Transportation (2005) 32: 165–186

Rural mobility and mode choice: Evidence from the 2001 National Household Travel Survey

JOHN PUCHER* & JOHN L. RENNE
Bloustein School of Planning and Public Policy, Rutgers University, New Brunswick, New Jersey 08901, USA
(Author for correspondence, E-mail: pucher@rci.rutgers.edu)*

Key words: accessibility, mobility, mode choice, rural, socioeconomics, travel behavior, urban

Abstract. This article uses data from the 2001 National Household Travel Survey (NHTS) to compare travel behavior in rural and urban areas of the U.S. As expected, the car is the overwhelmingly dominant mode of travel. Over 97% of rural households own at least one car vs. 92% of urban households; 91% of trips are made by car in rural areas vs. 86% in urban areas. Regardless of age, income, and race, almost everyone in rural areas relies on the private car for most travel needs. Mobility levels in rural areas are generally higher than in urban areas. That results from the more dispersed residences and activity sites in rural areas, which increase trip distances and force reliance on the car. Somewhat surprisingly, the rural elderly and poor are considerably more mobile than their urban counterparts, and their mobility deficit compared to the rural population average is strikingly less than for the urban elderly and poor compared to the urban average. Data limitations prevented a measurement of accessibility, however, and it seems likely that rural areas, by their very nature, are less accessible than urban areas, especially for the small percentage of car-less poor and elderly households.

Abbreviations: HOV–high occupancy vehicle; NHTS–National Household Travel Survey; NPTS–Nationwide Personal Transportation Survey; SOV–single occupancy vehicle

1. Introduction

Rural sociologists and planners generally argue that rural areas, by their very nature, offer less accessibility than urban areas (Hagerstrand 1970; Ingram 1971; Lapping et al. 1979; Mosley 1979; Bogren 1998). The low densities of rural areas – and the resulting distances between residences, service centers, schools, churches, shopping facilities, and job sites – make it more difficult for rural households to reach many destinations. While travel speeds are higher on most rural roads, trip distances are considerably longer, generally requiring more time per day for local travel in rural areas than in urban areas (U.S. Department of Agriculture 1999; Transportation Research Board 1999; Glascow & Blakely 2000). Moreover, the very

limited public transport services in rural areas sharply restrict travel options, forcing almost complete reliance on the car for almost all trips (Rosenbloom 2002, 2003).

Of course, accessibility can vary from one rural area to another, and from one urban area to another. Indeed, it is possible that households living in extremely congested, sprawling metropolitan areas might have less accessibility to some daily destinations than households in nearly self-sufficient rural communities. Thus, it is not clear to what extent there really is an accessibility gap between rural and urban areas.

The very notion of accessibility is subject to different interpretations. Virtually all experts, however, distinguish between mobility and accessibility (Schaeffer & Sclar 1970; Hanson 1996; Handy & Niemeier 1997; Meyer & Miller 2001; Pacione 2001). For example, Hanson (1996, p. 4) defines accessibility as ''the number of opportunities, also called activity sites, available within a certain distance or travel time.'' By comparison, she defines mobility as ''the ability to move between different activity sites (i.e. from home to a grocery store).'' Thus, mobility refers to the amount and type of travel that is possible, while accessibility refers to the ability (in terms of time, cost, and effort) to reach desired destinations.

Unfortunately, it is difficult to measure accessibility, since it requires quantifying and comparing travel needs with travel possibilities for each household, usually exceeding data availability. Conceptually, of course, it is possible, as explained by Hanson (1996, pp. 5–7), Handy and Niemeier (1997), Meyer and Miller (2001, pp. 95–103), and Handy and Clifton (2001). Empirical estimates, however, are generally done on a disaggregate, case-by-case basis. The national travel survey data examined in this article are far too aggregate for that sort of analysis, not even permitting disaggregation to a town-specific level, let alone census tract, neighborhood, or household level.[1]

A more feasible and less controversial – if less satisfying – approach is simply to measure actual travel, as reported by survey respondents. While not indicating the extent to which desired destinations can be reached, travel surveys at least permit comparisons of mobility rates and travel behavior among different areas. They also reveal the range of travel options available in different areas and in different segments of the population.

In this article, we limit ourselves to such an examination of mobility, using the most recent national travel survey to compare local travel in urban and rural areas of the U.S., especially as it varies for different socioeconomic groups. While such an analysis of actual mobility levels can help reveal the amount of travel and range of travel options, it can only suggest some possible implications for accessibility, and in particular, the degree of disadvantage faced by some groups.

Our main purpose is simply to present this most recent information on rural–urban differences in mobility and mode choice. An in-depth economic and sociological analysis of the survey data is beyond the scope of the current article, although we note some possibly significant patterns. Nevertheless, many of the rural–urban comparisons presented here may be interesting in themselves, since they reveal surprising similarities as well as expected differences. Moreover, the information may be useful to other researchers, not only transport planners but also geographers and rural sociologists.

2. Changing economics, demographics, and travel patterns of rural areas

As several studies indicate, rural areas in the U.S. have undergone enormous changes over the past few decades (U.S. Department of Agriculture 1997; Beale 1999; Transportation Research Board 2000; Rosenbloom 2002, 2003). Of course, there are vast differences among rural areas, but in most regions of the U.S., there has been a dramatic shift from a strong dependence on agriculture, mining, and forestry to a much more diverse, service-oriented economy. Moreover, in some rural counties, manufacturing and high-tech industries have been burgeoning, reflecting the ongoing decentralization of economic activities away from cities.

One result of that economic transformation is a reversal of the decades-long trend toward depopulation of rural America. For all rural counties combined, population increased by 10.3% from 1990 to 2000 (U.S. Department of Agriculture 2003). Most of the growth was in the West and the Southeast; indeed, rural counties in the West grew even faster than urban counties (Beale 1999). In general, the fastest growing rural counties also tended to be located near metropolitan areas, probably reflecting an overflow of both population and firms from cities to their surrounding regions. Rural population growth, in particular, has resulted from an influx of young professionals, retirees, and rural-based commuters to jobs in urban and suburban areas, in addition to the employees of new service and manufacturing firms in rural areas themselves. By comparison, rural counties in the Great Plains, Mississippi Valley, and Appalachia continue to lose population. Especially those isolated rural counties far from urban centers have languished in their decades-long decline (U.S. Department of Agriculture 2003).

