

Mobility, Time Poverty, and Well-Being: How Are They Connected and How Much Does Mobility Matter?

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ABSTRACT

This paper aims to determine the degree to which absence of mobility correlates with poor subjective well-being (SWB). Zero trip-making is often considered indicative of social exclusion and disengagement from society, potentially contributing to lower well-being. While this may be true for some, it may not necessarily be true for all. In the sociological domains, lower well-being is equated with the notion of time poverty that is defined as the lack of available time for pursuing discretionary activities. This paper explores the connections between the notions of time poverty, subjective well-being, and zero trip-making using the American Time Use Survey (ATUS) data. The data set is used to analyze time poverty and compute well-being scores for various subgroups of the population. The time poverty and well-being assessment is done separately for zero trip-makers and trip makers. Findings suggest that time poverty and subjective well-being are aligned with one another, although some deviations are seen for specific demographic groups. Zero mobility is not necessarily associated with time poverty or diminished well-being; in fact, zero trip-makers exhibit higher well-being scores than trip-makers for virtually all demographic groups, suggesting that a focus on eliminating time poverty would help enhance well-being. Well-being should be assessed based on time use patterns with a focus on types of activities pursued rather than mobility per se. Also, although time poverty is a useful metric of well-being, there is a need for well-being metrics and models that recognize taste heterogeneity in the population.

Keywords: *Zero trip-making, mobility, time poverty, well-being, time use, activity participation*

1. INTRODUCTION

Transportation systems – which enable people to travel, interact with others in person, and access destinations and economic opportunities – are viewed as critical to the vitality of a community, city, and country. The mobility afforded by transportation systems enables participation in society, accumulation of life experiences, and fulfillment of activities, all of which may be regarded as key determinants of quality of life. Investments in transportation infrastructure are therefore seen as investments in societal well-being because they ease the flow of goods and services and connect people and places.

In light of the connection that is often drawn between transportation and ability to engage in societal functions, those who are mobility disadvantaged may experience a lower quality of life. A number of studies have drawn the connection between mobility limitations and quality of life, focusing particularly on the notion of social exclusion (Stanley et al., 2011; Delbosc and Currie, 2011). Several demographic groups including the elderly, disabled, low income individuals, minorities, and those without access to a vehicle have generally been identified as being at risk of social exclusion because of their inability to use the transportation system and engage in (desirable) activities outside the home (Motte-Baumvol et al., 2012; Adeel et al., 2018; Corran et al., 2018). The inability to interact in person with the greater society outside home may lead to isolation, depression, and other mental health issues.

As a result of the seemingly important connection between mobility, participation in society, and quality of life, the literature has a number of examples and case studies that badge zero out-of-home activity-travel engagement as being representative of a poor quality of life (Kenyon et al., 2002; Spinney et al., 2009). While there is undoubtedly merit to the argument that an inability to travel (say, due to physiological or intellectual disabilities) may contribute to a lower quality of life, a systematic study that explicitly relates activity and time use patterns with measures of subjective well-being (which may be considered representative of quality of life, at least in the short term) would help establish and define the nature of the connection.

In the United States, the percent of individuals depicting daily activity-travel patterns characterized by zero trips (in the day) is on the rise. An analysis of the newest 2017 National Household Travel Survey data set shows that the percent of zero trip-makers is at the highest level since 2001 even though the data was collected at a time of relatively prosperous economic conditions characterized by record low unemployment rates. Why is zero trip-making on the rise? In the absence of explicit data to address this question, it is difficult to say for sure as to why the zero trip-making segment is rising over time. Some conjectures may be made, particularly in the context of the rapid evolution of technology and the workplace. Mobile technologies, ubiquitous connectivity, social media platforms, e-commerce, delivery-based services, streaming on-demand entertainment, and the internet of things have made it possible for individuals to work, study, play, shop, interact (virtually), and eat at home – essentially enjoying a high quality of life without setting foot outside the comforts of home.

It may be hypothesized that the zero trip-making segment is likely comprised of (at least) two broad segments; those who do not travel because they are truly mobility disadvantaged and those who do not want or need to travel because they can (happily) fulfill all of their activity needs from the comfort of their couch. While the former group is likely to experience a diminished sense of well-being (because they are not able to accomplish activities that they would like to undertake), the latter group may not necessarily be experiencing any diminished sense of well-being. In fact, they may be experiencing an elevated sense of well-being because they are accomplishing what they want to do at home and are not having to grapple with congestion, search for parking, wait

for the bus, or be exposed to the elements. In other words, if travel is truly a disutility to be minimized and people are able to accomplish activities at home, then those who consciously choose not to travel are unlikely to be experiencing a lower of quality of life – and may actually be experiencing a higher quality of life (as they eliminate the disutility of travel from their daily agenda).

A parallel stream of research in the sociological literature has focused on the notion of “time poverty”. This concept has been introduced as an alternative to the traditional notion of income poverty with a view to better understand well-being and quality of life. Different researchers have suggested alternative definitions and criteria for defining time poverty, but the central idea underlying this notion is that those who spend less time on leisurely activities (below a certain threshold) are said to experience time poverty (Vickery, 1977; Williams et al., 2016).

