Mode of Travel and Actual Distance Traveled
For Medical or Dental Care
By Rural and Urban Residents

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Mode of Travel and Actual Distance Traveled For Medical or Dental Care by Rural and Urban Residents

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May 2006

Funding acknowledgment:

This report was prepared under Grant Award No 6 UIC RH 03711-01-00 with the Federal Office of Rural Health Policy, Health Resources and Services Administration

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Executive Summary

Background and Objectives

The cost and difficulty associated with travel for medical or dental care may serve as a barrier for rural populations. However, nationally representative estimates of the actual travel burden of rural residents, measures of both distance traveled and time spent on the trip, have not previously been available. This study takes advantage of a highly detailed, nationally representative survey of travel conducted by the US Department of Transportation, the 2001 National Household Travel Survey (NHTS). The NHTS asks participants to record each of their trips and its purpose; one purpose was medical/dental care. While this is only a very broad measure of care, the associated travel measures are highly specific. We used this data source, restricting the analysis to households having at least one trip for medical/dental care, to meet the following research objectives:

- Provide a detailed description of travel to care patterns for rural residents, by race.
- Explore the potential for disparities in access associated with rural residence, focusing on the following hypotheses:
  - Rural populations travel further and spend more time traveling for care than do urban populations; distance traveled and time spent in travel is inversely related to population density.
  - Rural minority populations travel further and spend more time traveling for care than do rural white populations.
- Explore the degree to which rural residence may interact with other barriers (e.g., perceived barriers such as traffic congestion and truck traffic) to extend travel times and distances.

Definition of Rurality

The definition of rurality in the 2001 NHTS data set is derived from a measure developed by Claritas Inc. This measure divides the U.S. into standard-sized grids, and then calculates population density within each grid. Grids falling in the 19th percentile or below are classified as "rural." The Claritas methodology distinguishes among varying types of urban areas based on population gradients between grids at the 20th through 99th percentile; all urban grids are classified as "urban" in this report.

Key Findings

National travel patterns for medical/dental care:

- Americans made an estimated 5.9 **billion** trips for medical/dental care in 2001.
- Nearly all trips were made in a personal vehicle, a car (59.5%), van (15.4%), SUV (10.7%) or pickup truck.
- Only 2.73% of travelers used public transportation for care, while 2.73% walked and 0.73% fell into an "other" category.
  - African Americans (16.5%) and Hispanics (24.0%) were markedly more likely than whites (3.6%) to report traveling for care by public transportation or walking.
- About a quarter of travelers reported that the price of gasoline, rough pavement, or highway congestion were "very much" or "severe" problems for them.

- More rural (27.5%) than urban (21.4%) residents were concerned about the price of gasoline.

Average distance and time for medical/dental travel:

- Across the whole US, the average distance traveled for medical/dental care was 10.2 miles.
    - Rural trips averaged 17.5 miles, versus 8.3 miles for urban residents. Mean distance traveled did not differ by race.

- Nationwide, the average trip for medical/dental care took 22.0 minutes.
    - Rural trips averaged 27.2 minutes, versus 20.7 minutes for urban residents.
    - African Americans spent considerably more in travel time than whites (29.1 versus 20.6 minutes); other minorities did not differ from whites.
    - Travel time was inversely related to income, with families earning less than $20,000 per year traveling an average of 24.8 minutes, versus 19.0 minutes among those earning $70,000 per year or more.

High Travel Burden

We looked specifically at high travel burden, defined as trips that were over 30 miles in distance or greater than 30 minutes in time required. The purpose was to identify populations among which travel for care was particularly demanding.

More than 30 miles:

- Nationally, 7.9% of persons traveling for medical/dental care traveled 30 miles or more.
- Four times as many rural residents than urban residents traveled 30 miles or more for care (21.4% versus 4.5%).
- The proportion of persons traveling more than 30 miles for care did not vary across race/ethnicity.
- Rural residents remained more likely to report traveling more than 30 miles for care even when characteristics of the traveler, the trip itself, and the surrounding community were held constant in multivariate analysis (OR 2.67, CI 1.39-5.15).

More than 30 minutes:

- Nationally, 28.5% of trips for medical/dental care took 30 minutes or more. A higher proportion of rural (41.3%) than urban (25.3%) residents spent more than 30 minutes in travel.
- Overall, patterns of travel for work were similar to those for travel to care. A higher proportion of rural than urban residents took 30 minutes or longer to travel to work (32.2% versus 30.5%; $p < 0.0001$).
- In multivariate analysis, rural residents remained more likely to travel more than 30 minutes for care (OR 1.80, CI 1.09-2.99).
- African Americans (OR 3.04, CI 2.00-4.62) and persons of "other" race (OR 1.64, 1.07-2.51) were markedly more likely than whites to have trips for care that required more than 30 minutes of travel.
- Persons relying on public transportation, walking or other modes were more likely than persons traveling in a personal vehicle to spend more than 30 minutes traveling for care (OR 2.22, CI 1.42-3.46).

Conclusions and Implications

It is hardly surprising to find that rural residents travel further and spend more time in travel for medical/dental care than do persons in urban communities. The principal contribution of the research reported here is to quantify the magnitude of rural-urban differences using a nationally representative sample of travelers, and to identify specific populations most likely to experience a significant travel burden.

Long travel distances and times appear to be a consistent element of rural life, as similar patterns were found for travel for medical/dental care and travel to the workplace. However, disparities in travel for care experienced by African Americans were markedly higher than differences in travel to work, suggesting that this population has particular difficulty finding convenient health care providers. It may also be that minority patients elect to undertake relatively long trips in order to visit providers who have demonstrated cultural sensitivity as well as providers who accept Medicaid. If supported by future research, our findings about travel patterns for minority persons suggest that transportation may be a contributor to health disparities

Rural populations, more likely to perceive the price of gas as a problem, are likely to be particularly affected by current gasoline prices, which are now twice as high as in 2001, when the NHTS was conducted. The most common methods used to overcome transportation barriers in rural areas, mobile clinics and provision of transportation for low-income patients, are also likely to be adversely affected by gasoline price changes.

Chapter 1: Introduction: Why Travel Matters

Overview

Travel burden is a key element in conceptualizing geographic access to health care. A better understanding of distances and mode of travel for individuals seeking health care is particularly important for vulnerable populations, such as the poor, those living in rural areas, and racial and ethnic minorities, all of whom are more likely to experience barriers to transportation than their counterparts.

Rural households are more likely to own at least one car than urban residents (97% versus 92%) (Pucher & Renne, 2004). However, the authors note that one can interpret this as either "increased mobility" or "forced dependence on automobiles." Funds available for transportation and health care are often at odds with each other within household budgets (May & Cunningham, 2004). Persons who are unable to own or operate cars are often dependent on friends and family members for transportation, and this limits their flexibility, route, and preferred mode of travel. This dependence has been shown to be associated with reduced numbers of physician visits for chronic care (Arcury, Preisser, Gesler, & Powers, 2005).

Minorities are often at a particular disadvantage, as the barriers to transportation inherent in rural areas can compound those traditionally experienced by minorities in access to care (Borders, 2004; Braver, 2003). Utilization (as realized access) of health care tends to decrease as the distance traveled to care increases. Uninsured Americans living closer to safety-net providers, for example, report fewer unmet health needs and are more likely to have a usual source of care than those who live further away (Hadley et al., 2004). Increased distances to providers are also associated with reduced compliance to treatment regimens and lower rates of preventive care (Coronado et al., 2004; Thomas et al., 2004), as well as greater difficulties in

accessing emergency health care. A fuller discussion of health issues linked to transportation for care is provided in Appendix A.

Most studies of travel for care stem from the health services research literature, and typically involved travelers within a specific area, or specific populations such as women seeking obstetric care (Kreher, Hickner, Ruffin, & Lin, 1995; Mainous, III & Matheny, 1996; Orr, Blackhurst, & Hawkins, 1992; Piette & Moos, 1996; Smith & Yawn, 1994; Xu & Borders, 2003) or Medicare beneficiaries (Adams & Wright, 1991; Hogan, Eppig, & Waldo, 1995). As far as can be determined, there have been no studies examining travel for care in a nationally-representative population.

Paralleling the variety of populations studied, a variety of methods have been used to assess distance (more fully presented in Appendix A). Briefly, a review of 29 studies of travel for care conducted between 1991 and the present found several common methodologic limitations. First, many measured hypothetical distance, that is, distance to the nearest practitioner, regardless of whether the study subject actually intended to use the provider (e.g., Arcury, Preisser, Gesler & Powers, 2005; Lin, 2004). When distance traveled by actual patients is studied, it is often estimated as a straight line from the center of the patient's residence Zip Code to the center of the provider's Zip Code (e.g., Piette and Moos, 1996; Mooney, Zwanziger, Phibbs and Schmitt, 2000). While such analyses are extremely valuable for assessing travel differences across populations, they provide only an approximation of actual travel burden, as travel is rarely in a straight line and travel time is not measured by this technique. Asking patients about actual travel for care experiences is an improvement on both of the preceding techniques, which are subject to recall and distance estimations limits for the traveler. This technique has been used to study how far rural residents report traveling for care (Edelman and

Menz, 1996). A recent study reported on travel for care among the elderly using detailed information collected through a nationally representative, household survey of travel patterns (Collia , Sharp and Giesbrecht, 2003). The study used information from the 2001 National Household Travel Survey (NHTS), conducted by the US Department of Transportation (USDOT).

In a effort to assist state and federal engineers in their understanding and prediction of transportation infrastructure needs, the USDOT has periodically conducted large, nationally representative surveys of travel, the purposes of travel, distances and destinations, and the factors that influence how travel is conducted. (Details are provided in Appendix B.) Of interest for health planners, one potential purpose of the survey is "travel for medical/dental care." This item was used by Collia and co-investigators (2003) to explore travel made by elderly persons. The design and approach used by that team was the impetus for the research presented in the report that follows. While a single short question concerning medical or dental service use is somewhat broad for purposes of health services research, the NHTS constitutes the only known, nationally representative measure of the burden of travel for care. Further, it includes many measures not included in previous studies of travel for care, including time spent in travel, mode of travel, and perceived barriers stemming from traffic or road conditions.

