

Social Status of Head of Household and Trip Generation from Home

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The social scientist has for a number of years made use of the concept social status in explaining differential patterns of behavior. He has, more often than not, used occupation or income to operationalize this concept for selectively grouping households into various social status classes. This paper explores in detail, using the home interview survey data gathered in 1961 by the Puget Sound Regional Transportation Study (PSRTS), the relationships of "social status" and trip production from the home. Comparisons and comments on similar research done in this area by Shuldiner and Stowers are included.

•RECENTLY researchers associated with comprehensive transportation and land-use studies have uncovered many relevant variables related to household trip generation which should facilitate the task of forecasting trip demand. Unfortunately, the problem of reliably forecasting variables related to trip-making, not to mention their interrelationships with time, can be awesome indeed to those concerned with developing a reliable forecast.

This ominous note, however, has been sounded in every age and at every developmental level of the sciences. The process of scientific research, being generated as it is from theory, has usually permitted the theoretical possibility of an act to precede its pragmatic application. This paper deals with only part of the problem—examining at a point in time variables associated with trip generation. Although the author is aware of the attendant difficulties of their pragmatic application, they are ignored.

STATEMENT OF PROBLEM

To make any forecast of future trip demand better than an educated guess bounded by personal experience, it is imperative as a first step to isolate the relevant variables. This requires determining their general applicability to different geographical areas before determining their variance over time.

Although comprehensive studies of urban travel are concerned with forecasting the movement of persons and goods, it is the former with which this paper is concerned and in a very real sense it is the antecedent of the latter. The household serves as the unit of this analysis, with particular emphasis being given to the relationship of the occupation of the head of the household and trip generation from the home when size of household and automobile ownership are controlled. The generality of these relationships is tested by using data from the Chicago Area Transportation Study (CATS) as reported by Stowers (1) and data from the Puget Sound Regional Transportation Study (PSRTS).

PREVIOUS RESEARCH FINDINGS

Shuldiner, in summarizing the findings of his research, reported that he analyzed the relationship between a number of household variables and neighborhood characteristics and the frequency of person trips associated with individual households. He found family size and vehicle ownership to have the greatest influence on trip genera-

tion (2). Further on, Shuldiner notes, "The occupation of the head of the household is one of the major determinants of the level of living a family enjoys. As such, occupation should be associated with trip frequency, as well as with other household characteristics" (2, p. 49).

This suggestion by Shuldiner was further explored by Stowers working with Shuldiner at Northwestern University (1, Footnote 1). Stowers likewise found family size and car ownership the most important factors affecting trip-making, but their influence was significantly different among the various households classified by occupation of the head of household.

Michelson, in applying this line of research, found that occupation and family size were significant variables in predicting automobile ownership for small areas within metropolitan regions, particularly where other methods cannot be used because of lack of data (3).

To summarize, it is reasonable to assert that, taken together, these research findings have pointed out a direction to follow in trying to understand better the variables influencing person trip productions. The household is the generator of trip productions; the characteristics of its members determine the types and amounts of trips produced. Therefore, the researcher interested in improving the forecast procedures should pursue this line of research in the analyses of transportation data.

DATA USED IN THIS ANALYSIS

In 1961 PSRTS studied some 1,100 sq mi which comprise the major urban portion of four counties around Seattle and Tacoma, Washington. These counties include two Standard Metropolitan Statistical Areas (SMSA). The nearly 35,000 households sampled (factored to 474,032 households existing in 1961 for this area) were used, together with the Chicago Area Transportation Study data reported by Stowers, to derive the findings of this report.