Although there is a body of literature devoted to time poverty and another devoted to activity-travel behavior and well-being, there is very little work that connects these strands of research. It is undoubtedly likely that time poverty and subjective well-being are closely related to one another. If subjective well-being is higher for those who pursue leisure activities, then those who experience time poverty will have a lower subjective well-being. An objective of this paper is to determine the extent to which time poverty and subjective well-being are aligned with one another. This is accomplished by examining well-being and time use data available in the 2010, 2012, and 2013 versions of the American Time Use Survey (ATUS) data which included well-being modules that collected data on emotional ratings for various activities and feelings (happiness, meaningfulness, sadness, painfulness, stress, and tiredness). So, the first preliminary objective of this paper is to establish the connection between time poverty and feelings of well-being. It is hypothesized that there is a high degree of alignment between these two concepts.

The overarching goal of this paper is to examine the extent to which transportation (mobility) contributes to time poverty and subjective well-being. As noted earlier, not all zero-mobility individuals are created equal; there are those who desire to travel, but are not able to do so, and then there are others who consciously choose not to travel because that is their intrinsic preference. In this study, detailed comparisons of time poverty and subjective well-being are conducted between zero trip-makers and trip-makers. These comparisons are done for a variety of groups, including those that are generally considered mobility disadvantaged. The comparisons in time poverty and subjective well-being between zero trip-makers and trip-makers will help in identifying the specific groups for which zero trip-making is actually resulting in a lower subjective well-being and greater degree of time poverty.

The remainder of this paper is organized as follows. The next section describes the data used in the study. The third section documents an analysis of well-being and time poverty based on the ATUS well-being data. The fourth section provides a comparison of zero trip-makers and trip-makers with respect to their degree of time poverty and well-being scores, with a view to identify the role of transport in shaping these quality of life measures. Finally, concluding thoughts are offered in the fifth section.

2. DATA

This study primarily utilizes data from the 2017 American Time Use Survey (ATUS) data collected by the Bureau of Labor Statistics (BLS) in the United States. The 2017 ATUS provides detailed activity and time use data for a representative sample of 10,223 persons. The ATUS has individuals record all of their activities over the course of a day, including travel episodes. Because travel episodes are recorded, it is possible to identify individuals who did not engage in any travel

1 in the survey day. However, because it is a time use survey as opposed to a travel survey, there
2 may be concerns as to whether the time use survey adequately captured all travel episodes and
3 provides an accurate depiction of the percent of individuals who are zero trip-makers in various
4 population groups.

5 As a first step aimed at vetting the ATUS data with respect to its data on travel episodes,
6 statistical measures on zero trip-making obtained from the ATUS data were compared against
7 those obtained from the National Household Travel Survey (NHTS) data set collected in the same
8 year of 2017. The NHTS series is conducted by the US Department of Transportation to obtain
9 detailed information about household and personal travel over the course of a 24-hour period
10 (travel survey day). The 2017 edition of the survey obtained travel diary information from a
11 sample of 264,234 individuals; although this is a very large sample, it is not necessarily
12 representative of the general population because some states and jurisdictions were over-sampled
13 at their request. Prior research has analyzed differences between travel surveys and time use
14 surveys in terms of measures of travel and zero trip-making. Findings vary across studies. Some
15 indicated time use surveys reporting higher levels of zero trip-making (Bose et al., 2005) while
16 others reported that zero trip-makers appear higher in travel surveys (Aschauer et al., 2018;
17 Yennamani and Srinivasan, 2008; Richardson, 2007). Therefore, in the context of this study,
18 comparing NHTS and ATUS not only contributes to this strand of literature, but also enables an
19 assessment of the appropriateness in using ATUS to draw inferences about travel and zero trip-
20 making among various population groups.

21 A comparison of zero trip-makers and trip-makers is presented in Tables 1 and 2. The
22 samples were divided into four distinct and broad groups by day of week (weekday vs weekend)
23 and employment status (worker vs non-worker). The four groups are tabulated with respect to
24 their socio-economic characteristics in the context of zero trip-making and trip-making. For
25 comparison purposes, the analysis is limited to individuals of driving age, 15 years and over.

26 Table 1 shows the two weekday segments while Table 2 shows statistics for the two
27 weekend segments. Overall, it can be seen that workers depict low prevalence of zero trip-making
28 on weekdays. Only 7.3 percent of workers are zero trip-makers on weekdays in the NHTS; the
29 corresponding percentage in the ATUS is 5.6 percent. For non-workers, the prevalence of zero
30 trip-making is much higher. While 27 percent of non-workers are identified as zero trip-makers
31 on weekdays in the NHTS, the corresponding percentage in the ATUS is 28.6 percent. In other
32 words, the two surveys provide rather equivalent measures of zero trip-making in the population.
33 Note that all NHTS statistics are based on weighted data to account for the non-representativeness
34 of the raw sample. However, all of the sample sizes are reported based on the raw sample so that
35 the reader has a sense of the survey sample sizes for various groups.