Those economic and demographic changes have also affected travel patterns. In general, workers are commuting much farther to jobs than previously, often to urban areas or other rural counties (Rosenbloom 2002, 2003). The establishment of regional shopping centers, office complexes,

and industrial parks, either at the edge of suburban areas or in the exurban portions of rural counties, has also redirected travel. The continuing decentralization of jobs and population further and further from cities has been made possible by enormous advances in communications that have greatly reduced the disadvantages of peripheral locations, both for firms and households. Moreover, America's superb highway network reaches into virtually every part of rural America and provides convenient connections between rural locations and nearby urban areas as well as the rest of the country.

It seems clear that, whatever the accessibility disadvantages currently existing in rural areas, they are much less than even a few decades ago, and they continue to decline over time with further advances in communications and transport technologies. There are exceptions to that generalization, however. Those elderly and/or poor households without cars and licensed drivers probably face even greater mobility problems than previously, since public transport alternatives have diminished, and mobility is now overwhelmingly dependent on the private car (Transportation Research Board 1999; Glascow & Blakely 2000; Rosenbloom 2002, 2003). The increased mobility enjoyed by most of the rural population – made possible by ubiquitous roads and rising car ownership – has fostered the increased separation of activity sites, since car drivers can travel faster and farther than previously. Those increased trip distances, combined with the decline in public transport, walking, and cycling alternatives, place many car-less households at an even greater accessibility disadvantage than before.

3. Background on the 2001 National Household Travel Survey

The most recent comprehensive survey of personal travel in the U.S. is the 2001 National Household Travel Survey (NHTS) (U.S. Department of Transportation 2003). It is the only national survey that includes both work and non-work trips. The 2000 Census, by comparison, reports only journeys to and from work, less than a fourth of all trips. The 2001 NHTS reports a wide range of information about the socioeconomic characteristics of households as well as their motor vehicle ownership and many aspects of their travel. For example, it reports the number of trips per day and, for each trip, the means of travel, day and time of travel, trip distance, and trip purpose.

The 2001 NHTS incorporates several important improvements in survey methodology over its predecessor 1969, 1977, 1983, 1990, and 1995 Nationwide Personal Transportation Surveys (NPTS) (U.S. Department of Transportation 1999). For example, walk trips had been significantly underreported in all earlier surveys (Pucher et al. 1998; Pucher & Renne

2003). Thus, the 2001 NHTS included several special prompts in the survey questionnaire to ensure that all walk trips were reported. Moreover, because earlier surveys had reported some questionable trip lengths, multiple data collection methods were used to achieve more accurate trip distances. The 2001 survey also collected more detailed information on trips made to access transit services.

The NHTS still suffers from all the problems of telephone surveys. Most importantly, it undersamples low-income households without telephones. To correct for that problem, survey responses were weighted to make the overall sample representative of the population as a whole. Indeed, the weighting of undersampled households in the 2001 NHTS was more extensive than in any previous survey. The NHTS does not, however, take into account the increasing number of households with only cellular phones that cannot be reached by standard telephone survey techniques.

The 2001 NHTS was conducted over the 14-month period from March 2001 to May 2002, thus ensuring coverage of every month of the year. Each household reported all trips made over a 24-hour period, starting at 4:00 a.m. one day and terminating at 3:59 a.m. the following day. As with the earlier NPTS surveys, the NHTS only includes the civilian, non-institutionalized population of the U.S. It explicitly excludes motels, hotels, prisons, military barracks, convents, monasteries, and any living quarters with ten or more unrelated occupants. The NHTS included college students, however, provided that dormitory, fraternity or sorority rooms had telephones and fewer than 10 occupants. The 2001 survey interviewed 26,018 households nationwide, including 19,768 households in urban areas and 6,250 households in rural areas.

The NHTS survey data analyzed here (January 2003 release) used the U.S. Census definitions of urban and rural:[2]

> For Census 2000, the Census Bureau classifies as ''urban'' all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). It further defines urbanized areas and urban clusters as densely settled territory consisting of core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile. In addition, under certain conditions, less densely settled territory may be part of each UA or UC. The Census Bureau defines as ''rural'' all territory, population, and housing units located outside of UAs and UCs (U.S. Department of Commerce 2002b, pp. 1–3).

While urbanized areas include only the urban portions of counties, metropolitan statistical areas are delineated on the basis of entire counties,

often including rural portions. Thus, the Census's urbanized vs. non-urbanized classification used by the NHTS is more appropriate for dividing our sample into rural and urban portions.

There are, in fact, many alternative definitions of rural (Lapping 1992; McConnell & Zetzman 1993; Ricketts 1994; Halfacre 1995; Hibbard & Roemer 1999; U.S. Department of Health and Human Services 2002; U.S. Department of Commerce 2002). Different definitions would obviously yield somewhat different sample selections for the rural vs. urban comparisons. We have simply used the U.S. Census's rural classification embedded in the NHTS survey methodology. Overall, 24% of the surveyed households were classified as rural.

In order to isolate local travel, we eliminated all reported trips that exceeded 75 miles in length. The resulting sample included 173,974 trips by urban households and 55,288 trips by rural households. Our trip length limitation excluded 7% of all trips reported by rural households and 8% of all trips reported by urban households. Thus, our attempt to exclude long-distance intercity trips had approximately the same sample reduction impact both for urban and rural households.