Project Objectives

The research communicated in the report that follows had three major objectives:

- Provide a detailed description of travel to care patterns for rural residents, by race.
- Explore the potential for disparities in access associated with rural residence, focusing on ascertaining whether:

  - Rural populations travel further and spend more time traveling for care than do urban populations.
  - Rural minority populations travel further and spend more time traveling for care than do rural white populations.
- Explore the degree to which rurality may interact with other barriers (e.g., perceived barriers such as traffic congestion and truck traffic) to extend travel times and distances.

Definitions

The 2001 NHTS explored two types of travel: daily travel, measured through travel logs, and "longest trip," a measure of the furthest distance traveled by the respondent during the prior month, obtained through the respondent interview. This report is limited to information on daily travel for medical care. While "medical/dental" care was a possible purpose for distance travel, we wished to focus on routine travel for care as measured using a nationally representative snapshot of daily trips.

The analysis uses the definition of rurality incorporated within the 2001 NHTS data set, which is derived from a measure developed by Claritas Inc. More fully described in Appendix A, this measure divides the US into standard-sized grids, then calculates population density within each grid. Grids falling in the 19th percentile or below are classified as "rural." The Claritas methodology distinguishes among varying types of urban areas based on population gradients between grids at the 20th through 99th percentile; all urban grids are classified as "urban" in this report.

Providing a context

Because the anticipated audience for the present report is health services planners and researchers, and not transportation engineers, it was felt necessary to provide some information beyond travel for medical/dental care that might lend context to our findings. Briefly put, if someone travels 12 miles for care, is that a "long" or a "short" distance in comparison with the rest of their activities? To provide context, the descriptive analyses of travel for care presented in Chapter 2 are supplemented with descriptions of travel for work, with the analysis of work travel limited to the households that reported travel for medical care. Thus, findings on travel for care can be placed in context with other travel made by the same families.

Chapter 2: Routine Travel for Medical/Dental Care

Travelers Reporting a Trip for Medical/Dental Care

The characteristics of travelers for care follow patterns similar to those of the general population. The proportion of travelers who were white was higher in rural areas (81%) than in urban areas (69%; Table C-1). The proportion of Hispanics among travelers seeking care was lower than their representation in the population, with only 3.5% of rural and 5.4% of urban trips involving Hispanic travelers. We cannot ascertain from the data whether Hispanics were less likely to seek care during the period, or whether a low proportion of Hispanics overall may be a systematic problem of the NHTS. So few rural Hispanics made trips for care (19) that all projected information for that group is statistically unreliable.

Nationally, 13.6% of trips for care were made by persons with a medical condition that limits their ability to drive. The proportion of trips by driving-restricted persons was statistically equal across rural (16.2%) and urban areas (12.9%, $p = 0.1842$). Persons with a medical condition were more likely to report traveling as a passenger (50.5%) than were persons without such a condition (31.2%, $p = 0.0000$; data not presented in table form). The proportion of work trips that involved persons with medical limitations on their ability to drive was, as might be anticipated, much smaller. Only 2.1% of rural and 1.8% of urban work trips, were made by persons with medical limitations on driving (rural-urban differences not significant).

Our research is based on the National Household Travel Survey. This nationally representative survey recruits households across the US by telephone. Households that agree to participate then keep a log of their travel for a specific day. The overall response rate (agreeing and then keeping the log correctly) for the NHTS was 41%. Data collection was spaced across the period March 2001 and May 2002. Only households with at least one trip for medical/dental care were studied. The survey was conducted in English or Spanish.

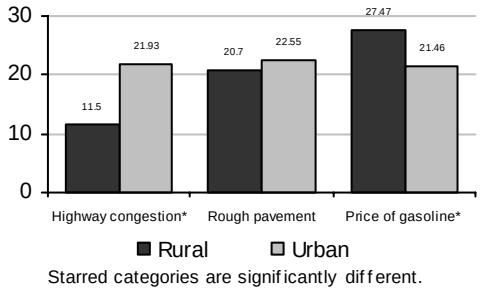
Volume of medical/dental travel and mode of transportation

Americans made an estimated 5.9 **billion** trips for medical/dental care in 2001 (Table C-1), out of an estimated 411 billion trips for all purposes (Collia et al, 2003). Nearly all trips were made in a personal vehicle, either a car (59.5%), van (15.4%), SUV (10.7%) or pickup truck (8.2%; mode data not in table). The studied traveler was a passenger in about a third of all trips. Only 2.73% of travelers used public transportation for care, while 2.73% walked and 0.73% fell into an "other" category; these value sum to the 6.2% shown in Table C-1. African Americans (16.5%) and Hispanics (24.0%) were markedly more likely than whites (3.6%) to report traveling for care by public transport or walking ($p = 0.0002$). (There were too few persons of "other" race who reported using public transport or walking for valid estimates.) In rural areas, all measurable travel for care involved private vehicles. Public transport or walking was used for so few rural trips that valid estimates of the proportion of rural travelers using this mode cannot be made.

More than three quarters of trips for medical/dental care took place on a weekday. Over 90% of trips were made during business hours, 8am to 5pm, with 6.3% made between midnight and 8am, and 3.2% made between 5pm and midnight.

About a quarter of trips for medical/dental involved travelers who, when surveyed, agreed that the price of gasoline, rough pavement, or highway congestion were "very much" or "severe" problems for them (See Figure 1 and Table C-2). It is interesting that the travel barrier most frequently cited by rural residents, even in 2001-2002, was the price of gasoline. While rural

Figure 1. Barriers to travel perceived by persons traveling for medical/dental care, NHTS 2001



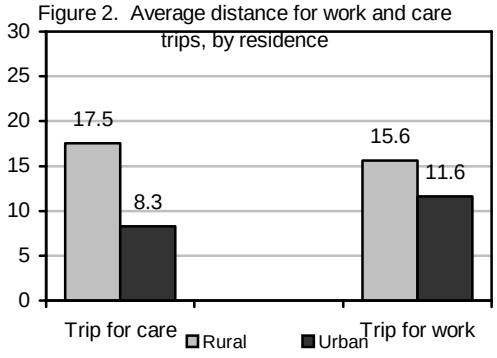
Starred categories are significantly different.

drivers were significantly more concerned about the price of gas than urban residents, urban persons were more likely to report highway congestion as a travel problem.

To establish a context for medical/dental travel within other trips made by the same persons, we also examined travel for work within households that had reported a trip for medical/dental care. Mode of travel to work was very similar to that for care among the same households. Only 7.9% of trips for work involved public transport, walking, or other modes. As with travel for care, African Americans (12.8%), Hispanics (8.1%) and persons of other race/ethnicities (11.2%) were more likely to use public transport or walking than were whites (6.6%; p = 0.0000). Similarly, a markedly lower proportion of rural work trips (3.9%) involved public transport or walking than was the case in urban areas (8.9%, p = 0.0000).

Distance Traveled for Medical/Dental Care

Across the whole US, the average distance traveled for medical/dental care was 10.2 miles (Table C-3). As shown in Figure 2, at right, rural residents traveled significantly farther for care than did urban residents. To establish a context for interpreting travel to care, we also examined work-related travel among the households that reported a medical/dental trip (Table C-4). For these families, the average length of a trip to work was 12.4 miles, slightly greater than the trip for care. While rural residents traveled further for work as well as for care, the disparities were more marked for medical/dental than for work travel.

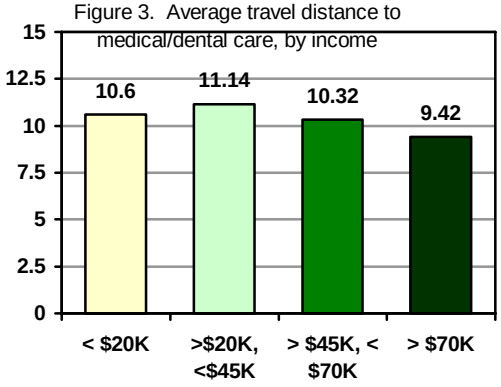


Mean distance traveled for routine medical/dental care did not differ significantly by race, varying only from 10.0 miles among African Americans to 10.7 miles among Hispanics

and persons of “other” race/ethnicity (Table C-3). For work-related travel, African Americans traveled slightly shorter distances than whites (11.0 versus 12.6 miles), but other minorities did not differ from whites (Table C-4).

Distance traveled for care was not influenced by most personal characteristics, including age, sex, occupation of head of household or family size. Household income was related to distance traveled for care, but not in a linear fashion (data not in tables). Travel distances were greatest among households in the $20,000 - $44,999 income bracket, and lowest among households earning $70,000 or more per year.

Figure 3. Average travel distance to medical/dental care, by income

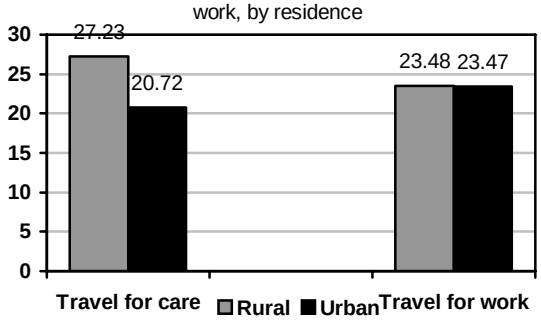


Surprisingly, whether one of the persons making the trip had a medical condition that reduced their ability to drive did not statistically affect distance (condition present, 12.2 miles, no condition 9.8 miles, $p = 0.0603$; data not in tables). However, when a person was driving for personal care, the trip was markedly shorter than when the driver was taking someone else for care or had other persons in the vehicle (8.4 miles versus 11.2 miles, $p = 0.0000$).