36 The remainder of Table 1 provides a detailed picture of the composition of zero trip-makers
37 and trip-makers. In general, the statistics are consistent with expectations and mimic the presence
38 of various demographic groups in the population. For example, a majority of non-workers in the
39 population are females. Their presence is therefore higher in all four non-worker segments (NHTS
40 and ATUS zero trip-makers and trip-makers). However, there are subtle differences that suggest
41 important demographic differences in the prevalence of zero trip-making. For example, consider
42 the weekday-worker segment in the ATUS sample. The zero trip-maker subsample is about equally
43 split between females and males (49.5 to 50.5 percent). The trip-maker subsample has higher
44 proportion of males than females (54.7 percent males to 45.3 percent females). By combining the
45 information contained in the two columns, it is possible to infer that females have a diminished
46 level of trip-making than males.

Overall, it can be seen that ATUS and NHTS are rather similar in the extent to which they portray zero trip-making among various population groups. A few differences are discernible, however. For example, consider the age distributions in the weekday-worker segment. In the NHTS, the age distributions between zero trip-makers and trip-makers are rather similar (qualitatively speaking). However, the ATUS shows a marked difference in the distributions. Among zero trip-makers, 37.9 percent fall in the 51-65 year age category and 8.9 percent fall in the 66+ year age category. Among trip-makers, the corresponding percentages are 27.9 percent and 5.5 percent. Thus, in the ATUS it appears that zero trip-makers (in the weekday-worker segment) do skew towards older age groups when compared to trip-makers. However, this skew is not seen in the NHTS, suggesting that there are subtle but important differences in the inferences drawn from different survey approaches. While the time use survey suggests that older people above the age of 50 comprise 46.8 percent of zero trip-makers, the travel survey suggests that older people above the age of 50 comprise only 31.9 percent of zero trip-makers (which is very close to the value of 31.7 percent for trip-makers in the travel survey). These differences should be kept in mind when studying zero trip-making among different demographic groups. A few other differences emerge between NHTS and ATUS in the context of race, household location, and household size.

Table 2 presents similar statistics, but for the weekend groups. According to the NHTS, 12.9 percent of employed individuals are zero trip-makers on weekends; the percentage for non-workers is considerably higher at 29 percent. It is not surprising to see that workers show a higher prevalence of zero trip-making on weekend days than weekdays. However, the percentages between weekdays and weekend days are not all that different for non-workers. Overall, it appears that nearly 30 percent of non-workers report zero travel, whether on a weekday or weekend day. These percentages are consistent between the NHTS and ATUS. Again, subtle differences in distributions are discernible, once again in the context of age, race, and household size.

Although there are some differences in the distributions as noted above between the NHTS and ATUS in terms of the incidence of zero trip-making for specific market segments, the overall distributions and the general patterns or trends are quite similar (qualitatively speaking). The ATUS is broadly offering measures of zero trip-making and distributions of various demographic groups in the zero trip-making and trip-making segments that are in line with those seen in the NHTS. Given that the ATUS constitutes a representative sample of the nation, it may in fact be giving more accurate depictions of zero trip-making than the NHTS, whose statistics are derived from a weighted, but non-representative raw sample. As such, based on the information in Tables 1 and 2, using the ATUS data to measure and assess zero trip-making and the extent to which it impacts time poverty and well-being appears very appropriate.

1 **TABLE 1 Socioeconomic and demographic characteristics of the weekday samples (N_{NHTS}=230,081, N_{ATUS}=9,560)**

Person Characteristics		Segment 1: Weekday*Workers				Segment 2: Weekday*Non-workers			
		NHTS 2017 (N=78,685)		ATUS 2017 (N=2,282)		NHTS 2017 (N=64,522)		ATUS 2017 (N=1,532)	
Attribute	Categories	Zero-trip-maker (7.3%)	Trip-maker (92.7%)	Zero-trip-maker (5.6%)	Trip-maker (94.4%)	Zero-trip-maker (27.0%)	Trip-maker (73.0%)	Zero-trip-maker (28.6%)	Trip-maker (71.4%)
Gender	Female	48.7	46.6	49.5	45.3	60.5	59.0	62.8	61.1
	Male	51.3	53.4	50.5	54.7	39.5	41.0	37.2	38.9
Age	15–20	7.4	4.4	2.1	1.8	6.9	7.5	3.1	10.8
	21–30	20.4	20.2	7.8	20.2	12.9	10.9	6.1	8.5
	31–50	40.3	43.7	43.3	44.5	17.0	18.9	11.1	17.9
	51–65	26.0	26.5	37.9	27.9	23.6	25.5	28.7	22.5
	66 or more	5.9	5.2	8.9	5.5	39.6	37.2	51.0	40.4
Educational attainment	Less than a high school diploma	5.0	3.1	15.8	6.2	15.1	10.1	20.1	21.5
	High school graduate or GED	26.2	18.7	24.9	28.2	35.4	27.4	41.0	31.5
	Some college or associates degree	31.4	30.4	19.6	23.9	29.0	31.4	19.4	21.7
	Bachelor's degree	21.2	26.4	25.5	25.8	12.5	17.2	13.3	15.5
	Graduate or professional degree	16.2	21.5	14.2	15.9	8.0	13.9	6.2	9.8
Race	White	69.9	74.6	73.5	82.2	70.0	72.1	76.0	82.7
	Black or African American	12.9	11.5	20.6	11.3	14.7	14.5	18.4	11.8
	Asian	7.0	5.4	3.4	4.3	6.5	4.8	3.8	2.8
	Some other race	10.1	8.5	2.5	2.3	8.8	8.6	1.8	2.7
Annual household income	< \$35K	26.8	20.7	18.6	18.1	48.5	42.6	56.0	40.4
	≥ \$35K, < \$50K	11.8	11.7	15.4	12.7	11.4	12.2	16.7	15.9
	≥ \$50K, < \$75K	17.3	17.2	16.3	21.3	15.0	15.3	11.4	16.6
	≥ \$75K	44.2	50.3	49.6	47.8	25.1	29.9	15.9	27.1
Household size	1 person	8.9	12.3	13.0	13.3	16.1	19.1	23.7	19.1
	2 person	30.6	30.4	31.3	34.6	35.7	37.9	48.6	40.2
	3 person	22.3	21.5	22.7	19.6	18.2	17.7	11.3	13.0
	4+ person	38.1	35.7	33.1	32.5	32.5	30.0	16.4	27.7
Household location	Urban area	79.1	84.0	91.1	85.9	78.4	82.3	75.8	82.9
	Non-urban area	20.9	16.0	8.9	14.1	21.6	17.7	24.2	17.1

