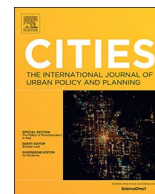


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Are multimodal travelers more satisfied with their lives? A study of accessibility and wellbeing in the Denver, Colorado metropolitan area

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ABSTRACT

In this study, we ask how the ability to use multiple transportation options affects one's subjective wellbeing (SWB), including aspects such as physical health, financial security, standard of living, and personal relationships. A clearer understanding of these associations can inform investments in multimodal infrastructure. We draw on 232 surveys from a diverse set of residents in the Denver, Colorado metropolitan area and find that having more transportation choices can improve standard of living for low- and middle-income residents. Multimodal middle-income residents are also more satisfied with their health and what they are achieving in life. Vehicle owners report higher levels of satisfaction with their standard of living, health, and achievements, compared to non-owners, unless auto is their only travel mode. Only low-income respondents had significant differences in standard of living by where they lived, with greatest satisfaction in the urban core. These results confirm the relationship between public transit and SWB, and contribute to our understanding of how the concept of motility (social and spatial mobility) shapes one's quality of life. The findings have implications for investments in transportation modes across neighborhood types and populations, so that people have a range of travel options to meet their needs and increase their satisfaction with their goals through improved daily travel.

1. Introduction

On May 26, 2015, Denver's Regional Transportation District (RTD) voted to pass sweeping bus and light-rail fare increases. At the meeting, elected board members listened to dozens of impassioned pleas from community activists, transit-reliant citizens, and advocates for poor and marginalized residents, who accused the city of catering to “choice” riders over those who depend on public transit for their daily activities. In one powerful exchange, a transit rider argued “My route is a lifeline to work, medical care and education ...Your actions are dramatically affecting the Hispanic community where I live” to which a RTD board member replied “I know the Denver community is struggling with a lot of problems right now, but RTD can't be the solution to all of them” (Aqra, 2015).

Around the same time that RTD was raising fares, cutting bus service, and opening new light rail lines almost exclusively in the suburbs, Car2Go, the city's largest car share service, decided to remove their vehicles from nearly all of Denver's lowest income neighborhoods. In addition, analyses emerged in this period showing that the city's poorest neighborhoods lacked adequate bicycle infrastructure and that Denver

B-Cycle, the region's popular bike share system, had located their stations disproportionately in middle- and upper-income neighborhoods, the same neighborhoods from which low-income residents were being evicted or displaced with increasing regularity.

Amidst these cuts, we discussed regularly the value that we, the authors, as middle-income households living in dense, transit-rich neighborhoods, were afforded by having multiple transportation choices. Any given day, we could bicycle or walk to the office or appointments or use our employer-subsidized, all-access transit passes to catch the bus a block from our homes and get dropped directly at our destination. And if the bus did not go to a destination, we would use a personal car or reserve a car-share. So if we benefitted in these multiple ways from access to multiple transportation modes, what was the impact of these cuts in service on the quality of life of lower-income, transit-dependent folks living in places that also lacked the multi-modal accessibility that we so enjoyed?

Although wellbeing is measured regularly in an increasing number of countries, we know very little about the impact of transportation accessibility on what researchers call subjective wellbeing (SWB).¹ By asking how access to a multitude of transportation options affects one's

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¹ We use the term subjective well-being (SWB) instead of personal well-being as it is based on one's own opinions of their health, security, and happiness.

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personal wellbeing, including physical and emotional health, financial security, and standard of living, this study breaks new ground in understanding how place, personal characteristics, and multimodal access to daily activities interact to shape one's satisfaction with life. We show that regardless of personal characteristics or built environment factors, transportation choice can improve certain facets of subjective wellbeing, particularly for lower income persons for whom owning a vehicle may be out of reach.

To test the relationships between use of multiple transportation modes² and SWB, we administered a unique travel and wellbeing survey to 232 residents from different economic backgrounds and neighborhood types across the Denver metropolitan area. We find that having more transportation choices can improve certain aspects of SWB. Low- and middle-income respondents who use multiple transportation alternatives for their daily activities report a higher standard of living than those relying primarily on a single transportation mode. Middle-income multimodal travelers also had higher levels of satisfaction with their physical health and what they are achieving in life. When one of the modes was a personal vehicle, respondents indicated an even higher standard of living and satisfaction with life. Nevertheless, dependency on any one mode, whether transit or automobile, tended to lower one's subjective rating of their standard of living.

These findings build on research linking transportation accessibility and SWB in three ways. First, we take into account how *who* we are, *where* we live, *how* we travel, and *where* we are able to travel interact to affect SWB (Cao, 2016; De Vos, Schwanen, Van Acker, & Witlox, 2013; Okulicz-Kozaryn, 2011). Second, we emphasize how regular use of multiple modes for all trips – and not just public transit or a personal automobile for the commute – affects SWB. And third, we break down SWB (our composite dependent variable) into seven life domain components, recognizing that our lives are complex and multi-faceted, and our physical health, for example, doesn't always vary directly with emotional health or financial security (Cummins, Eckersley, Pallant, van Vugt, & Misajon, 2003). In sum, this study furthers the research on travel and wellbeing by looking at the various wellbeing effects from a combination of modes rather than satisfaction with particular modes or trip types.

