Journal of Transport Geography 31 (2013) 286–295

Contents lists available at SciVerse ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo

Built environments, social environments, and activity-travel behavior: a case study of Hong Kong

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ARTICLE INFO

Keywords:
Built environments
Social environments
Activity-travel behavior
Public/private housing
Hong Kong

ABSTRACT

The influence of individuals' living environment such as the built environment on their activity-travel behavior has been an important topic in activity-travel behavior research. Not much research attention has been paid to the social aspect of the living environment, which may impact activity-travel decision making or be an important mediating factor for the built environment. This paper makes an attempt to fill the gap by simultaneously considering the built and social environment in studying their impacts on activity-travel behavior. Using the sample data from an activity-travel diary survey conducted in Hong Kong in 2010, this study employs a structural equations model to investigate the effects of built and social environments on social contacts and activity-travel behavior in time allocation between in-home and out-of-home activities, trip generation and travel time. The study reveals that people living in public and private housing in Hong Kong have significantly different built and social environments, and that built environments significantly determine social environments and exert significant influences on social contacts and activity-travel behavior.

1. Introduction

Individuals' daily activity engagement and trip making behavior are explained by not only their socio-economic attributes, but also opportunities and constraints, which are largely defined by their living environments. The constraint effects of living environments on daily activities and time spending have been acknowledged in Hägerstrand's time geography framework in terms of authority constraints. Since the 1950s, the role of land use, urban form or the physical aspect of living environments, i.e., the built environments in shaping travel demand, has consistently been a topic of great interest in travel behavior and transport planning studies (Mitchell and Rapkin, 1954; Hamilton and Röell, 1982; Giuliano, 1991; Ewing and Cervero, 2001; Cao et al., 2009a). A substantial body of literature has been established on the linkages between built environments and activity-travel behavior (Handy, 1996; Cao et al., 2006; Ewing and Cervero, 2010).

However, the impacts of the social aspects of living environments or social environments on travel behavior have not received much research attention. Different from social networks that are concerned about individuals' social relations, social environments here refer to the socio-demographic compositions and social ties of people living in the neighborhoods. Though lately there has been a growing literature on the connections between individuals' social networks and their activity-travel behavior (Carrasco and Miller, 2006; Axhausen, 2008; Dugundji et al., 2011), there are not many studies examining the impacts of the social environment on activity engagement and travel behavior. Referring to research findings in urban sociology studies which suggest that social environments have strong impacts on individuals' behavior, McDonald (2007) argues that ignoring the social aspects of living environments may mis-estimate the relationship between the built environment and travel behavior and fail to recognize that individuals' activity-travel behavior may be affected by neighborhood social interactions. Studies in public health show that individuals living in an environment with intensive social interactions tend to get together more frequently with friends and neighbors (e.g., Leyden, 2003). Further, the effects of built environments on activity-travel decision making may be mediated by social environments because the type of built environment may determine the type of social ties and community connections (Freeman, 2001; Leyden, 2003). This discussion suggests that acknowledgement of the social dimensions of one's living environment is important not only for a full understanding of the contextual effects of living environment on travel behavior but also to obtain more insights into the connections between the built environment and travel behavior. If the impacts of the social environment on travel behavior and the effects of the built environment on social environment are confirmed, policy measures aiming to influence travel behavior through built environment designs may need to consider not only the direct effects but also the potential indirect effects through the social environ-

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http://dx.doi.org/10.1016/j.jtrangeo.2013.04.012

ment. Further, policy options aimed at influencing travel behavior through changing the social environment may be designed (e.g., more activities conducted within the neighborhoods may reduce people's desire to travel beyond the neighborhoods; community building policies may help advocate green travel or facilitate information exchange between neighbors concerning trip making, etc.).

It is thus necessary to study the impacts of not only the physical aspect but also the social aspect of living environment on travel behavior. This study aims to make such an attempt and hopes to extend the literature on the contextual effects of living environments on activity-travel behavior with a case study of Hong Kong. As a city well-known for its high density and many high-rise residential towers, Hong Kong is probably less well-known for the fact that about one half of its population lives in public rental and government subsidized housing and another half in private housing (CSDHK, 2012a). We assume that these two types of housing represent two distinctive built and social environments. As the data presented later shows, private housings have in general larger living space and residents of higher socio-economic status than public housing. We hypothesize that the differences in built and social environments of people residing in private and public housing significantly impact their activity-travel behavior. Using the sample data from an activity-travel diary survey conducted in 2010, this study employs a structural equations model to simultaneously investigate the effects of built and social environments on social contacts and activity-travel behavior in time allocation between in-home and out-of-home activities, trip generation and travel time. The study sheds some light on the following issues: How do built environments impact social environments and social contacts? How do social environments impact time use and activity-travel behavior? How do social environments mediate the effect of built environments on activity-travel behavior? A major finding of this study is that built environments significantly determine social environments and exert significant influences on social contacts and activity-travel behavior.