Time Spent in Travel for Care

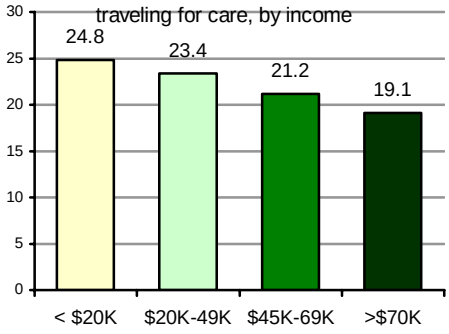
The average trip for medical/dental care took 22.0 minutes, comparable to the amount of time persons in the same households spent in traveling to work, 23.5 minutes (Tables C-3 and C-4). Rural trips averaged 27.2 minutes, versus 20.7 minutes for urban residents (p = .0000; Figure 3). Differing from travel for care, the time spent in work trips was the same for both urban and rural households, 23.5 minutes (Table C-4).

Figure 4. Time spent in trips for medical/dental care and work, by residence



While distance traveled was generally not linked to demographic characteristics, time invested in travel for care did vary significantly across many personal characteristics (data other than race not in tables). Travel time differed significantly by race, with African Americans reporting significantly longer travel times than whites (29.1 minutes versus 20.6 minutes; Table C-3). Other minorities did not differ from whites. Women spent slightly less time traveling for routine care than did men, 21.5 minutes versus 23.0 minutes (p = 0.0155). Education was inversely related to travel time. Persons with only a high school diploma or less traveled an average of 23.6 minutes for care, college graduates, 21.5 minutes, and those with some graduate education, 20.0 minutes (p = 0.0258). Similarly, income was inversely related to travel time (p = 0.0007; see chart at right). Family size was also related to travel time, but not in a linear fashion. Small families (one or 2 persons) and large families (5 or more persons) had the longest travel times (22.8 and 24.1 minutes, respectively, followed by 3 person (21.5 minutes) and 4 person families (18.9 minutes).

Figure 5. Average time in minutes spent traveling for care, by income



While persons having a medical condition that impairs their ability to drive did not differ from others in the distance they traveled for care, they took slightly longer for the trip. Persons with such a condition averaged 25.5 minutes for travel, versus 21.3 minutes for other persons ($p = 0.0013$).

Overall, occupation influenced the time an individual would report traveling for care ($p = 0.0005$). Persons whose occupation was categorized as clerical or administrative support reported the shortest travel times (18.0 minutes), followed by professional, managerial or technical (20.6 minutes) and manufacturing, construction, maintenance or farming (20.9 minutes). Persons engaged in sales or service (22.1 minutes) and other, uncategorized occupations (22.9 minutes) spent the longest time in travel. Reflecting the geographic characteristics, travelers in the Northeast (19.9 minutes) and Midwest (20.6 minutes) spent less time in travel than those in the South (23.3 minutes) or West (23.2 minutes; $p = 0.0081$).

How and when a trip for care was made affected travel time. Persons who used public transportation or walked to care spent the greatest time in travel (28.8 minutes), followed by persons who traveled as a passenger in a personal vehicle (23.5 minutes) and persons who drove themselves to care (20.5 minutes; $p = 0.0000$). Persons spent the greatest time traveling for care if their trip began between midnight and 8 am (30.2 minutes). A trip that began during normal business hours averaged 21.7 minutes, and one initiated between 5 pm and midnight averaged 16.8 minutes ($p = 0.0001$). A trip that began during the business day averaged 21.9 minutes, and one initiated during the weekend averaged 22.5 minutes ($p = 0.5368$).

High Travel Burden – More than 30 Miles or 30 Minutes

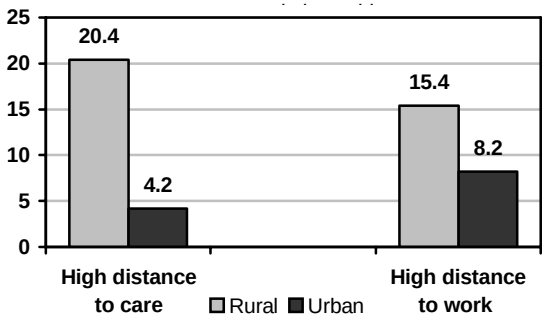
One way of conceptualizing the burden caused by travel is to measure the proportion of persons whose travel exceeded a cut-point. Reflecting recent research, we have chosen 30 miles

(Jacoby, 1991; Ricketts, Savitz, Gesler, & Osborne, 1994) and 30 minutes (Pathman, Ricketts, Konrad 2005) as measures suggesting a "high" travel burden. Each of these measures of travel burden is examined separately.

Trips for Medical/Dental Care of 30 Miles or More

Overall, 7.9% of persons traveling for medical/dental care had to go 30 miles or more. Rural residents were more likely to travel 30 miles or longer for care than urban residents ($p < 0.0001$; see Figure 6, and Table C-5). Variations in travel distance by race/ethnicity were not statistically significant. About one in 10 persons traveled more than 30 miles for work (9.6%). Rural/urban differences in the proportion of persons traveling 30+ miles for work, while statistically significant, were less marked than differences in travel for care.

Figure 6. Percent of persons traveling more than 30 miles



To look at rural/urban differences in the likelihood of a trip for care of 30 miles or more while holding personal characteristics constant, we conducted multivariate logistic regression. We used 3 models, beginning with the demographic characteristics of the traveler, then adding characteristics of the trip (mode and time of travel), and finally adding characteristics of the community (perceived traffic conditions, region, and job density).

When only personal characteristics were considered, rural residents were markedly more likely to have a trip for medical/dental care of 30 miles or longer (OR 6.08, 95% Confidence Interval 3.88-9.52; Table C-7). Even with characteristics of the trip and of the community added, rural residents were still more likely to experience lengthy trips (OR 2.67, CI 1.39-5.15). Race/ethnicity was not a significant predictor of a 30+ mile trip, with other characteristics held

constant. No other personal characteristics of the traveler affected the risk of high time burden travel.

The time of day during which a trip was made was strongly associated with the odds that a trip for care would reach or exceed 30 miles. Trips taken in the evening (5 pm – 12 midnight) had reduced odds for long travel (OR 0.20, CI 0.09-0.43), while trips at night (midnight – 8 am) were more likely to entail long travel (OR 2.54, CI 1.12-5.78). Traffic conditions and region were not statistically associated with the risk of a trip of 30 miles or more, with rural residence already accounted for. However, persons living in areas falling in the top quartile for job density were less likely than those at the lowest job density quartile to travel 30+ miles for care (OR 0.19, CI 0.07-1.52).

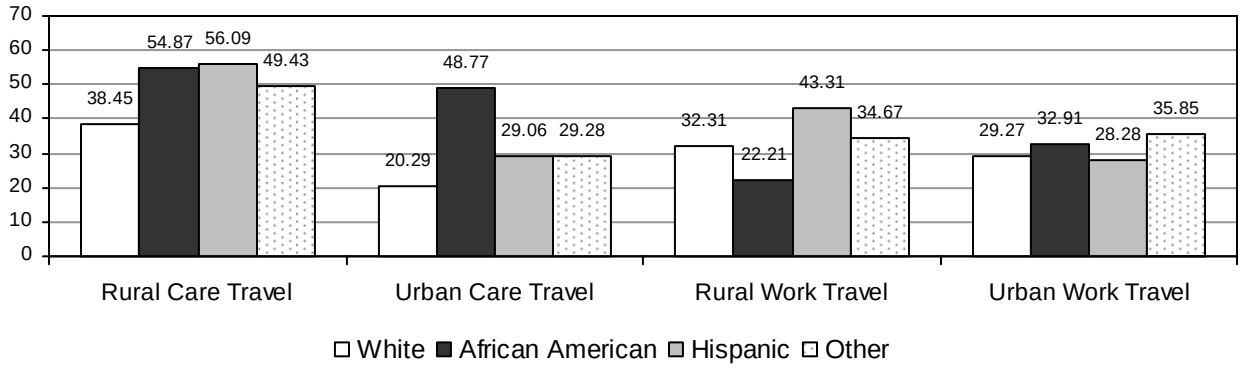
In a parallel analysis, multivariate techniques were used to examine travel to work. Rural residents, not surprisingly, had greater odds than their urban peers for a trip to work that was 30 miles or more, even with all else held constant (OR 1.47, CI 1.14-1.90; Table C-9). Persons of "other" race ethnicity also had higher odds for a long trip to work. While sex had not been significant in modeling travel for care, female travelers had reduced odds for a work trip of 30 miles or more (OR 0.51, CI 0.44-1.58). Several other factors pertaining to the individual (occupation, income, number of persons in household), the trip (time of day) and the community (traffic conditions, job density) were significantly related to the odds that a person would travel 30 miles or more to work. These are provided in Table C-9.

Trips for Medical/Dental Care of 30 Minutes or more

Nationally, 28.5% of trips for medical/dental care took 30 minutes or more (Table C-5). Rural residents were markedly more likely to experience long trips, with no significant differences by race/ethnicity within rural residents alone (Figure 7, following page, and Table C-5). Overall, 41.3% of rural residents, versus 25.3% of urban, spent more than 30 minutes in

travel. Among urban residents, African Americans and other minorities were markedly more likely to report a trip for medical/dental care lasting 30 minutes or more (p= 0.0001).

Figure 7. Percent of trips that are 30 minutes or more, by type of trip, residence, and race, NHTS 2001



Patterns of travel for work were similar to those for travel to care (Table C-6). A higher proportion of rural than urban residents took 30 minutes or longer to travel to work (32.2% versus 30.5%; $p < 0.0001$). Work travel patterns differed significantly across race/ethnicity for both rural and urban residents, but with no consistent pattern of minority disadvantage.

As with distance, we used multivariate analysis to ascertain the odds that a rural person would have to spend 30 minutes or more traveling for care, holding characteristics of the person, the trip and the community constant (Table C-8). Rural residents remained more likely than urban residents to experience a high travel burden when time (trip of 30 minutes or more) was used as the measure, but effect sizes were smaller, perhaps because of the higher speeds typical on rural roads. When only the characteristics of the traveler were considered, the odds that a rural resident would travel more than 30 minutes for care were 2.23 those of an urban resident (CI 1.62- 3.07; Table C-8). In the full model, including characteristics of the traveler, the trip, and the community, rural residents remained more likely to travel more than 30 minutes for care (OR 1.80, CI 1.09-2.99). African Americans (OR 3.04, CI 2.00-4.62) and persons of "other"

race (OR 1.64, 1.07-2.51) were markedly more likely than whites to have trips for care that required more than 30 minutes of travel.

