

Travel Patterns in 50 Cities*

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During the past 15 years origin-and-destination traffic surveys of the home-interview type have been conducted in more than one hundred cities. This article presents information regarding the purpose for which trips were made by residents in 50 of these urban areas and the mode of travel they used. Data are also included pertaining to basic household characteristics of the areas such as the numbers of dwelling units, residents, and automobiles owned, and the relations between these characteristics and the volume of trips classified according to purpose and mode of travel. The urban areas have been grouped by population size to disclose whatever travel trends or patterns may exist among cities in the several population groups.

The percentage distribution of major trip purposes is fairly uniform in cities of all sizes. Analysis by mode of travel, however, shows a variable pattern. The proportion of trips by automobiles and taxis increases as city size decreases. On the whole, mass transit is by far the most prevalent mode of travel in the largest cities, but its relative importance varies depending upon the trip purpose. Trips for social and recreational purposes, for instance, generally involve the use of automobiles.

In most cases, the volume of daily trips by residents within an urban area is directly related to the number of persons, dwelling units, and automobiles registered in the area. The relations vary, however, depending upon the trip purpose and mode of travel.

● **AMONG** the more important factors affecting the planning of streets and highways are the means by which residents travel within the city, the purposes for which the trips are made, and the relations between these trips and residential characteristics such as the number of persons living in the area, the number of dwelling units they occupy, and the number of automobiles they own. At the time this article was prepared, information of this sort was available from origin-and-destination traffic studies¹ of the home-interview type which had been made in 101 urban areas since 1944. The product of these studies includes a great mass of data on the local travel habits of urban residents on an average weekday during the period of the survey.

Data from these studies have already been analyzed and the results have been put to use in each of the individual urban areas surveyed. However, knowledge of the general or average pattern for groups of cities of similar size should be very beneficial to highway planners. Thus it may be possible to establish norms that might be helpful in anticipating the changes which will take place in the traffic patterns of a city as the pattern of living changes.

The primary intent of this article, therefore, is to call attention to the more significant aspects of the many-sided travel patterns for 50 of these cities, considered either singly or in combination. Information from the recent past regarding travel habits of city residents should be valuable to urban planners, highway engineers, and

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¹"Traffic Planning Studies in American Cities," by John T. Lynch. Public Roads, Vol. 24, No. 6, Oct.-Nov.-Dec. 1945. The procedures used in these studies are given in greater detail in the "Manual of Procedures for Home Interview Traffic Study," which is available by purchase from the Public Administration Service, 1313 East 60th Street, Chicago, Ill.

economists in attacking the transportation problems of the present and future. It is also hoped that the article will serve to call attention to the quantity and quality of data that have become available as a result of such surveys. A list of the selected cities showing survey dates and population at the time of the study is given in Table 1. It should be noted that almost one-third of the studies were conducted during the latter part of World War II and the year following the end of the war. Some of the variations in trip-purpose and travel-mode patterns which are discussed later may be associated with the year of the basic survey or the geographical location of the study area.

DEFINITIONS

The urban areas referred to in this article are the areas within which the basic sur-