4. Rural-urban differences in daily trip rates and distance traveled

As shown in Table 1, rural households make only slightly fewer trips per person per day than urban households. Although there are some variations by income category, rural households make an average of 5% fewer trips per day than urban households. There is no rural–urban difference among the poorest households (incomes less than $20,000), while the largest rural–urban difference is among the most affluent households (incomes of $100,000 or more), who make 15% fewer trips per day in rural areas.[3]

The differences in daily distance traveled are much larger and in the reverse direction. On average, rural households cover 38% more mileage per person per day than urban households. The differences in distance traveled are greatest among households earning less than $20,000, with the rural poor covering 59% more miles per day than their urban counterparts. That is almost twice the 31% difference in daily travel distance between rural and urban affluent households (incomes over $100,000).[4]

As discussed by Handy and Niemeier (1997), travel generally adjusts to overall levels of accessibility. Thus, households living close to potential destinations (more likely in cities) would be expected to make more frequent but shorter trips. Conversely, households living far from potential destinations (such as in isolated rural areas) would be expected to make fewer but longer trips. That probably explains why the NHTS survey found

Table 1. Daily travel per capita by income class.

Household income	Trips per day per person		Miles traveled per day per person	
	Rural	Urban	Rural	Urban
Less than $20,000	3.2	3.2	28.5	17.9
$20,000 – $39,999	3.7	3.9	35.6	26.4
$40,000 – $74,999	4.0	4.2	41.3	30.2
$75,000 – $99,999	4.2	4.3	41.6	30.7
$100,000 and over	4.1	4.8	41.8	31.8
All	3.8	4.0	37.1	26.9

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
Source: Calculated from the 2001 NHTS by Hikari Nakamoto.

more trips per household in urban areas but much longer trips in rural areas.

Table 1 also shows that trip rates and travel distance fall considerably with declining income in both rural and urban areas, but the difference is greater in urban areas. The rural poor (incomes less than $20,000) make 16% fewer trips per day than the rural average, while the urban poor make 25% fewer trips per day than the urban average. Similarly, the rural poor cover 23% less mileage per day than the rural average, while the urban poor cover 33% less mileage than the urban average.

In short, the relative mobility of the poor appears to be higher in rural areas than in urban areas, both in terms of trip numbers and distances covered. That does not mean that overall accessibility is higher for the rural poor, but the differences in mobility rates between the poor and affluent are smaller in rural areas than in urban areas. Clearly, the rural poor are forced by more dispersed destinations and longer trip distances to be more mobile, while the urban poor are more likely to live in relatively compact communities that permit shorter trips.

As shown in Table 2, mobility rates fall considerably above the age of 65, both for urban and rural households. With the sole exception of people 80 years of age or older, urban households in every other age category make more trips than their rural counterparts. Yet rural households in every age category, without exception, cover much longer distances per day. For all age groups combined, rural households covered 38% more mileage per day than urban households. Differences are much larger among the most elderly, however. Seniors between 80 and 84 years of age covered 62% more mileage per day than their urban counterparts, and seniors aged 85 or more covered 51% more mileage per day in rural areas.

Thus, the very age groups one might have expected to suffer the most from mobility problems in rural areas have the highest levels of mobility relative to their age cohorts in urban areas. Not only do they make slightly more trips

Table 2. Impact of age on mobility levels.

Age	Trips per day per person		Miles traveled per day per person	
	Rural	Urban	Rural	Urban
5–15	3.3	3.4	27.1	17.1
16–24	3.9	4.0	37.5	28.3
25–39	4.2	4.4	46.5	32.9
40–64	4.1	4.4	42.5	32.4
65+	3.2	3.4	26.0	18.7
65–69	3.7	3.9	31.0	24.4
70–74	3.3	3.8	26.3	20.8
75–79	2.8	3.1	24.4	16.2
80–84	2.9	2.8	22.0	13.6
85+	2.0	1.9	13.9	9.2
All	3.8	4.0	37.1	27.0

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
Source: Calculated from the 2001 NHTS by Hikari Nakamoto.

per day, but they also cover much longer distances. Of course, these statistics cannot be interpreted as indicating no accessibility problems of rural seniors. In particular, they do not reflect the disadvantage of having few travel options in rural areas, where public transport services are quite limited, and most trip distances are too long for walking and cycling. The rural elderly without cars are forced to rely on relatives, friends, and neighbors for rides and are thus deprived of their independence as well as flexibility in the timing and route of their travel. The car-less elderly also make about a third fewer trips per day than elderly households with cars and driver's licenses (U.S. Department of Transportation 1999; Glascow & Blakely 2000). For those elderly who have cars and can drive safely, getting around may not be much of a problem, but for those without access to a car, living in such a car-dependent environment surely impairs their overall quality of life.

Notwithstanding all these warnings about interpreting the NHTS statistics too positively, they do suggest a surprisingly high degree of mobility, especially among the most elderly.

5. Rural–urban differences in car ownership

Given the lower density of rural areas, and the longer distances between various possible trip origins and destinations, the much greater mileage covered by all rural income and age groups is perhaps inevitable. That high level of rural mobility is made possible almost entirely due to the extensive road network in American rural areas and almost universal car ownership. Indeed, as shown in Table 3, only 11% of poor rural households have no

car, compared to 27% of poor urban households. Moreover, 44% of poor rural households have two or more cars, and 17% of poor rural households have three or more cars. Those rates are much higher than in urban areas, where only 25% of poor households have two or more cars, and only 8% have three or more cars. Clearly, the flexible, convenient transportation provided by the private car is virtually indispensable for virtually every rural household, regardless of income.

As one would expect, the rate of car ownership increases with income level, both in rural and urban areas. For example, 84% of all non-poor rural households (incomes $20,000 or more) have two or more cars, and 43% have three or more cars, roughly twice the percentages for poor households (incomes less than $20,000). It is noteworthy, however, that the car ownership gap between the poor and non-poor is considerably larger in urban areas, probably because the urban poor are more likely to live in denser, central city areas with public transport services and more walkable trip distances. Thus, there is a 24% gap between the urban poor and non-poor in their percentages of car-less households, compared to a gap of only 10% between the rural poor and non-poor.

The availability of a car has an enormous impact on a household's travel behavior. As shown in Table 4, even households with no cars make 64% of their daily trips by car in rural areas, roughly twice the percentage of car trips made by car-less households in urban areas (34%). With the availability of at least one car, roughly nine of every ten trips are made by car, both in rural and urban areas (91% vs. 88%, respectively). Almost no one in rural areas uses public transport; even households without cars make only 1% of their trips by public transport, not much different from the 0.1% among households with cars. The drop in transit use with car ownership is far more dramatic in urban areas, falling from 19% for households without a car to only 1% of trips by households with a car.

