Health & Place 18 (2012) 76–84

Contents lists available at SciVerse ScienceDirect

Health & Place

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

Investigating the impact of a smart growth community on the contexts of children's physical activity using Ecological Momentary Assessment

Genevieve F. Dunton [a,*], Stephen S. Intille [b], Jennifer Wolch [c], Mary Ann Pentz [a]

[a] University of Southern California, 200 Soto N. Street, 3rd floor, MC 9239 Los Angeles, CA 90033, USA
[b] Northeastern University, 202 West Village H (Office 450), 360 Huntington Avenue, Boston, MA 02115, USA
[c] University of California Berkeley, 230 Wurster Hall, 1820, Berkeley, CA 94720, USA

ARTICLE INFO

Keywords:
Built environment
Social environment
Walking
Traffic

ABSTRACT

This quasi-experimental research used Ecological Momentary Assessment with electronic surveys delivered through mobile phones to determine whether children change the type of contexts (i.e., settings) where they engage in physical activity after a recent move to a smart growth (SG) community in the U.S. as compared to children living in conventional low-to-medium density U.S. suburban communities (controls). SG vs. control children engaged in a greater proportion of physical activity bouts with friends, a few blocks from home, and at locations to which they walked. Over six months, the proportion of physical activity bouts reported at home (indoors) and in high traffic locations decreased among SG but not control children. Six-month increases in daily moderate-to-vigorous physical activity did not significantly differ by group. Children might have altered the type of contexts where they engage in physical activity after moving to SG communities, yet more time may be necessary for these changes to impact overall physical activity.

1. Introduction

Obesity and physical inactivity increase risk for serious health conditions among children (Biro and Wien, 2010; Ogden et al., 2010; Strong et al., 2005). Recent estimates suggest that only 40–50% of U.S. children 6–11 years of age and 6–11% of children 12–15 years of age engage in $\geq$60 min per day of moderate-intensity activity on at least 5 out of the past 7 days (Troiano et al., 2008). Low levels of physical activity in children are increasingly being linked to physical characteristics of neighborhood and community environments that favor inactive forms of leisure and transportation (Anderson and Butcher, 2006; Salmon and Timperio, 2007). Children with access to parks and recreational facilities, sidewalks and controlled intersections, destinations and public transportation engaged in more physical activity than children living in neighborhoods that lack these types of facilities (Davison and Lawson, 2006; Ferreira et al., 2007; Santos et al., 2009). Other recent work suggests that physical activity among youth is related to the proportion of green space (de Vries et al., 2007), traffic volume (Crawford et al., 2010), number of accessible destinations (Hume et al., 2007), safety (Alton et al., 2007), and having places to be active (Heitzler et al., 2006).

Smart growth (SG) is an increasingly popular international urban planning strategy that incorporates many of these activity-promoting features (Catlin, 2007; Dalbey, 2008; Durand et al., 2011; Knaap and Talen, 2005; Song, 2005; Talen and Knaap, 2003; U.S. Environmental Protection Agency, 2010). SG offers a set of broad principles that provide a framework for making development decisions that are designed to result in vibrant, diverse, economically healthy communities with a strong sense of place (Knaap and Talen, 2005). The Smart Growth Network, a national umbrella organization, uses 10 principles to describe SG planning including compact building design (e.g., minimum housing densities, reduced lot size guidelines), walkable neighborhoods (e.g., reduction of street widths, sidewalk requirements), sense of place (e.g., enhanced neighborhood character and identity, places for interaction among residents), mixed uses (e.g., combination of residential and commercial use), and open space (e.g., parks, wetlands, natural spaces) (Knaap and Talen, 2005). Although SG planning is similar to goals of the New Urbanism movement in that both seek to manage and reduce urban sprawl, New Urbanism is more closely associated with specific architectural styles including neotraditional urban design. Also, SG is increasingly based on a set of policies and related growth management tools to encourage sustainability, reduce sprawl, and strengthen existing urban centers. Despite the potential of SG design to promote physical activity, little is known about how frequently children living in SG communities actually use the environmental features that are available, and whether their use of these features translates into higher overall physical activity. Lack of awareness of opportunities for physical activity

* Corresponding author. Tel.: +1 626 457 4126; fax: +1 626 457 4012.
E-mail address: dunton@usc.edu (G.F. Dunton).

1353-8292/$ - see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.healthplace.2011.07.007

(Irwin et al., 2007), lack of time (Dunton et al., 2003), and safety concerns (Salmon et al., 2007) may serve as barriers to use of facilities and amenities. To better understand the effect of SG communities on children's physical activity, research is needed on whether the types of settings used for physical activity differ between children living in SG communities as compared to conventional low-to-medium density suburban developments.