1 **TABLE 2 Socioeconomic and demographic characteristics of the weekend samples (N_{NHTS}=230,081, N_{ATUS}=9,560)**

Person Characteristics		Segment 3: Weekend*Workers				Segment 4: Weekend*Non-workers			
		NHTS 2017 (N=47,914)		ATUS 2017 (N=3,462)		NHTS 2017 (N=38,960)		ATUS 2017 (N=2,284)	
Attribute	Categories	Zero-trip-maker (12.9%)	Trip-maker (87.1%)	Zero-trip-maker (10.4%)	Trip-maker (89.6%)	Zero-trip-maker (29.0%)	Trip-maker (71.0%)	Zero-trip-maker (30.4%)	Trip-maker (69.6%)
Gender	Female	45.7	47.0	45.2	45.5	59.4	58.4	61.1	61.9
	Male	54.3	53.0	54.8	54.5	40.6	41.6	38.9	38.1
Age	15–20	6.4	4.5	1.0	1.8	9.4	6.5	4.2	10.0
	21–30	22.0	20.4	17.5	18.7	13.0	9.9	5.0	8.2
	31–50	41.1	43.4	36.6	45.5	13.9	18.9	12.2	17.9
	51–65	25.2	27.0	36.5	28.9	24.2	25.9	28.3	21.4
	66 or more	5.3	4.7	8.3	5.2	39.5	38.8	50.2	42.5
Educational attainment	Less than a high school diploma	4.4	3.3	9.3	6.2	14.3	9.6	23.0	17.3
	High school graduate or GED	23.8	17.6	29.6	27.8	33.9	28.8	38.8	31.3
	Some college or associates degree	33.9	29.6	25.7	24.6	31.3	30.2	21.1	23.6
	Bachelor's degree	21.4	27.3	22.8	25.5	12.1	17.3	11.4	17.8
	Graduate or professional degree	16.5	22.2	12.6	15.9	8.4	14.1	5.8	9.9
Race	White	73.8	75.8	80.1	80.1	70.9	71.8	80.4	81.5
	Black or African American	12.3	10.6	15.7	12.4	14.9	14.7	15.7	11.9
	Asian	6.0	5.4	2.1	5.5	5.3	5.1	2.8	4.5
	Some other race	7.0	7.3	0.9	1.3	7.7	7.8	0.6	1.4
Annual household income	< \$35K	23.4	19.0	25.8	18.5	45.5	40.6	55.8	38.3
	≥ \$35K, < \$50K	10.9	11.3	10.0	13.2	13.0	13.2	12.8	15.2
	≥ \$50K, < \$75K	18.4	17.7	21.5	19.9	15.4	16.4	15.1	17.8
	≥ \$75K	47.3	52.0	42.7	48.5	26.0	29.9	16.3	28.7
Household size	1 person	9.4	12.1	12.2	13.4	15.2	19.4	25.8	18.8
	2 person	29.0	30.5	42.1	33.7	34.7	40.2	44.7	41.9
	3 person	23.4	21.5	20.8	20.1	19.7	15.6	13.6	14.2
	4+ person	38.2	35.9	25.0	32.9	30.3	24.8	15.9	25.2
Household location	Urban area	80.3	83.0	81.2	86.9	77.2	80.0	78.0	83.0
	Non-urban area	19.7	17.0	18.8	13.1	22.8	20.0	22.0	17.0

2 *Sample is weighted

3. TIME USE AND TIME POVERTY

As noted in the introduction, a number of previous studies in the transportation domain have linked zero trip-making with a diminished quality of life due to isolation, social exclusion, and non-participation in society at large (Spinney et al., 2009; Stanley et al., 2011; Lucas, 2012). Thus, transportation researchers have attempted to draw a linkage between mobility (out-of-home activity participation) and well-being. At the same time, sociologists and economists have been linking well-being to time use to define *time poverty*, similar to the notion of income-based poverty. A number of studies have attempted to define time poverty based on the time spent on discretionary leisure activities and identify the groups that are vulnerable to experiencing time poverty. In general, the literature has documented that women, parents with children, workers, and employed single parents with children are time poor, presumably because of the many obligations that they must fulfill – leaving limited time available to pursue desirable discretionary activities (Harvey and Mukhopadhyay, 2007; Bernardo et al., 2015; Kalenkoski et al., 2010; Qi and Dong, 2017).

