

Rural-Urban Variations in Travel Burdens for Care: Findings from the 2017 National Household Travel Survey

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Purpose

Burdensome travel arrangements for medical or dental care have been identified as barriers to healthcare access, particularly in rural areas. Higher travel burden has been associated with delayed or foregone medical care and missed appointments, which leads to reduced preventive care, greater disease burden, poorer treatment outcomes, and reduced quality of life. A previous study using the 2001 National Household Travel Survey (NHTS) found that rural residents traveled farther and spent more time in travel for medical and dental care. Given that the previous study is 20 years old, this study uses the more recent 2017 NHTS to achieve the following objectives:

- i) provide recent national estimates of the distance traveled and time spent on one-way trips for medical and dental care among rural and urban dwellers,
- ii) examine how the travel behaviors of rural residents vary by socio-demographic and geographic characteristics, and
- iii) evaluate factors associated with a high travel burden for medical and dental care among rural residents.

Background

It is well documented that many rural Americans encounter significant challenges in accessing healthcare services. Among recognized challenges is the burden of travel for medical and dental care, which has been highlighted as a contributing factor to disparities in the equitable distribution of healthcare providers and provision of healthcare for rural Americans.¹⁻³ Prior research

Key Findings

- ◆ About 5.5 billion (1.8%) of all trips in the United States in 2017 were for medical or dental care.
- ◆ On average, U.S. residents traveled 9.9 miles one-way for medical/dental care in 2017. Rural residents traveled more than twice the distance for care than urban residents (urban, 8.10 miles; rural, 17.8 miles, $p < 0.0001$).
- ◆ On average, U.S. residents spent 27.1 minutes in transit or travel for medical/dental care in 2017. Rural residents spent more time in travel for care than urban residents (urban, 25.5 minutes; rural, 34.2 minutes, $p < 0.0001$).
- ◆ When urban-rural comparisons were made within each racial/ethnic category, the differences in distance traveled and trip time for medical/dental care was highest among Blacks and Hispanics. On average, Hispanics in rural areas traveled more than three times the distance for care compared to Hispanics in urban areas (urban, 8.9 miles; rural, 28.3 miles, $p < 0.0001$). Additionally, Hispanics in rural areas traveled 17 more minutes for medical/dental care compared to Hispanics in urban areas (urban, 27.6; rural, 44.6 minutes, $p = 0.002$).
- ◆ Rural trips made between midnight and 6:59 a.m. were 22 miles farther and 24 minutes longer than urban night trips.
- ◆ Rural residents in the West covered the most mileage during travel for care (22.7 miles), followed by rural residents in the Midwest (18.4 miles) and South census regions (17.5 miles). As with miles traveled, the urban-rural difference observed in travel time was greatest in the West (urban, 25.8 minutes; rural, 41.7 minutes, $p = 0.006$), followed by the South (urban, 25.8 minutes; rural, 35.4 minutes, $p < 0.0001$), and the Midwest (urban, 23.5 minutes; rural, 31.5 minutes, $p = 0.006$).
- ◆ In multivariable analysis, among rural residents, higher travel burden (trips longer than 30 minutes) was associated with older age, male gender, low income, night travel, and living in the Midwest census region.
- ◆ A higher proportion of rural than urban residents identified the price of gasoline and the financial burden of travel as barriers to travel. More than half (55.8%) of rural residents agreed or strongly agreed that the price of gasoline affects their travel, while 45 percent of urban residents gave a similar response.

has shown that compared to their urban counterparts, rural residents depend more on personal automobiles for travel, have little access to public transportation, and have limited transit options.⁴ As economic opportunities and community resources diminish in rural areas, rural residents must travel farther distances and spend more time to meet everyday needs such as healthcare, food, and work.^{1,5} The greater travel burden for medical care is further heightened by the shortage of primary and specialty care in rural areas.⁶⁻⁸

Data from several studies have established that increased travel burden negatively impacts health. Higher travel burden has been associated with reduced access to preventive care, greater disease burden, exacerbation of pre-existing chronic conditions, later-stage diagnoses of cancers, poorer treatment outcomes, and reduced quality of life.^{4,9,10} This association is particularly pronounced among subpopulations such as the rural elderly, those with low English proficiency, racial/ethnic minorities and rural residents with low income.^{3,5} In addition, rural residents without access to a personal vehicle, or access to reliable transit options, are more likely to miss medical appointments or delay medical treatment.³

Previous analysis of the 2001 NHTS showed that compared to urban residents, rural residents traveled farther for medical and dental care (17.5 miles versus 8.3 miles), and spent more time during such trips (27.2 minutes versus 20.7 minutes). Even after controlling for socio-economic status and mode of travel, rural residents were more likely to travel farther than 30 miles or longer than 30 minutes for medical and dental care compared to urban residents.¹ Another analysis of the 2009 NHTS showed that in adapting to medical conditions that limited travel, rural residents were less likely to limit their travel to daytime hours or use specialized transportation means.¹¹ Rural residents were also more likely to identify the financial burden or cost of travel as the most pertinent barrier to travel.¹¹ Given the datedness of the data used in these previous studies and the renewed focus on modernizing transportation in recent times¹², a more contemporary national estimate of the travel trends among rural residents is needed.

Methods

Sample Selection and Survey Administration

The 2017 NHTS is administered by the Federal Highway Administration (FHWA). The NHTS is a stratified random sample of U.S. households and is an established source of information on the travel behavior of U.S. residents in all 50 states and the District of Columbia. The first NHTS survey was administered in 1969, and subsequent surveys were conducted in 1977, 1983, 1990, 1995, 2001, 2009, and 2017, respectively. The NHTS is used by federal, state, and regional agencies to monitor the adequacy of current facilities for long-term transportation planning, and for responding to queries from Congress. The survey covers all forms of travel including private, public, pedestrian and cycling, as well as all trip purposes including work, school, medical/dental care, recreation, and personal/family trips. The NHTS collects travel data at the household, personal, trip and vehicle levels, and provides insight into economic, demographic, geographic and other factors that influence travel behavior.¹³

The 2017 NHTS, which was the most recently available data at the time of publication, was conducted between April 2016 and May 2017. The 2017 NHTS data came from 264,234 individuals aged five and up in 129,112 households. The survey included national and supplemental samples collected by partner states and regional planning agencies. The initial recruitment survey involved address-based sampling with an option to return the survey primarily by mail. Each participating household was asked to record in a 24-hour travel diary all travel by household members on a previously assigned day of the week. The weighted response rate was 33.4 percent, with large variations observed in some study areas giving a range of 24.4 to 42.4 percent. Because we were primarily interested in trips made for medical or dental purposes, we analyzed the data at the trip level.

Measures

Dependent variables

The major outcomes of this study were the one-way distance traveled for medical/dental care and the time spent during such travels. The distance traveled for care was measured as the shortest network path distance in miles generated by Google Maps for each reported trip. Time spent in travel was measured in minutes. There were no distinctions made between trips for medical or dental purposes in the survey. Hence, for this study, trips are identified as ‘medical/dental’. To provide context, we compared the distance and time spent in travel for medical/dental care with that of travel for work. To assess the travel burden for medical/dental care, we characterized trips of more than 30 miles or minutes as indicators of a high travel burden, as is consistent with prior research.¹ Lastly, we examined the responses to the survey items on barriers to travel for medical/dental care – “price of gasoline affects travel”, and “travel is a financial burden.” Responses to the items were graded on a 5-point Likert scale, with responses ranging from 1 (strongly agree) to 5 (strongly disagree).

Independent variables

The main independent variable was the rural/urban classification of the respondent’s home location - a measure developed by Claritas Inc.¹⁴ This measure of urbanicity classified households into urban, suburban, second city, and town & rural segments based on a population density grid and nearness to urban segments. The grids were then ranked and divided into centiles, with zero representing the least dense areas, and 100, the densest areas. The four urbanicity categories are briefly described. The urban segments represent areas with population density scores between 75 and 99. These include downtowns of major cities and are the population centers of their communities. Suburban segments refer to areas with density scores between 40 and 90. These segments are considered to be a continuum of the urban segments or second cities, but with lower population densities compared to the major population centers. Second city segments refer to areas with population densities between 40 and 90. Second

cities differ from suburban segments in that they are the population centers of the surrounding communities and are located within larger towns and smaller cities. Town & rural segments are areas with population density scores between 0 and 40. These include segments that are small towns and villages and areas outside of suburban areas.¹⁴ For this study, urban, suburban and second city segments were classified as urban, while those in town & rural segments were classified as rural.

