

# Socio-Economic Relationships of Highway Travel of Residents of a Rural Area

LORIN A. THOMPSON, Director, Bureau of Population and Economic Research,  
and CARL H. MADDEN, Research Assistant; University of Virginia

THIS paper is a progress report upon a study sponsored jointly by the Bureau of Public Roads, the Virginia Department of Highways, and the University of Virginia of the effects of a new manufacturing plant upon the economic pattern of a rural county of declining population and low income, and upon the pattern of employment, income, occupation, motor vehicle ownership, and travel habits of the residents.

A comparison of selected socio-economic characteristics with travel habits in two counties shows that (1) the amount of travel of a family varies proportionally with the size of the income; (2) travel varies directly with the socio-economic level; (3) there is little consistency between the age composition of the family and the amount of travel, however, each county seems to have its own pattern in this respect; (4) the amount of travel tends to be inversely proportional to the age of the vehicle; (5) livestock and poultry farmers travel more than general of subsistence farmers; (6) among the total population of each county, clerical, professional and government workers travel most and subsistence farmers travel least.

In Charlotte County there has been a diversification of farming since the plant started its operation. The relative income level has increased and this has been reflected in an increased volume of trade. Some of the workers have changed their residences since 1949. The change of residence, however, does not indicate any tendency for the workers necessarily to move any closer to the plant. Their movements thus far have been on to hard surfaced roads, even if such a move means increasing the distance of their residence from the plant.

● MEASURING future highway needs in urban and rural areas has increasingly engaged the attention of social scientists, as well as the engineers who have been primarily concerned with road construction and design. The present study is concerned mainly with an analysis of the changes in motor-vehicle ownership and travel habits of the population of rural counties as they may be related to changes in the pattern of employment, income, and occupation. Some 3 years ago the Bureau of Population and Economic Research of the University of Virginia undertook a study to trace the changes in travel habits of the people and their income, socio-economic status, occupation, and the like in a county which had acquired a new industry. Within the last year we have undertaken a similar study for a county in which there has been no new industry.

One reason for the interest in the development of rural industry is that it has often been suggested as a method of improving the income level of agricultural workers in the southeastern United States. It was also deemed to be of equal importance to study the effect of the new industry and altered economy upon road use and travel habits. From such study the facts would be developed to show the most likely pattern of future travel and this in turn would indicate the pattern of road needs.

The original concept of the study was to measure so far as possible the impact of a new plant upon various social and economic relationships, travel habits, and patterns of road use in a rural county by measuring these various attributes prior to the operation of the plant. The present plan is to repeat this same series of measurements after an interval of five

years to determine more precisely (1) what changes have occurred among the population of the area with respect to such characteristics as occupation, income, travel habits, motor-vehicle ownership, and the like and (2) the changes in the business structure of the county.

The project has developed as a series of case studies. The first county chosen was Charlotte, a rural county in the South-side Virginia Bright tobacco belt with declining population and few off-farm job opportunities but with a new industrial plant. The new plant, the Drakes Branch Plant of Pacific Mills, manufacturers of textiles, employs around 400 people, predominately females. This employment is from a county population of 14,057 and a county labor force of 4,922, or it is about one tenth of the labor force.

In designing the study the problem of isolating changes in the county attributable to the new plant from other changes in the county has been attacked by the use of a control county. Buckingham County, Virginia, similar to Charlotte in many respects, was chosen as the control county since no industry like Pacific Mills has yet been located in it. The arrangement of the studies in the project as a whole has been to measure (1) the social and economic characteristics of the study area and the travel habits of the people prior to the establishment of the new plant; (2) the changes in social and economic characteristics of the area following the establishment of the plant; and (3) the economic and social characteristics of the area some 5 years after the establishment of the plant and to analyze the changes resulting during the interval.

The method employed in making the studies has been the home-interview survey of a 25 percent sample of the dwelling units in the county, secured by the selection of every fourth house on each road and street in the county, including both public and nonpublic. In this connection, Virginia is one of the states where the responsibility for administering rural roads lies in the hands of the state highway department in all counties but two, Henrico and Arlington. Public roads are, in general, those that in the opinion of the county government officials acting under state policy render a public service and have sufficient

traffic to justify state highway-department maintenance. Nonpublic roads include private driveways and property-entrance roads, as well as some few multiple-family roads with very few occupied dwelling units per mile of road. Nonpublic streets include those not constructed to highway-department standards.