A threshold value of available time for discretionary activities is used to classify whether a person is time poor. This threshold value has been conceptualized and measured in different ways across studies due to the subjective nature of the concept; and hence it appears that the field has not necessarily settled on a single definition for time poverty (Williams et al., 2016). Some studies define time poverty based on a fixed amount of time that should be available for the pursuit of discretionary activities (regardless of whether they are actually pursued or not). Vickery (1977) proposed a time threshold of 10 hours per week while Harvey and Mukhopadhyay (2007) used a time threshold of two hours per day in defining time poverty. They posited that individuals must have at least this amount of time available for pursuing discretionary activities to be identified as not being time poor.

More recently, a number of studies have pegged time poverty to the median time available for discretionary activities (Burchardt, 2008; Spinney and Millward, 2010). Using the American Time Use Survey data set, Kalenkoski et al. (2011) defined the time poverty threshold at various levels – 50%, 60%, or 70% of median available discretionary time – and calculated time poverty rates for the US population and various subgroups of the population. Kalenkoski and Hamrick (2013) applied the “60% of the median available discretionary time” threshold to explore the relationship between time poverty, eating, and physical activity engagement. As there are a number of definitions that have been used to define time poverty, this study adopts the “60% of median” definition that has been used by Burchardt (2008) and Kalenkoski and Hamrick (2013). To define available discretionary time, Kalenkoski and Hamrick (2013) essentially subtracted the total necessary activity time and committed activity time from 1440 minutes. The median available discretionary time across the entire population was then multiplied by 0.6 to determine the threshold; those who had more discretionary time available were not time poor and vice versa. The activities were classified as follows:

- **Necessary activities**

- (1) Personal care (includes sleeping and grooming)

- **Committed activities**

- (1) Household activities (includes housework, food & drink preparation)
- (2) Caring for and helping household members, both children and adults
- (3) Work and work-related activities

- **Discretionary activities**

- (1) Caring for and helping non-household members

- (2) Education
- (3) Consumer purchases
- (4) Professional and personal care services (includes banking, paying for daycare, doctor's appointment, getting a haircut)
- (5) Household services (includes dropping off/picking up clothes from dry cleaner, hiring a plumber for home repair, waiting while car is repaired)
- (6) Government services and civic obligations (includes using social services, getting car inspected, serving on jury duty, voting)
- (7) Eating and drinking
- (8) Socializing, relaxing, and leisure (includes entertaining family and friends, watching television, computer use for leisure, attending performing arts event, gambling)
- (9) Sports, exercise, and recreation (includes participating in sports and attending a sporting event)
- (10) Religious and spiritual activities
- (11) Volunteer activities
- (12) Telephone calls

It is undoubtedly possible to quibble with the categorization of activities presented above. For example, the transportation literature often treats education (school) as a mandatory (committed activity) as opposed to a discretionary activity. Nevertheless, in the interest of being consistent with the literature and the work of Kalenkoski and Hamrick (2013), who essentially used the same ATUS data to study time poverty, this exact same classification has been adopted in this study.

In this study, the ATUS sample was extensively analyzed to determine the percent of individuals in various population subgroups that experience time poverty (based on the 60% of median definition). After computing the median of available discretionary time, the 60% value was determined to be *306 minutes* per day. Anybody having more time available for discretionary activities was considered not time poor. Table 3 shows the percent of individuals in each subgroup that is time poor (i.e., they had less than 306 minutes of available discretionary time). The results offer a compelling narrative of the prevalence of time poverty according to the definition postulated in the literature.

Considering the four segments (defined by employment status and day of week) it is found that 52.8 percent of workers are time poor on weekdays. This is not surprising as workers spend considerable amount of time at work. Once work time and other necessary time (sleep and personal care) is subtracted from the 1440 minute time budget of a day, not much time is left for discretionary activities. Thus workers have a high degree of time poverty. Does this mean that they have lower quality of life? It is not entirely clear if that is indeed true. Only 11.7 percent of non-workers are time poor on weekdays. The corresponding percentages for weekend days are 23.2 percent for workers and just 8.8 percent for non-workers (that also includes retirees). The extent of time poverty is lowest for 65+ year olds. Among workers, higher income individuals and individuals with higher level of education are more time poor than other groups, presumably because they spend more time working. Among non-workers, however, the most highly educated exhibit the lowest prevalence of time poverty. Non-workers do not have to spend long periods of time working, and those who are highly educated may be equipped to perform committed and necessary activities more efficiently, thus leaving more time available to discretionary activities. In general, females are more time poor than men, presumably because they shoulder the household

obligations to a greater degree. Those in the middle age groups are more likely to be time poor, presumably due to lifecycle stage effects. Individuals in larger household sizes show a greater prevalence of time poverty due to higher level of household obligations.