The second major variable of interest was self-reported race and ethnicity. This was originally classified as White, Black/African American, Asian, American Indian or Alaska Native, Native Hawaiian and Pacific Islander, and multiple race categories. Due to limited numbers for certain groups, race/ethnicity was reclassified as White, Black/African American, Hispanic and ‘Other’.

Other covariates

In addition to urbanicity and race/ethnicity, we accounted for traveler characteristics such as age, gender, education, household income, whether the respondent had a medical condition that limited day-to-day travel (yes/no), and the length of time that the respondent had such conditions. Age was coded as 5-17, 18-34, 35-49, 50-64, and 65 and older. Gender was coded as male/female, education was categorized as high school or lower, some college/college graduate, and graduate (which includes professional degrees). Household income was coded as less than \$25,000, \$25,000-\$49,999, \$50,000-\$74,999, \$75,000-\$99,999, \$100,000 or more, and missing. We also included trip characteristics such as the specific mode of transportation, the travel day of the week (weekday/weekend), the trip start time, whether the traveler was the driver or the passenger during the trip, and the amount of time spent at the destination. Mode of transportation was categorized as personal vehicle, public transportation, taxi/Uber/Lyft, and other (which includes rental vehicle). Trip start time was coded as midnight to 6:59 a.m., 7:00 a.m. to 4:59 p.m., and 5:00 p.m. to 11:59 p.m. In addition, we included the census region where the respondent resided (Northeast, Midwest, South, and West census regions).

Statistical analysis

We used the weights provided in the data to obtain national estimates. For descriptive analysis, we calculated the average one-way distance and time spent in travel for medical/dental care for the entire sample, and by urban-rural classification. Two-sample t-tests were used to determine whether the urban-rural differences in travel time and distance were statistically significant. For analysis of the barriers to travel, we collapsed survey responses to the 5-point Likert scale into three categories: 1 (strongly agree/agree), 2 (neither agree nor disagree) and 3 (disagree/strongly disagree). We then conducted chi-square tests to examine the urban-rural differences in the responses to the identified barriers. Next, we ran separate multivariable logistic regressions to identify the factors associated with a high travel burden for medical/dental care in urban and rural households, i.e. separate regressions to identify predictors of traveling 30 miles or more for medical/dental care and predictors of traveling for 30 minutes or more for medical/ dental care. All analyses were conducted in Stata 16 (StataCorp, College Station, TX).

Results

Overall distribution of trips for medical/dental care in the U.S.

There were approximately 371,144,402,988 trips made in the U.S. in 2017 in both rural and urban areas. About 5.5 billion (1.8%) of these trips were for medical/dental care. More than half (56.9%) of the trips for medical/dental care were made by those aged 50 years and older, and about 61 percent were made by females. About 18 percent of all trips for medical/dental care were made by persons whose medical condition resulted in reduced day-to-day travel. A majority of the trips was made with personal vehicles (86.5%), while about 8 percent of the trips were made using public transportation. Among those who used personal vehicles, 59.4 percent were the drivers, while 27.1 percent were passengers. Twenty-three percent of Blacks used public transportation to get to medical/dental care, followed by 11.8 percent of Hispanics, 8 percent of individuals from 'Other' race, and 3 percent of Whites. Just 1.3 percent of the trips were made using ridesharing

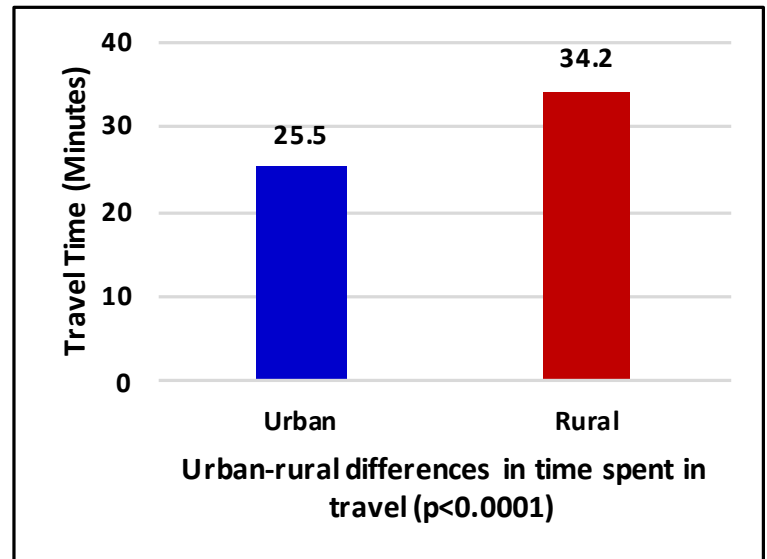
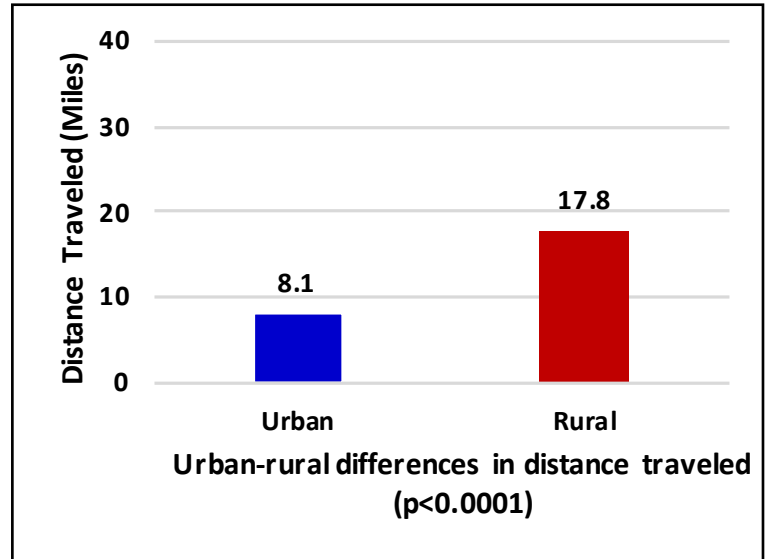
services such as Uber or Lyft or with taxis. Most of the trips were made during the weekdays (92.5%) and during works hours, between 7:00 a.m. and 4:59 p.m. (91.2%). Almost four out of every 10 trips were made in the South (38%), while 22 percent of the trips were made in the West and 21 percent in the Midwest census region. This distribution of trips by census region is reflective of the U.S. population; in 2017, 38 percent of the U.S. population lived in the South, 23.8 percent in the West, 21 percent in the Midwest, and 17.2 percent in the Northeast.¹⁵

Distance and time spent in travel for medical/dental care by rural/urban residence

Table 1 (see page 14) describes the urban-rural differences in the miles traveled and the number of minutes traveled for medical/dental care by traveler characteristics. On average, U.S. residents traveled 9.94 miles for medical/dental care in 2017. Rural residents traveled more than twice the distance for care than urban residents (urban, 8.10 miles; rural, 17.80 miles, $p < 0.0001$). Stated alternatively, the average rural resident covered 120 percent more mileage per trip for medical/dental care compared to an urban resident (**Figure 1**).