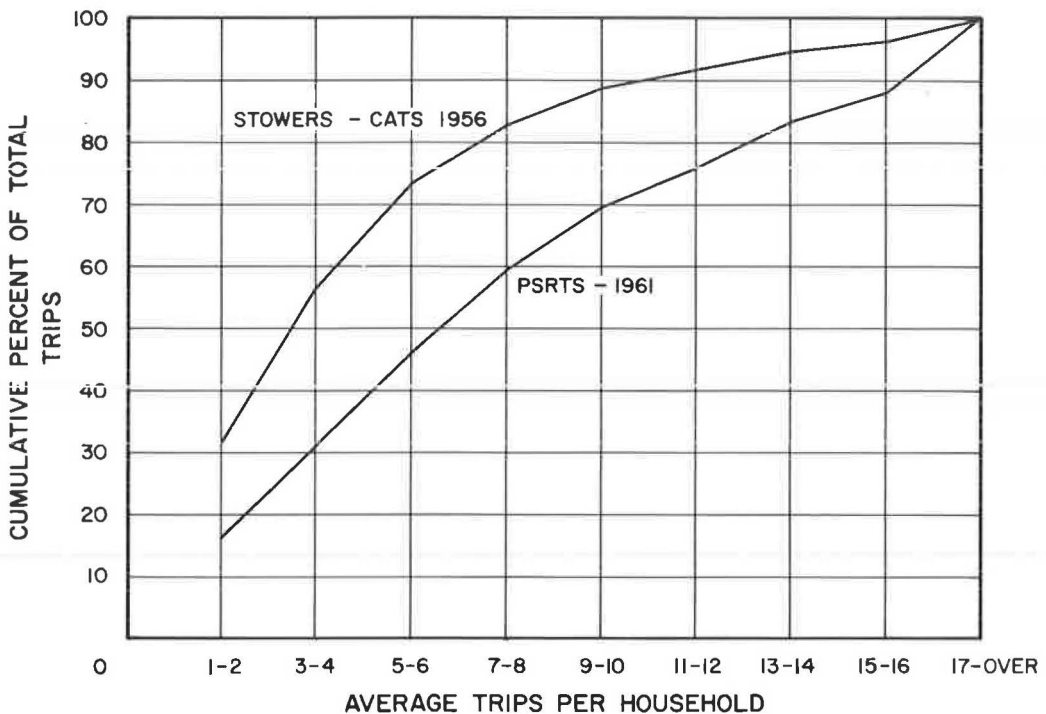


Figure 1. Cumulative percent by average trips per household for CATS and PSRTS data, all occupational groups.

The definitions for both the CATS and PSRTS data were comparable and patterned after the guidelines suggested by the U. S. Bureau of Public Roads: (a) trip information is for residents of the cordon area; (b) persons in household are for all persons, not just those 5 years of age and over; (c) occupation of the household is based on the occupation of the head of the household who makes trips, since the occupation of non-trip-makers was not coded; (d) miscellaneous occupational classifications, such as unemployed, housewife, student, or retired, are usually omitted from the analysis; and (e) the number of automobiles per household included those that are available for regular use by members of the household.

The accuracy checks of the characteristics of the household and selected trip information for PSRTS showed a rather remarkable agreement for the total cordon area when compared to independent source data (4).

COMPARISON OF TRIP GENERATION FOR HOUSEHOLDS BY OCCUPATION OF HEAD OF HOUSEHOLD

Figure 1 illustrates for all occupational groups the difference in the cumulative percent of the trip generation of the households analyzed by Stowers, using CATS 1956 data and PSRTS 1961 data. In general, the graph shows a consistently higher level of household trip generation for the PSRTS data. Seventy percent of all CATS household trips were made by households averaging fewer than six trips daily, compared to 45 percent of all PSRTS household trips for the same interval.

Many factors, such as automobile ownership, family size, and density of the area, can explain this difference, and to make a fair comparison of trip-making of the households classified by the occupation of the head of household, it will be necessary to control for these factors. In addition, the possibility exists that by occupational groups the relationship observed in Figure 1 does not hold for the two comparative areas; that is, PSRTS data by occupational group may, in fact, have a lower trip production rate. Some evidence of this can be found in Table 1.

TABLE 1
AVERAGE TRIPS PER HOUSEHOLD CLASSIFIED BY
OCCUPATION OF HEAD OF HOUSEHOLD

Occupation	Avg. Trips per Household	
	Stowers' CATS Data, 1956	PSRTS Data, 1961
Professional	7.07	7.11
Manager	7.29	7.35
Clerical	4.90	5.40
Sales	7.40	6.59
Craftsman	5.70	7.13
Operative	5.04	6.76
Service	4.80	5.86
Laborer	4.61	5.74
Unemployed	4.47	6.43

The only group having a higher household generation rate for the CATS data than for the PSRTS data is the sales occupational group. Whether or not this is a real difference, or only indicative of some of the difficulties inherent in classification schemes, or simply insignificant statistically without regard to classification problems must await further research. (It should be pointed out that for the CATS occupation of head of household data, it was assumed that the trip-maker, person 01 of a household, was the head, whereas PSRTS specified that the head of household always be coded trip-maker 01 on the internal trip report.)