TABLE 3 Percent of Individuals Experiencing Time Poverty by Subgroup (N=9,560)

Person characteristics	Weekday Worker	Weekday Non-worker	Weekend Worker	Weekend Non-worker
Gender				
Female	54.3%	13.8%	24.4%	12.7%
Male	51.5%	8.4%	22.3%	8.6%
Age				
15-20 years	32.6%	11.2%	10.0%	11.8%
21-30 years	46.1%	28.1%	25.8%	14.7%
31-50 years	61.7%	28.7%	26.1%	15.8%
51-65 years	50.3%	7.6%	19.7%	7.6%
65+ years	25.0%	4.9%	14.8%	5.3%
Educational attainment				
Less than a high school diploma	47.8%	10.5%	24.3%	9.5%
High school graduate or GED	52.2%	12.2%	23.4%	10.2%
Some college or associate degree	49.2%	14.6%	25.0%	8.9%
Bachelor's degree	54.7%	11.9%	22.6%	5.9%
Graduate or professional degree	58.1%	5.6%	20.7%	6.3%
Race				
White	52.6%	10.5%	23.2%	8.9%
Black or African American	53.9%	17.4%	20.8%	7.3%
Asian	58.5%	12.7%	30.6%	11.3%
Some other race	43.4%	17.2%	22.0%	7.0%
Household income				
< \$35K	49.2%	11.7%	27.4%	11.3%
≥ \$35K, < \$50K	49.2%	14.3%	21.3%	5.2%
≥ \$50K, < \$75K	51.6%	7.5%	27.4%	6.9%
≥ \$75K	55.6%	12.6%	20.3%	7.6%
Household size				
1	46.9%	6.9%	21.2%	6.2%
2	47.4%	7.0%	19.3%	6.1%
3	52.2%	18.1%	24.8%	15.3%
4+	61.1%	20.7%	27.4%	12.1%
Household location				
Urban area	53.2%	12.2%	23.5%	8.5%
Non-urban area	52.4%	10.0%	22.1%	9.0%
Segment average (%)	52.8	11.7	23.2	8.8
Segment size	N= 2,282	N=1,532	N=3,462	N=2,284

*Sample is weighted

4. WELL-BEING, TIME POVERTY, AND ZERO TRIP-MAKING

While the notion of time poverty is quite appealing and intuitive, the connection to well-being is not yet well-established. The following is a direct quote from Krueger et al. (2009), reproduced here because it states, very eloquently, the challenges associated with using the time poverty concept for assessing well-being:

“ ... problems with this approach are that: (a) many people derive some pleasure from non-leisure activities; (b) not all leisure activities are equally enjoyable to the average person; (c) the nature of some activities changes over time; (d) people have heterogeneous emotional experiences during the same activities; and (e) emotional responses during activities are not unidimensional.”

In other words, not all activities are created equal and not all people assess the activities in the same way. Accounting for this heterogeneity in the time poverty approach is extremely difficult because everybody is measured against the same discretionary time availability threshold. It is therefore necessary to more intricately connect the notion of time poverty with the notion of subjective well-being. Subjective well-being (SWB) may be viewed as a composite representation of the emotional feelings of a person at any point in time or during an activity episode. Presumably, if the SWB of an individual stays positive for an extended period of time, then the person is experiencing a high quality of life.

The challenge with connecting time use to well-being is that data on measures of well-being is virtually never available in travel and time use survey data sets. An exception is the American Time Use Survey (ATUS), when a special well-being module was administered in 2010, 2012, and 2013 to a sample of those who participated in the time use survey. The well-being module asked respondents to rate their emotional feelings for three randomly identified activities from their time use diary. The six emotions included happiness, meaningfulness, sadness, painfulness, tiredness, and stress. On each of these emotions, the respondents rated the intensity of the emotion on a scale of 0 through 6, with a higher number indicating a greater level of emotional intensity.

In order to connect the zero trip-making, time poverty, and subjective well-being, a convenient measure or score of subjective well-being (SWB) is needed. In prior research (Khoeini et al., 2019), a subjective well-being score for each individual in the ATUS data set was computed through a five-step approach. Full details are available in Khoeini et al. (2019), and only an outline of the procedure is described here. The steps involved in computing a person-level daily well-being score are:

- 1) Conduct a factor analysis to develop two factors for each activity episode for which emotional ratings are available. The positive emotions of happiness and meaningfulness are loaded on a positive emotion factor, and the four negative emotions of sadness, painfulness, stress, and tiredness are loaded onto a negative emotion factor.
- 2) Apply the results of the factor analysis to each activity episode (for which emotional ratings are available) and append positive and negative emotion factor scores to the records. Take the difference (positive factor score – negative factor score) to compute a composite emotional score for each activity. This score is called the Activity Composite Well-being Score (ACWS).
- 3) Conduct a regression analysis of the activity well-being score (ACWS) as a function of socio-economic and demographic variables as well as attributes of the activity or travel episode itself (duration, timing, purpose, and accompaniment). Three distinct regression equations are estimated for three different types of activities (in-home activities, out-of-home activities, and travel).