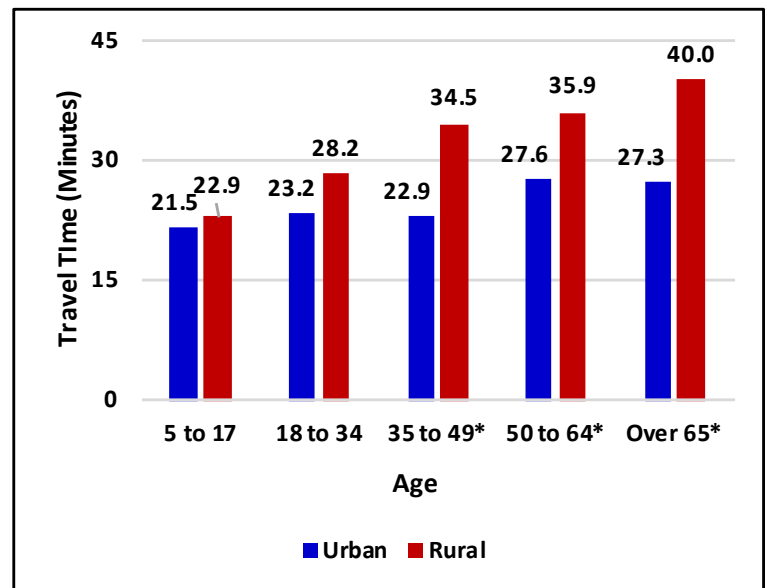
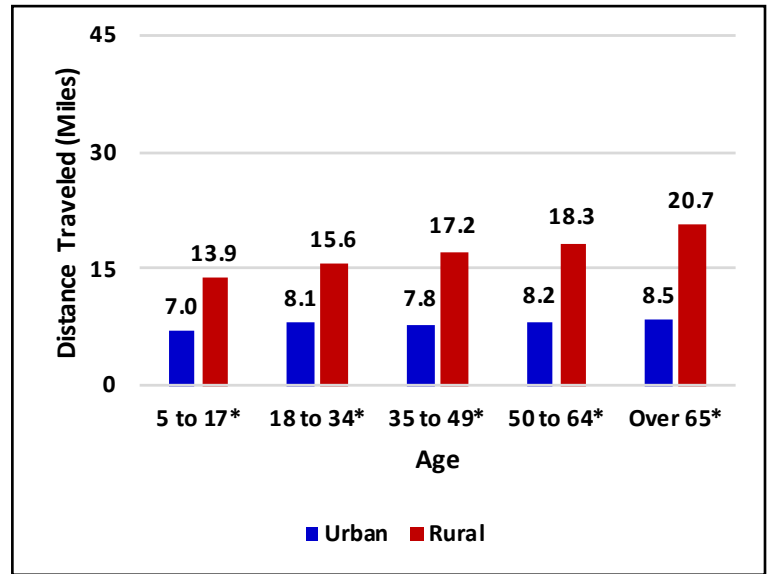
On average, U.S. residents spent 27.10 minutes in travel for medical/dental care in 2017. Rural residents spent more time in travel for care than urban residents (urban, 25.50 minutes; rural, 34.20 minutes) (**Figure 1**). This difference was statistically significant ($p < 0.0001$) (**Table 1**). As with the distance traveled for care, significant urban-rural differences in time spent during travel for medical/dental care were observed across age, race-ethnicity, gender, educational and household income categories. For example, males in rural areas traveled 10.78 miles more for medical/dental care compared to males in urban areas (urban, 8.86 miles; rural, 19.64 miles, $p < 0.0001$). The urban-rural difference in time spent traveling for care was 8 minutes for men (urban, 26.71 minutes; rural, 34.80 minutes, $p = 0.002$) and 9 minutes for women (urban, 24.72 minutes; rural, 33.75 minutes, $p < 0.0001$).

Figure 1: Distance and time spent in travel for medical/dental care



Regarding age, the distance traveled for care increased with age among both urban and rural residents, and the urban-rural differences in distances traveled for care were statistically significant across the age categories (**Figure 2**). Further, the rural-urban difference in the absolute values of the miles traveled for care was highest among residents aged 50 to 64 (urban, 8.14 miles; rural, 19.05 miles, difference=10.91 miles) and those who were 65 and older (urban, 8.61 miles; rural, 20.44 miles, difference=11.83 miles). The time spent in travel for medical/dental care also increased with age among urban and rural residents (**Figure 2**). However, rural residents aged 35 and older spent significantly more time in travel for care compared to their urban counterparts (**Table 1**).

Figure 2: Distance and time spent in travel for medical/dental care by age and urban-rural residence

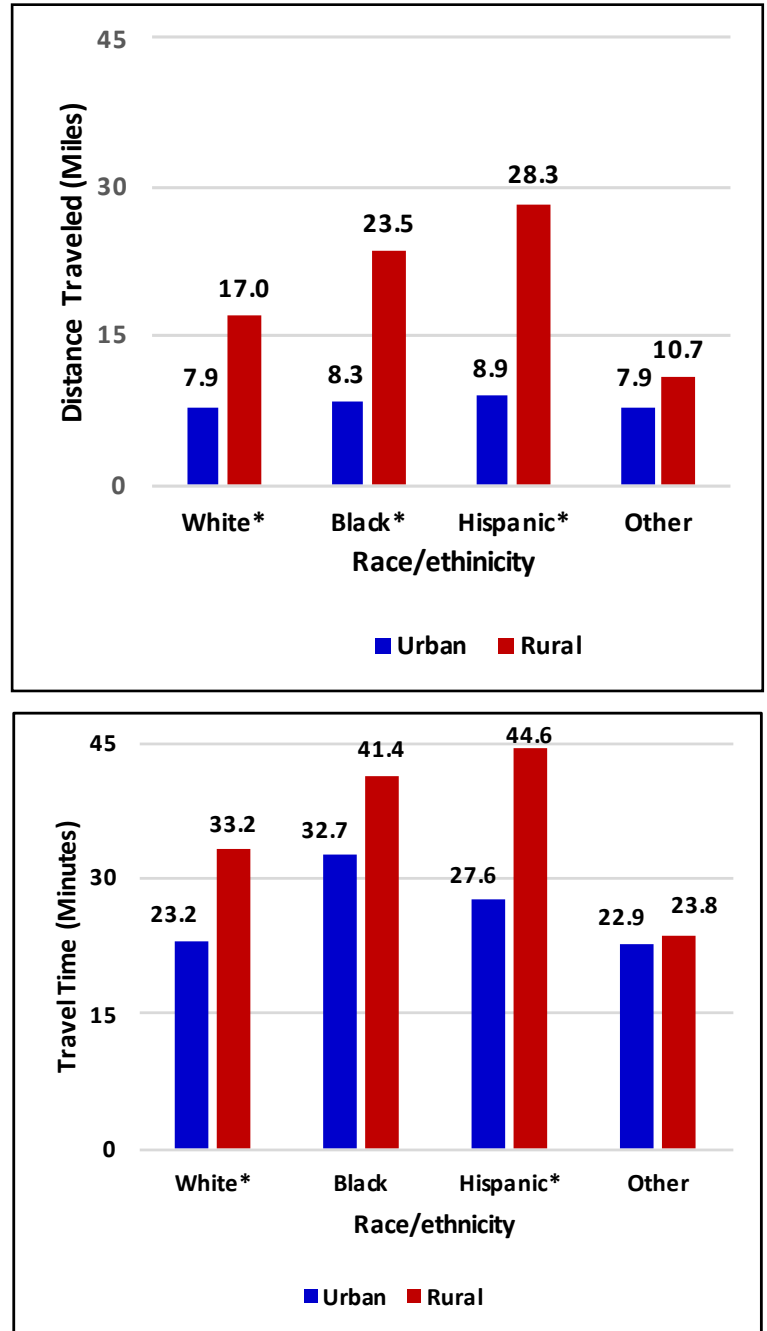


Note: * indicates statistically significant urban-rural differences

Across race/ethnicity, Blacks and Hispanics traveled farther for care in urban and rural areas compared to Whites. Furthermore, when urban-rural comparisons were made within each racial/ethnic category, the differences in distance traveled for medical/dental care was most marked among Blacks and Hispanics. On average, Blacks in urban areas traveled 8.29 miles for medical/dental care, while those in rural areas traveled 23.54 miles ($p=0.002$). Hispanics in rural areas traveled more than three times the distance for care compared to Hispanics in urban areas (urban, 8.92 miles; rural, 28.29 miles, $p<0.0001$).