TABLE 2
TRIP PRODUCTION BY OCCUPATION AND SIZE OF FAMILY FOR ONE-CAR HOUSEHOLDS

Occupation of Head of Household	Trips per Household											
	CATS 1956 (Stowers)						PSRTS 1961					
	1 Person	2 Persons	3 Persons	4 Persons	5 Persons	≥ 6 Persons	1 Person	2 Persons	3 Persons	4 Persons	5 Persons	≥ 6 Persons
Professional	3.58	5.52	6.69	7.88	8.22	13.30	4.51	7.02	8.25	9.15	11.37	12.18
Manager	3.00	5.19	6.84	7.36	6.53	8.32	5.09	6.79	9.43	10.01	12.49	13.05
Sales	3.83	7.19	6.32	8.52	9.71	8.50	5.25	7.61	10.69	10.58	11.90	12.04
Craftsman	2.45	4.29	5.24	5.74	6.73	7.95	3.73	6.11	7.72	9.34	10.56	12.25
Operative	2.35	4.33	5.09	5.28	6.01	7.37	3.70	6.49	7.44	9.30	10.24	10.33
Clerical	3.23	4.57	5.40	6.61	6.91	8.15	3.87	6.94	8.30	9.60	11.17	12.90
Service	3.15	4.53	5.96	6.08	6.11	8.15	3.53	6.16	9.36	9.15	8.55	13.26
Laborer	2.09 ^a	3.79	4.83	6.41	4.80	7.83	3.21	5.32	7.64	8.08	9.25	9.80

^aRepresents fewer than 10 observations.

As mentioned earlier, both Shuldiner and Stowers in their research found automobile ownership and family size the most important variables in explaining trip generation of the household. Table 2 compares CATS and PSRTS data for households owning one automobile by eight generalized occupational groups and by number of persons in the household. Data were available for comparing zero and two or more automobiles per household by family size, but in many instances the number of cell entries for the CATS data were statistically "thin." Nevertheless, the zero and two or more car families' patterns of relationship for the two studies were very similar. One-car families for both areas represent over 50 percent of the households and will serve to illustrate the relationship of trip production by occupational groups.

Table 2 gives only one case in which the trips per household are larger for the CATS data than for PSRTS data, i. e., for households classified as professional and having six or more members. Conversely, if we compare across the cell entries by each occupational group, only three cell entries of CATS data and three of PSRTS data fail to register an increase in trips per household with an increase in the number of persons in the household.

The answer to the question of which variable, family size or number of automobiles available for a household to use has more influence on household trip production was found by Shuldiner and Stowers to be automobiles available. Table 3 compares CATS and PSRTS trips per household by occupation and car ownership, using a typical household size of three persons. (In 1960 the average household size for SMSA's in the United States was slightly over three persons per occupied housing unit.)

In comparing Tables 2 and 3, it is readily evident that, although both family size and automobile ownership influence trip generation of the household, a change in the number of automobiles in a household has the greater impact on household trip-making. The greatest change in trip-making of households occurs between households owning no and one automobile and between households having one and two persons. This relationship is more clearly illustrated in Figure 2, using PSRTS data.

TABLE 3
TRIP PRODUCTION BY OCCUPATION AND CARS PER HOUSEHOLD
FOR HOUSEHOLDS HAVING THREE PERSONS

Occupation of Head of Household	Trips per Household					
	CATS 1956 (Stowers)			PSRTS 1961		
	No Cars	1 Car	≥2 Cars	No Cars	1 Car	≥2 Cars
Professional	5.29 ^a	6.69	9.50	7.70	8.25	11.69
Manager	3.71 ^a	6.84	9.53	6.01	9.43	11.90
Sales	5.75 ^a	6.32	8.06	5.40	10.69	13.60
Craftsman	3.76	5.24	7.70	3.77	7.72	9.82
Operative	3.53	5.09	8.95	3.62	7.44	10.08
Clerical	3.67	5.40	6.82	4.93	8.30	10.77
Service	3.80	5.96	6.10	5.17	9.36	10.64
Laborer	3.32	4.83	— ^b	3.93	7.64	9.57

^aRepresents fewer than 10 observations.