To address this question, context-specific methods of assessing children's physical activity behavior are necessary. Past research has employed in-person observational techniques to measure children's activity in single settings, such as on school playgrounds, at parks, or during physical education classes (McKenzie et al., 2006, 2000; Nader and National Institute of Child Health and Human Development Study of Early Child Care and Youth Development Network, 2003). However, these context-specific observational techniques do not capture children's physical activity behaviors across the full range of settings in which they take place throughout the day. Other research in this area has used time use survey, 3-day recall, and Global Positioning Systems (GPS) methodology to describe the percentage of physical activity bouts that take place in various social and physical contexts (Dunton et al., 2010a; Jones et al., 2009; Pate et al., 2011; Wheeler et al., 2010). Yet, these studies typically assess broad categories of settings (e.g., home, school, outdoors) and also may be vulnerable to recall and reporting biases. These limitations can be overcome using real-time data capture methods such as Ecological Momentary Assessment (EMA) (Dunton and Atienza, 2009; Dunton, 2011; Dunton et al., 2010b). Through electronic surveys delivered on the display screen of mobile phones, children can report where and with whom they are currently engaging in physical activity, as well as how they perceive those settings. The current study used EMA to determine (1) whether among children reporting physical activity, the contexts of those physical activity episodes differed between children recently moving to a SG community as compared with children living in conventional low-to-medium density U.S. suburban communities, which served as the control (Group Effects); (2) whether the contexts of children's physical activity change across the 6-month duration of the study, which represents the initial time period after children in the SG group have moved to the new community (Time Effects); (3) whether changes in physical activity contexts differ between the SG and control groups (Group × Time Effects); and (4) whether changes in physical activity contexts mediate the effects of moving to a SG community on physical activity (Mediation Effects). Throughout this paper, the words "context" and "setting" are used interchangeably to mean the circumstances (physical and social) under which physical activity behavior occurs.

2. Methods

2.1. Research setting: smart growth and control communities

The current study took place in San Bernardino County, California, in the United States, a primarily suburban area located about 35 miles East of downtown Los Angeles. San Bernardino County has a moderate climate (summer temperatures 60–90 °F and winter temperatures 40–70° F) and an average annual rainfall of about 17 in., with the majority of precipitation occurring between December and March. The target community, the Preserve, was designed to follow SG principles. Homes are set close to the streets, with garages set back, and porches up front to encourage interaction. The Preserve was designed so that school, public and private recreational facilities, and future commercial facilities are within a 5–15 min walking distance from any residence. Housing options were targeted primarily toward middle income families, but the community also offers low income apartments as a part of its affordable housing obligation. The total area of the Preserve is 5435 acres, of which 53% is open space, 25% is residential, 13% will be commercial, and 9% consists of public facilities and roads. The community is currently under development with residents moving in on a rolling basis as housing becomes available. At the time of this study, 1701 homes plus 255 apartment units were complete, out of an estimated 12,231 home/apartment units (33,249 residents) to be available when the community is fully built out. The control group included children living in one of the six nearby low-to-medium density suburban municipalities (within a 30-min drive of Chino, CA) including Chino, Chino Hills, Corona, Ontario, Pomona, and Montclair. Residents of the Preserve (31% Hispanic, 26% White/Caucasian, 34% Asian, and 6% African-American) and the control communities (26–64% Hispanic, 41–62% White/Caucasian, 4–22% Asian, 6–10% African-American) were similar in terms of demographic composition (U.S. Census Bureau, 2009). Unlike the SG community, which is still under development, the control communities are mainly built out. According to an environmental audit (results presented elsewhere), the SG community had significantly greater building density, less auto-dominated form, greater non-residential land uses, fewer barriers to connectivity, more parks and playgrounds, more traffic safety and esthetic features, and fewer physical incivilities such as graffiti and litter than the control communities (Alfonzo et al., 2011).

2.2. Participants and recruitment

Participants included 121 ethnically-diverse children (9–13 years old) from primarily low to middle income households. The current study collected data from a subgroup comprising 23% of the total sample of children participating in a larger 4-year intervention trial (Healthy PLACES), which is investigating the effects of SG community design principles on the prevention of family obesity risk. The intervention group consisted of children whose families had recently moved to the SG community. The control group consisted of children living in nearby communities whose family considered buying or renting a home or apartment in the specific SG community under examination. Recruitment for the SG group used a variety of channels including informational flyers and letters distributed at community events, housing association meetings, residences, and the school within the SG community. To recruit control group participants, posters and flyers were given out at community health clinics, churches, grocery stores, schools, and community events. Additionally, study advertisements were placed in local newsletters and newspapers. Parents were screened by phone to determine children's eligibility for the study. Inclusion criteria for both groups consisted of the following: (a) lived in Chino, CA or within a 30-min drive of Chino, CA, (b) enrolled in the 4–8th grade, (c) annual household income less than $165,000, and (d) ability to complete questionnaires in English. Parents of children living in the control communities were additionally asked if they had considered moving into the Preserve. Children who met the eligibility criteria were scheduled for a data collection appointment at a local community site or their home. This research was reviewed and approved by the Institutional Review Board at the University of Southern California.

2.3. Study design

Participants in both groups were measured twice during a one-year period. Baseline data (T1) were collected from May to mid-July and from September to October of 2009. The second wave (T2) of data collection occurred approximately 6 to 12 months after the baseline (from November to December of 2009 and from