



Choice of commuting mode among employees: Do home neighborhood environment, worksite neighborhood environment, and worksite policy and supports matter?

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ABSTRACT

Background: Promoting the use of public transit and active transport (walking and cycling) instead of car driving is an appealing strategy to increase overall physical activity.

Purpose: To quantify the combined associations between self-reported home and worksite neighborhood environments, worksite support and policies, and employees' commuting modes.

Method: Between 2012 and 2013, participants residing in four Missouri metropolitan areas were interviewed via telephone ($n=1338$) and provided information on socio-demographic characteristics, home and worksite neighborhoods, and worksite support and policies. Commuting mode was self-reported and categorized into car driving, public transit, and active commuting. Commuting distance was calculated using geographic information systems. Commuters providing completed data were included in the analysis. Multivariate logistic regression models were used to examine the correlates of using public transit and active commuting.

Result: The majority of participants reported commuting by driving (88.9%); only 4.9% used public transit and 6.2% used active modes. After multivariate adjustment, having transit stops within 10–15 min walking distance from home ($p=0.05$) and using worksite incentive for public transit ($p < 0.001$) were associated with commuting by public transit. Commuting distance ($p < 0.001$) was negatively associated with active commuting. Having free or low cost recreation facilities around the worksite ($p=0.04$) and using bike facilities to lock bikes at the worksite ($p < 0.001$) were associated with active commuting.

Conclusion: Both environment features and worksite supports and policies are associated with the choice of commuting mode. Future studies should use longitudinal designs to investigate the potential of promoting alternative commuting modes through worksite efforts that support sustainable commuting behaviors as well as the potential of built environment improvements.

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1. Introduction

Physical activity is associated with lower risk of various chronic diseases, yet levels of physical activity are declining worldwide (Knuth and Hallal, 2009). The World Health Organization's and the US Centers for Disease Control and Prevention's physical activity guidelines both recommend adults to engage in at least 150 min of moderate-intensity or 75 min of vigorous-intensity physical activity per week, accumulated in bouts of at least 10 min (CDC, 2011; World Health Organization, 2010). Only a small portion of adults in the US currently achieve this level (Troiano et al., 2008; World Health Organization, 2010). Adults accumulate daily physical activity from four domains including household, transport, occupation and leisure time (Pratt et al., 2004). Factors influencing different domains of physical activity may be diverse and context-specific. For example, the factors associated with walking to the post office may be different from the factors

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associated with walking during leisure time. Therefore, behavior- and context-specific interventions may be more effective than interventions targeting overall physical activity (Baranowski et al., 1998).

Walking and cycling are recommended forms of moderate-to-vigorous physical activity (MVPA) that can serve as means of travel to substitute for short car trips. Walking and cycling to work (active commuting) have the potential to be incorporated into commuters' daily routine and might therefore be more easily adopted and maintained than other forms of physical activity (Yang et al., 2012). In addition, active commuting is specifically associated with reduced cardiovascular risk, physical fitness, and weight control in adults (de Geus et al., 2009; Hamer and Chida, 2008; Lusk et al., 2010).

Despite these benefits, active commuting is not widely practiced in the US, where more than 90% of the population use automobiles and less than 10% use other modes of transport, including public transit, walking, and cycling as their usual mode of travel to work (Santos et al., 2011). The proportion of walking and cycling to work in the US is extremely low compared to many European countries, such as Denmark (31%), Germany (32%), The Netherlands (47%), and Switzerland (50%) (Buehler and Pucher, 2012), and continues to decline (Brownson et al., 2005). The use of public transit usually involves walking or cycling to and from bus or train stations and has the potential to contribute to the commuter's overall physical activity level (Rissel et al., 2012). Commuters who use multi-modal transit tend to achieve greater levels of physical activity than those who use only motorized modes of transport (Sahlqvist et al., 2012). Despite this, public transit and multi-modal transit have been under-studied compared to active commuting.