Table 3. Vehicle ownership by income class.

Vehicles per household	Households earning less than $20,000		Households earning more than $20,000		All	
	Rural	Urban	Rural	Urban	Rural	Urban
0	11.3	26.5	0.7	3.0	3.3	8.3
1	44.9	48.3	14.9	28.8	22.0	33.2
2	27.2	17.5	41.6	43.2	38.2	37.4
3 or more	16.5	7.7	42.7	25.0	36.5	21.1
All	100	100	100	100	100	100

Note: Vehicles include passenger cars, as well as station wagons, pallenger vans, sport-utility vehicles, pickup trucks, light trucks, motorcycles, mopeds, and recational vehicles.
Source: Calculated by the authors from the 2001 NHTS.

Table 4. Impact of auto ownership on mode choice.

Mode of transportation	Vehicles per household			
	None		One or more	
	Rural	Urban	Rural	Urban
Auto	63.5	34.1	90.8	87.8
SOV[1]	21.4	5.2	39.5	38.5
HOV[2]	42.1	28.9	51.3	49.3
Transit	1.0	19.1	0.1	1.1
Total non-motorized	24.4	43.5	5.9	9.2
Walk	20.9	41.1	5.3	8.9
Bicycle	3.5	2.4	0.6	0.8
School bus	6.0	1.5	2.7	1.5
Other	5.1	1.8	0.5	0.5
All	100.0	100.0	100.0	100.0

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
[1] SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
[2] HOV (high occupancy vehicle) includes vehicles with two or more occupants.
Source: Calculated by the authors from the 2001 NHTS.

Having a car has a considerable impact on levels of walking and cycling in rural areas. The percentage of trips by walking is only a fourth as high among households with one car as it is for households without a car (5% vs. 21%), and the percentage of bike trips is only a sixth as high among households with one car (0.6% vs. 3.5% for households without a car). The difference in the percentage of walk trips between households with and without cars is even greater in urban areas: 9% vs. 41% of all trips. The difference in the percentage of bike trips between households with and without cars is slightly less in urban areas: 0.8% vs. 2.4%. It is also noteworthy that the rural car-less rely somewhat more than the urban car-less on bicycling for daily travel (3.5% vs. 2.4%). That might be due to higher cycling speeds that permit coverage of the longer distances in rural areas. Since many rural roads are lightly traveled, some are probably ideal for cycling, although in most cases, rural trip distances exceed the practical range of bike trips.

6. Impacts of income, race, and age on choice of travel mode

All income, race, and age groups in rural areas are almost entirely dependent on the car for all their trip purposes. As shown in Table 5, even the rural poor (incomes less than $20,000) make 89% of their trips by car, much higher than the 76% of car trips made by the urban poor. Indeed, the

poor and non-poor in rural areas make virtually the same percentage of their trips by car (89% vs. 91%). Within urban areas, the poor are far more likely than the affluent to live in central cities with shorter, more walkable trip distances and the most public transport services. In rural areas, both the poor and non-poor live at low densities, with long trip distances and very little public transport service. In fact, 38% of rural Americans live in areas that have no public transit service at all (U.S. Department of Transportation 2001, p. 13).

While the poor walk about twice as much as the non-poor in urban areas, the walk share of trips is about the same for the poor and non-poor in rural areas (6% vs. 5%). Similarly, both the poor and non-poor in rural areas make only a tiny percentage of their trips by public transit (0.3% vs. 0.1%), while the difference is much larger in urban areas (5% vs. 1%). The rural poor rely slightly more than the urban poor on both cycling (1.2% vs. 0.9% of trips) and the school bus (2.9% vs. 1.9%). The main point, however, is that the car is practically the only way everyone gets around in rural areas, regardless of income.

The same is true of racial groups, as shown in Table 6. Indeed, there is virtually no difference at all in rural areas in the car share of trips between blacks (91%), Hispanics (90%), and whites (91%). By comparison, car shares of trips differ considerably more in urban areas: 79% for blacks, 83% for Hispanics, and 88% for whites. One notable difference is that, in rural areas Hispanics use transit more than blacks, while in urban areas,

Table 5. Modal split by income group (percentage of trips by type of transportation).

Means of transportation	Households earning less than $20,000		Households earning more than $20,000		All	
	Rural	Urban	Rural	Urban	Rural	Urban
Auto	89.4	75.9	90.7	87.5	90.5	85.9
SOV[1]	35.8	30.0	40.0	38.5	39.3	37.3
HOV[2]	53.6	45.9	50.7	49.0	51.2	48.6
Transit	0.3	4.6	0.1	1.2	0.1	1.7
Total non-motorized	7.2	17.0	5.9	9.4	6.1	10.4
Walk	6.0	16.2	5.2	8.5	5.3	9.5
Bicycle	1.2	0.9	0.7	0.9	0.8	0.9
School bus	2.9	1.9	2.7	1.4	2.7	1.5
Other	0.3	0.5	0.6	0.5	0.6	0.5
All	100.0	100.0	100.0	100.0	100.0	100.0

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
[1] SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
[2] HOV (high occupancy vehicle) includes vehicles with two or more occupants.
Source: Calculated by the authors from the 2001 NHTS.

blacks use transit more than Hispanics. Moreover, Hispanics bicycle at about the same rate as whites and considerably more than blacks, both in urban and rural areas. All three groups rely about twice as much on school bus transport in rural areas as in urban areas, highlighting the crucial role of school bus systems in rural areas.