^bNo observations.

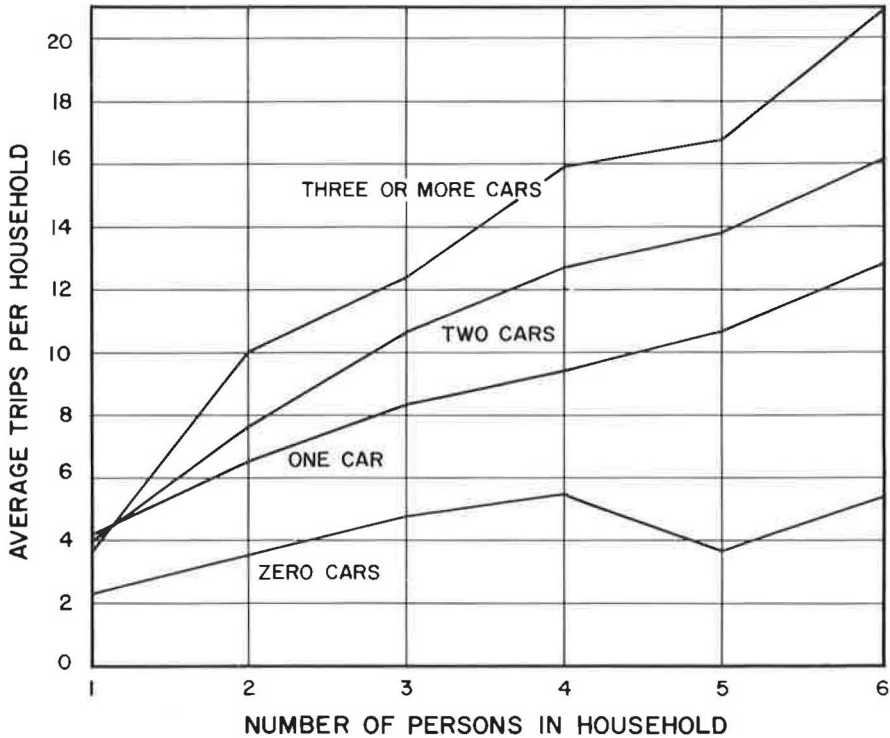


Figure 2. Average trips per household by persons in household and number of automobiles per household.

As pointed out by Stowers (1, Footnote 1), and as can be seen from examination of the preceding tables, the use of the generalized occupational groups shows little in the way of a consistent pattern with household trip production. The final sections of this paper report on trip production and the household using summary groupings of the generalized occupational classes.

CONCEPT OF SOCIAL STATUS

Shuldiner, Stowers, and Michelson are agreed that the concept of social or socioeconomic status of the household should be useful in distinguishing between households manifesting different trip generation rates. Indeed, they did find that occupation affected trip generation but was not as influential as size of family and automobile ownership.

The concept of social or socioeconomic status of a household refers to a generalized pattern or standard of living to which the members of a household strive. Many indices have been used to operationalize this concept at some point in time for a household. These indices range from such subjective methods as an individual ranking himself in a particular status or class, to the more objective criteria of educational attainment, wages or salary earned, and an individual's occupation. Implicit in the use of such a generalized or summary measure is that the categories or classes comprising the index are systematically related to other variables or behaviors not included in the formation of the index. This is to say, that if one can categorize persons or households as being of a particular class or status, one can also predict various patterns of behavior for individuals or households that are related to their class groups but are independent of the variables used to establish the class groupings. A society is the product of its institutions and institutions are, in turn, made up of organizations, composed of individuals especially trained to carry out the daily tasks necessary for the healthy functions of the organization. In a very real sense, the backbone of the "straw man" is joined together by occupational vertebrae.

