date? _____

3. How would you rate your <u>current neighborhood</u> as a place for each of the following? Answer even if you don't use that travel mode.

	Poor	Fair	Good	Very Good	Excellent	Don't know
Walking	☐1	☐2	☐3	☐4	☐5	☐6
Driving a car (including parking)	☐1	☐2	☐3	☐4	☐5	☐6
Taking transit (bus or rail)	☐1	☐2	☐3	☐4	☐5	☐6
Riding a bicycle	☐1	☐2	☐3	☐4	☐5	☐6

4. Compared to your previous home, would you say your housing costs have increased, decreased, or stayed about the same (including mortgage or rent, utilities, and other costs)?

   ☐1 Increased ☐2 Decreased ☐3 Stayed about the same

5. Compared to your previous home, would you say transportation costs have increased, decreased, or stayed about the same (including car payments, insurance, fares, gas, and other costs)?

   ☐1 Increased ☐2 Decreased ☐3 Stayed about the same

6. Thinking about your current home and neighborhood, to what extent do you agree with each statement?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
I could bicycle for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6
I could take transit for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6
I could drive for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6
I could walk for much of my daily non-work travel if I wanted to.	☐1	☐2	☐3	☐4	☐5	☐6

7. Thinking about your current home and neighborhood, to what extent do you agree with each statement?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
I often see people taking transit or waiting at a transit stop in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I often see people walking in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I often see people bicycling in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
I often see people driving in my neighborhood.	☐1	☐2	☐3	☐4	☐5	☐6
There are many places to go within easy walking distance of my new home.	☐1	☐2	☐3	☐4	☐5	☐6
It would be easy to walk to a transit stop (bus or rail) from my new home.	☐1	☐2	☐3	☐4	☐5	☐6
I feel pressure from friends and family to limit my car driving.	☐1	☐2	☐3	☐4	☐5	☐6
I feel general social pressure to limit my car driving.	☐1	☐2	☐3	☐4	☐5	☐6

8. To what extent would people who are important to you, such as your friends and family, approve or disapprove of you doing the following for non-work travel from your current home?

	Strongly approve	Approve	Somewhat approve	Neither	Somewhat disapprove	Disapprove	Strongly Disapprove
Riding a bicycle	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Walking	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Taking transit	☐1	☐2	☐3	☐4	☐5	☐6	☐7
Driving a car	☐1	☐2	☐3	☐4	☐5	☐6	☐7

Questions 9 asks you to share your thoughts on several characteristics of walking, bicycling, taking transit and driving from your home. Please check a box for each characteristic and travel mode whether or not you use that type of transportation.

9. To what extent do you agree or disagree with the following statements?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
Walking can sometimes be easier for me than driving.	☐1	☐2	☐3	☐4	☐5	☐6
Traveling by car is safer overall than walking.	☐1	☐2	☐3	☐4	☐5	☐6
I prefer to walk rather than driving whenever possible.	☐1	☐2	☐3	☐4	☐5	☐6
I like walking.	☐1	☐2	☐3	☐4	☐5	☐6
Biking can sometimes be easier for me than driving.	☐1	☐2	☐3	☐4	☐5	☐6
I like riding a bike.	☐1	☐2	☐3	☐4	☐5	☐6
I like driving a car.	☐1	☐2	☐3	☐4	☐5	☐6
Traveling by car is safer overall than riding a bike.	☐1	☐2	☐3	☐4	☐5	☐6
Taking transit can sometimes be easier for me than driving.	☐1	☐2	☐3	☐4	☐5	☐6
I prefer to take transit rather than drive whenever possible.	☐1	☐2	☐3	☐4	☐5	☐6
I like taking transit.	☐1	☐2	☐3	☐4	☐5	☐6
Traveling by car is safer overall than taking transit.	☐1	☐2	☐3	☐4	☐5	☐6
I need a car to do many of the things I like to do.	☐1	☐2	☐3	☐4	☐5	☐6
It would be nice to live in a place where I could get by without a car for many of my day to day activities.	☐1	☐2	☐3	☐4	☐5	☐6

10. To what extent do you agree or disagree with the following statements?

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly Disagree
Many people I know ride bicycles for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6
Many people I know drive for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6
Many people I know take transit for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6
Many people I know walk for at least some of their transportation needs.	☐1	☐2	☐3	☐4	☐5	☐6

For each pair of opposites listed in questions 11-14, please select the point between them that best completes each statement.

11. In general, walking for non-work travel from my current home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

12. In general, taking transit for daily non-work travel from my current home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

13. In general, bicycling for daily non-work travel from my current home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

14. In general, driving for daily non-work travel from my current home is/would be…

Possible	☐-----☐-----☐-----☐-----☐-----☐-----☐	Impossible
Inconvenient	☐-----☐-----☐-----☐-----☐-----☐-----☐	Convenient
Safe	☐-----☐-----☐-----☐-----☐-----☐-----☐	Dangerous
Good	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad
Difficult	☐-----☐-----☐-----☐-----☐-----☐-----☐	Easy
A good use of time	☐-----☐-----☐-----☐-----☐-----☐-----☐	A waste of time
Inexpensive	☐-----☐-----☐-----☐-----☐-----☐-----☐	Expensive
Good for environment	☐-----☐-----☐-----☐-----☐-----☐-----☐	Bad for environment
Uncomfortable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Comfortable
Bad for my health	☐-----☐-----☐-----☐-----☐-----☐-----☐	Good for my health
Relaxing	☐-----☐-----☐-----☐-----☐-----☐-----☐	Stressful
Unreliable	☐-----☐-----☐-----☐-----☐-----☐-----☐	Reliable