The rest of this paper is structured as follows: the next section sets up the theoretical framework by reviewing the literature on the contextual effects of built and social environments on activity-travel behavior. Section 3 explains the built and social environments of public and private housing in Hong Kong. Section 4 introduces the survey and the sample and reports the modeling results. Research findings and a discussion are presented in the last section.

2. Built and social environments and activity-travel behavior: a literature review

Numerous studies have examined the effects of the physical aspect of individuals' living environment or the built environment on travel behavior (Ewing and Cervero, 2001; Ewing and Cervero, 2010). Ewing and Cervero (2010) suggest using six D's to measure built environments: design, diversity, density, destination accessibility, distance to transit, and demographics. The association between the built environment and travel behavior is well documented. The built environment has been found to be an important factor explaining vehicle miles traveled, trip generation, and trip length, etc. (Ewing and Cervero, 2001). The usage of non-motorized transport modes is reported to be highly associated with mixed land use and walkable environments in North American cities (Cervero and Duncan, 2003; Cao et al., 2006). Residents of pedestrian/cyclist-friendly neighborhoods are found to travel shorter distances than those of other types of neighborhoods (Pan et al., 2009; Wang and Chai, 2009). Residents of newly developed neighborhoods in suburbs are found to have higher car ownership, spend more time on daily travel, and make longer trips than those of traditional neighborhoods close to city center and with mixed land use (Wang et al., 2011). The built environment has also been reported as a significant factor explaining time use and activity patterns (Ettema et al., 2007; Schwanen et al., 2007; Wang et al., 2011). In the debate over the relationship between the built environment and travel behavior, the issue of residential self-selection has attracted a lot of attention in the past decade (Mokhtarian and Bagley, 2002; Handy et al., 2005; Mokhtarian and Cao, 2008; Cao et al., 2009b). Notwithstanding the large body of literature on the linkages between the built environment and travel behavior, very few travel behavior studies examine the influence of the social environment on travel behavior or take into consideration the social environment when examining the influence of the built environment on travel behavior. The few exceptions include McDonald (2007) who reveals that neighborhood cohesion influences children's decision to walk to school and Handy et al. (2005) who find that people living in a social environment with diverse neighbors and having lots of interactions with neighbors have frequent strolling trips. As argued in the previous section, considering the social dimension may improve our existing knowledge on the associations between the built environment and travel behavior.

Previous studies suggest that the social environment can be characterized by variables measuring neighborhood socioeconomic compositions (Morenoff, 2003; McDonald, 2007). These variables are mostly the aggregated data of individuals' socioeconomic characteristics such as unemployed rate, per capita income, and percentage of people living below the poverty threshold, etc. (Brooks-Gunn et al., 1993; Estabrooks et al., 2003). They capture the characteristics of the social structure and community resources, which are directly linked to individuals' social life and behavior (Blau, 1982). They are also indirect indicators of individuals' social relations because studies in sociology suggest that the size and composition of personal social networks are linked to individuals' socioeconomics (Campbell et al., 1986; Huang and Tausig, 1990).

Apart from neighborhood socio-economic composition, one may include the direct measures of social cohesion and trust to differentiate social environments (McDonald, 2007). Examples of such measures include those used in the California Health Interview Survey (CHIS) and the Canada National Longitudinal Survey of Children and Youth (NLSCY). In CHIS, respondents were required to answer how strongly they agree or disagree with statements such as "people in my neighborhood are willing to help each other", "people in this neighborhood can be trusted", "you can count on adults in this neighborhood to watch out that children are safe and don't get in trouble" (UCLA Center for Health Policy Research, 2013). Though the expressions of questions are slightly different, the measures used in NLSCY are similar to that in CHIS. Examples of statements include "people around here are willing to help their neighbors", "when I'm away from home, I know that my neighbors will keep their eyes open for possible trouble", "if there is a problem around here, the neighbors get together to deal with it", "it is safe for children to play outside during the day" (Statistics Canada, 2013).

Studies in fields such as sociology and gerontology suggest that the built environment may determine the social environment and the social environment is influential on individuals' behavior. Built environments with certain architectural features are hypothesized to be conducive to social interactions between neighborhood residents (Evans, 2003; Leyden, 2003). Abu-Ghazzeh (1999) finds that multi-family housing layout with opportunities to walk around and sit in small and confined spaces are significantly related to social interaction and friendship formation. Though not many, there are a few studies in the field of public health that investigate the connection between the social environment and activity-travel