With respect to time, rural residents traveled farther than their urban counterparts across the four racial/ethnic categories. However, the urban-rural difference was highest among Hispanics. On average, Hispanics in rural areas traveled 17 more minutes for medical/dental care compared to Hispanics in urban areas (urban, 27.56 minutes; rural, 44.62 minutes, $p=0.002$). Compared to Whites in urban areas, Whites in rural areas spent an additional 10 minutes in travel for care (urban, 23.16 minutes; rural, 33.23 minutes, $p<0.0001$). Rural Black/African American residents traveled 8.70 more minutes for care compared to Blacks in urban areas, though this difference was not statistically significant (urban, 32.71 minutes; rural, 41.38 minutes, $p=0.333$).

Figure 3: Distance and time spent in travel for medical/dental care by race/ethnicity and urban-rural residence



Note: * indicates statistically significant urban-rural differences

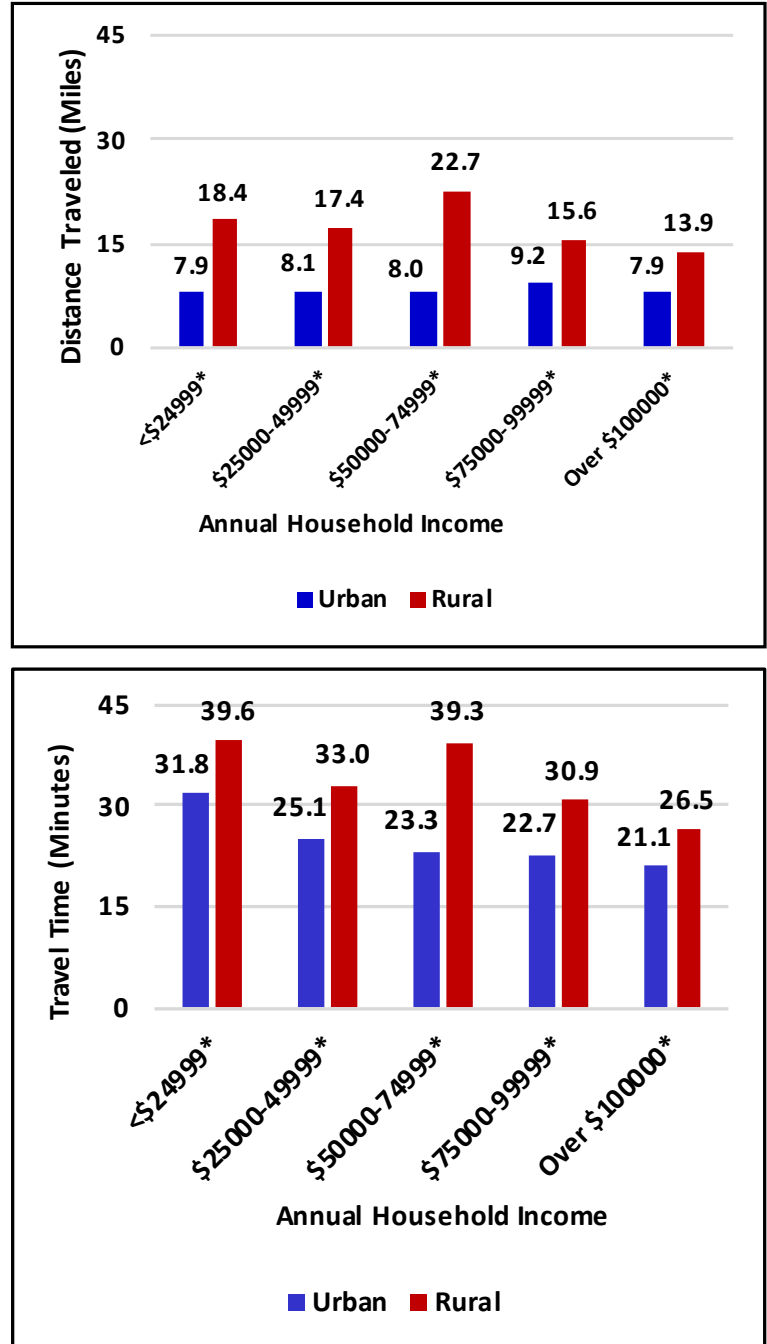
Pertaining to education, the urban-rural difference in miles traveled was highest among those with a high school education or lower. On average, rural residents with a high school education or lower traveled 10.73 more minutes for medical/dental care compared to similar residents in urban areas (urban, 7.17 miles; rural, 17.90 miles, $p < 0.0001$). Similarly, rural residents with a high school degree or lower spent the highest amount of time in travel, and this difference was significantly different from that of urban residents with a similar level of education (urban, 27.72 minutes; rural, 36.00 minutes, $p = 0.004$).

With respect to income, significant urban-rural differences in travel distance were observed across all income categories (Figure 4). Rural residents with annual incomes under \$75,000 traveled farther for medical/dental care compared to their wealthier rural counterparts. However, this pattern was not observed among urban residents. Rural residents with incomes under \$25,000 traveled 18.40 miles, those with incomes between \$25,000 and \$49,999 traveled 17.36 miles, and those with incomes between \$50,000 and \$75,000 miles traveled 22.70 miles for medical/dental care.

Regarding travel time, poorer residents in both urban and rural areas significantly spent more time traveling for care compared to their wealthier counterparts. Rural residents who earned less than \$25,000 annually spent the highest amount of time traveling for care, and this difference was significantly different compared to urban residents with a similar income (urban, 31.76 minutes; rural, 39.62 minutes, $p = 0.004$). Rural and urban residents with incomes over \$100,000 spent the least amount of time traveling for care (urban, 21.08 minutes; rural, 26.50 minutes, $p = 0.001$).

Rural residents who reported having a medical condition that results in limited day-to-day travel covered 138 percent more mileage for medical/dental care compared to urban residents with similar limitations (urban, 7.40 miles; rural, 17.61 miles, $p < 0.0001$). Urban-rural differences in travel time among this group were not statistically significant.

Figure 4: Distance and time spent in travel for medical/dental care by household income and urban-rural residence



Note: * indicates statistically significant urban-rural differences

Pertaining to trip characteristics found in **Table 2** (see page 16), rural residents differed significantly from urban residents with respect to transportation mode, travel day of the week, trip start time, and driver/passenger status during the trip. Rural residents traveling for medical/dental care in their personal vehicles journeyed 17.92 miles on their one-way trips, while urban residents traveled 8.56 miles ($p<0.0001$). Likewise, rural residents who commuted with their personal vehicles spent 11 more minutes for travel than urban residents who used personal vehicles (urban, 22.82 minutes; rural, 33.94 minutes, $p<0.0001$). However, though not statistically significant, rural residents using public transportation spent a shorter time in their travel compared to urban residents (urban, 53.37 minutes; rural, 30.67 minutes, $p=0.072$). The same pattern was observed among those who used taxi or ridesharing services to travel (urban, 30.47 minutes; rural, 23.89 minutes, $p=0.277$).

Rural residents traveled 18.12 miles for medical/dental care during the weekdays, while urban residents traveled 8.04 miles on similar days ($p<0.0001$). In both urban and rural areas, those who traveled for care between midnight and 6:59 a.m. covered more mileage compared to those who traveled during work hours and in the evening. Still, rural residents who traveled for care between 12:00 a.m. and 6:59 a.m. traveled 38.06 miles while those in urban areas traveling in the same time frame traveled 15.63 miles ($p<0.020$). Regarding time spent in travel, rural residents who traveled for care between midnight and 6:59 a.m. spent 24 additional minutes in travel than urban residents who traveled at night (urban, 42.56 minutes; rural, 66.98 minutes, $p=0.027$), while rural residents who traveled during the day spent an average of 8 more minutes (urban, 25.0 minutes; rural, 33.16 minutes, $p<0.0001$).