**Please answer even if you do not use this travel mode.*

15. How important is each of the following considerations to you when selecting a transportation mode?

	Not at all important	**A little bit important**	**Moderately important**	**Quite important**	**Very important**	**Extremely important**
Safety	☐1	☐2	☐3	☐4	☐5	☐6
Convenience	☐1	☐2	☐3	☐4	☐5	☐6
Reliability	☐1	☐2	☐3	☐4	☐5	☐6
Comfort	☐1	☐2	☐3	☐4	☐5	☐6
Impact on my health	☐1	☐2	☐3	☐4	☐5	☐6
Time efficiency	☐1	☐2	☐3	☐4	☐5	☐6
Enjoyment	☐1	☐2	☐3	☐4	☐5	☐6
Environmental impact	☐1	☐2	☐3	☐4	☐5	☐6
Cost	☐1	☐2	☐3	☐4	☐5	☐6

16. How often do you use each of the following for your daily non-work travel?

	Never	**Less than once/week**	**Once or twice/week**	**3-5 times/ week**	**Nearly every day**
Walk	☐0	☐1	☐2	☐3	☐4
Transit (bus or rail)	☐0	☐1	☐2	☐3	☐4
Car	☐0	☐1	☐2	☐3	☐4
Bicycle	☐0	☐1	☐2	☐3	☐4

17. What is your *primary* travel mode to be for each of the following destinations? Please check just one for each destination.

	Walk	Bus/ Train	Car	Bicycle	Don't go there
Restaurant	☐1	☐2	☐3	☐4	☐N/A
Bar	☐1	☐2	☐3	☐4	☐N/A
Coffee shop	☐1	☐2	☐3	☐4	☐N/A
A grocery store	☐1	☐2	☐3	☐4	☐N/A
Store or shop (non-grocery)	☐1	☐2	☐3	☐4	☐N/A
A park	☐1	☐2	☐3	☐4	☐N/A
Children's school	☐1	☐2	☐3	☐4	☐N/A
Home of a friend	☐1	☐2	☐3	☐4	☐N/A
Library	☐1	☐2	☐3	☐4	☐N/A
Movie theater	☐1	☐2	☐3	☐4	☐N/A
Post office	☐1	☐2	☐3	☐4	☐N/A
My place of work	☐1	☐2	☐3	☐4	☐N/A
Downtown for weekend or evening shopping or entertainment	☐1	☐2	☐3	☐4	☐N/A
Other 1:_____	☐1	☐2	☐3	☐4	☐N/A
Other 2:_____	☐1	☐2	☐3	☐4	☐N/A

18. Now, <u>think about the last time</u> you traveled from your home to each of the following destinations. On that trip, which travel mode did you use?

	Walk	Bus/ Train	Car	Bicycle	Don't go or can't remember
Restaurant	☐1	☐2	☐3	☐4	☐N/A
Bar	☐1	☐2	☐3	☐4	☐N/A
Coffee shop	☐1	☐2	☐3	☐4	☐N/A
A grocery store	☐1	☐2	☐3	☐4	☐N/A
Store or shop (non-grocery)	☐1	☐2	☐3	☐4	☐N/A
A park	☐1	☐2	☐3	☐4	☐N/A
Children's school	☐1	☐2	☐3	☐4	☐N/A
Home of a friend	☐1	☐2	☐3	☐4	☐N/A
Library	☐1	☐2	☐3	☐4	☐N/A
Movie theater	☐1	☐2	☐3	☐4	☐N/A
Post office	☐1	☐2	☐3	☐4	☐N/A
My place of work	☐1	☐2	☐3	☐4	☐N/A
Downtown for weekend or evening shopping or entertainment	☐1	☐2	☐3	☐4	☐N/A

19. Approximately what percentage of your non-work trips to or from your home would you say are by each of the following travel modes? These should add up to 100%.

Car	Transit	Walking	Bicycling	
☐	☐	☐	☐	= 100%

20. Do you currently have a valid driver's license?
    - ☐1 Yes
    - ☐0 No

21. How many cars, trucks, or vans are owned or leased by members of your household? _____

22. Is one of these cars, trucks or vans available for your use most days?
    - ☐1 Yes
    - ☐0 No

23. Do you have access to a working bicycle on most days?
    - ☐1 Yes
    - ☐0 No

24. Do you receive government financial assistance to help you pay for housing?

    - ☐1 Yes → If yes, *continue to question 25*
    - ☐0 No → If no, skip *to question 26*

25. Which of the following best describes your housing subsidy?

    - ☐1 I/we receive a housing choice voucher (sometimes called Section 8)
    - ☐2 I/we live in public housing
    - ☐3 I/we live in an income restricted unit
    - ☐4 Other _____

26. Are you currently employed in a job outside your home?

    - ☐1 Yes, full-time
    - ☐2 Yes, part-time
    - ☐0 No

27. Are you currently a student?

    - ☐1 Yes, I am a full-time student
    - ☐2 Yes, I am a part-time student
    - ☐0 No, I am not a student.

Thank you for your time! Now please return the survey using the stamped envelope provided.

If you are a drawing winner you will be notified in the next two to three weeks.

Portland State UNIVERSITY