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Does telecommuting promote sustainable travel and physical activity?

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ABSTRACT

Researchers have explored the efficacy of telecommuting as a travel demand management strategy in the U.S. Conditions under which telecommuting can reduce VMT (vehicle miles traveled) and ease peak-period traffic congestion have been extensively investigated; empirical findings are well documented in the literature. Analysis of the impact of telecommuting on non-motorized travel, public transit use, and physical activity, however, has received relatively less attention in the past.

In this paper, I use the 2009 U.S. National Household Travel Survey to explore how telecommuting is associated with usual travel behavior, i.e. walking/bicycling, transit use and driving, as well as with average time spent in daily physical activity. I also compare telecommuters' travel behavior and physical activity on a typical workday in telecommuting vs. non-telecommuting scenarios.

I find that frequent telecommuting (4+ times/month) is associated with 15% more walk trips per week, 56% higher odds of 1+ transit trip per month, 44% higher odds of 30+ minutes of physical activity per day, and 27% higher odds of driving 20,000+ miles per year compared to no-telecommuting scenario. On a typical workday, telecommuting is associated with 41% higher odds of walking/bicycling > 1 mile, 71% higher odds of 30+ minutes of physical activity, 71% lower odds of riding transit, and 3.58 times greater odds of driving < 10 miles. Findings suggest that telecommuting can increase non-motorized travel and physical activity in the presence of latent demand for active living. Increase in transit ridership and reduction in VMT are not automatic. Planning and policy implications are discussed.

1. Introduction

The rise of telecommuting in the U.S. is regularly highlighted in the popular media (e.g. [Rapoza, 2013](#); [Tugend, 2014](#); [Jones, 2015](#)). The reports indicate that more companies are adopting or expanding work-from-home policies, more full-time employees are choosing to telecommute (i.e. work at home, or any other preferred location away from the primary workplace) for entire workdays at least occasionally, and the share of workers frequently or permanently working at home or at other remote, casual, variable locations is growing. National Household Travel Survey (NHTS) data estimates show that over the 2001–2009 period, the proportion of the U.S. workforce telecommuting at least once a month on average increased from 5.67% to 7.60%. The increase in share of workers telecommuting once a week or more on average over the same period was relatively modest – from 3.83% to 3.97%.

Researchers have extensively analyzed the growing demand for and provision of spatial and temporal flexibility in the organization of work. Empirical studies show that employees value the option to telecommute primarily because it saves time and money by

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eliminating the need for traveling to work, and also provides the freedom of scheduling activities based on personal preferences or requirements (Tremblay and Thomsin, 2012; Sewell and Taskin, 2015). Employees generally report higher job-related emotional well-being on telecommuting days compared to non-telecommuting days (e.g. Anderson et al., 2015). Working at home is also found to be positively associated with work-life balance and family success (Hill et al., 2003). Many companies that consider employees' job-satisfaction as key to increasing productivity have, among other things, adopted or expanded flexible work-from-home programs and invested in technologies to facilitate telecommuting (Morganson et al., 2010; Koloc, 2014; Bae and Kim, 2016).

Working away from a designated workplace, however, has some disadvantages. Research shows that frequently working alone can cause loneliness, irritability and stress, and consequently reduce productivity (Mann and Holdsworth, 2003). In the absence of fixed work hours, some people fail to manage time efficiently, tend to work continually throughout the day, and their family life suffers as a result (Kossek et al., 2009; Grant et al., 2013). Some employers believe that face-to-face communication and spontaneous conversations in the workplace are essential for innovation, and therefore refuse to offer generous work-from-home programs (Tkaczyk, 2013; Thibodeau, 2017). Indeed, although video-conferencing and remote collaboration tools have improved, they have not been able to perfectly substitute in-person interactions. Tietze et al. (2009) conducted a review of literature and found that evidence on impacts of telecommuting on companies and workers is mixed.

The emerging phenomenon of telecommuting has important implications for cities. Increasing work place and work time flexibility for a larger share of the workforce can influence housing demand (Nilles, 1991; Tayyaran et al., 2003), travel patterns (Mokhtarian, 1991; Kim, 2016) and social interactions (Demerouti et al., 2014), thereby affecting urban form, air quality, physical and mental health, and overall quality of life. Empirical studies emphasize the role of public policies to reduce negative urban consequences such as sprawl, and organizational support systems to reduce negative emotional impacts such as stress.