Somewhat surprisingly, there is almost no difference between rural and urban areas in the reliance of the elderly on cars (92% vs. 89% of trips for persons 65 or older). As shown in Table 7, they make roughly half of those car trips as drivers without passengers (SOVs or single-occupant vehicles), both in rural and urban areas. The overall 3% rural–urban difference in car dependence is due to slightly more walking in urban areas (9% vs. 7%) as well as slightly more transit use (1.3% vs. 0.3%). By far the largest differences in travel behavior among children are that rural children rely on school buses for almost twice as high a percentage of their trips as urban children (15% vs. 9%), while urban children are almost twice as likely to walk (15% vs. 8%). Most striking, however, is that both rural and urban children make over 70% of their trips as passengers in cars. Such limited physical activity from daily travel may have contributed to the tripling in childhood obesity in the U.S. over the past two decades (Ogden et al. 2002).

Similarly, both rural and urban elderly in the U.S. miss out on the daily physical exercise they would get from walking or cycling for some local trips. While Americans 65 years of age or older make less than 10% of their

Table 6. Variation in modal choice by race/ethnicity (percentage of trips by type of transportation).

Mode of transportation	Black		Hispanic		White	
	Rural	Urban	Rural	Urban	Rural	Urban
Auto	90.6	78.9	89.7	83.1	90.5	87.6
SOV[1]	35.8	35.7	31.0	27.5	40.5	40.1
HOV[2]	54.7	43.2	58.7	55.5	50.1	47.6
Transit	0.3	5.3	0.5	2.4	0.1	0.9
Total non-motorized	4.3	13.2	5.5	12.6	6.3	9.6
Walk	3.9	12.6	4.8	11.8	5.5	8.6
Bicycle	0.4	0.6	0.7	0.9	0.8	0.9
School bus	4.1	2.1	3.8	1.5	2.4	1.3
Other	0.7	0.4	0.6	0.4	0.6	0.5
All	100	100	100	100	100	100

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
[1] SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
[2] HOV (high occupancy vehicle) includes vehicles with two or more occupants.
Source: Calculated by the authors from the 2001 NHTS.

Table 7. Impact of age on modal choice (percentage of trips by type of transportation).

Mode of transportation	Children[3]		Adults[4]		Seniors[5]	
	Rural	Urban	Rural	Urban	Rural	Urban
Auto	73.0	70.7	94.0	88.2	92.2	89.1
SOV[1]	0.8	0.5	50.8	46.7	43.6	45.7
HOV[2]	72.2	70.2	43.2	41.5	48.6	43.4
Transit	0.1	1.1	0.2	2.0	0.1	1.3
Total non-motorized	11.2	18.4	4.9	9.1	7.0	9.3
Walk	7.9	15.2	4.6	8.6	6.7	8.9
Bicycle	3.4	3.2	0.3	0.5	0.3	0.4
School bus	15.0	8.9	0.4	0.2	0.0	0.1
Other	0.6	0.9	0.5	0.5	0.7	0.3
All	100	100	100	100	100	100

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
[1] SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
[2] HOV (high occupancy vehicle) includes vehicles with two or more occupants.
[3] Children include all respondents from age 5 to 15 years.
[4] Adults include all respondents from age 16 to 64 years.
[5] Seniors include all respondents 65 years or older.
Source: Calculated by the authors from the 2001 NHTS.

trips by walking or cycling, Germans and Dutch who are 75 years of age or older make 48–55% of all their daily trips by either walking or cycling. That much higher reliance on active transport modes in Europe probably contributes to average healthy life expectancies (i.e. without major disabilities) that are 2.5–4.4 years longer than in the U.S., in spite of per-capita health expenditures that are only half as high in Europe (World Health Organization 2001; Organization for Economic Cooperation and Development 2002; Pucher & Dijkstra 2003).

7. Differences in trip length and purpose

Surely the least surprising difference between travel in rural and urban areas is that rural trips tend to cover much longer distances. As shown in Table 8, the biggest differences are for transit trips, which are 87% longer in rural areas, and school bus trips, which are 62% longer. Car trips are only 40% longer. The much longer transit trip lengths might be due to circuitous routing of public transit in low-density areas (to pick up passengers in scattered locations), or simply due to longer distances between trip origins and destinations. Since there are also fewer passengers per bus, rural transportation is quite expensive to provide, requiring much higher subsidies per passenger than urban transit,[5] yet

providing much less frequent service and more indirect, time-consuming routing (Federal Transit Administration 2003; American Public Transportation Association 2003; Community Transportation Association of America 2003). As one might expect, walk trips are equally short in both rural and urban areas, but surprisingly, urban bike trips are considerably longer.

The car is most dominant for the work trip, accounting for 97% of all journeys to work in rural areas and 92% in urban areas (see Table 9). That suggests that it is almost impossible to get to jobs in rural areas without cars. Moreover, 82% of both rural and urban car commuters drive alone to work (SOV[6] as percent of total auto). By comparison, carpooling (HOV[7]) is almost twice as likely as driving alone for non-work trips, presumably because family members are more likely to come along for shopping, school, social, and recreational trips.

Currently used for only a tenth of one percent of both work and non-work trips, public transit is virtually irrelevant for anyone in rural areas trying to reach anything. Transit is used much more in urban areas, but even there it accounts for only 4% of work trips and only 1% of non-work trips. Walking accounts for about three times as high a proportion of non-work trips as it does for work trips, both for urban and rural areas. That suggests that it is mainly for recreational or social trips where travel speed is not crucial. Due to longer distances between places in rural areas, walking accounts for roughly half the share of trips as in urban areas. Similarly, bicycling accounts for a much higher proportion of non-work trips, both in urban and rural areas.

Table 8. Average trip length by mode.

Mode of transportation	Rural	Urban
Auto	10.5	7.5
SOV[1]	10.2	7.6
HOV[2]	10.7	7.5
Transit	15.6	8.3
Total non-motorized	0.8	0.8
Walk	0.7	0.7
Bicycle	1.5	1.9
School bus	8.6	5.3
All	9.8	6.8

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
[1] SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
[2] HOV (high occupancy vehicle) includes vehicles with two or more occupants.
Source: Calculated by the authors from the 2001 NHTS.

Table 9. Modal choice by trip purpose (percentage of trips by type of transportation).