Our findings also suggest that policies and market forces that make it more difficult for low- and middle-income households to have transportation choice, such as reduced bus service, lack of quality sidewalks, higher transit fares, unsafe biking conditions, reduced access to owned or shared vehicles, and displacement from the most transit-accessible places due to high housing costs can reduce one's quality of life. Further, communicating the wellbeing effects that multimodal travelers enjoy might encourage higher income travelers to reduce their dependency on automobiles.

2. People, place, access, and subjective well-being

SWB is the cognitive evaluation of one's life on interrelated areas such as emotion, engagement, fulfillment, satisfaction, peace, and even happiness (Diener, Diener, & Diener, 1995). Because individuals and societies have been known to rate themselves very high on some of these components and very low on others, Diener and Suh (1997) suggest that researchers should analyze SWB both as a composite whole and on its constituent dimensions. A core assumption of SWB research is that in order to obtain the best data, we need to ask people directly how they feel about their lives, according to their own standards (see Seligman, 2002).

A growing number of cities and organizations have begun collecting self-reported SWB data as opposed to relying on objective, aggregated

sources alone, and they are using these data as a key metric for zeroing in on how real problems affect real people in very different ways (Graham, 2015a). These initiatives are not confined to the local level: the Gallup-Sharecare Well-Being Index has collected over 2.5 million surveys to date using questions that capture how people feel about their social, financial, community, and physical wellbeing (Sharecare, Inc, 2017).

There are a number of strengths of SWB measures. Since SWB studies focus on personal perceptions and individual opinions instead of resource levels or objective indicators, they tend to capture what is most important to individuals, what affects them most on a daily basis (Diener et al., 1995). Although reliant on self-reported data, SWB measures have been shown to have adequate levels of validity and convergence with more objective factors known to influence wellbeing and quality of life; as such, SWB studies help researchers make more confident and definitive conclusions about how specific community features, policies, or programs tend to impact life for respondents (see Diener & Suh, 1997; Suh, Diener, & Fujita, 1996). SWB measures also move us beyond economic indicators, which do not always reflect how people are doing: although economic progress has skyrocketed over the past several decades, levels of life satisfaction have remained flat and depression and distrust have increased over this same period. So although the U.S. is the richest country in the world, it ranked 23 of 145 in overall SWB in 2014 and countries as stable and well-off as South Korea, Croatia, and Singapore ranked near the bottom in most categories (Chappell, 2015). Methodologically, SWB measures can still be easily standardized across populations by asking the same question to different respondents, and conceptually, SWB studies can tease out interactions between who we are and how we feel; because SWB relies on “dispositional characteristics” and not just external life conditions, it accounts for the fact that everyone comes from different backgrounds and starting points in life and that “objectively similar life circumstances can be construed very differently” (Diener & Suh, 1997, 202).

SWB measures also have several weaknesses. First, although comprised of valid individual components, survey respondents can respond inaccurately or dishonestly, though this same shortcoming exists for certain “objective” behavioral and socioeconomic measures collected via surveys such as the U.S. Census. Second, subjective survey responses are situational and can be highly sensitive to respondents' moods or emotional states at the time of survey completion (Schwarz & Strack, 1991). Third, up to 50% of the variance in SWB has been shown to be simply attributed to stable personality traits over which we have little control (Lyubomirsky, King, & Diener, 2005), because of the genetic effects on approximately half of the variance on certain personality domains (Weiss, Bates, & Luciano, 2008). Indeed, in addition to income, marital status, and education level, researchers have found that SWB is statistically significantly dependent on age, sex, race, and ethnicity, all factors to which we are genetically predisposed (Ettema et al., 2011). Thus, SWB “also appears to be moderately heritable” (2008, 205). As such, researchers universally suggest that SWB measures be used in conjunction with objective social indicators in order to develop the most robust evaluation results possible.

With some exceptions, individuals report higher SWB if they are wealthy, religious, married, employed, educated, and healthy (Graham, 2015b). Nevertheless, residents of some of the world's poorest countries often indicate higher levels of happiness and life satisfaction than folks living in rich countries, where residents claim lower levels of job security, air quality, housing affordability, and work-life balance (OECD, 2015). Income only seems to impact SWB up to the point that one's basic needs are met and personal goals achieved (Diener & Suh, 1997). Working males show higher levels of SWB than working females; health satisfaction increases with income and education; unemployed respondents are happier than those involuntarily employed part-time; and children from better-off families nearly always indicate higher life satisfaction (Graham & Niklova, 2014; OECD, 2015; Van Praag, Frijters, & Ferrer-i-Carbonell, 2003; Niklova & Graham, 2014). Some relationships

² Our survey instrument asks respondents about their actual use of different transportation modes, which assumes they have access to such modes. Throughout the paper, then, we use the terms “access” and “use” interchangeably.

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