Table 1.—Population and period of survey in 50 urban areas

Urban area	Population	Period of survey
Albuquerque, N. Mex.....	116,056	June 1949-July 1949.
Altoona, Pa.....	85,347	July 1950-Sept. 1950.
Appleton, Wis.....	39,172	June 1953-July 1953.
Baltimore, Md.....	912,809	Sept. 1945-Oct. 1945.
Bay City, Mich.....	69,231	July 1948-Oct. 1948.
Charleston, S. C.....	73,205	Feb. 1947-Mar. 1947.
Chester, Pa.....	127,408	June 1951-Oct. 1951.
Columbus, Ga.....	79,192	Oct. 1945-Dec. 1945.
Dallas, Tex.....	533,606	Nov. 1950-Mar. 1951.
Duluth, Minn.-Superior, Wis.....	130,847	May 1948-June 1948.
Fargo, N. Dak.-Moorhead, Minn.....	49,852	June 1949-Aug. 1949.
Grand Rapids, Mich.....	220,977	July 1947-Oct. 1947.
Harrisburg, Pa.....	103,303	June 1946-Sept. 1946.
Honolulu, T. H.....	214,236	Apr. 1947-Sept. 1947.
Houston, Tex.....	878,629	Mar. 1953-June 1953.
Johnstown, Pa.....	87,509	July 1949-Sept. 1949.
Kalamazoo, Mich.....	72,024	Apr. 1946-May 1946.
Lansing, Mich.....	122,776	Sept. 1946-Nov. 1946.
Macon, Ga.....	77,665	July 1946-Aug. 1946.
Madison, Wis.....	104,074	May 1949-June 1949.
Muskegon, Mich.....	83,724	July 1946-Aug. 1946.
Newark, N. J.....	1,456,947	Aug. 1945-Jan. 1946.
Norfolk, Va.....	335,910	June 1950-Aug. 1950.
Norristown, Pa.....	39,485	June 1949-Aug. 1949.
Philadelphia, Pa.....	2,233,531	June 1947-Nov. 1947.
Phoenix, Ariz.....	161,567	Nov. 1946-Feb. 1947.
Pontiac, Mich.....	79,431	Apr. 1947-May 1947.
Portland, Oreg.....	453,128	July 1946-Sept. 1946.
Racine, Wis.....	78,033	Aug. 1949-Oct. 1949.
Reading, Pa.....	119,851	Nov. 1946-Dec. 1946.
Rockford, Ill.....	116,000	July 1950-Aug. 1950.
Sacramento, Calif.....	201,345	Dec. 1947-May 1948.
Saginaw, Mich.....	112,902	July 1948-Sept. 1948.
St. Louis, Mo.....	974,545	Apr. 1945-July 1945.
St. Paul-Minneapolis, Minn.....	915,960	May 1949-Nov. 1949.
Salt Lake City, Utah.....	196,571	June 1946-Sept. 1946.
San Francisco, Calif.....	1,468,933	July 1946-Dec. 1946.
San Juan, P. R.....	312,069	June 1948-July 1948.
Scranton, Pa.....	137,089	June 1950-Aug. 1950.
Seattle, Wash.....	518,563	May 1946-Aug. 1946.
Sharon-Farrell, Pa.....	48,432	June 1949-July 1949.
Spokane, Wash.....	138,381	July 1946-Dec. 1946.
Tacoma, Wash.....	138,700	June 1948-Aug. 1948.
Tucson, Ariz.....	126,900	Mar. 1948-Apr. 1948.
Washington, D. C.....	1,109,860	May 1948-Sept. 1948.
Wichita, Kans.....	238,302	Nov. 1951-Apr. 1952.
Williamsport, Pa.....	55,216	July 1954-Aug. 1954.
Wilmington, Del.....	181,445	Apr. 1948-July 1948.
Wisconsin Rapids, Wis.....	16,504	Sept. 1950-Oct. 1950.
York, Pa.....	77,350	July 1951-Aug. 1951.