Means of transportation	Work and work related		Non-work	
	Rural	Urban	Rural	Urban
Auto	96.8	92.1	89.2	84.7
SOV[1]	79.2	75.4	30.5	29.2
HOV[2]	17.6	16.7	58.6	55.5
Transit	0.1	3.7	0.1	1.2
Total non-motorized	2.3	3.9	6.9	11.8
Walk	2.0	3.4	6.0	10.8
Bicycle	0.2	0.5	0.9	1.0
School bus	0.3	0.1	3.3	1.8
Other	0.5	0.3	0.6	0.5
All	100	100	100	100

Notes: In order to isolate daily travel, the sample was limited to trips of 75 miles or less.
[1] SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
[2] HOV (high occupancy vehicle) includes vehicles with two or more occupants.
Source: Calculated by the authors from the 2001 NHTS.

8. Regional variations in travel behavior

The preceding analysis aggregates all regions of the country, thus hiding a substantial amount of variation from one part of the country to another. As shown in Table 10, the car dominates local travel in all regions of the country, both in rural and urban areas. In general, there is greater regional variation for urban travel than for rural travel. The car's share of rural trips ranges from 87% in the New England and Pacific Census regions to 93% in the East South Central region (only 6 percentage points difference), while the car's share of urban trips ranges from 75% in the Middle Atlantic to 92% in the East South Central (17 percentage points difference). Thus, there is far more regional uniformity in car dependence among rural areas than among urban areas. Similarly, there is far less regional variation in public transit's modal share among rural areas than among urban areas. For example, the transit share of rural trips spans a regional range of only 0.4 percentage points (0.0–0.4%), while the regional range for urban trips is 5.4 percentage points (0.4–5.8%), almost 14 times more.

While Table 10 shows the extent of variation among aggregate Census regions, it does not reveal the likely variation among rural areas within each Census region. As indicated earlier, it seems likely that rural counties adjacent to metropolitan areas have quite different economic and demographic characteristics than isolated rural counties far from the nearest urban center. Travel behavior in those two types of rural counties almost certainly varies as well, but the 2001 NHTS does not permit distinguishing between them.[8]

Table 10. Regional variations in modal shares for the automobile, transit, walking, and bicycling (percentage of trips by type of transportation).

Mode of transportation	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Rural									
Auto	86.6	89.9	90.2	90.2	91.5	92.9	92.1	88.3	87.3
Transit	0.1	0.4	0.0	0.1	0.3	0.0	0.0	0.3	0.1
Total non-motorized	8.8	5.7	6.2	7.4	4.9	4.4	4.5	9.5	8.4
Walk	8.3	5.3	5.3	6.7	4.2	3.5	3.7	8.0	7.1
Bicycle	0.5	0.4	0.9	0.8	0.6	1.0	0.8	1.5	1.3
Urban									
Auto	83.6	74.8	87.1	90.2	87.6	91.6	90.6	87.9	84.7
Transit	1.8	5.8	1.3	0.6	1.6	0.4	0.7	0.8	2.2
Total nonmotorized	11.0	16.7	9.5	7.3	8.5	6.4	7.1	9.5	11.7
Walk	10.3	15.8	8.6	6.6	7.6	6.0	6.3	8.7	10.6
Bicycle	0.7	0.8	0.9	0.7	0.9	0.4	0.8	0.8	1.1

Note: Values of 0.0 in some of the regional cells for the transit modes are due to very low levels of transit use in some regions. They indicate either no transit survey responses at all in those cells, or such low levels that they rounded to 0.0, i.e. less than 0.05% of all trips.
Source: Calculated by the authors from the 2001 NHTS.

9. Conclusions

The overwhelming impression left from this comparison of rural and urban travel behavior in the U.S. is that for both types of areas, and for all social and economic groups, the car is the overwhelmingly dominant mode. Regardless of age, income, and race, almost everyone relies on the private car for most of their travel needs. As summarized in Table 11, the degree of auto-dependence is somewhat higher for all socioeconomic groups in rural areas, where public transit is rare, and most trips are too long for walking or cycling.

Perhaps more surprising is the finding that the poor and elderly in rural areas are at least as mobile as their urban counterparts, making roughly as many trips per day and covering much more mileage. That higher mobility results largely from the lower density and more scattered trip origins and destinations in rural areas. Nevertheless, most rural poor are by no means immobilized by their lack of economic resources. Moreover, almost 90% of poor rural households own at least one car. Similarly, the rural elderly get around much more often and cover longer distances than their urban age cohorts.

The finding that mobility levels in rural areas are, in fact, at least as high as in urban areas does not mean that accessibility is not a problem for rural households. In particular, those without cars or unable to drive are clearly at a disadvantage in rural areas, since most destinations can only be reached by car. Moreover, the limited alternatives to the car may, in itself, have a detrimental impact on quality of life, restricting independence and flexibility of travel.

While it would not be economically feasible to provide truly comprehensive public transit services to rural areas, there are many ways current services could be improved. Rosenbloom (2003) summarizes five strategies that would increase the effectiveness of rural transit. Most involve the transformation of public transit agencies from service providers to managers of a whole range of mobility services. In addition to better coordinating the demand-response services currently offered by different agencies, such rural transit brokers might also facilitate carsharing, volunteer ride programs, social service transportation, and the delivery of goods and services to needy households. The focus would shift to more flexible transport services better suited to low-density rural conditions.

Even the most successful innovations in rural transit, however, would probably not result in raising the rural share of transit trips from its current level of 0.1% to even 0.5%, which would be a dramatic improvement indeed. While rural transit almost certainly will continue to be a fringe mode, it provides important services – however limited they might be – to those rural households who are either so poor that they cannot afford a car

Table 11. Summary of rural–urban variations in travel behavior.