OPERATIONAL DEFINITION OF SOCIAL STATUS

In this paper, occupation has been selected to operationalize the concept of social status. More specifically, the occupation of the head of household who made trips on the survey day is used. The head of household's description of his work activities was coded to a two-digit number based on the 1960 Alphabetical Index of Occupations and Industries, formulated by the U.S. Bureau of the Census. For the purpose of this report, only the generalized tens digit of the occupation code was used.

This general functional code of occupations was first described by Alba M. Edwards in the *Journal of the American Statistical Association* in 1917; in the same *Journal* in 1933, the code was revised and brought up to date, listing six general categories of socioeconomic rankings. Edwards' groupings and the ones used in this report, although different in ordering and grouping, contain basically the same general classes of:

1. Professional,
2. Managers,
3. Clerical,
4. Sales,
5. Craftsmen,
6. Operatives,
7. Service, and
8. Laborers.

Edwards combined occupations 3, 4, 7, and 8 into one class, and also listed separately unemployed and unknown.

Stowers noted in his thesis that, "Edwards considered these groupings to be a logical socioeconomic ranking of all occupations and presented them as such without offering any rigid sociological or economic justification for doing so" (1, p. 11). However, some objective evidence is available which permits grouping of the general occupational classes into socioeconomic categories. North and Hatt, using a national sample of public opinion after World War II, developed the North-Hatt scale of occupational status and prestige (5) based on the two-digit occupational classification used by the Bureau of the Census. The list given in Table 4 of generalized occupation groups ordered from the highest scaled to the lowest scaled are based on the work of North and Hatt.

The North-Hatt rating of occupational status and prestige is very similar to that advanced by Alba M. Edwards in 1933. The major difference is the ranking of government

TABLE 4
NORTH-HATT OCCUPATIONAL RATING OF STATUS AND
PRESTIGE

No.	General Occupational Groups	Score
1	Government officials	90.9
2	Professional and semiprofessional workers	80.6
3	Proprietors, managers, and officials (except farm)	74.9
4	Clerical, sales, and kindred workers	68.2
5	Craftsmen, foremen, and kindred workers	68.0
6	Farmers and farm managers	61.3
7	Protective service workers	58.0
8	Operatives and kindred workers	52.8
9	Farm laborers	50.0
10	Service workers (except domestic and protective)	46.7
11	Laborers (except farm workers)	45.8

officials: first in the North-Hatt ranking and included in the second grouping in the Edwards ranking. For the purpose of this analysis, however, this difference is not significant since professional, manager, and government occupational groups are always grouped together into the same summary status of class grouping. A more serious difficulty, from the point of view of the relationship of social status and trip-making, is the grouping together in the North-Hatt scale of clerical and sales workers, particularly traveling salesmen. The North-Hatt ranking permitted score values ranging from 100 to 20 to be assigned to the 90 individual occupations representing the two-digit occupational classifications used by Bureau of the Census, but excluding the 90 series of retired, unemployed housewife, etc. Examination of the detailed two-digit status and prestige scores of occupations reported by North and Hatt reveals that "traveling salesmen" scored 68, whereas "clerks in a store" scored 58. Other research evidence has shown that in terms of similarity in selected behavioral patterns the clerical and kindred workers are different from sales workers but more similar in certain respects to the "so-called blue collar workers" and more particularly to the protective service workers, whereas craftsmen, foremen, and kindred workers are more like the "so-called white collar workers (6, 7).

TABLE 5
STATUS GROUPINGS USING
GENERALIZED OCCUPATIONAL
GROUPS

Occupation	Group I ^a	Group II ^b
Professional	W	H
Manager	W	H
Clerical	B	M
Sales	W	M
Craftsman	W	M
Operative	B	L
Service	B	L
Laborer	B	L

^aW = white collar; B = blue collar.

^bH = high; M = medium; L = low.

SOCIAL STATUS AND HOUSEHOLD TRIP GENERATION

The two summary groupings of occupational status used here are composed of (a) two occupational status classes traditionally referred to as the "white collar" and the "blue collar" groups, and (b) three occupational status classes called the high, medium, and low groups. Table 5 identifies the occupations included in the definition of these two summary groupings.