- 4) Apply the regression equations to *all* of the activities in the entire ATUS data set of 2017 to compute an ACWS value for every activity and travel episode in the 2017 data set. The ACWS is appended to every activity and travel episode record.
- 5) Add the ACWS values corresponding to all activities and trips undertaken by an individual to compute a person-daily composite well-being score (PCWS). The person-daily composite well-being score is a measure of the accumulated emotions from the pursuit of activities and trips over the course of the day. The summation of individual activity well-being scores allows the computation of a single subjective well-being score for each person in the ATUS. A lower score signifies a poorer well-being and vice versa.

Following the computation of the PCWS for each individual in the ATUS, a tabulation that relates time poverty, subjective well-being, and zero trip-making was developed with a view to establish the connections between them. The tabulation was developed to see how different demographic groups compared with respect to their well-being scores and time poverty levels. The time poverty literature considers the concept as binary in nature – either an individual is time poor or not. In order to provide a greater degree of granularity in the analysis, the time poor individuals are further disaggregated in this study into quartiles. The time poor individuals were sorted with respect to their available discretionary time, and those who are close to the threshold of 306 minutes are less time poor on the scale of time poverty than those whose time availability for discretionary activities is far removed from the threshold value. Results of this exercise are presented in Table 4. It should be noted that the numeric value of the subjective well-being score does not have an interpretation per se. However, differences represent the extent to which individuals experience higher or lower SWB.

A number of interesting trends emerge when connecting time poverty to SWB. Note that the SWB score is based on what people have directly reported as their emotional feelings for different activity episodes. In other words, the SWB score reflects what people are feeling as they undertake activities and travel. What is immediately discernible is that there is a reasonably strong correspondence and alignment between SWB and time poverty. The degree of time poverty increases as one goes from left to right in the table. It is found that, with a few exceptions, the SWB score decreases (on average) as time poverty level increases. This trend is fairly consistent across the board for all demographic groups considered in this table. The table includes a number of demographic groups that are traditionally considered mobility disadvantaged and at risk of social exclusion (Delbosc and Currie, 2011) – besides the four segments defined by employment status and day of week. A few notable exceptions in the alignment between time poverty and average SWB score are worth exploring further.

1 **TABLE 4 Average Well-being Scores Across Selected Population Segments by Time Poverty Level (N=9,560)**

Segment	Avg SWB score	Trip making	Sample size	Row Average	Time poverty levels				
					Non-time poor	Low	Mid-low	Mid-high	High
Full sample	1.10	Trip maker	7,843	0.88	1.69	-0.37	-0.84	-1.09	-1.55
		Zero-trip maker	1,717	2.27	2.41	2.38	1.63	2.19	0.62
Weekday worker	-0.58	Trip maker	2,144	-0.66	-0.01	-0.83	-1.14	-1.26	-1.65
		Zero-trip maker	138	0.70	0.89	0.29	0.97	1.55	-0.78
Weekday non-worker	3.16	Trip maker	1,086	3.28	3.54	3.48	1.09	-0.34	0.70
		Zero-trip maker	446	2.84	2.84	3.03	1.80	4.18	2.17
Weekend worker	0.36	Trip maker	3,059	0.22	0.60	-0.30	-1.14	-0.92	-1.88
		Zero-trip maker	403	1.54	1.61	2.88	0.86	0.99	0.44
Weekend non-worker	3.32	Trip maker	1,554	3.63	3.82	0.90	2.10	1.38	-0.75
		Zero-trip maker	730	2.61	2.66	2.47	3.21	2.42	1.02
Low-income (< \$35K)	1.31	Trip maker	2,233	0.92	1.63	-0.19	-1.02	-1.31	-1.77
		Zero-trip maker	854	2.45	2.51	2.89	1.34	2.76	1.13
Disabled	1.02	Trip maker	314	0.74	0.76	1.50	1.02	2.26	-1.27
		Zero-trip maker	274	1.37	1.39	1.66	1.40	1.44	0.62
Non-metropolitan	1.45	Trip maker	1,098	1.15	2.02	0.04	-1.51	-0.79	-2.17
		Zero-trip maker	343	2.54	2.63	2.18	2.00	2.88	1.15
Age 75+	5.99	Trip maker	653	7.01	7.09	4.74	4.68	4.69	7.42
		Zero-trip maker	352	3.99	4.05	4.64	4.86	0.77	2.47
Female	1.00	Trip maker	4,198	1.87	2.71	0.59	0.19	-0.21	-0.87
		Zero-trip maker	1,012	2.65	2.70	2.51	2.22	3.21	1.65
Minority	0.56	Trip maker	1,578	0.26	0.92	-0.17	-0.58	-1.50	-1.61
		Zero-trip maker	414	1.87	2.00	1.44	2.43	1.26	0.30
Foreign born non-citizen	0.58	Trip maker	671	0.39	1.09	0.28	-0.32	-1.10	-1.18
		Zero-trip maker	89	2.29	2.09	3.81	3.66	3.15	0.92