The final results of this project must wait upon the completion of the after part of the study. Meanwhile, information has been revealed by the work thus far that might be of interest. The present paper, a kind of progress report, has as its purpose that of discussing some of the socio-economic relationships associated with the travel of the residents.

The paper will first describe briefly the character of the rural areas studied and the nature of the travel patterns found in them. Then, the variation of travel among residents with different socio-economic characteristics will be discussed and the relationships of travel patterns and socio-economic characteristics of residents will be examined.

The areas under study, Buckingham and Charlotte Counties, are rural Piedmont counties of low population density, neither having any place larger than 1,000 people. Relatively heavily wooded, with poor soil, limited in natural resources and water supply, they derive their chief source of income from agriculture and forest products, and the agriculture of both has traditionally been centered around tobacco. In Charlotte County about three fourths of the population live on farms. In Buckingham about half of the population is on farms and another 30 percent depend for their livelihood upon timbering and slate mining.

They have both been areas of declining population since the turn of the twentieth century, each having lost around 10 percent of its population between 1940 and 1950 while the state gained around 24 percent.

The white population has shifted from about 50 percent of the total in 1900 to about 60 percent in 1950 as the Negro has migrated to nearby cities faster than the white. The population of both counties is young when compared with that of the state; the adults have on the average a year's less education than in the state as a whole; family income and level of living are lower. The low-income farm families, the

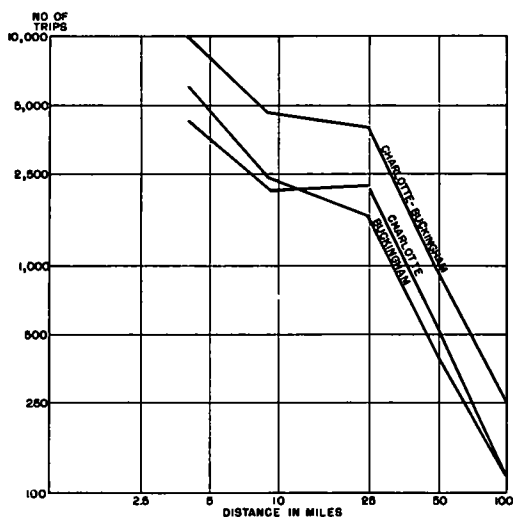


Figure 1. Number of trips by length of trip, home-interview survey, Buckingham and Charlotte counties, February to March, 1949 and 1952.

5 to 9 percent subsistence farm families, and an 11 percent smaller number of females in the county labor force than in the state all indicate potential off-farm employables in the labor force.

The location of each county in the state system of highways is similar; their geographical centers are over 40 mi. from any city of 25,000 or more and they are both about the same distance from Farmville, a trading center of some 4,500 people. Both counties are traversed by US-numbered highways, Buckingham by Routes 15 and 60 and Charlotte by Routes 15 and 360.

Thus the two counties are fairly similar and each is representative of the low-income rural area of declining population in the Southeast. Now, what was found regarding the travel habits of the sample families in these areas?

First of all, average trips and miles per day found in Charlotte County, if corrected from 1949 to 1952 by an assumed annual increase of 8 percent per year,<sup>1</sup> would be close to those in Buckingham in 1952. They would be 2.1 and 2.2 trips per day and 14.9 and 15.6 mi. per day travelled for the sample families in the respective counties. Average length of trip was 9.7

<sup>1</sup> The amount Virginia highway engineers estimate travel increases annually in the state

mi. in Charlotte as compared with 7.0 mi. in Buckingham.

Over half the trips reported in the Buckingham home-interview study were less than 5 mi. in length, and around 95 percent of them were less than 30 mi. in length. In Charlotte County 43 percent of trips of home interview families were less than 5 mi. long and 80 percent were less than 15 mi. long. In addition, the distribution of the number of trips of different lengths in the two counties seems similar. If logarithms of trips are plotted against logarithms of distance of trip, as shown in Figure 1, the shapes of the curves are similar. The pattern of trips by purpose was similar in both counties. In each, business trips made up the largest share of total trips and work trips were next in importance. In both counties shortest trips were made to church and trips for medical purposes were among the longest.