Persons relying on public transportation, walking or other modes were more likely than persons traveling in a personal vehicle to spend more than 30 minutes traveling for care (OR 2.22, CI 1.42-3.46). As was the case with distance, trips made at night (midnight to 8 am) were more likely to take more than 30 minutes than trips made during business hours (OR 1.86, CI 1.12, 3.10). No community characteristics were significantly linked to travel time in multivariate analysis.

Rural residents were also more likely than urban residents to spend 30 minutes or more traveling to work. When only the characteristics of the traveler were considered, the odds that a rural resident would travel more than 30 minutes to work were 1.16 those of an urban resident (CI 1.05-1.27; Table C-10). In the full model, including characteristics of the traveler, the trip, and the community, rural residents remained more likely to travel more than 30 minutes for work (OR 1.23, CI 1.03-1.46). Persons of "other" race/ethnicity, but not other minority populations, were more likely than whites to spend 30 minutes or more to reach work (OR 1.23, CI 1.07-1.43).

While relatively few factors measured by the NHTS were associated with travel time for care in multivariate analysis, several factors were linked to travel time for work. Sex, occupation, income, and family size were all associated with work travel times (See Table C-10). Mode of travel strongly affected time, with persons relying on public transportation or walking being markedly more likely to spend more than 30 minutes getting to work than those in private vehicles (OR 2.42, CI 2.08-2.81). Persons traveling in non-business hours also had increased odds for a trip of 30 minutes or more. The absence of perceived driving barriers was associated

with decreased odds of a trip of 30 minutes or more, as was residence in the South. Details are provided in Table C-10.

Chapter 3: Conclusions

Travel for Health Care

It is hardly surprising to find that rural residents travel further and spend more time in travel for medical/dental care than do persons in urban communities. The principal contribution of the research reported in the preceding chapter is to quantify the magnitude of rural-urban differences using a nationally representative sample of travelers, and to identify specific populations most likely to experience a significant travel burden.

Rural residents, on average, traveled about eight miles further for care than urban residents, though it only took them about six additional minutes to complete their trip. The proportion of persons with a high travel burden, measured either as miles (30 miles or more) or minutes (30 minutes or more) was also higher among rural residents. Four times as many rural as urban individuals had to go 30 miles or more for care (21.4% versus 4.5%). Time differences were less severe; 41.3% of rural residents traveled 30 minutes or more for care, versus 25.3% of urban residents. Rural residence remained an independent risk factor for a high travel burden when all other characteristics of the traveler were held constant, whether burden was measured by miles (OR 2.67) or time (OR 1.80). Longer travel distances and times appear to be a consistent element of rural life, as similar patterns were found for travel to the workplace.

Travel disadvantages experienced by African Americans emerged clearly in the NHTS. African Americans travelers are not burdened by distance; both mean distance traveled and proportion of persons traveling 30 miles or more for care did not differ significantly between African American and white populations. However, the mean African American travel time of 29.1 minutes approached our cutoff for high travel time burden, 30 minutes or more. Half of

African American trips for medical/dental care took 30 minutes or more (49.7%), versus a quarter for whites (24.4%). The higher proportion of African Americans using public transportation (16.5%, versus 3.6% among whites) may contribute to lengthy travel times. However, even when public versus private modes, personal characteristics and community factors were held constant through multivariate analysis, African Americans were more likely to experience a high travel time burden when seeking care (OR 3.04). In the same model, use of public transportation was independently associated with increased odds for a trip of over 30 minutes (OR 2.22). Thus, an African American seeking health care and using public transportation would be particularly disadvantaged.

While rural travel for care disparities paralleled work travel disparities, the same was not the case for African American travel. Travel for work was not associated with the race/ethnicity differences that emerged for medical/dental travel. Minorities were not more likely than whites to travel 30 miles or more for care. With the exception of persons of "other" race/ethnicity, minorities were also not more likely than whites to use more than 30 minutes to travel to work.

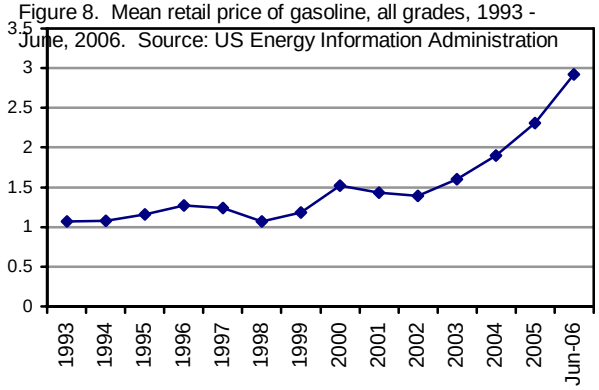
If supported by future research, our findings about travel patterns for minority persons suggest that transportation may be a contributor to health disparities. We cannot ascertain, from the sketchy data about travel for medical/dental care available in the NHTS, whether differences between African Americans and whites in the time burden of travel for medical/dental care stem from patient choice or provider availability. Minority patients may elect to undertake relatively long trips in order to visit providers who have demonstrated cultural sensitivity or who in other ways make them feel comfortable. Alternatively, African American patients may have a more limited provider base to choose from, requiring longer and perhaps more complex trips. The African American population is more likely to be uninsured (18.1% versus 11.9% for whites

during 2003) or to have public insurance (23.7% on Medicaid versus 10.4% of whites during 2003; (U.S.Department of Health and Human Services, 2005). The number of providers willing to accept such patients is substantially lower than the number of those willing to accept private insurance payments (Berman, Dolins, Tang, & Yudkowsky, 2002; Cykert, Kissling, Layson, & Hansen, 1995; Damiano, Momany, Willard, & Jogerst, 1997).

Additional Transportation Factors

One cannot comment on travel for care without addressing recent increases in the cost of gasoline. In 2001, when the NHTS was administered, retail gasoline prices averaged $1.46 per gallon (Figure 8), a slight decline from the $1.52 average for 2000. At that level, about a quarter of persons making trips for medical/dental care reported that the price of gas was a problem for them. As of July, 2006, the average retail price of gasoline reported by the US Energy Information was $2.97, slightly more than twice as high. It is likely that the surge in prices would lead a far larger proportion of rural residents to identify the price of gas as a problem if the survey were conducted at this time.

Figure 8. Mean retail price of gasoline, all grades, 1993 - June, 2006. Source: US Energy Information Administration



Rural populations, more likely to perceive the price of gas as a problem in 2001, are particularly affected by current prices (McDonald, 2005) The A survey conducted by the Consumer Federation of America found that 82% of rural households, versus 71% of urban, viewed the price of gas as a "great concern" in August, 2005 (Cooper, 2005). In 2001, rural households spent an estimated $1,506, or 4.8% of income, on gas, compared to $1,247, 3.2% of income, among urban households (Cooper, 2005). Poor populations in rural areas are likely to

be particularly at risk. Low-income families, households in the bottom fifth of the income distribution (roughly $15,000 or less), spent 8.2% of income for gasoline in 1999, increasing to 10.4% in 2005. Among households in the top one-fifth for income, the proportion of income devoted to gasoline has remained relatively flat, 1.5% in 1999 and 1.9% in 2005. (Cooper, 2005) Thus, to the extent that rising gas prices will constitute a barrier to travel for care, rural and poor populations will be the first to defer or avoid care.

Also, rural residents tend to utilize modes of transportation that are more individualized in their nature and operation. Urban residents are more likely to have access to and to utilize mass transit systems such as subways, buses, and trains and urban and suburban travel-to-work patterns are also more conducive to carpooling. All of these mass transportation modes benefit from an increased economy of scale in terms of fuel costs as compared to the use of personal automobiles, the predominant mode of transportation in rural areas. Also, mass transportation modes are often subsidized by governmental entities and public utility organizations and companies, which further decreased the direct individual economic burden placed upon urban travelers by increasing fuel costs. Finally, non-rural areas are often more accessible to manually-powered modes of transportation (such as walking or biking) due to both increased sidewalk/bike lane construction efforts and decreased distances to retail and commercial districts. All of these aspects of personal travel create a greater economic burden on rural households to purchase fuel for their daily trip-making activities.

Limitations to the research

As noted throughout this report, use of a survey designed for transportation analysis to examine medical/dental travel is hampered by several limitations. Details about the NHTS response rate (41%) and other technical problems are addressed in Appendix B. Several

additional limitations are associated with its use for a study of travel for care. First, grouping all travel for care under the rubric "medical/dental" care is quite simplistic. Earlier research (Mainous, III et al., 1996; Lamont et al., 2003; Basu & Friedman, 2001) has indicated that persons will travel further for what they perceive to be more complex or more valuable care than for primary care. Second, the NHTS only captures information for persons who *completed* a trip, that is, it provides information about realized access. Thus, it excludes people who perceive that travel would be difficult, and thus defer or avoid seeking medical/dental care. Next, the NHTS included relatively few Hispanic households with travel for medical/dental care. Finally, the restricted nature of the NHTS public use files, which did not provide actual residence data other than state, meant we were limited to using the Claritas definition of "rural," which is based on a proprietary method. The exact relationships between the present findings and research that might be conducted using other geographic units, such as county, cannot be stated.

Conclusions

Addressing differences in travel burden for care based on residence and race/ethnicity will require health planners to work more extensively with transportation planners than they have in the past. In urban areas, access to public transportation (routes, hours, frequency of transport) clearly needs to be assessed when planning safety net hours and locations. For rural areas, the implications are less clear. Rural travel is overwhelmingly private vehicle travel, and public infrastructure for travel generally does not exist. Thus, an important criterion for locating rural safety net services would be matching site distribution to population distribution, ensuring that facilities are located where they can be accessed with equal convenience by all race/ethnicity groups. Work with transportation planners might reveal other patterns that could be exploited, perhaps locating health care services on routes heavily used for work or shopping travel,

allowing rural residents to meet multiple purposes when traveling. With the 2006 increase in gas prices showing no signs of being reversed, such planning will be increasingly important.