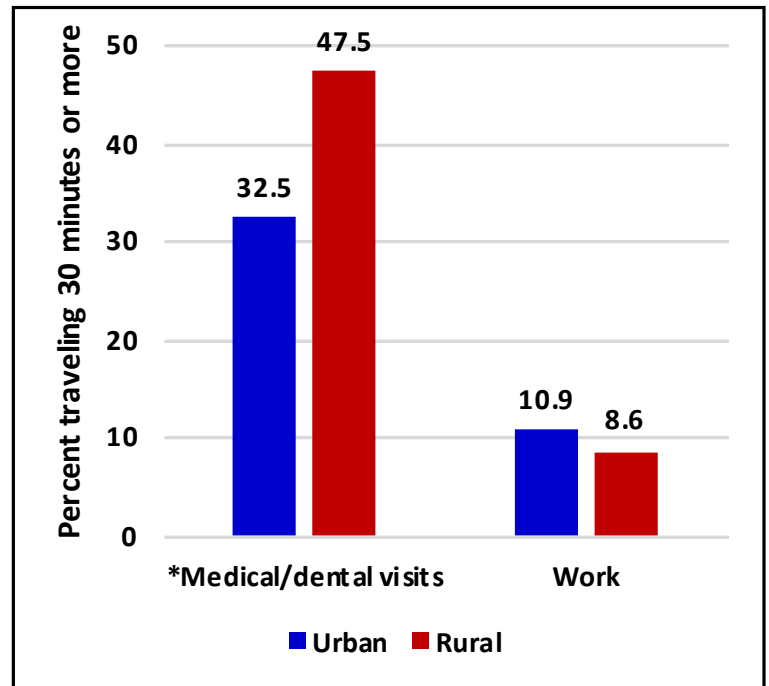
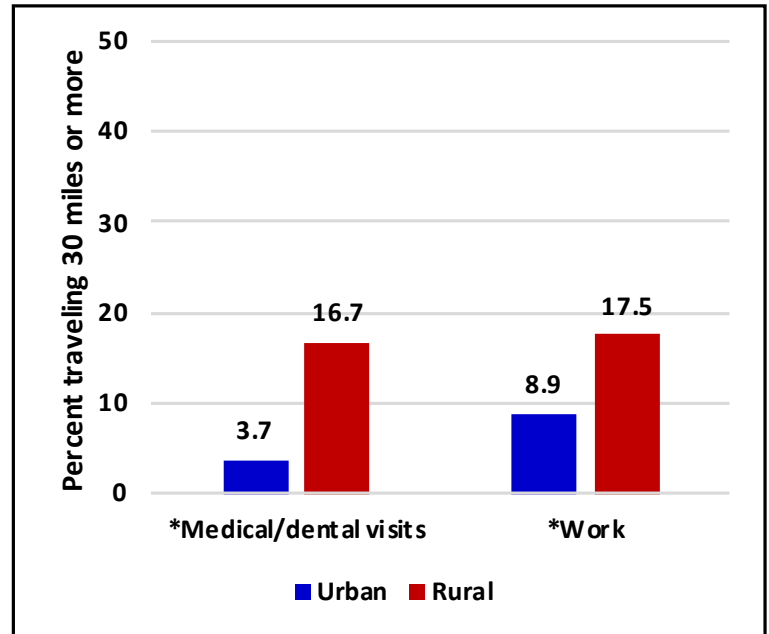
There were no significant urban-rural differences in the time spent waiting for public transit (urban, 11.14 minutes; rural, 10.98 minutes, $p=0.958$), and the amount of time spent at the destination for care (urban, 85.75 minutes; rural, 79.40 minutes, $p=0.122$).

Significant urban-rural differences in travel distance were observed across all four census regions. Rural residents in the West covered the most mileage during travel for care (urban, 8.83 miles; rural, 22.66 miles $p<0.0001$). This was followed by rural residents in the Midwest (urban, 7.23 miles; rural, 18.37 miles $p<0.0001$) and South census regions (urban, 9.15 miles; rural, 17.52 miles $p<0.0001$). With the exception of the Northeast, rural residents across the census regions spent significantly more time traveling for care compared to urban residents. As with miles traveled, the urban-rural difference seen in travel time was greatest in the West (urban, 25.76 minutes; rural, 41.66 minutes, $p=0.006$), followed by the South (urban, 25.75 minutes; rural, 35.41 minutes, $p=0.004$), and the Midwest (urban, 23.48 minutes; rural, 31.52 minutes, $p=0.006$).

Comparing travel for medical/dental care with travel for work by rural/urban residence

In Table 3 (see page 17), we compared the distance and time spent in travel for medical/dental care versus traveling for work by race/ethnicity among rural and urban residents. Overall, urban residents traveled significantly farther for work than for medical/dental care (medical/dental care travel=8.10 miles, work travel=11.82 miles, $p=0.035$). On the other hand, rural residents traveled similar distances for medical/dental care and for work (medical/dental care travel=17.80 miles, work travel=18.13 miles, $p=0.265$). No statistical differences were observed when time spent in travel for medical/dental care was compared to time spent in travel for work by race/ethnicity among urban and rural residents. Figure 5 describes the percentage of urban and rural residents who traveled for more than 30 miles or 30 minutes for medical/dental care and for work. Only 3.8 percent of urban residents traveled 30 miles or more for medical/dental care, while 8.9 percent spent similar times in travel for work. As was observed earlier, a similar proportion of rural residents reported traveling 30 miles or more for work (17.5%) and care (16.7%).

Figure 5: Percentage of urban and rural residents who traveled more than 30 miles or 30 minutes for medical/dental care and for work



Note: * indicates statistically significant urban-rural differences

Barriers to travel

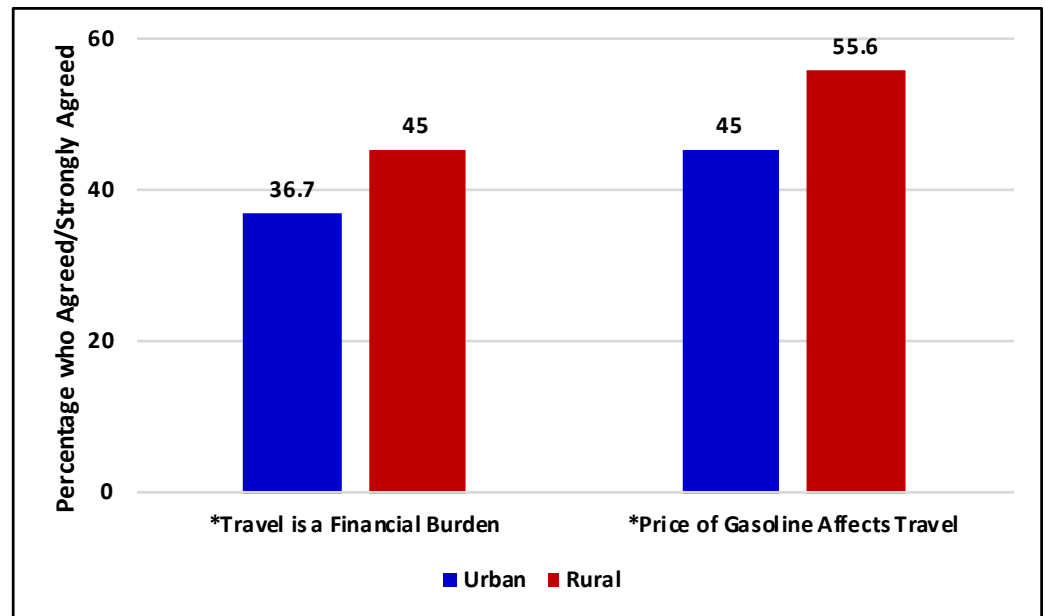
A higher proportion of rural than urban residents identified price of gasoline and the financial burden of travel as barriers to travel (Figure 6). More than half (55.8%) of rural residents agreed or strongly agreed that the price of gasoline affects their travel, while 45 percent of urban residents gave a similar response ($p < 0.001$). Approximately one-third of urban residents (32.9%) disagreed or strongly disagreed that the price of gasoline affects their travel compared to 23.76 percent of rural residents ($p < 0.001$).

The proportion of those who agreed or strongly agreed that travel was a financial burden differed significantly by race/ethnicity. Sixty-eight percent of Blacks agreed or strongly agreed that travel was a financial burden compared to 53 percent of Hispanics and 49 percent of Whites ($p = 0.0212$). However, similar proportions of Whites (58.9%), and Blacks (60.6%), and majority of Hispanics (78.3%) agreed/or disagreed that price of gasoline affects their travel ($p = 0.249$).