The operational use of the concept of status in transportation and land-use analysis is not new. Hansen in calibrating the gravity trip distribution model for Washington, D. C., used measures of white and blue collar workers in developing K

factors (8). Others in the development of land-use models have tried to incorporate some status or prestige measures for distribution of population and residential land (9). However, to my knowledge, status measures have not been utilized directly in the forecasting of trip productions.

The general hypothesis of this analysis is that there is a direct relationship between trip generation from the home and social status; that is, as status increases trip generation from home will also increase. It was reasoned that a valid test of the hypothesis could be made only if the effect of automobile ownership and persons in the household were controlled, since previous research has shown the importance of these two variables in explaining trip production from the home.

No statistical tests are explicitly used to test the hypothesis for two reasons: (a) the author doubts that the basic assumption underlying the use of the available statistic (analysis of variance) could be met; and (b) the nature of the research is expository (10). However, the hypothesis can be accepted or rejected implicitly on the basis of the number of successes or failures observed in analyses of the two occupational status groupings.

Tables 6 and 7 summarize for the two measures of status the average trips per household by selected modes of travel. In general, the findings of these two tables are that trip-making of the household is directly related to the status classification of the household head. There are exceptions to the general relationship, particularly in the "transit bus passenger" mode of travel, where an inverse relationship exists between social status of household and transit bus passenger trip productions.

If one excludes transit bus passenger trips from this comparison, there are only four of the 144 cells in Tables 6 and 7 in which a horizontal, or between status, move does not result in a change in trip production in the direction hypothesized. By the same token, there are only eight of the 144 cells in which a vertical, or within status, move to a larger household size within an automobile per household class does not result in increasing the average trips per household. Of the 12 exceptions to the hypothesis in the within and between status cells, eleven of these occur in the no automobile per household class. (The peculiarity of the trip-making of households having no automobiles available for making trips has been noted by Keefer in his analysis of the "captive choice" transit ridership of the Pittsburgh Area Transportation Study.)

INTERPRETATION AND APPLICATION OF FINDINGS

The inclusion of the social status variable with automobiles per household and family size of the household helps in understanding and explaining trip generation from the home, at least for a point in time. Whether or not this relationship is retained over time, not to mention the interrelationships or interdependence of the variables, are questions to be answered before any reliable predictive model utilizing these variables can be constructed.

Given the present state of the art, particularly in forecasting trips from the home for small areas, no relationship which can help one to accomplish this task should be overlooked. It is at the small area level of forecasting that the inclusions of the social status variable can be most helpful.

It is apparent from the analysis that households with like automobile ownership and family size have different trip production generation rates when examined by social status groups. For small areas within a community this fact can be significant, since research in community patterns of living has shown that families of a particular occupation tend to be separated spatially from families of other occupations in direct proportion to the distance between the occupations on the Edwards ranking by socioeconomic status (11).

I conclude by pointing out two ways in which the inclusion of the social status variable could aid researchers confronted with analysis and forecasting of trip generation from the home. From census data, automobiles per household, number of persons per household, and occupation of the head of the household are available by small statistical areas. By application of generation rates based on the composition of the statistical area with regard to these variables, an independent forecast of trip generation from the