Next we turn briefly to road use. It is clear from maps of traffic volume in these two counties that the US-numbered highways carry most of the traffic. In Charlotte County, US 15 and US 360 carry over half, and in Buckingham US 15 and US 60 carry 80 percent of the daily vehicle-miles travelled on all primary routes. Much of this traffic is through traffic. This means that any increase in traffic of the residents of the county arising from such a development as a plant employing one tenth of the existing working force would probably affect total traffic volume on these roads only slightly. It is the traffic of the residents, the traffic of the local

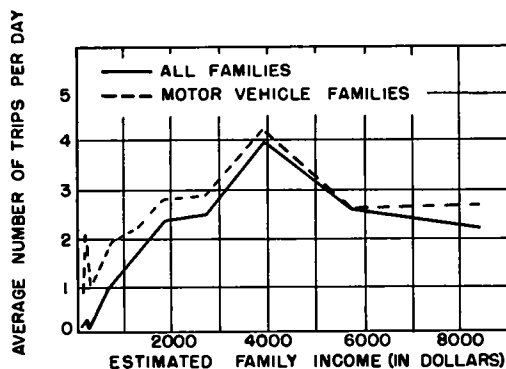


Figure 2. Average number of trips per day for the 783 home-interview families classified by estimated family income, Charlotte County.

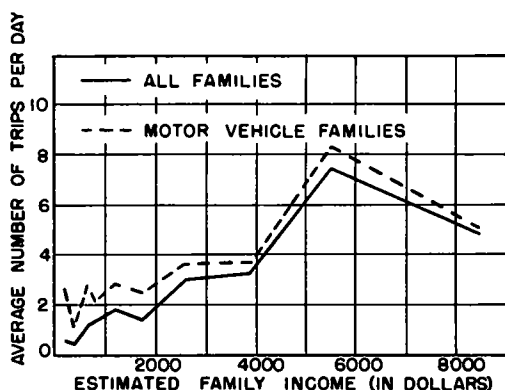


Figure 3. Average number of trips per day for the 687 home-interview families by family income, Buckingham County.

road system, not total traffic on the roads in the counties that is being analyzed intensively. This viewpoint has led in this project to the study of the variation of traffic of county residents with changes in socio-economic status.

To study the socio-economic characteristics of families in relation to their travel, families were classified by income, socio-economic status, and family-cycle status. Particular attention was given to farm families to show the travel by type of farm, major source of income, or economic land class. In addition, travel has been studied by color of family, vehicle ownership, and occupation.

First, a word about the measures used. The data on income in both counties were estimates made by local tax officials using their knowledge of families and data collected during the surveys. The estimates for Buckingham County for 1951 income were compared with the 1950 Census income data secured by a 20-percent sample. The estimates of the local officials gave a median income of around \$1,600 as compared with a census median of around \$1,200. Whether this difference is due to an actual increase in income from 1949 to 1951 in Buckingham or is the result of technical differences in the methods employed is impossible to determine at this time.

Socio-economic status is a measure of the standard of living based upon the ownership of material goods. Since it reflects saving and the accumulation of capital

goods, this scale appears to be a more stable indication of a family's social and economic position in the community than annual income, which may fluctuate for many reasons. Essentially, it is a method of ranking people by weighting the ownership of different items in proportion to the incidence of their ownership in a larger population like the United States.<sup>2</sup> The eight items included in this scale in this study were: construction of house, rooms per person, lighting facilities, water piped into house, electric refrigerator, radio, telephone, and automobile other than truck.

Cycle status refers to the stage of de-

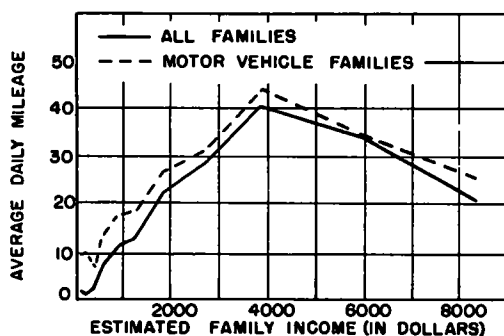


Figure 4. Average daily mileage for the 783 home-interview families classified by estimated family income, Charlotte County.

velopment of the family. The family goes through stages as children are born, grow up, then leave the household. The family-cycle-status classification provides a method of systematically taking these changes into account.