Factors associated with a high travel burden of 30 miles or more among rural residents

Separate multivariable logistic regressions were conducted to identify the factors associated with travel of 30 miles or more among urban and rural residents, adjusting for personal and trip-level characteristics (Table 4). Variables with significant categories are reported. For rural Hispanic residents, the odds of traveling 30 miles or more for medical/dental care were almost three times higher compared to rural White residents (OR=2.91, 95% C.I.= 1.24,6.84). Rural residents with household incomes between \$50,000 and \$74,999 were more likely to travel more than 30 miles for care compared to rural residents who earned above \$100,000 (OR=3.51, 95% C.I.= 1.37,8.95). Rural residents in the Midwest census region

Figure 6: Reported barriers to travel by urban-rural residence



Note: * indicates statistically significant urban-rural differences

were more likely to travel 30 miles or more for care compared to rural residents in the Northeast (OR=2.60, 95% C.I.= 1.17,5.93).

Factors associated with a high travel burden of 30 minutes or more among rural residents

Table 4 also shows the factors associated with spending more than 30 minutes traveling for care among rural and urban residents. Rural residents aged 50 to 64 (OR=1.36, 95% C.I.= 1.01,1.82) and over 65 years of age (OR=1.38, 95% C.I.= 1.03,1.83) were more likely to spend over 30 minutes traveling for medical/dental care compared to rural residents aged 18 to 34. Males in rural areas were also significantly more likely to spend more than 30 minutes in travel for care compared to rural female residents (OR=1.25, 95% C.I.= 1.09,1.43). Rural residents whose annual income was less than \$25,000 were more likely to travel more than 30 minutes for care compared to rural residents with incomes greater than \$100,000 (OR=1.48, 95% C.I.= 1.18,1.87). Rural residents who traveled for care between midnight and 6.59 a.m. (OR=6.71, 95% C.I.= 3.58,12.56) and during work hours (OR=1.75, 95% C.I.= 1.09,2.81) were more likely to spend 30 minutes or more during their travel compared to rural residents who traveled for care during evening hours.

Discussion

The purpose of this study was to use a nationally representative sample to quantify the distance and time spent on trips for medical/dental care, to examine how the travel behaviors of rural residents vary by socio-demographic and geographic characteristics, and to evaluate factors associated with a high travel burden for medical/dental care among rural residents. Several findings emerged from our study. First, rural residents covered more than twice the distance for care compared to urban residents (urban, 8.10 miles; rural, 17.80 miles). This is similar to the findings of the 2001 NHTS analysis which showed that the average urban trip was 8.3 miles, while rural trips averaged 17.5 miles.¹⁶ Likewise, rural trips for medical/dental care took almost nine minutes longer than urban trips (urban, 25.5 minutes; rural, 34.2 minutes). In the analysis of the 2001 NHTS, the average time spent was 20.7 minutes for urban trips and 27.2 minutes for rural trips.¹⁶ These findings show that between 2001 and 2017, not much changed in terms of the discrepancies in the average distance traveled for medical/dental care between rural and urban residents in the U.S. Notably, in 2017, medical/dental trips took longer time compared to 2001.

When examining travel patterns, unadjusted analysis showed that trip distance and time increased with age, and that rural Blacks and Hispanics, and those with incomes under \$75,000 were more likely to travel longer and further for care compared to rural Whites, and wealthier rural dwellers. Rural residents with a medical condition that limited travel also had to travel greater distances for care compared to their urban counterparts. Rural trips using personal vehicles took longer than rural trips using public transportation, taxis, and Uber or Lyft, and rural trips made between midnight and 6:59 a.m. were 22 miles further and 24 minutes longer than urban night trips. It is unclear whether trips made at night were emergency or planned visits. However, the large rural-urban disparity suggests that rural residents who sought care during the night were encumbered with a higher travel burden compared to their urban counterparts. This disparity may also reflect the lower availability of after-hours providers in rural areas.

Not surprisingly, a higher percentage of rural trips (16.7%) for medical/dental care were more than 30 miles. When put in the context of work however, a similar percentage of rural trips for medical/dental care (16.7%) and work (17.5%) were more than 30 miles, suggesting that longer trips are an integral part of rural life. In a mixed-methods study analyzing distance as a barrier to care for rural veterans, the perception of distance as a way of life for rural veterans was relative. For example, rural veterans perceived distance as burdensome when they had to travel farther for routine or emergency care that could have been available locally, but were more likely to accept longer travel distance as ‘necessary’ when specialty care was sought.¹⁷

When examining barriers to travel, rural residents were more likely than urban residents to identify the financial burden of travel and the price of gasoline as barriers to travel. The average price of gasoline in 2017 was \$2.41 per gallon, 13 percent higher than in 2016.¹⁸ Compared to urban households, rural households are less likely to reduce travel when gasoline prices rise because they are less likely to have access to public transportation and rideshare services and therefore have fewer opportunities to adapt their travel patterns.^{4,19}

In the multivariable analysis, even when socioeconomic status, trip and traveler characteristics were controlled for, rural Hispanics were three times more likely to travel more than 30 miles for medical/dental care compared to rural Whites. Though it is not clear from the data whether this is due to patient preference or provider availability, one possible explanation is that Hispanics may be more likely to travel farther for care that they deem to be culturally appropriate.¹⁶ A recent analysis of the 2017 National Health Interview Survey found that Hispanics were more likely to report transportation-delayed care compared to Whites, even after controlling for socioeconomic and health characteristics.²⁰

Longer trip time was associated with older age, male gender, low income, night travel, and residence in the Midwest census region in the multivariable analysis. Though unexpected, the relationship between older age, lower income, and longer travel times may be explained

by the fact that older and poorer rural residents are more mobile than their urban counterparts.¹⁹ This subpopulation may also be covered by public insurance such as Medicaid or Medicare, making it more challenging for them to find providers. Moreover, the higher travel burden in the rural Midwest highlights the intersectionality between rurality and geographical location.

Implications

Examining the burden of travel among rural residents is important because the distance and time spent in travel are reasons why many delay or forego care. Finding solutions to the burden of travel will continue to require partnerships among stakeholders, town planners, and policy makers. The higher burden experienced among minority groups such as rural Hispanics highlights the need for other interventions such as telehealth, travel discounts, and ridesharing services for medical travel. For these interventions to be successful, particularly telehealth, greater attention should be given to ensuring broadband access in rural areas. If Hispanic rural residents must travel farther to see Spanish-speaking providers or to get culturally congruent care, then efforts to expand telehealth within this subpopulation must be tailored to meet these needs. Other means that have been suggested to improve the uptake of telehealth among Hispanics include familiarizing patients with the telehealth platform, and providing continuous health education and care that is consistent with cultural values.²¹

Though it was not possible to identify travel for emergency visits in the data, there may be adverse consequences associated with the higher travel distance and time experienced during rural night trips for medical/dental care.

Limitations

There are notable limitations to this study. This is a self-reported survey, and entries may have been subject to recall bias. Additionally, it is unclear whether the higher travel distance among rural residents was due to patient choice or provider availability. The extent to which rural residents bypassed local providers to seek care in more urban areas was also unclear. Though some of the travel patterns associated with age and income may reflect Medicaid status, and difficulty finding providers who will accept Medicaid, the data did not contain information on health insurance status. Because each participating household was asked to record all travel by household members in a 24-hour travel diary on a previously assigned day of the week, the data captured may not reflect longitudinal patterns in the travel burden associated with seeking medical/dental care. Finally, because this was a cross-sectional study, therefore only associations can be inferred, and not causation.