Rural health infrastructure, however, is already in place; it is not likely that a burst of rural clinic building will distribute facilities more evenly. Thus, developing, evaluating, and disseminating the results of rural projects to alleviate existing travel barriers is an important effort. The Rural Assistance Center (www.raconline.org) maintains a file of "success stories" which, as of July 2006, listed 16 rural transportation projects. Approaches that reduce travel distance through the use of mobile clinics are notably present in this list, as are approaches that provide transportation to existing clinics, using either volunteers or local public transportation services. Recent increases in gasoline prices, however, may make such transportation supports more difficult to maintain.

Appendix A: Geography as a Component of Access to Care

Defining Access Geographically

Transportation is linked to health through the concept of access. It is generally accepted that access to health care is an important determinant of health status. However, the proper conceptualization and measurement of access to care has evolved over the past several decades, expanding to include spatial measurement.

One of the earliest attempts to model the concept of access was proposed by Andersen (Andersen, 1968) as his "Behavioral Model of Health Services Use," theorizing that access was determined by predisposing, enabling, and need-based factors, and this was later expanded to classify access as *potential* or *realized* (Aday & Andersen, 1975). Penchansky and Thomas (Penchansky & Thomas, 1981) described access in five dimensions: availability, accessibility, accommodation, affordability and acceptability. Later, Kahn (Khan, 1992) noted that access measures could be sorted into a two-way framework: potential or realized and spatial or aspatial. Subsequently, Guagliardo (Guagliardo, 2004), following Gesler (Gesler, 1986), divided up Penchansky and Thomas' five dimensions of access spatially, with availability and accessibility (in a geographic sense) collectively grouped as *spatial accessibility* (with the remainder as *aspatial*). Guagliardo also delineated four categories of spatial accessibility measurements: provider-to-population ratios, distances to the nearest provider, average travel impedance to a provider, and gravity models. In the present study, we use reported measurements of distance and time traveled for health or dental care purposes as a measure of geographic/spatial accessibility to health care.

Prior research on geographic access and travel for care

Utilization (as realized access) of health care tends to increase as the distance traveled to care decreases. For example, uninsured Americans living closer to safety-net providers report fewer unmet health needs and are more likely to have a usual source of care than those who live further away (Hadley et al., 2004). Increased distances to providers are also associated with reduced compliance to treatment regimens and lower rates of preventive care (Coronado et al., 2004; Thomas et al., 2004), as well as greater difficulties in accessing emergency health care. On the other hand, some studies have observed the opposite effect, such as in mammography screening (Kreher, Hickner, Ruffin, & Lin, 1995), clinical trials (Lamont et al., 2003), and general no-show rates (Smith & Yawn, 1994).

Rural residents face particular travel barriers. Those unable to own or operate cars are often dependent on friends and family members for transportation, and this limits their flexibility, route, and preferred mode of travel. This dependence has been shown to be associated with reduced numbers of physician visits for chronic care (Arcury, Preisser, Gesler, & Powers, 2005). Rural patients with relatively more complex conditions are more likely to travel further for care than their urban counterparts, as are rural children and elderly persons (Adams & Wright, 1991). Rural residents are also more likely to travel longer distances to urban hospitals when their nearest rural hospital is small (Adams et al., 1991). Also, patients reporting a lack of a medical home tend to travel further distances to care (Tai, Porell, & Adams, 2004). Finally, many rural patients suffering from diseases to which significant social stigmas are attached (such as mental disorders, substance abuse problems, or HIV/AIDS) often prefer to travel longer distances to access care in urban areas, where anonymity can be more readily assured and where

some clients feel more confident in the technical abilities of their selected providers (Fortney, Booth, Blow, & Bunn, 1995; Fortney, Owen, & Clothier, 1999; Mainous, III & Matheny, 1996).

Counterbalancing the disadvantages cited above, rural households are more likely than urban households to own at least one car (97% versus 92%) (Pucher & Renne, 2004). However, funds available for transportation and health care are often at odds with each other within household budgets (May & Cunningham, 2004). A prior study using the 2001 National Household Transportation Survey found that both the distance traveled and the total number of trips per day per person tend to increase with household income in both rural and urban households, though rural households tend to make fewer trips per day per person and have longer distances traveled per day per person (Pucher et al., 2004). For all age groups, rural households covered 38% more mileage than their urban counterparts per day per person, increasing to 59% more miles per person per day among the rural poor as compared to the urban poor (Pucher et al., 2004). Also, rural roads are often less accessible, of a lower quality, or in a lesser state of upkeep than those in urban areas. Finally, public transportation in rural areas is both scarcely available and rarely used; even in rural households without cars, only 1% of trips are made by public transportation (Pucher et al., 2004).

Minorities are often at a particular disadvantage in transportation to care, as the barriers to transportation inherent in rural areas can compound those traditionally experienced by minorities in access to care (Borders, 2004; Braver, 2003). Considering all non-work related trips, minorities are more likely to use public transportation (Polzin et al., 1999), even when accounting for socioeconomic characteristics of travelers, and many modes of public transportation are often lacking or non-existent in rural areas. In addition, African-Americans report longer travel distances for non-work related trips, and similar trips made by Hispanics are,

on average, longer in duration than those made by other racial and/or ethnic groups (Polzin et al., 1999). All persons of color in the United States are less likely to use the most common mode of transportation for non-work related trips, the automobile (Polzin et al., 1999).

Prior Measures of Distance

The previously mentioned "travel impedance to nearest provider" category (Guagliardo, 2004) includes measures of Euclidean (straight-line) distance, travel distance along a given path (over a road network, for instance), travel time between points, or travel cost (such as shipping or gas costs) between points. By virtue of their point-to-point nature, these "travel impedance" measures have an advantage over provider/population ratios as they are able to account for border-crossing behaviors (Lin, 2004; Luo, Wang, & Douglass, 2004) and intra-area/local provider variations (Guagliardo, 2004). However, their use also carries distinct disadvantages. If made retrospectively by matching of addresses, distance measures typically require higher-resolution point location data in order to accurately locate provider and patient locations. Mapping distances between points plotted with lower-resolution data (such as county or zip-code area centroids) can bias distance estimates (Guagliardo, 2004; Lin, 2004). Also, using Euclidean ("as the bird flies") distances will always underestimate the actual travel distance (Fryer, Jr. et al., 1999), as roads rarely form a perfectly straight line between any two geographic points of interest.

Travel time analyses often assume ideal driving conditions: weather disturbances (Goodman et al., 2003), rural terrain, and urban traffic congestion can all inflate estimated travel times that are based on observed measurements of distance (Fryer, Jr. et al., 1999). Travel impedance measurements are often more appropriate in rural areas, where provider choices are limited and the nearest provider is usually the one most likely to be utilized. In urban areas,

multiple provider choices are often found at equal distances from any single point, and travel impedance measures are unable to account for this (Guagliardo, 2004).

Using centroids of areal polygons (the mean geographic centers of counties, for instance) as data points for travel impedance measures can seriously hinder measurement precision. Virtually all areal units of analysis (states, counties, census blocks, zip codes, etc.) are based on either some core population measure or upon historical or administrative boundary lines, none of which tend to preserve a uniform area between the units of analysis. For example, counties in densely settled areas (like the Northeast) tend to be smaller in area than counties is more sparsely populated areas (like the Midwest). This means that as these areal units increase in size, their average distances from their geographic centers to any given point within their bounds increase, giving centroids of larger areas less absolute precision in their use as a proxy location for the "real" point/event location as compared to the same use in comparatively smaller areas. Zip-codes, popular in geographic-based health services research, also have additional issues that prevent their effective use in these types of measurements. Although they are often conveniently derived from administrative records (particularly when de-identification concerns prevent the use of the street address portion of the full location address), they often lack definitive boundaries and are temporally unstable. Additionally, many people can choose where they want to receive their mail (and hence, the zip code in which they fall); some may only have access to post office boxes which may be in a different area from where they live, while others may have home delivery. Issues such as these should discourage the use of areal-unit centroids as data points in geographically-based health services research, particularly when the spatial scope of analysis includes both rural and urban areas.

Appendix B: Data and Methods

National Household Travel Survey

We conducted a cross-sectional analysis of the 2001 National Household Travel Survey (NHTS). The NHTS is a key planning resource developed by the US Department of Transportation, with input from the Bureau of Transportation Statistics, the Federal Highway Administration, and the National Highway Traffic Safety Administration. The information it yields on travel patterns is used extensively in planning the development of roads and public transportation. From a health and safety point of view, information generated by the NHTS also provides denominator data that can be used to assess crash and injury rates by type of vehicle. This data set has received little attention to date, however, from health services researchers.

Definition of Rural and Urban

The definition of rurality as used within the 2001 NHTS is derived from a measure developed by Claritas Inc. The formal definition as found in the 2001 NHTS User's Guide is as follows:

> The classification that is reflected in the Urban/Rural variable is based on population density, but not just the density of a specific geography, but the density in context of its surrounding area, or "contextual density". To establish this classification, the United States was divided into a grid to reduce the impact of variation in size (land area) of census tracts and block groups. Density was converted into centiles, that is, the raw numbers (persons per square mile) were translated into a scale from 0 to 99. "Rural" (centiles 19 and less) and "small town" (centiles 20 to 39) definitions are based solely on the density. Population centers were defined if a route through the 8 neighboring cells could be constructed in which the density of successive cells was decreasing or equal. Population centers with centiles greater than 79 were designated "urban." Other centers were classified as "second cities." Finally, "suburban" areas of the population centers were defined, using both the cell density and the cell's density relative to the population center's density (Bureau of Transportation Statistics, 2005).

The classification levels of the above measure were collapsed into a dichotomous variable for this study: Households classified as "rural" in the original scheme were retained as "rural" in our analyses. All other original levels ("urban", "second city", "suburban," and "town") were classified as "urban".