	Rural	Urban
Trip frequency	3.8 trips per day per person	4.0 trips per day per person
Trip distance	37.1 miles per day per person	26.9 miles per day per person
	9.8 average miles per trip	6.8 average miles per trip
Vehicle ownership	3.3 % of households without automobiles	8.3 % of households without automobiles
	74.4 % of households with two or more cars	58.5 % of households with two or more cars
Mode choice	91 % of all trips are by automobile	86 % of all trips are by automobile
	0.1 % of all trips are by transit	1.7 % of all trips are by transit
	6.1 % of all trips are non-motorized	10.4 % of all trips are non-motorized
Mode choice for work trips	96.8 % of trips are by automobile	92.1 % of trips are by automobile
	0.1 % of trips are by transit	3.7 % of trips are by transit
	2.3 % of trips are non-motorized	3.9 % of trips are non-motorized
Mode choice for non-work trips	89.2 % of trips are by automobile	84.7 % of trips are by automobile
	0.1 % of trips are by transit	1.2 % of trips are by transit
	6.9 % of trips are non-motorized	11.8 % of trips are non-motorized
Mobility of the elderly	3.2 trips per day per person	3.4 trips per day per person
(65 years and older)	26.0 miles per day per person	18.7 miles per day per person
Mobility of the poor	3.2 trips per day per person	3.2 trips per day per person
(household income less than $20,000)	28.5 miles per day per person	17.9 miles per day per person
Mode choice by the poor	89.4 % of all trips are by automobile	75.9 % of all trips are by automobile
(household income less than $20,000)	0.3 % of all trips are by transit	4.6 % of all trips are by transit
	7.7 % of all trips are non-motorized	17.0 % of all trips are non-motorized
Mode choice by blacks	90.6 % of all trips are by automobile	78.9 % of all trips are by automobile
	0.3 % of all trips are by transit	5.3 % of all trips are by transit
	4.3 % of all trips are non-motorized	13.2 % of all trips are non-motorized
Mode choice by hispanics	89.7 % of all trips are by automobile	83.1 % of all trips are by automobile
	0.5 % of all trips are by transit	2.4 % of all trips are by transit
	5.5 % of all trips are non-motorized	12.6 % of all trips are non-motorized

Source: Calculated by the authors from the 2001 NHTS.

or who are physically or mentally unable to drive a car (due to disability). Most disadvantaged rural households will probably continue to rely primarily on friends, relatives, and neighbors for rides, but improved rural transit would at least enhance their options.

This raises the larger issue of whether public policies should continue to subsidize the higher costs of providing a whole range of services to low-density rural areas. For many decades, regulatory policies and government aid programs have generously supported rural electrification, telephone service, school systems, and roads. Just as longer distances make it more expensive to provide public utilities in rural areas than in urban areas, transit is also more difficult and expensive to provide. Limited accessibility is the very nature of rural areas, and it seems inevitable that urban areas will always offer quicker and cheaper access to most destinations. One possible solution for the small minority of rural car-less households might be to facilitate their voluntary relocation to more accessible nodes of activities and services within or near rural areas, instead of providing a vast network of transit services for so few households.

Levels of mobility in rural areas are already quite high for the vast majority of residents. Of course, the longer distances traveled per person per day in rural areas are mainly a reflection of the low density and dispersed locations of destinations. While they force rural households to be more mobile, that greater mobility can hardly be viewed as a benefit, since it requires more time and money spent traveling. Since we have only been able to measure mobility, we cannot really assess the actual accessibility deprivation of any group in rural America. Surely, this is a topic for much more detailed research, including surveys that measure not only actual travel behavior but also travel needs. Future research might also investigate the variation in travel behavior by type of rural area. It would be especially useful to document differences between rural areas on the fringe of metropolitan areas and isolated rural areas far away from the nearest urban center.

Notes

1. Later releases of the NHTS in 2004 included variables permitting spatial disaggregation to the census tract level, but that sort of disaggregation is not possible for the sort of detailed crosstabs shown here, which yet further disaggregate by socioeconomic category, travel mode, trip purpose, etc. There would not be enough observations in each cell to ensure statistically reliable estimates.
2. The January 2004 release, by comparison, used a different classification of urban and rural based not only on density of each place but also the contextual density of each place in relation to the surrounding area.
3. For purposes of compactness and variety, we often refer to the under-$20,000 income category as "poor" and the over-$100,000 income category as "affluent." This usage is not intended to reflect any official definitions or value judgements on our part.

4. Incomes in rural and urban areas are not fully comparable, since the cost of living in rural areas can be considerably lower than in most urban areas. Moreover, there are substantial variations in costs of living among regions of the country, and these data aggregate survey responses from every part of the country. It was not possible to obtain any Census breakdowns of cost of living between rural and urban areas, but it seems certain that reported nominal incomes of rural households understate their real incomes or purchasing power relative to urban households.
5. The higher cost of providing transit services to rural areas is mainly due to primary reliance on demand-responsive paratransit services in small buses or vans, which virtually always costs more than conventional transit in full-sized buses. Paratransit services in urban areas are also much more expensive than regular bus service, but they account for less than one percent of urban transit riders.
6. SOV is the standard abbreviation for single-occupant vehicle, i.e. vehicles with no passengers other than the driver.
7. HOV is the standard abbreviation for high-occupancy vehicle, i.e. vehicles with the driver and at least one passenger. For some HOV lanes, HOV is defined as a minimum of the driver and at least two passengers.
8. It might be possible to do a supplemental disaggregate county-by-county analysis that would collect additional information on county characteristics and match them up with the county-specific data reported in the 2004 release of the NHTS. Alternatively, one might examine the new density variable in the 2004 release and compare that to travel behavior. Both types of analysis, however, are beyond the scope of this article.

References

American Public Transportation Association (2002) *Public Transportation Fact Book 2002*. Washington, DC: American Public Transportation Association.

Beale C (1999) Nonmetro population rebound: Still real but diminishing. *Rural Conditions and Trends* 9(2): 20–27.

Borgen S (1998) You can get there from here. *Community Transportation* 16(3): 10–33.

Community Transportation Association of America (2004) *National Summary Statistics for Federally Funded Rural Transit Programs*. Washington, DC: CTAA. Accessible at http://www.ctaa.org/ntrc/directories/intro_5311.asp.

Foster N, Damiano P, Momany E & McLeran H (1995) Travel pattern of rural elders. *Transportation Quarterly* 49(3): 51–65.

Federal Transit Administration (2003*) 2002 Statistical Summaries: Grant Assistance Programs*. Washington, DC: U.S. Department of Transportation.