The results found by the two studies follow. Although there are exceptions for small subgroups, travel in both counties is directly related to income and socio-economic status, both trips and miles per day, as Figures 2 through 5 indicate. In both counties trips per day increase with income up to a level of about \$4,000 in Charlotte County and about \$5,500 in Buckingham County. Thereafter travel decreases with increasing income. The pattern of daily mileage for Charlotte

<sup>2</sup> This socio-economic scale is a short form of the Sewell scale. Eight of the fourteen items which he used were available from the county studies. See William H. Sewell's "A Short Form of the Farm Family Socio-Economic Status Scale," *Rural Sociology*, Vol. 8, No. 1 (June, 1943), pp. 161-170.

County families shows the same peak at an income level of \$4,000. In Buckingham County the relation between income and mileage is direct for all incomes. In both counties the number of samples in the high-income group was small; thus sampling errors probably contribute to the difference found for these groups. The irregularity in the low-income groups is a result of fine gradation of the income scale for incomes less than \$1,000. Among low-income families the greater difference between the travel of motor-vehicle families and all families results because fewer low-income families are motor-vehicle owners, and low-income families without vehicles travel very little.

Socio-economic status is also directly related to travel, as reference to Figures 6 through 9 reveals. The peak in Buck-

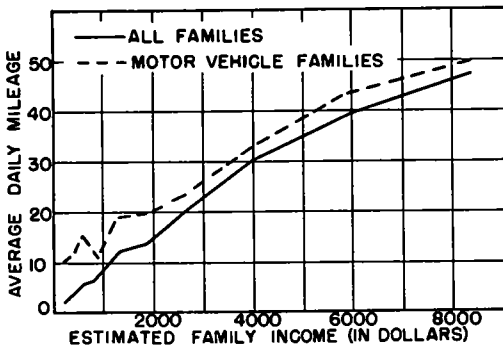


Figure 5. Average daily mileage for the 687 home-interview families by estimated family income, Buckingham County.

ingham County for motor-vehicle families with socio-economic status scores of 29 through 31 may be due partially to sampling errors, since only 13 families were observed in this group.

The evidence on the variation of travel with the stage or age of the family group is ambiguous as Figures 10 and 11 show. The high-travel families in Charlotte County were the two-generation-type families with the oldest child over 36 years of age living at home; in Buckingham County they were younger families with children up to 35 years of age and living at home. The occupational structure in the two counties may affect this relation. In Buckingham the timbering industry employs young and vigorous men and requires much travel.

Among the various occupations, fam-

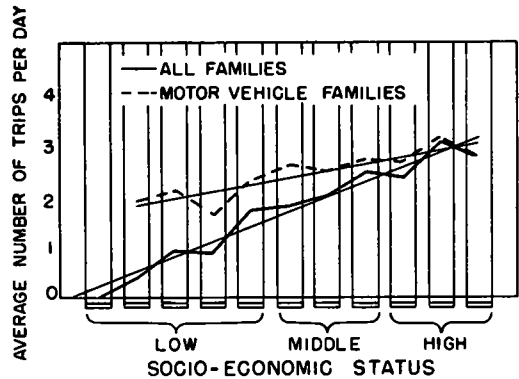


Figure 6. Average number of trips per day for 783 home-interview families and the 516 motor-vehicle families classified by socio-economic status with linear least squares relationships plotted, Charlotte County. Low: 23 to 37. Middle 38 to 46. High 47 to 55.

ilies engaged exclusively in farming travel the least miles while professional, clerical, and government workers travel most in both counties. Owner-operators of established businesses were also high-travel families. Vehicle ownership is directly related to travel; the more cars a family has and the newer they are, the more the family travels. For families with one vehicle, however, whether it is a car or a truck does not affect travel. Age of vehicle is inversely related to travel but there are seasonal variations in this relation.