Table 1: Characteristics of trips for medical and dental care by traveler characteristics and geographical location, National Household Travel Survey, 2017

	Trips (%)		Miles per trip (SE)				Minutes per trip (SE)			
		Average	Urban	Rural	P-value	Average	Urban	Rural	P-value	
Total sample	100	9.94 (0.29)	8.10 (0.24)	17.8 (1.01)	0.000	27.11 (0.50)	25.46 (0.50)	34.21 (1.51)	0.000	
Traveler Characteristics										
Age										
5 to 17	8.68	8.70 (0.65)	7.06 (0.61)	13.92 (1.55)	0.000	21.87 (1.46)	21.54 (1.89)	22.93 (1.52)	0.568	
18 to 34	16.28	9.45 (0.72)	8.16 (0.54)	15.65 (2.91)	0.011	24.10 (1.17)	23.26 (1.24)	28.17 (3.09)	0.140	
35 to 49	18.10	9.59 (0.73)	7.84 (0.60)	17.24 (2.72)	0.001	25.06 (1.20)	22.92 (1.10)	34.46 (4.30)	0.009	
50 to 64	27.86	10.06 (0.49)	8.19 (0.44)	18.34 (1.54)	0.000	29.15 (0.97)	27.62 (1.00)	35.94 (2.91)	0.007	
Over 65	29.08	10.80 (0.59)	8.50 (0.49)	20.70 (2.13)	0.000	29.75 (0.95)	27.36 (0.90)	40.07 (2.95)	0.000	
Race/ethnicity										
White	63.84	10.17 (0.30)	7.85 (0.22)	16.95 (0.91)	0.000	25.72 (0.56)	23.16 (0.50)	33.23 (1.58)	0.000	
Black	13.9	9.33 (1.00)	8.29 (0.96)	23.54 (4.71)	0.002	33.33 (2.02)	32.71 (2.06)	41.38(9.22)	0.333	
Hispanic	15.18	10.43 (0.99)	8.92 (0.70)	28.29 (7.54)	0.011	28.89 (1.38)	27.56 (1.32)	44.62 (6.36)	0.009	
Other	7.083	7.99 (0.68)	7.88 (0.72)	10.72 (1.34)	0.052	22.94 (1.16)	22.87 (1.23)	23.79 (3.17)	0.787	
Gender										
Male	39.06	11.24 (0.56)	8.86 (0.48)	19.64 (1.76)	0.000	28.50 (0.89)	26.71 (0.91)	34.80 (2.43)	0.002	
Female	60.92	9.12 (0.30)	7.65 (0.25)	16.40 (1.11)	0.000	26.23 (0.60)	24.72 (0.59)	33.75 (1.89)	0.000	
Education										
High School or Lower	32.71	9.56 (0.47)	7.17 (0.31)	17.90 (1.63)	0.000	29.56 (1.01)	27.72 (1.03)	36.00 (2.66)	0.004	
Some College	45.83	10.37 (0.44)	8.69 (0.39)	17.72 (1.50)	0.000	26.79 (0.72)	25.25 (0.70)	33.58 (2.26)	0.000	
Graduate	15.35	9.74 (0.77)	8.54 (0.67)	18.27 (3.91)	0.014	24.47 (0.99)	23.00 (0.93)	34.80 (4.27)	0.007	
Household income										
<\$24999	26.65	9.66 (0.63)	7.90 (0.59)	18.40 (2.09)	0.000	33.07 (1.25)	31.76 (1.29)	39.62 (3.67)	0.044	
\$25000-49999	22.78	10.04 (0.50)	8.08 (0.43)	17.36 (1.61)	0.000	26.78 (1.04)	25.12 (1.12)	32.96 (2.66)	0.007	
\$50000-74999	13.40	11.48 (0.96)	7.96 (0.46)	22.70 (3.49)	0.000	27.13 (1.42)	23.33 (0.92)	39.28 (4.96)	0.002	
\$75000-99999	10.17	10.43 (0.95)	9.17 (0.98)	15.56 (2.40)	0.013	24.35 (1.27)	22.73 (1.34)	30.88 (3.31)	0.022	
Over \$100000	24.78	8.81 (0.36)	7.88 (0.36)	13.86 (1.00)	0.000	21.92 (0.61)	21.08 (0.65)	26.50 (1.55)	0.001	
Missing	2.216	13.39 (3.58)	9.32 (1.21)	27.19 (11.10)	0.110	29.46 (3.19)	26.77 (1.74)	38.59 (10.23)	0.255	

Table 1 Continued:

	Trips (%)		Miles per trip (SE)			Minutes per trip (SE)			
Medical Condition Results in Reduced Day-to-Day Travel									
Yes	17.19	9.27 (0.52)	7.40 (0.40)	17.61 (2.00)	0.000	31.08 (1.24)	30.07 (1.37)	35.54 (2.91)	0.089
No	8.35	9.00 (0.71)	7.90 (0.75)	15.45 (1.88)	0.000	28.96 (1.75)	28.80 (1.84)	35.85 (4.89)	0.123
Not applicable	74.45	10.23 (0.36)	8.31 (0.30)	18.15 (1.22)	0.000	25.99 (0.58)	24.11 (0.56)	33.78 (1.82)	0.000
Among those with medical conditions, how long?									
6 months or less	2.55	7.39 (0.98)	6.59 (0.81)	10.78 (3.50)	0.244	29.32 (3.91)	29.26 (4.70)	29.57 (4.75)	0.963
More than 6 months	16.84	9.61 (0.57)	7.70 (0.49)	19.06 (2.05)	0.000	31.72 (1.27)	30.27 (1.33)	38.83 (3.51)	0.023
All their life	2.39	8.27 (1.11)	7.08 (0.98)	16.26 (6.30)	0.150	30.29 (3.96)	30.39 (4.44)	29.64 (6.48)	0.923
n=16,784 trips, Weighted N= 5,556,740,787									
Note: Bolded numbers represent statistically significant urban-rural comparisons									

Table 2: Characteristics of trips for medical and dental care by geographical location, National Household Travel Survey, 2017

	Trips (%)		Miles per trip (SE)			Minutes per trip (SE)			
		Average	Urban	Rural	P-value	Average	Urban	Rural	P-value
Trip Characteristics									
Transportation Mode									
Personal vehicle	86.52	10.54 (0.31)	8.56 (0.25)	17.92 (1.02)	0.000	25.18 (0.48)	22.82 (0.44)	33.94 (1.49)	0.000
Public	7.69	8.28 (1.07)	8.20 (1.09)	11.72 (6.68)	0.604	52.87 (2.79)	53.37 (2.80)	30.67 (12.32)	0.072
Taxi/Uber/Lyft	1.34	6.89 (1.14)	6.47 (1.65)	11.17 (2.56)	0.095	29.89 (4.50)	30.47 (4.97)	23.89 (2.19)	0.277
Walk	2.92	0.50 (0.06)	0.46 (0.04)	2.88 (1.24)	0.052	16.41 (2.08)	16.38 (2.11)	18.04 (4.03)	0.714
Other	1.53	4.91 (2.20)	2.39 (0.39)	27.32 (6.08)	0.000	24.88 (6.57)	18.44 (3.11)	82.10 (19.10)	0.001
Travel day of the week									
Monday to Friday	92.51	9.98 (0.31)	8.04 (0.25)	18.12 (1.06)	0.000	26.94 (0.52)	25.19 (0.52)	34.32 (1.57)	0.000
Saturday to Sunday	7.49	9.51 (0.87)	8.79 (0.96)	13.75 (1.93)	0.021	29.26 (1.92)	28.74 (2.10)	33.27 (4.73)	0.496
Trip start time									
Midnight to morning (12:00 am to 6:59 am)	4.40	19.81 (3.26)	15.63 (3.26)	38.06 (9.06)	0.020	47.10 (4.47)	42.56 (4.80)	66.98 (9.91)	0.027
Work hours (7:00 am to 4:59 pm)	91.23	9.64 (0.27)	7.86 (0.21)	17.19 (0.99)	0.000	26.56 (0.50)	25.00 (0.49)	33.16 (1.53)	0.000
Evening (5:00 pm to 11:59 pm)	4.36	6.32 (0.59)	5.63 (0.61)	10.28 (1.90)	0.020	18.60 (1.38)	18.25 (1.59)	20.67 (1.82)	0.317
Driver/passenger status during trip									
Passenger	27.14	12.08 (0.66)	9.74 (0.64)	19.59 (1.73)	0.000	27.29 (1.05)	24.70 (1.07)	35.56 (2.73)	0.000
Not passenger	59.41	10.14 (0.35)	8.36 (0.27)	17.22 (1.27)	0.000	24.22 (0.51)	21.99 (0.44)	33.05 (1.76)	0.000
Public/Walk/Other	13.45	6.12 (0.69)	5.76 (0.67)	15.72 (5.26)	0.060	39.56 (2.04)	39.39 (2.03)	44.17(15.51)	0.753
Derived length of time to get to public transit		---	---	---		7.96 (0.65)	8.00 (0.65)	3.15 (0.81)	0.000
Derived length of wait for public transit		---	---	---		11.14 (0.81)	11.14 (0.82)	10.98 (2.85)	0.958
Calculated time (minutes at destination)		---	---	---		84.55 (1.82)	85.75 (2.08)	79.40 (3.54)	0.122
Census region									
Northeast	18.69	7.30 (0.34)	6.11 (0.32)	14.16 (1.04)	0.000	27.05 (1.03)	26.52 (1.15)	30.13 (1.94)	0.110
Midwest	21.24	10.14 (0.68)	7.23 (0.50)	18.37 (2.06)	0.000	25.58 (1.11)	23.48 (1.17)	31.52 (2.67)	0.006
South	38.07	11.00 (0.51)	9.15 (0.46)	17.52 (1.49)	0.000	27.88 (0.88)	25.75 (0.87)	35.41 (2.38)	0.000
West	22	10.17 (0.60)	8.83 (0.50)	22.66 (3.70)	0.000	27.31 (1.01)	25.76 (0.91)	41.66 (5.68)	0.006
n=16,784 trips, Weighted N= 5,556,740,787									