NHTS – Background

The 2001 National Household Travel Survey (NHTS) obtained information from a nationally-representative sample of households, between March 2001 and May 2002. Co-sponsored by the Bureau of Transportation Statistics (BTS), the Federal Highway Administration (FHWA), and the National Highway Traffic Safety Administration (NHTSA), the 2001 NHTS was designed to replace both the Nationwide Personal Transportation Survey (of the FHWA) and the American Travel Survey (of the BTS). Types of data collected include information on the purpose, mode, transit time, trip length, and other related aspects of daily trips taken within a 24-hour period. For private vehicle trips, additional information was collected concerning vehicle attributes (make, model, year, etc.), the number of occupants, and characteristics of drivers (age, sex, education level, etc).

Eligible participants were civilian, non-institutionalized persons who considered themselves primary residents of sampled households. Eligible households excluded "motels, hotels, group quarters, such as nursing homes, prisons, barracks, convents or monasteries and any living quarters with 10 or more unrelated roommates."

The survey took place in three-stages. First, potential households chosen by random telephone digit selection were mailed an advance-notice letter notifying residents of the upcoming contact by NHTS survey personnel and encouraging their participation in the survey. Approximately a week later, survey personnel contacted the household and attempted to speak

with an adult household member to administer the household-level interview portion. A section of this interview contained screening questions to determine if the household was residential in nature. Households deemed eligible and which subsequently elected to participate in the survey were then mailed a travel diary package, for the third stage of the survey. The package contained forms on which each member of the household would record details of their travel activities over the following 24-hour period, designated as their "travel day." After the travel day, survey personnel contacted the household again by phone and administered the final person-level interviews to each participating member of the household (Bureau of Transportation Statistics, 2005).

All trips taken by all household members on the selected day are recorded. The NHTS interviewers then call the household after the travel day and record trip information for that day (routine travel). In addition, each household member is asked about "farthest trip" travel during the past four weeks. "I'm going to ask some questions about [your] long-distance travel during that time. These trips were for the farthest destination that was at least 50 miles away from your home, even if you did not begin the trip at your home." (NHTS 2001 p. M-60)

NHTS – Response Rate Limitations

The overall response rate for the NHTS was 41% (Bureau of Transportation Statistics, 2005). Survey results are weighted to account for under-response among specific populations. However, it is possible that adjustments cannot fully compensate for under-represented groups.

As the data collection phase of the NHTS is conducted via telephone, its low response rate is thought to derive from increasing levels of consumer resistance to unsolicited phone calls, the presence of cell-phone only households, and language barriers to survey administration. The two-stage interview design also contributes to the lowered overall response rate, as the overall

rate is a product of the response rates from both interview portions. Additionally, the level of participant burden is relatively high; households may collectively make dozens of trips per day, and both detailing them in a travel diary and recalling them from memory may be a significant obstacle to participation (Committee to Review the Bureau of Transportation Statistics' Survey Programs, 2002). An analysis of NHTS non-respondents found that response rates differ significantly by home value, race/ethnicity, the number of adults and presence of married persons in the household, and the type and size of the dwelling. Interestingly, low socio-economic status was correlated with high response rates for the screener/household-level interview, but with low response rates for the extended/personal-level interview (Cantor, Shapiro, Chen, Choudhry, & Freedman, 2005).

Methods for the present study

Population

We subset the NHTS 2001, deriving data from households in which at least one member makes at least one trip for medical/dental care. These data described 3,914 trips made by 2,432 households, which were then weighted to provide national estimates of 5,963 million trips in the United States. The outcome variables used were distance to care (miles) and travel time (minutes). The main independent variables of interest were residence (rural/urban), race, and ethnicity. Additional covariates included in the models were age, sex, educational attainment, occupation, income, and family size. Additionally, the analyses also controlled for the presence of medical conditions limiting driving, specific trip/travel characteristics (such as perceived road conditions, day of the week, and the mode of travel), and ecological factors (job density and national region).

Descriptive and multivariate analyses were conducted in SAS-callable SUDAAN to account for the complex NHTS sampling design. The need for weighting to account for under-represented groups has already been described. In addition, specific states could purchase larger sample sizes, allowing them to make sub-analyses of interest. Survey weights account for the over-representation of such states.

Appendix C: Detailed Tables

Table C-1. Characteristics of trips for medical or dental care, NHTS 2001

	Unweighted Observations	Estimated Total Trips (Millions)	Percent	SE
Characteristics of Traveler Reporting Trip				
Total	3914	5963.73	100.00	0.00
White	3174	4275.57	71.69	1.34
Black	240	664.84	11.15	1.05
Hispanic	123	296.49	4.97	0.67
Other	377	726.82	12.19	1.09
Rural				
Total	926	1201.04	100.00	0.00
White	803	970.32	80.79	2.81
Black	39	102.69	8.55	2.42
Hispanic	19	41.59	3.46	1.16
Other	65	86.43	7.20	1.85
Urban				
Total	2988	4762.69	100.00	0.00
White	2371	3305.25	69.40	1.61
Black	201	562.15	11.80	1.22
Hispanic	104	254.91	5.35	0.77
Other	312	640.39	13.45	1.26
Age				
0~25	704	1280.69	21.47	0.87
26~50	1340	2301.46	38.59	0.99
51~75	1401	1802.78	30.23	0.96
76~100	469	578.79	9.71	0.71
Sex				
Male	1462	2207.58	37.02	0.89
Female	2452	3756.15	62.98	0.89
Education				
High School or Lower	1484	2260.97	37.91	1.41
College	1797	2747.52	46.07	1.41
Graduate School	566	816.09	13.68	0.80
Not Ascertained	67	139.14	2.33	0.49
Medical Condition that Limits Driving				
Yes	566	808.87	13.56	0.81
No	3348	5154.85	86.44	0.81
Occupation of Head of Household				
Sales or Service	421	698.49	11.71	0.66
Clerical or Administrative Support	242	340.61	5.71	0.49
Manufacturing, Construction, Maintenance, or Farming	241	422.23	7.08	0.66

	Unweighted Observations	Estimated Total Trips (Millions)	Percent	SE
Professional, Managerial or Technical	616	940.32	15.77	0.97
Other	2394	3562.08	59.73	1.09
Household Income				
<$20,000	710	1148.64	19.26	1.25
>$20,000 and <$44,999	1044	1603.89	26.89	1.26
>$45,000 and <$69,999	921	1408.43	23.62	1.09
>$70,000	933	1339.72	22.46	1.32
Not Ascertained	306	463.04	7.76	0.70
Family Size				
<= 2 Family Members	1920	2498.34	41.89	1.38
3 Family Members	638	1044.66	17.52	1.13
4 Family Members	698	1184.56	19.86	1.23
>4 Family Members	658	1236.16	20.73	1.37
Characteristics of Trip				
Mode of Travel				
Personal Vehicle	3731	5592.95	93.78	0.64
Public/Walk/Other	183	370.78	6.22	0.64
Driver/Passenger Status				
Passenger	1263	2012.80	33.75	0.90
Not Passenger	2475	3585.31	60.12	0.99
Public/Walk/Other	176	365.62	6.13	0.64
Day of Week				
Business Day (Monday-Friday)	3154	4558.91	76.44	1.12
Weekend (Saturday-Sunday)	760	1404.82	23.56	1.12
Time of Day				
Midnight - 8 am	298	372.99	6.25	0.65
Business Hours (8 am - 5 pm)	3500	5398.74	90.53	0.80
5 pm - Midnight	116	191.99	3.22	0.51
Characteristics of Community				
Traffic Conditions				
Yes	1025	1575.40	26.42	0.98
No	2889	4388.32	73.58	0.98
Region				
Northeast	755	1159.83	19.45	1.00
South	973	1298.69	21.78	1.09
Midwest	1249	2116.79	35.49	1.49
West	937	1388.42	23.28	1.13
Job density				
Low	1018	1331.41	22.33	1.27
Median	977	1462.32	24.52	1.28
High	954	1468.69	24.63	1.27
Very High	965	1701.31	28.53	1.19

Table C-2. Perceived barriers to day-to-day travel, among persons traveling for medical/dental care, NHTS 2001. Perceived barriers were rated on a 5-point scale, from 1 (not a problem) through 5 (severe problem). Values shown indicate the percent of persons scoring the possible barrier as 4 or 5 were defined as perceiving a barrier

Traffic condition	Total (%)	Rural (%)	Urban (%)	P value
Unweighted observations	3,914	926	2,988	
Price of gasoline	22.67	27.47	21.46	0.0075
Rough pavement	22.18	20.70	22.55	0.3698
Highway congestion	19.83	11.50	21.93	0.0000

Table C-3. Average travel time and distance for a routine trip for medical/dental care, by residence and race, NHTS 2001

Average distance of a routine trip for care			
	Miles	SE	P-value
All US	10.16	0.31	
Race			0.9602
White	10.06	0.38	----
African American	9.99	1.01	0.9560
Hispanic	10.65	2.54	0.8189
Other	10.68	1.22	0.6352
Residence			0.0000
Rural	17.48	1.11	0.0000
Urban	8.31	0.30	----
Average time in minutes of a routine trip for care			
	Minutes	SE	P-value
All US	22.03	0.47	
Race			0.0001
White	20.64	0.46	----
African American	29.11	1.72	0.0000
Hispanic	22.49	2.58	0.4855
Other	23.53	2.18	0.2000
Residence			0.0000
Rural	27.23	1.31	0.0000
Urban	20.72	0.52	----

Unweighted observations for table:	Total
Total	3914
White	3174
Black	240
Hispanic	123
Other	377
Rural	926
Urban	2988

Table C-4. Average travel time and distance for a routine trip to work, by residence and race, NHTS 2001

Average distance of a routine trip to work			
	Miles	SE	P-value
All US	12.39	0.16	
Race			0.0026
White	12.57	0.15	----
African American	11.01	0.37	0.0002
Hispanic	12.09	1.25	0.7016
Other	12.86	0.55	0.5983
Residence			0.0000
Rural	15.56	0.35	0.0000
Urban	11.62	0.17	----
Average time in minutes of a routine trip to work			
	Minutes	SE	P-value
All US	23.47	0.23	
Race			0.0000
White	22.92	0.21	----
African American	24.80	0.63	0.0025
Hispanic	23.53	1.01	0.5414
Other	25.53	0.65	0.0001
Residence			0.9709
Rural	23.48	0.43	0.9709
Urban	23.47	0.23	----

Unweighted observations for table:	Total
Total	3914
White	3174
Black	240
Hispanic	123
Other	377
Rural	926
Urban	2988

Table C-5. Proportion of persons with a high travel burden for medical/dental care, by residence and race, NHTS 2001. (Note: The value for rural, Hispanic travelers is statistically unreliable.)