TABLE 6
TRIP-MAKING RELATIONSHIPS, STATUS CLASSES BASED ON WHITE AND BLUE COLLAR GROUPINGS

Autos In Household	Persons In Household	White Collar					Blue Collar				
		No. Households	Trips per Household				No. Households	Trips per Household			
			Total Trips	Auto-Driver Trips	Auto-Truck Pass. Trips	Transit Bus Pass. Trips		Total Trips	Auto-Driver Trips	Auto-Truck Pass. Trips	Transit Bus Pass. Trips
0	1-2	5,455	2.84	0.21	1.02	1.30	10,610	2.64	0.04	0.88	1.42
	3-4	1,067	5.76	0.41	2.48	2.26	1,999	4.82	0.31	2.15	1.93
	≥5	432	4.53 ^a	0.40 ^a	2.19 ^a	1.70	715	4.66 ^a	0.29 ^a	2.34	1.53
	Total	6,954	3.39	0.25	1.32	1.47	13,324	3.07	.10	1.15	1.50
1	1-2	45,132	6.11	4.31	1.40	0.32	26,868	5.50	3.77	1.23	0.42
	3-4	42,090	9.05	5.41	2.93	0.39	20,114	8.57	5.13	2.73	0.43
	≥5	25,715	11.75	6.10	4.35	0.40	12,002	10.56	5.52	3.78	0.50
	Total	112,937	8.49	5.13	2.64	0.36	58,984	7.58	4.59	2.26	0.44
2	1-2	15,931	8.09	6.80	1.14	0.10	5,226	6.67	5.42	.98	0.22
	3-4	29,625	12.18	8.55	2.94	0.23	9,172	11.45	7.95	2.93	0.27
	≥5	22,198	15.02	9.02	4.68	0.26	6,342	14.11	8.15	4.68	0.36
	Total	67,754	12.15	8.29	3.09	0.21	20,740	11.06	7.37	2.97	0.29
≥3	1-2	454	10.08	8.70	1.20	0.08	151	8.87	8.25	.43	0.09
	3-4	3,894	14.85	11.70	2.76	0.18	1,452	12.68	9.78	2.45	0.20
	≥5	3,323	19.04	12.52	5.03	0.45	964	17.61	11.96	4.22	0.28
	Total	7,671	16.38	11.88	3.65	0.29	2,567	14.30	10.51	2.99	0.22
Grand Total		195,316	9.89	6.32	2.79	0.35	95,615	7.88	4.73	2.28	0.55

^aException to hypothesis.

TABLE 7
TRIP-MAKING RELATIONSHIPS, STATUS CLASSES BASED ON HIGH, MEDIUM, LOW OCCUPATIONAL GROUPINGS

Autos In Household	Persons In Household	High			Medium			Low		
		Total Households	Trips per Household		Total Households	Trips per Household		Total Households	Trips per Household	
			Total Trips	Auto-Driver Trips		Total Trips	Auto-Driver Trips		Total Trips	Auto-Driver Trips
0	1-2	2,965	2.85	0.14	6,904	2.75	0.12	6,196	2.59	0.06
	3-4	543	6.68	0.45	1,235	4.99	0.39	1,288	4.66	0.26
	≥5	185	4.81 ^a	0.29	479	5.32 ^a	0.62	483	3.82 ^a	0.05
	Total	3,693	3.51	0.19	8,618	3.21	0.18	7,967	3.00	0.09
1	1-2	24,479	6.25	4.49	30,302	5.80	4.03	17,219	5.50	3.71
	3-4	21,893	9.10	5.48	25,516	8.97	5.31	14,795	8.47	5.09
	≥5	12,304	12.10	6.31	15,511	11.50	5.96	9,902	10.27	5.35
	Total	58,676	8.54	5.24	71,329	8.17	4.91	41,916	7.67	4.59
2	1-2	9,571	8.26	6.93	7,682	7.84	6.49	3,904	6.29	5.24
	3-4	17,257	12.27	8.60	14,319	12.09	8.50	7,221	11.23	7.79
	≥5	13,016	15.36	9.29	10,591	14.32	8.53	4,933	14.45 ^a	8.22
	Total	39,844	12.31	8.42	32,592	11.81	8.03	16,058	11.02	7.30
≥3	1-2	203	12.51	11.46	280	8.61	7.03	122	7.90	7.37
	3-4	2,298	15.56	12.18	1,890	14.10	11.13	1,158	11.94	9.28
	≥5	1,842	19.40	13.09	1,631	18.26	11.60	814	18.07	12.43
	Total	4,343	17.05	12.53	3,801	15.48	11.03	2,094	14.09	10.40
	Grand Total	106,556	10.12	6.55	116,340	9.06	5.63	68,035	8.11	4.88

^aException to hypothesis.

home can be developed to compare against and check the reasonableness of the results of the particular procedure used for the actual forecast, for example, regression analysis or land-use generation rates. In addition, by using census data to estimate trip productions (lacking a full-scale origin and destination survey), small area comprehensive community planning could benefit, particularly in the development of more realistic circulation plans.

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