Transportation planners believe that telecommuting can reduce peak-period traffic congestion, energy use, and air pollution by eliminating some trips to the primary workplace (Siha and Monroe, 2006). Significant research effort has gone into exploring the telecommuting-travel connection in the U.S. Emphasis has been on analyzing telecommuters' travel choices and patterns in order to identify land use-transport based policies that can influence their decisions and increase the efficacy of telecommuting as a travel demand management tool (Singh et al., 2013; Perks and Raborn, 2013).

Theoretically, transportation impacts of telecommuting are uncertain. In fact, telecommuting may increase travel, and travel-related energy consumption and emissions. Work at home may make the household car available to other household members who can drive to various activities; on telecommuting days, individuals may drive long distances to work in desirable locations (e.g. coffee shops, libraries, parks, etc.); frequent telecommuters may choose to live far away from their workplaces and drive long distances on commute days; and on telecommuting days, people can make additional off-peak recreational and social trips by car (Lachapelle et al., 2017). Promoting work-from-home without careful consideration of personal and household responses may therefore lead to undesirable transportation outcomes.

Empirical evidence from the U.S. on this topic is mixed. Zhu (2012), and Zhu and Mason (2014) found that telecommuters, personally and at the household level, travel more miles and spend more time traveling for both work and non-work trips on average compared to non-telecommuters. Others found telecommuting to be associated with reduced vehicle miles traveled and peak-period trips (Pendyala et al., 1991), lower air pollution (Mokhtarian and Varma, 1998), and increase in close to home activities (Saxena and Mokhtarian, 1997). The studies, however, used data from different time periods having different geographic coverage (e.g. national vs. city-level or regional) and sampling methodology, and they used different methods and measures. The findings, therefore, may not be easily comparable.

Recent studies have analyzed impacts of part-day telecommuting on peak-period congestion (Asgari et al., 2016a), and how full- and part-day telecommuting influences time allocated among non-mandatory activities (Asgari et al., 2016b). These studies have underscored the importance of identifying various forms of daily telecommuting arrangements, and analyzing how these alternative arrangements could affect personal activity-travel decisions and hence regional transportation system performance. There is need to expand this thread of research further in order to develop effective sustainable transportation policies.

Past studies in the U.S. have focused more on the effect of telecommuting on vehicle miles traveled (VMT), or driving. Very few studies have analyzed impacts on non-motorized (or active) travel and public transit use. Mokhtarian and Varma (1998) found walking and biking trip shares to increase marginally and transit trip share to decrease on telecommuting days relative to non-telecommuting days. Lachapelle and Noland (2012), however, did not find any significant influence of working at home on walking. This paper provides additional insights.

The impact of telecommuting on daily physical activity remains unexplored. This study addresses the gap in literature. Analysis of the link is critical as policy-makers search for strategies to address various chronic illnesses linked to sedentary lifestyle such as obesity, cardiovascular diseases, and diabetes (Kohl et al., 2012). Promotion of physical activity is also a critical part of transportation decision-making (Dannenberg and Sener, 2015; Lee and Sener, 2016). If telecommuting is found to be associated with higher levels of physical activity, transportation planning agencies may consider ways to incentivize work-from-home programs and further facilitate active travel among telecommuters (e.g. free bike-share vouchers or free transit passes on telecommuting days).

We should expect telecommuting – active travel (including transit use) and telecommuting – physical activity relationships to exist. Since people are found to engage in activities near home on their telecommuting days (Saxena and Mokhtarian, 1997), it is possible that they walk or use bicycle or ride public transit (which generally requires additional access and egress trips on foot or bicycle) for reaching some of those destinations. It is also possible that people allocate saved commute time to recreational activities such as walking or running outdoors, working out at the gym, playing sports, walking the dog, etc. Some people, however, may choose to stay at home all day – their active miles and time spent in physical activity may be lower on telecommuting days compared to non-telecommuting days.

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