Percent of trips that are 30 or more miles							
	Total		Rural		Urban		
	Percent	SE	Percent	SE	Percent	SE	P-value
Total	7.91	0.72	21.44	2.45	4.50	0.70	0.0000
White	7.46	0.82	21.53	2.81	3.33	0.58	0.0000
African American	6.71	1.91	23.35	9.47	3.67	1.44	0.0484
Hispanic	11.68	5.15	*6.40*	*6.02*	12.54	5.95	0.4777
Other	10.08	3.54	25.42	12.85	8.01	3.79	0.2201
P=0.6461			P=0.3560		P=0.2434		
Percent of trips that are 30 minutes or more							
	Total		Rural		Urban		
	Percent	SE	Percent	SE	Percent	SE	P-value
Total	28.54	1.33	41.26	2.99	25.33	1.49	0.0000
White	24.41	1.32	38.45	2.98	20.29	1.43	0.0000
African American	49.71	4.85	54.87	16.35	48.77	5.09	0.6933
Hispanic	32.86	7.48	*56.09*	*19.37*	29.06	8.60	0.2241
Other	31.68	4.09	49.43	10.14	29.28	4.60	0.1100
P=0.0000			P=0.4320		P=0.0001		

Unweighted observations for table:	Total	Rural	Urban
Total	3914	926	2988
White	3174	803	2371
Black	240	39	201
Hispanic	123	19	104
Other	377	65	312

Table C-6. Travel time and distance for a routine trip to work, by residence and race

Percent of routine work trips that are 30 or more miles							
	Total		Rural		Urban		
	Percent	SE	Percent	SE	Percent	SE	P-value
Total	9.58	0.29	15.39	0.79	8.17	0.29	0.0000
White	9.71	0.30	15.59	0.77	7.99	0.30	0.0000
African American	7.79	0.87	8.47	3.22	7.70	0.89	0.8154
Hispanic	9.75	1.32	*16.64*	*5.80*	8.79	1.35	0.1818
Other	10.63	1.06	19.18	3.38	9.43	1.09	0.0056
P=0.1780			P=0.1884		P=0.5418		
Percent of routine work trips that are 30 minutes or more							
	Total		Rural		Urban		
	Percent	SE	Percent	SE	Percent	SE	P-value
Total	30.81	0.48	32.17	0.96	30.48	0.50	0.0941
White	29.96	0.49	32.31	0.96	29.27	0.54	0.0056
African American	31.69	1.54	22.21	3.25	32.91	1.67	0.0044
Hispanic	30.12	2.08	*43.31*	*7.23*	28.28	2.35	0.0682
Other	35.70	1.46	34.67	3.63	35.85	1.55	0.7585
P=0.0029			P=0.0154		P=0.0009		

Unweighted observations for table:	Total	Rural	Urban
Total	3914	926	2988
White	3174	803	2371
Black	240	39	201
Hispanic	123	19	104
Other	377	65	312

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Table C-7. Travel Burden Medical/Dental Care, Miles: Factors associated with a trip for routine care that is 30 miles or more.

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Traveler Reporting Trip						
Residence						
Rural	6.08	3.88, 9.52	5.49	3.53, 8.56	2.67	1.39, 5.15
Urban (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Race						
White (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Black	0.98	0.48, 1.98	0.98	0.48, 1.97	1.03	0.53, 2.02
Hispanic	1.92	0.48, 7.67	2.00	0.47, 8.52	2.45	0.51, 11.77
Other	1.79	0.69, 4.68	1.91	0.73, 4.99	1.90	0.69, 5.19
Age						
0~25	1.14	0.66, 1.96	1.24	0.72, 2.14	1.32	0.73, 2.36
26~50 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
51~75	1.45	0.81, 2.57	1.38	0.78, 2.45	1.31	0.73, 2.35
76~100	1.70	0.67, 4.33	1.64	0.68, 3.95	1.59	0.68, 3.69
Sex						
Male (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Female	1.06	0.80, 1.40	1.09	0.82, 1.45	1.08	0.80, 1.46
Education						
High School or Lower	1.03	0.58, 1.83	1.06	0.58, 1.94	1.10	0.59, 2.04
College (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Graduate School	0.67	0.27, 1.66	0.66	0.27, 1.64	0.63	0.25, 1.61
Not Ascertained	0.67	0.17, 2.59	0.63	0.16, 2.50	0.65	0.15, 2.78
Medical Condition that Limits Driving						
Yes (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
No	0.61	0.37, 1.00	0.64	0.39, 1.05	0.64	0.39, 1.04
Occupation of Head of Household						
Sales or Service (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Clerical or Administrative Support	0.48	0.18, 1.26	0.49	0.18, 1.28	0.52	0.19, 1.39
Manufacturing, Construction, Maintenance, or Farming	1.15	0.45, 2.90	1.21	0.48, 3.07	1.23	0.47, 3.26
Professional, Managerial or Technical	0.99	0.50, 1.97	0.98	0.47, 2.03	1.02	0.48, 2.17
Other	0.84	0.48, 1.46	0.86	0.47, 1.54	0.84	0.46, 1.55
Household Income						
<$20,000 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
>$20,000 and <$44,999	1.14	0.56, 2.30	1.10	0.53, 2.28	1.18	0.54, 2.61
>$45,000 and <$69,999	0.84	0.43, 1.63	0.80	0.40, 1.59	0.90	0.43, 1.87
>$70,000	1.11	0.50, 2.46	1.02	0.45, 2.31	1.17	0.51, 2.69
Not Ascertained	0.25	0.09, 0.72	0.25	0.08, 0.78	0.30	0.09, 0.93
Family Size						
<= 2 Family Members (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
3 Family Members	1.06	0.52, 2.18	1.03	0.49, 2.16	0.98	0.46, 2.10
4 Family Members	0.84	0.43, 1.66	0.86	0.43, 1.73	0.80	0.39, 1.63
>4 Family Members	1.34	0.67, 2.71	1.33	0.64, 2.73	1.29	0.62, 2.68

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Trip						
Mode of Travel						
Personal Vehicle (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Public/Walk/Other			0.31	0.10, 0.92	0.40	0.13, 1.26
Day of Week						
Business Day (Monday-Friday) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Weekend (Saturday-Sunday)			1.38	0.84, 2.26	1.43	0.88, 2.34
Time of Day						
Midnight - 8 am			2.56	1.06, 6.16	2.54	1.12, 5.78
Business Hours (8 am - 5 pm) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
5 pm - midnight			0.19	0.10, 0.37	0.20	0.09, 0.43
Characteristics of Community						
Traffic_Condition						
Yes (ref)					1.00	1.00, 1.00
No					0.83	0.58, 1.20
Region						
Northeast (ref)					1.00	1.00, 1.00
South					0.98	0.47, 2.06
Midwest					1.46	0.76, 2.80
West					2.11	0.88, 5.05
Job Density						
Low (ref)					1.00	1.00, 1.00
Median					0.52	0.23, 1.16
High					0.49	0.20, 1.19
Very High					0.19	0.07, 0.52

Table C-8. Travel Burden, Medical/Dental Care, Time: Factors associated with a trip for routine care that is 30 minutes or longer.

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Traveler Reporting Trip						
Residence						
Rural	2.23	1.62, 3.07	2.23	1.62, 3.06	1.80	1.09, 2.99
Urban (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Race						
White (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Black	3.18	2.07, 4.88	2.94	1.91, 4.53	3.04	2.00, 4.62
Hispanic	1.36	0.67, 2.75	1.19	0.56, 2.52	1.23	0.56, 2.69
Other	1.56	1.04, 2.33	1.58	1.05, 2.38	1.64	1.07, 2.51
Age						
0~25	0.89	0.66, 1.20	0.92	0.68, 1.23	0.95	0.70, 1.31
26~50 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
51~75	1.04	0.78, 1.37	1.07	0.81, 1.42	1.05	0.79, 1.40
76~100	1.11	0.72, 1.72	1.19	0.78, 1.81	1.18	0.77, 1.83
Sex						
Male (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Female	0.81	0.68, 0.98	0.85	0.70, 1.02	0.83	0.68, 1.00
Education						
High School or Lower	0.94	0.71, 1.23	0.92	0.70, 1.21	0.94	0.71, 1.24
College (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Graduate School	0.96	0.61, 1.49	0.94	0.60, 1.48	0.95	0.60, 1.51
Not Ascertained	0.61	0.32, 1.18	0.61	0.32, 1.18	0.63	0.32, 1.27
Medical Condition that Limits Driving						
Yes (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
No	0.80	0.59, 1.08	0.81	0.60, 1.10	0.82	0.60, 1.11
Occupation of Head of Household						
Sales or Service (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Clerical or Administrative Support	1.10	0.71, 1.69	1.07	0.69, 1.66	1.11	0.71, 1.71
Manufacturing, Construction, Maintenance, or Farming	0.78	0.46, 1.35	0.82	0.48, 1.42	0.84	0.49, 1.45
Professional, Managerial or Technical	1.23	0.83, 1.81	1.22	0.82, 1.80	1.25	0.85, 1.86
Other	1.19	0.85, 1.66	1.19	0.85, 1.67	1.20	0.85, 1.70
Household Income						
<$20,000 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
>$20,000 and <$44,999	0.92	0.62, 1.35	0.96	0.65, 1.44	0.97	0.65, 1.45
>$45,000 and <$69,999	0.72	0.50, 1.03	0.75	0.51, 1.12	0.78	0.52, 1.16
>$70,000	0.65	0.41, 1.02	0.66	0.42, 1.06	0.68	0.42, 1.09
Not Ascertained	0.83	0.50, 1.35	0.84	0.51, 1.40	0.89	0.53, 1.51
Family Size						
<= 2 Family Members (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
3 Family Members	0.93	0.62, 1.39	0.97	0.65, 1.45	0.96	0.64, 1.45
4 Family Members	0.95	0.63, 1.43	1.00	0.66, 1.51	1.02	0.67, 1.54
>4 Family Members	1.36	0.90, 2.05	1.42	0.95, 2.14	1.44	0.96, 2.18