2 *Sample is weighted

For example, consider the demographic group aged 75 years or above. The SWB score is found to be the highest for this group, presumably because they do not spend time working and spend more time engaged in discretionary enjoyable activities – whether inside the home or outside the home. In other words, their feelings of well-being have not diminished with age; in fact, they have been amplified, suggesting that they are not necessarily experiencing diminished quality of life in their older years. For trip-makers, it is found that the average SWB is higher than for non-travelers; and this is largely due to the fact that they are engaging in discretionary activities outside the home, and such activities engender the most positive emotional feelings among all activity types. Among trip-makers, the well-being score drops for the time poor groups, but then increases to the highest level for the most time poor subgroup. This is rather counter-intuitive. A deep dive into the data shows that these individuals are time poor because they are taking care of household members – both children and adults; according to the time poverty definition, these individuals are time poor. However, these individuals are engaging in care-taking and companionship activities that they find very meaningful and give them happiness. They are taking care of family members, enjoying time with children and grandchildren, going out to places with family members, and experiencing a high level of positive emotions through such activities. In other words, it is difficult to define emotional state of an individual based solely on their time use patterns.

Another key finding is that zero trip-makers are almost always experiencing a higher level of SWB than trip-makers. The notable exception is the 75+ year old group and the non-worker groups. As explained above, 75+ year old individuals who travel are engaging in discretionary and enjoyable activities outside the home; the travel is enhancing their well-being. However, it should be noted that the zero trip-makers are reporting a rather high (relative to all other groups) SWB score as well, suggesting that even those who stay at home are not necessarily suffering a diminished quality of life. Non-workers also gain SWB by traveling and engaging in activities out-of-home, largely because they are pursuing activities that engender positive emotions. All other groups depict higher SWB scores for zero trip-makers, implying that staying at home is not necessarily associated with a diminished quality of life.

5. DISCUSSION AND CONCLUSIONS

This paper attempts to bridge two streams of literature that address the role of activity engagement in influencing well-being and quality of life. In the transportation literature, an absence of travel and out-of-home activity engagement is often viewed as leading to a diminished quality of life due to the risk of social exclusion, isolation, and disengagement from society. Many mobility disadvantaged groups such as the elderly, disabled, low-income, carless, and minorities are viewed as potentially at risk of social exclusion and diminished quality of life due to lower access to mobility options. In the sociological and economic literature, the notion of time poverty has been used to assess well-being and quality of life. People who do not have available discretionary activity time that exceeds a certain threshold are viewed as experiencing time poverty – and hence a diminished quality of life.

Due to an absence of data, notions of well-being and time poverty have not been adequately related to one another. In addition, the role of mobility in influencing well-being for different demographic groups has not been studied in detail. This paper utilizes data from the American Time Use Survey (ATUS) to assess the extent to which well-being and time poverty are correlated with one another. It is found that time poverty (availability of discretionary activity time) and subjective well-being align with each other quite well, with those experiencing high degrees of time poverty also experiencing a lower SWB. A couple of exceptions to this pattern are

discernible, such as the case of 75+ year old individuals. Activities that are considered as contributing to time poverty are actually activities that 75+ year olds rate very positively. Thus, for some, the definition of time poverty established in the literature does not correspond well with subjective well-being.

The analysis revealed that mobility does not appear to be a key factor in contributing to higher levels of well-being. The paper includes a detailed analysis of the level of zero trip-making among various demographic groups and finds that non-workers generally exhibit much higher levels of zero trip-making than workers. However, non-workers report higher levels of well-being than workers, presumably because work episodes do not engender positive emotional feelings. For virtually all demographic groups (including those traditionally considered mobility disadvantaged), it is found that zero trip-makers have a higher subjective well-being score than trip-makers. Zero trip-makers engage in discretionary and desirable activities at home and experience positive emotions from their activity and time use patterns.

This study shows that well-being and quality of life cannot be viewed in terms of mobility alone. It should be viewed in terms of time spent pursuing activities that engender positive emotions. Transportation improvements and land use policies that save time for, and increase access to, discretionary activity opportunities would increase well-being by making it possible for people to pursue leisure activities more easily. However, because there is heterogeneity in how people associate emotional feelings with different types of activities, there is a need for a model of well-being that computes well-being metrics as a function of activity and travel attributes, attitudes and lifestyle preferences, and socio-demographic characteristics. Such a model would help transportation planners accurately assess the well-being implications of their actions.

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The authors confirm contribution to the paper as follows: study conception and design: I. Batur, T. Kim, S. Khoeini, R. M. Pendyala; C.R. Bhat; data collection: I. Batur, T. Kim, S. Khoeini, R. M. Pendyala; C.R. Bhat; analysis and interpretation of results: I. Batur, T. Kim, S. Khoeini, R. M. Pendyala; C.R. Bhat; draft manuscript preparation: I. Batur, T. Kim, S. Khoeini, R. M. Pendyala; C.R. Bhat. All authors reviewed the results and approved the final version of the manuscript.

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