Table 3: Comparing Time and Minutes spent in travel for medical/dental care with travel for work and by rurality and race/ethnicity

	Miles per trip (SE)			Minutes per trip (SE)		
Urban Residents						
	Trips for Medical/dental care	Trips to Work	P-value	Trips for Medical/dental care	Trips to Work	P-value
Total sample	8.10 (0.24)	11.82 (0.54)	0.035	25.41 (0.50)	26.36 (0.94)	0.446
Race/ethnicity						
White	7.85 (0.22)	11.69 (0.62)	0.035	23.16 (0.50)	24.25 (0.82)	0.259
Black	8.29 (0.96)	12.11 (1.63)	0.302	32.71 (2.06)	29.82 (4.22)	0.965
Hispanic	8.92 (0.70)	12.90 (2.05)	0.309	27.56 (1.32)	33.89 (3.48)	0.134
Other	7.88 (0.72)	11.35 (1.19)	0.762	22.87 (1.23)	25.23 (2.02)	0.502
Rural Residents						
	Trips for Medical/dental care	Trips to Work	P-value	Trips for Medical/dental care	Trips to Work	P-value
Total sample	17.8 (1.01)	18.13 (1.38)	0.265	34.17 (1.51)	27.63 (1.66)	0.249
Race/ethnicity						
White	16.95 (0.91)	18.49 (1.50)	0.263	33.23 (1.58)	27.89 (1.81)	0.374
Black	23.54 (4.71)	22.83 (5.63)	0.965	41.386 (9.22)	43.71 (11.85)	0.819
Hispanic	28.29 (7.54)	12.49 (1.97)	0.134	44.62 (6.36)	21.55 (2.35)	0.067
Other	10.72 (1.34)	15.85 (1.96)	0.502	23.79 (3.17)	22.31 (3.27)	0.684

Table 4: Factors associated with high travel burden for medical/dental care among rural and urban respondents, National Household Travel Survey, 2017

Variable	Travel of 30 miles or more		Travel of 30 minutes or more	
	Rural OR [95% CI]	Urban OR [95% CI]	Rural OR [95% CI]	Urban OR [95% CI]
Age				
5 to 17	0.06 [0.01,0.29]***	1.02 [0.18,5.69]	0.32 [0.17,0.62]***	0.64 [0.33,1.23]
18 to 34	Reference	Reference	Reference	Reference
35 to 49	1.07 [0.36,3.18]	1.27 [0.62,2.59]	1.18 [0.85,1.66]	1.02 [0.70,1.48]
50 to 64	1.93 [0.73,5.08]	1.15 [0.65,2.03]	1.36 [1.01,1.82]*	1.21 [0.87,1.70]
Over 65	1.37 [0.57,3.30]	1.13 [0.63,2.03]	1.38 [1.03,1.83]*	1.21 [0.87,1.69]
Race/ethnicity				
White	Reference	Reference	Reference	Reference
Black	2.81 [1.00,7.89]*	1.21 [0.67,2.19]	0.96 [0.68,1.34]	1.19 [0.85,1.66]
Hispanic	2.91 [1.24,6.84]*	0.86 [0.53,1.38]	1.3 [0.86,1.99]	1.27 [0.94,1.73]
Other	0.28 [0.09,0.83]*	0.78 [0.31,1.96]	0.86 [0.59,1.26]	0.7 [0.48,1.02]
Gender				
Male	1.61 [0.98,2.66]	1.56 [1.04,2.34]*	1.25 [1.09,1.43]**	1.19 [0.97,1.45]
Female	Reference	Reference	Reference	Reference
Education				
High School or Lower	1.44 [0.72,2.89]	0.41 [0.21,0.80]**	1.2 [0.97,1.49]	0.78 [0.56,1.08]
Some College	1.35 [0.70,2.62]	0.86 [0.51,1.46]	1.1 [0.90,1.33]	0.94 [0.73,1.21]
Graduate	Reference	Reference	Reference	Reference
Household income				
<25,000	1.8 [0.72,4.50]	1.31 [0.64,2.69]	1.48 [1.18,1.87]***	1.52 [1.09,2.12]*
\$25,000-49,999	1.53 [0.56,4.17]	0.82 [0.44,1.55]	1.12 [0.91,1.37]	1.26 [0.91,1.73]
\$50,000-74,999	3.51 [1.37,8.95]**	1.3 [0.70,2.40]	1.05 [0.85,1.30]	0.89 [0.68,1.18]
\$75,000-99,999	0.95 [0.33,2.73]	0.76 [0.37,1.53]	1.03 [0.81,1.30]	0.96 [0.69,1.34]
Over \$100,000	Reference	Reference	Reference	Reference
Missing	9.64 [1.78,52.15]**	2.12 [0.68,6.68]	1.29 [0.86,1.94]	1.75 [0.95,3.23]
Medical condition that limits day-to-day travel				
Yes	0.35 [0.12,0.99]*	0.49 [0.20,1.16]	0.61 [0.42,0.87]**	1.5 [0.91,2.47]
No	Reference	Reference	Reference	Reference
Not applicable	0.94 [0.50,1.78]	1.55 [0.93,2.59]	0.87 [0.73,1.03]	1.41 [1.08,1.83]*

Table 4 Continued:

Variable	Travel of 30 miles or more		Travel of 30 minutes or more	
	Rural OR [95% CI]	Urban OR [95% CI]	Rural OR [95% CI]	Urban OR [95% CI]
Trip start time				
Midnight to 6:59 am	3.63 [0.95,13.89]	12.87 [3.19,52.00]***	6.71 [3.58,12.56]***	2.46 [1.14,5.31]*
Work hours (7:00 am to 4:59 pm)	1.25 [0.40,3.92]	4.65 [1.31,16.47]*	1.75 [1.09,2.81]*	1.43 [0.84,2.42]
Evening (5:00 pm to 11:59 pm)	Reference	Reference	Reference	Reference
Driver passenger status on trip				
Passenger	Reference	Reference	Reference	Reference
Not passenger	0.52 [0.30,0.89]*	0.44 [0.28,0.69]***	0.58 [0.49,0.68]***	0.74 [0.56,0.97]*
Public/Walk/ Other	13.07 [0.49,345.51]	0.06 [0.00,1.72]	0 [0.00,.]	2.7 [0.15,47.61]
Census region				
Northeast	Reference	Reference	Reference	Reference
Midwest	2.63 [1.17,5.93]*	1.41 [0.61,3.24]	0.75 [0.60,0.94]*	0.75 [0.52,1.08]
South	1.39 [0.70,2.76]	2.56 [1.43,4.59]**	1 [0.83,1.19]	1.13 [0.85,1.51]
West	1.97 [0.80,4.83]	2.22 [1.20,4.11]*	1.06 [0.85,1.33]	1.04 [0.79,1.37]

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Bolded numbers represent statistically significant urban- rural comparisons. Mode of transportation and travel day were also controlled for.

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