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Trip						
Mode of Travel						
Personal Vehicle (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Public/Walk/Other			1.77	1.14, 2.72	2.22	1.42, 3.46
Day of Week						
Business Day (Monday-Friday) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Weekend (Saturday-Sunday)			1.14	0.83, 1.55	1.16	0.85, 1.59
Time of Day						
Midnight - 8 am			1.85	1.13, 3.03	1.86	1.12, 3.10
Business Hours (8 am - 5 pm) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
5 pm - midnight			0.63	0.27, 1.44	0.71	0.31, 1.61
Characteristics of Community						
Traffic_Condition						
Yes (ref)					1.00	1.00, 1.00
No					0.81	0.64, 1.02
Region						
Northeast (ref)					1.00	1.00, 1.00
South					1.24	0.87, 1.78
Midwest					1.38	0.97, 1.95
West					1.40	0.98, 2.00
Job Density						
Low (ref)					1.00	1.00, 1.00
Median					0.94	0.58, 1.53
High					0.86	0.50, 1.46
Very High					0.62	0.37, 1.03

Table C-9. Travel Burden, Work, Miles: Factors associated with a trip to work that is 30 miles or more.

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Traveler Reporting Trip						
Residence						
Rural	2.16	1.86, 2.51	2.08	1.78, 2.43	1.47	1.14, 1.90
Urban (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Race						
White (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Black	1.03	0.78, 1.36	1.03	0.77, 1.36	1.00	0.74, 1.34
Hispanic	1.17	0.86, 1.60	1.13	0.83, 1.55	1.20	0.87, 1.66
Other	1.23	0.99, 1.53	1.26	1.02, 1.56	1.31	1.06, 1.63
Age						
0~25	0.85	0.66, 1.09	0.92	0.72, 1.19	0.95	0.74, 1.23
26~50 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
51~75	0.91	0.77, 1.08	0.91	0.77, 1.09	0.90	0.76, 1.07
76~100	0.53	0.15, 1.81	0.61	0.19, 1.99	0.60	0.18, 1.96
Sex						
Male (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Female	0.52	0.46, 0.59	0.53	0.47, 0.61	0.51	0.44, 0.58
Education						
High School or Lower	0.96	0.83, 1.12	0.94	0.80, 1.10	0.91	0.77, 1.06
College (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Graduate School	0.75	0.61, 0.92	0.79	0.64, 0.96	0.77	0.63, 0.95
Not Ascertained	0.79	0.48, 1.27	0.80	0.49, 1.30	0.77	0.47, 1.27
Medical Condition that Limits Driving						
Yes (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
No	1.04	0.57, 1.89	1.00	0.55, 1.84	1.07	0.58, 1.97
Occupation of Head of Household						
Sales or Service (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Clerical or Administrative Support	1.21	0.92, 1.58	1.13	0.86, 1.49	1.15	0.87, 1.52
Manufacturing, Construction, Maintenance, or Farming	1.93	1.53, 2.42	1.69	1.34, 2.12	1.69	1.34, 2.12
Professional, Managerial or Technical	1.77	1.47, 2.13	1.63	1.36, 1.97	1.61	1.33, 1.94
Other	0.83	0.47, 1.46	0.86	0.48, 1.52	0.87	0.49, 1.53
Household Income						
<$20,000 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
>$20,000 and <$44,999	1.23	0.92, 1.65	1.18	0.88, 1.58	1.18	0.88, 1.59
>$45,000 and <$69,999	1.56	1.19, 2.03	1.47	1.11, 1.93	1.48	1.12, 1.95
>$70,000	1.89	1.44, 2.48	1.80	1.37, 2.37	1.81	1.37, 2.39
Not Ascertained	1.57	1.06, 2.32	1.52	1.04, 2.24	1.62	1.11, 2.37
Family Size						
<= 2 Family Members (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
3 Family Members	1.23	1.00, 1.51	1.22	0.99, 1.49	1.22	1.00, 1.50
4 Family Members	1.15	0.93, 1.42	1.14	0.92, 1.41	1.15	0.93, 1.42
>4 Family Members	1.45	1.15, 1.83	1.45	1.14, 1.83	1.47	1.16, 1.86

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Trip						
Mode of Travel						
Personal Vehicle (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Public/Walk/Other			0.76	0.60, 0.95	0.86	0.67, 1.10
Day of Week						
Business Day (Monday-Friday) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Weekend (Saturday-Sunday)			0.96	0.81, 1.14	0.96	0.81, 1.13
Time of Day						
Midnight - 8 am			1.91	1.66, 2.20	1.87	1.62, 2.16
Business Hours (8 am - 5 pm) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
5 pm - midnight			1.85	1.30, 2.64	1.87	1.32, 2.65
Characteristics of Community						
Traffic_Condition						
Yes (ref)					1.00	1.00, 1.00
No					0.56	0.48, 0.65
Region						
Northeast (ref)					1.00	1.00, 1.00
South					0.83	0.68, 1.01
Midwest					1.01	0.85, 1.21
West					0.92	0.72, 1.18
Job Density						
Low (ref)					1.00	1.00, 1.00
Median					0.77	0.59, 0.99
High					0.62	0.47, 0.82
Very High					0.46	0.35, 0.60

Table C-10. Travel Burden, Work, Time: Factors associated with a trip to work that is 30 minutes or longer.

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Traveler Reporting Trip						
Residence						
Rural	1.16	1.05, 1.27	1.18	1.07, 1.30	1.23	1.03, 1.46
Urban (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Race						
White (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Black	1.23	1.06, 1.42	1.17	1.00, 1.36	1.07	0.91, 1.25
Hispanic	1.09	0.88, 1.35	1.09	0.88, 1.35	0.96	0.78, 1.19
Other	1.34	1.17, 1.54	1.33	1.15, 1.54	1.23	1.07, 1.43
Age						
0~25	0.81	0.71, 0.93	0.82	0.72, 0.94	0.85	0.75, 0.98
26~50 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
51~75	0.89	0.80, 0.99	0.90	0.81, 1.00	0.90	0.81, 1.01
76~100	0.60	0.30, 1.19	0.67	0.34, 1.34	0.67	0.32, 1.36
Sex						
Male (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Female	0.67	0.62, 0.73	0.69	0.64, 0.75	0.67	0.62, 0.73
Education						
High School or Lower	1.02	0.93, 1.13	1.01	0.91, 1.11	1.00	0.90, 1.11
College (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Graduate School	0.89	0.79, 1.00	0.89	0.79, 1.00	0.86	0.77, 0.98
Not Ascertained	0.96	0.75, 1.22	0.94	0.74, 1.20	0.91	0.72, 1.16
Medical Condition that Limits Driving						
Yes (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
No	0.74	0.53, 1.05	0.79	0.56, 1.12	0.88	0.62, 1.26
Occupation of Head of Household						
Sales or Service (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Clerical or Administrative Support	1.47	1.27, 1.70	1.34	1.15, 1.55	1.34	1.15, 1.56
Manufacturing, Construction, Maintenance, or Farming	1.53	1.35, 1.74	1.41	1.24, 1.60	1.44	1.26, 1.64
Professional, Managerial or Technical	1.59	1.41, 1.78	1.49	1.33, 1.67	1.47	1.31, 1.66
Other	0.77	0.57, 1.04	0.80	0.59, 1.08	0.81	0.60, 1.09
Household Income						
<$20,000 (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
>$20,000 and <$44,999	0.94	0.77, 1.13	0.99	0.81, 1.20	1.00	0.82, 1.22
>$45,000 and <$69,999	1.10	0.91, 1.33	1.17	0.97, 1.42	1.20	0.99, 1.45
>$70,000	1.35	1.12, 1.64	1.44	1.19, 1.76	1.47	1.20, 1.79
Not Ascertained	1.18	0.93, 1.51	1.21	0.95, 1.55	1.28	1.00, 1.64
Family Size						
<= 2 Family Members (ref)	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
3 Family Members	1.09	0.97, 1.22	1.12	0.99, 1.26	1.15	1.02, 1.29
4 Family Members	1.00	0.89, 1.12	1.01	0.90, 1.13	1.04	0.93, 1.17
>4 Family Members	1.08	0.94, 1.25	1.11	0.96, 1.27	1.17	1.02, 1.34

	Model 1: Traveler		Model 2: Traveler plus Trip		Model 3: Travel, Trip, and Community	
	OR	95% CI	OR	95% CI	OR	95% CI
Characteristics of Trip						
Mode of Travel						
Personal Vehicle (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Public/Walk/Other			2.43	2.11, 2.81	2.42	2.08, 2.81
Day of Week						
Business Day (Monday-Friday) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
Weekend (Saturday-Sunday)			0.95	0.85, 1.06	0.95	0.85, 1.06
Time of Day						
Midnight - 8 am			1.58	1.45, 1.73	1.58	1.45, 1.73
Business Hours (8 am - 5 pm) (ref)			1.00	1.00, 1.00	1.00	1.00, 1.00
5 pm - midnight			1.34	1.05, 1.71	1.39	1.09, 1.78
Characteristics of Community						
Traffic_Condition						
Yes (ref)					1.00	1.00, 1.00
No					0.55	0.50, 0.61
Region						
Northeast (ref)					1.00	1.00, 1.00
South					0.78	0.69, 0.88
Midwest					0.98	0.87, 1.11
West					0.92	0.79, 1.06
Job Density						
Low (ref)					1.00	1.00, 1.00
Median					0.94	0.78, 1.13
High					0.89	0.73, 1.08
Very High					1.01	0.82, 1.25

Appendix D: References

Reference List

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