The pattern of farm-family travel in both counties is similar. Livestock, dairy, and poultry farmers travel most; sub-

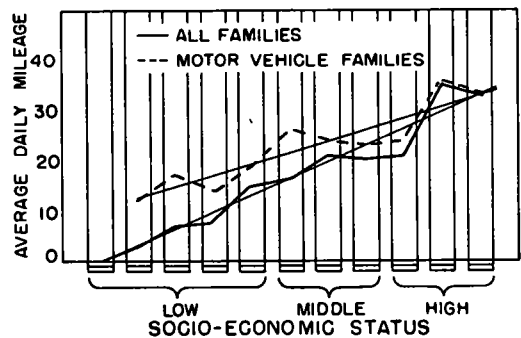


Figure 7. Average daily mileage for the 783 home-interview families and the 516 motor-vehicle families classified by socio-economic status with linear least squares relationships plotted, Charlotte County.

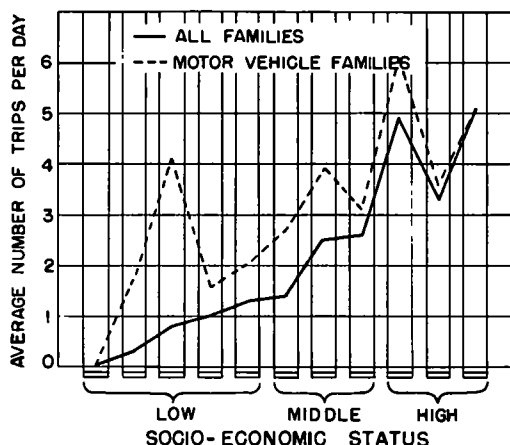


Figure 8. Average number of trips per day for 687 home-interview families and 430 motor-vehicle families by socio-economic status, Buckingham County.

sistence farmers travel least. Part-time farmers and nonfarm families are also relatively high-travel families. Though the evidence is not clear, it appears, too, that travel increases according to the level of appraised value of land of the residents.

To find out whether these relations are stable and to trace seasonal changes in travel, seasonal surveys were made during 1950 and 1951 of a smaller sample in Charlotte County of 125 motor-vehicle owners stratified by income. The sample was again interviewed in 1952. These surveys indicate the stability of the relations over the period involved. They also show that the economy of Charlotte County is becoming more diversified. Since 1945,

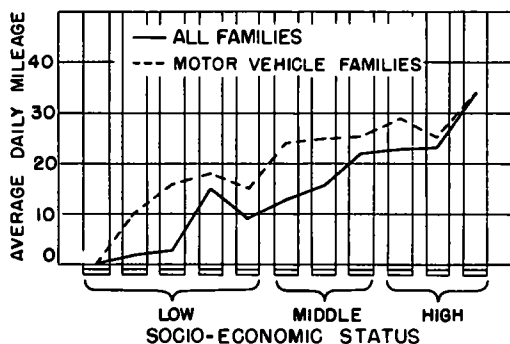


Figure 9. Miles per day for 687 home-interview families and 430 motor-vehicle families by socio-economic status, Buckingham County.

there has been a decline in the number of farms in the county as in the state. Also there has been an increase in the importance of livestock, dairy, and poultry farms and a decline in tobacco farms. Income and level of living have increased in the county, and families with members employed at the new plant have the largest percentage of families with increased income. Trade and commerce have increased, and the pattern of retail sales in the county has changed. Between 1948 and 1950 the share of open-country stores in Charlotte County retail trade declined while that of the towns increased. In Buckingham County during the same period, with an increase in income the reverse

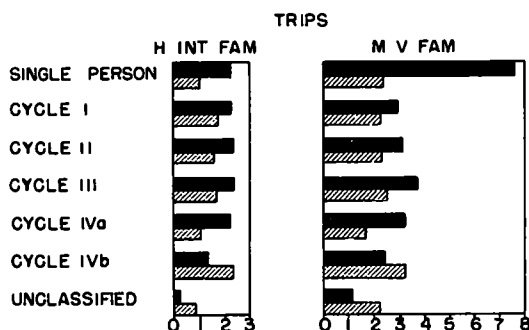


Figure 10. Trips per day of home-interview and motor-vehicle families by cycle status compared in Buckingham and Charlotte counties. Cycle I: Childless couple, wife less than 45 years of age. Cycle II: Family with oldest child less than 14 years of age. Cycle III: Family with oldest child between 14 and 35 years of age. Cycle IVa: Childless couple, wife 45 years of age or over. Cycle IVb: Family with oldest child 36 years of age or over. Unclassified: Childless couple, age of wife unknown. Solid bars represent data from Buckingham County, and shaded bars represent data from Charlotte County.

tendency has occurred; the share of open-country stores on secondary roads in the county retail trade is increasing in importance there.