Federal Transit Administration (2003) *National Transit Database 2001*. Washington, DC: U.S. Department of Transportation.

Glascow N & Blakely R (2000) Older nonmetropolitan residents' evalutations of their transportation arrangements. *Journal of Applied Gerontology* 19(1): 95–116.

Hagerstrand T (1970) What about people in regional science? *Papers of the Regional Sciences Association* 24: 7–21.

Halfacre K (1995) Talking about rurality: Social representations of rural as expressed by the residents of six English parishes. *Rural Studies* 1: 1–20.

Handy S & Clifton K (2001) Evaluating neighborhood accessibility: Possibilities and practicalities. *Journal of Transportation and Statistics*, September/December 2001: 67–78.

Handy S & Niemeier D (1997) Measuring accessibility. *Environment and Planning* A29: 1175–1194.

Hanson S (1996) Getting there. In: Hanson S (ed) *Geography of Urban Transportation* (pp 3–25) New York: Guilford Press.

Hibbard M & Roemer C (1999) Planning the global countryside: Comparing approaches to teaching rural planning. *Journal of Planning Education and Research* 19: 44–56.

Ingram D (1971) The concept of accessibility: A search for an operational form. *Regional Studies* 5(2): 101–107.

Lapping M, Daniels T & Keller J (1989) *Rural Planning and Development in the United States*. New York: Guilford Press.

Lapping M (1992) American rural planning, development policy, and the centrality of the federal State: An interpretative history. *Rural History: Economic, Society, Culture* 3(2): 219–242.

Meyer M & Miller E (2001) *Urban Transportation Planning*. New York: McGraw-Hill.

Mosley M (1979) *Accessibility: The Rural Challenge*. London: Methuen.

Ogden C, Flegal K, Carroll M & Johnson C (2002) Prevalence and trends in overweight among US children and adolescents. *Journal of the American Medical Association* 288: 1728–1732.

Organization for Economic Cooperation and Development (2002) *Total Expenditures on Health per Capita, 1960–2000, in US Dollars, Purchasing Power Parity*. OECD, Washington, DC. Accessible at http://www.oecd.org/xls/M00031000/M00031378.xls.

Pacione M (2001) *Urban Geography: A Global Perspective*. London: Routledge.

Pucher J, Evans T & Wenger J (1998) Socioeconomics of urban travel: Evidence from the 1995 NPTS. *Transportation Quarterly* 52(3): 15–33.

Pucher J & Dijkstra L (2003) Promoting safe walking and cycling to improve public health: Lessons from the Netherlands and Germany. *American Journal of Public Health* 93: 1509–1516.

Pucher J & Renne J (2003) Socioeconomics of urban travel: Evidence from the 2001 NHTS. *Transportation Quarterly* 57(3): 49–78.

Ricketts T, Johnson-Webb K & Taylor P (1998) *Definitions of Rural: A Handbook for Health Policy Makers and Researchers*. Chapel Hill, NC: North Carolina Rural Research Health Program, University of North Carolina.

Rosenbloom S (2002) Facing societal challenges: The need for new paradigms in rural transit service. *Community Transportation* 20(4): 16–27.

Rosenbloom S (2003) Facing societal challenges: The need for new paradigms in rural transit service. *Journal of Public Transportation* 6(1): 1–18.

Schaeffer K & Sclar E (1980) *Access for All*. New York: Columbia University Press.

Strunkel E (1997) Rural public transportation and the mobility of older persons: Paradigms for policy. *Journal of Aging and Social Policy* 9(3): 67–86.

Transportation Research Board (1999) *New Paradigms for Local Public Transportation Organizations* (TCRP Report 53). Washington, DC: National Academy of Sciences.

U.S. Department of Agriculture (1997) *Understanding Rural America*. Washington, DC: U.S. Department of Agriculture, Economic Research Service. Accessible at http://www.ers.usda.gov/publications/aib710/.

U.S. Department of Agriculture (2002) *Rural America at a Glance: Nonmetro population change: 1990–2000* (Rural Development Research Report No. 94–1). Washington, DC: USDA Economic Research Service. Accessible at http://www.ers.usda.gov/publications/rdrr94-1/.

U.S. Department of Commerce (2002a) *Census 2000 Basics*. Washington, DC: U.S. Government Printing Office.

U.S. Department of Commerce (2002b) *Census 2000 Urban and Rural Classification*. Washington, DC: U.S Census Bureau. Accessible at http://www.census.gov/geo/www/ua/ua_2k.html.

U.S. Department of Commerce (2003) *Statistical Abstract of the United States*. Washington, DC: U.S Government Printing Office.

U.S. Department of Health and Human Services (2002) *One Department Serving Rural America: HHS Rural Task Force Report to the Secretary*. Washington, DC: Office of Rural Health Policy, U.S. Department of Health and Human Services.

U.S. Department of Transportation (2001) *Planning for Transportation in Rural Areas*. Washington, DC: Federal Highway Adminstration.

U.S. Department of Transportation (1999) *1995 Nationwide Personal Transportation Survey*. Washington, DC: Federal Highway Administration.

U.S. Department of Transportation (2003) *2001 National Household Travel Survey*. Washington, DC: Federal Highway Administration and Bureau of Transportation Statistics. Accessible at http://nhts.ornl.gov/2001/index.shtml.

World Health Organization (2001*) Estimates of Healthy Life Expectancy for 191 Countries in the Year 2000: Methods and Results*. Geneva, Switzerland: World Health Organization.

About the authors

John Pucher is a professor in the Bloustein School of Planning and Public Policy at Rutgers University. Since 1980 he has specialized in comparative analysis of transport systems, travel behavior, and transport policies in Europe, Canada, and the U.S. Currently, his research focuses on promoting safe walking and bicycling to improve public health.

John L. Renne is an FHWA Eisenhower Fellow, Eno Transportation Fellow, and doctoral candidate at the Bloustein School of Planning and Public Policy at Rutgers University. His research focuses on coordinating transportation and land use planning policies to promote smart growth and sustainable development.