In order to develop effective interventions to promote more active alternative commuting modes (other than car driving), an understanding of the factors associated with this particular behavior is required (Baranowski et al., 1998; Owen et al., 2004). A few environmental and psychological factors and worksite policies have been shown to be associated with active commuting or the use of public transit, with commuting distance being the strongest and most consistent factor (Badland et al., 2008; Kaczynski et al., 2010; Lemieux and Godin, 2009; Panter and Jones, 2010; Zwald et al., 2014). To our knowledge, no study has examined the combined effect of neighborhood environment, work environment, and worksite supports and policies on employees' commuting mode choices. The objective of the current study was to examine employees' choices of commuting mode in relation to the home neighborhood environment, worksite neighborhood environment, and worksite policies and supports.

2. Methods

Participants were from the Supports at Home and Work for Maintaining Energy Balance (SHOW-ME) study (Hoehner et al., 2013), a cross-sectional study designed to understand environmental and worksite policy influences on employees' obesity status. Census tracts in four Missouri metropolitan areas (St. Louis, Kansas City, Springfield, and Columbia) were used for sampling. Census tracts with a population density less than the 10th percentile of the population density of the study areas and those with more than 50% of inhabitants aged 15–24 years were excluded. A multistage, stratified sampling procedure was used to sample individuals across seven strata, including metro size (large vs. small), and within the large metro size, walkability (low, moderate, and high) and racial/ethnic minority (low vs. high) strata (Frank et al., 2010). Potential participants were recruited using list-assisted telephone random-digit-dialing methods.¹ The first eligible adult in each household that volunteered to participate was sampled. The response rate for interviews was 49%. Between 2012 and 2013, participants were recruited ($n=2015$) who met each of the following criteria: between the age of 21 and 65 years; employed outside the home at one primary location; employed for 20 or more hours per week at one site with at least five employees; not pregnant; and having no physical limitation to prevent walking or bicycling in the past week. The telephone-based survey instrument was developed using existing self-reported and environmental assessment instruments as well as input from a Questionnaire Advisory Panel comprised of experts in survey development, nutrition/food environment, physical activity, transportation, and worksite environmental interventions. Instrument development and telephone interview procedures have been detailed elsewhere (Hoehner et al., 2013). The study design was approved by the Institutional Review Board of Washington University in St. Louis. All participants provided informed consent.

2.1. Measures

2.1.1. Main outcome

The outcome of interest was commuting mode; participants self-reported their usual mode of travel to work. Response options included: drive alone, bus or train, bicycle, walk, carpool, and other modes. Participants could select multiple modes. We asked participants not to report walking to or from a public transit stop or parking place as 'walk', unless this walk accumulated at least 10 min of activity to account for its health benefits (CDC, 2011; World Health Organization, 2010). We then recoded the commuting mode into three categories: driving alone or carpool; public transit; multi-modal or active commuting (walking & cycling). We grouped those who used multi-modal travel (reported using both active and non-active modes) together with active commuting in order to capture the active components of multi-modal commuters. Those who reported using multi-modal travel that involves only non-active modes were grouped together with driving alone or carpool.

¹ We used landline phone numbers to recruit participants. First, the study sampling method was based on census tract geography (for purposeful variation in size of metro area, proportion of minority population, and walkability). Due to the portability and transfer of cell phones, it is unlikely that those who own cell phones associated with the switches for particular census tracts will actually live in those census tracts. Second, prior to the start of our data collection period, we consulted the most current data on cell phone use (from NHIS (<http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201106.pdf>) and (<http://www.cdc.gov/nchs/data/nhsr/nhsr039.pdf>)). Which showed that ~27.8% of adults in the US live in households with only wireless phones. This percentage was lower for all of Missouri (22.4%) where all study areas are located, but higher for adults age 34 and younger, for racial and ethnic minorities, and for those living in poverty. Despite these differences, our recruitment distribution was monitored throughout the data collection period and did not show any dearth of participants in these categories. We do not know if there are other characteristics of wireless-only households that are not captured through standard demographics, but we have nonetheless attempted to address this potential bias.

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