Changes in the residence of workers in the new plant have been followed since 1949. They show no tendency for movement closer to the plant; on the contrary, there has been a tendency for an increase in the number of workers living from 5 to 10 mi.

from the plant. At the same time, of course, the density of workers decreases with distance from the plant in a regular manner, as would be expected. There has also been noted a tendency for workers to move towards all-weather roads whether the movement takes them nearer to the plant or farther from it by a few miles.

The method to be employed in the after study in the project will be to compare the changes that have occurred in Charlotte County during the 5-yr. period between 1949 and 1954 with changes over a comparable period in the control county.

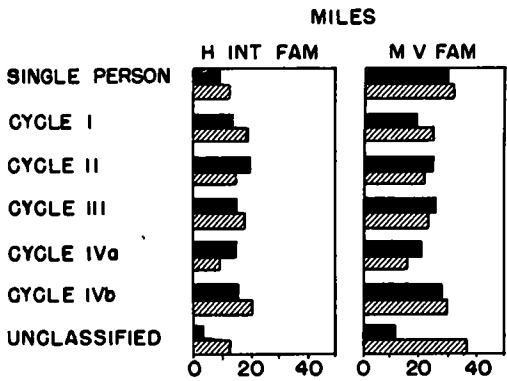


Figure 11. Miles per day of home-interview and motor-vehicle families by cycle status compared in Buckingham and Charlotte counties.

Factors such as employment, income, occupation, motor-vehicle ownership, and travel habits need to be compared before an analysis can be made of the effect of the plant during the time interval involved. But some of the findings—the movement of workers in the plant, the change in the type of farming, the increase in income of the plant workers—are already fairly clear.

Certain other problems which go beyond the scope of the present case studies remain to be investigated. It is uncertain as to whether case studies such as the present ones will indicate the pattern of future highway needs in rural counties.

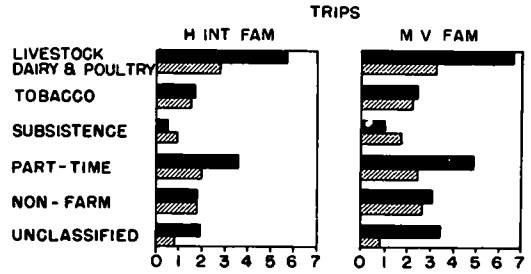


Figure 12. Trips per day of home-interview and motor-vehicle families classified by type of farm in Buckingham and Charlotte counties.

Modifications in travel habits with respect to shopping centers indicate the changing importance of different roads in the county system. If travel for business and social purposes follows similar patterns, then the relative amount of local travel would reflect the increasing or diminishing importance of each road. Questions have also arisen regarding the relation of traffic volume and population density, of the relation of classes of roads to relative sizes of the places they connect. The present study will undoubtedly show the roads which are indispensable for trade, work, and other social contacts between and among residents of a county, and how road use has changed with shifts in the economic pattern. Some suggestions may also emerge as to how the road requirements of local residents may be better integrated into intercity and interstate road needs.

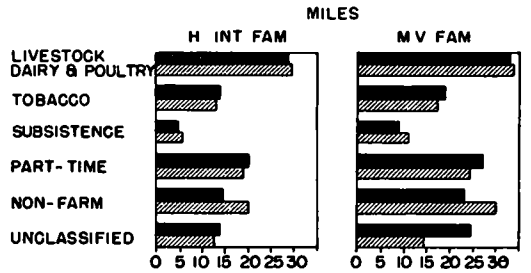


Figure 13. Miles per day of home-interview and motor-vehicle families classified by type of farm in Buckingham and Charlotte counties.