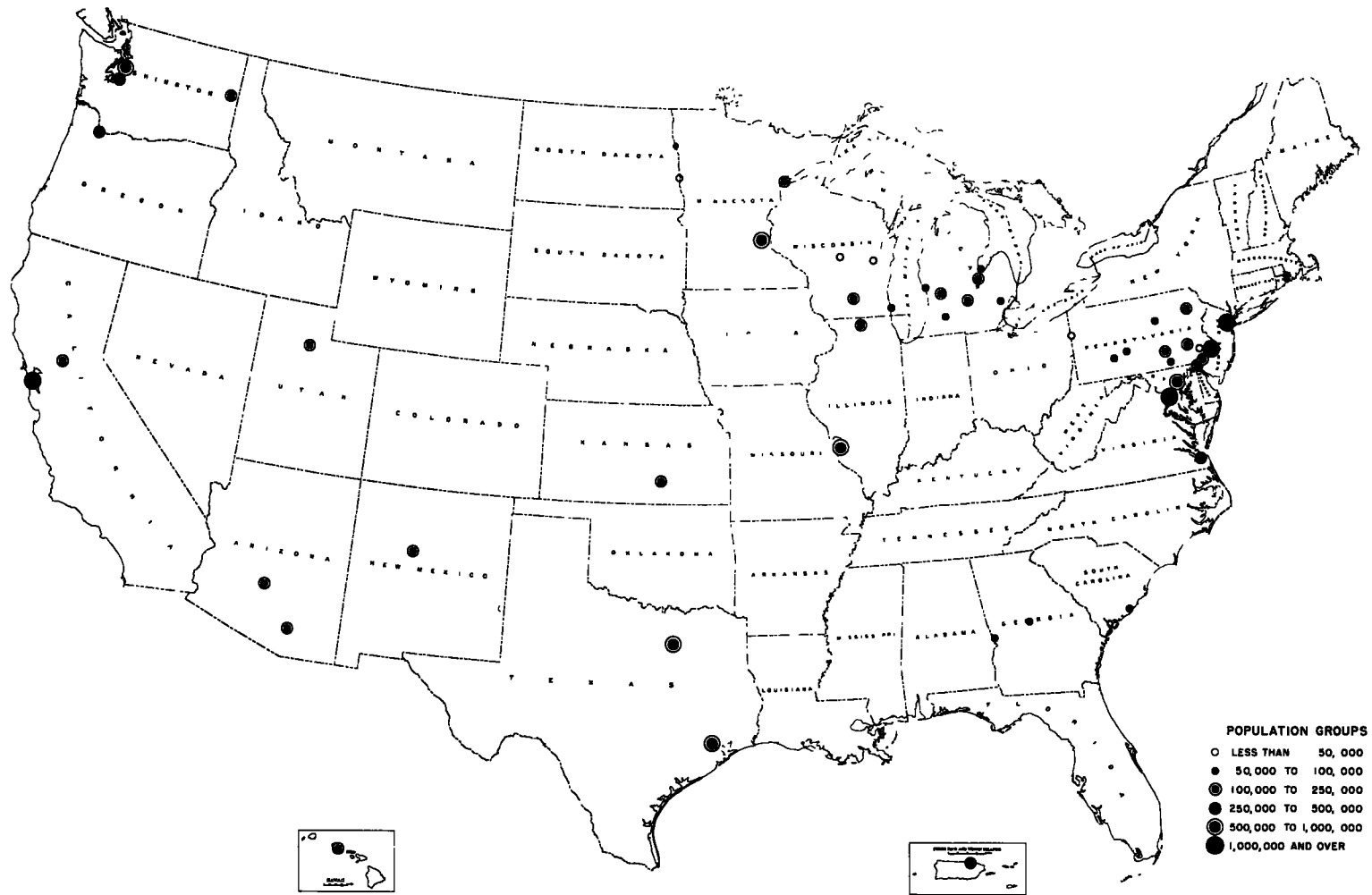


Figure 1. Geographical distribution of the 50 cities included in study.

veys were conducted. They generally include the central city as well as any portion of the contiguous built-up area that may exist beyond the corporate limits. Their boundaries are usually delimited by an imaginary line called the external cordon. These areas resemble but do not coincide with urbanized areas as defined by the Bureau of the Census. In this article the terms urban area and city are used interchangeably.

A trip is defined as a one-way movement in a vehicle by a resident of the urban area. There are no round trips but rather two or more one-way trips. The only trips considered here are internal trips, so-called because both origin and destination are within the boundaries of the survey area. External trips to or from points beyond the external cordon are not included. The external phase of the basic surveys was concerned only with automobile travel beyond the cordon and only automobile-driver trip information was included. These external automobile-driver trips amounted to about 5 percent of the total internal and external automobile-driver trips in the largest urban areas and about 45 percent in the smallest cities included in this study.

As the term is used in these surveys, mode of travel depends upon (1) the type of vehicle used (automobile, taxi, truck, or mass-transit vehicle), and (2) the status of the user (driver or passenger). The modes of travel recorded in most of the individual surveys were as follows: automobile drivers, automobile passengers, taxi passengers, truck passengers, bus or streetcar passengers, railroad passengers, and passengers in other mass-transit vehicles. For purposes of analysis, some of these modes have been combined.

The term purpose of trip is used in its obvious sense to explain why a person made the trip. However, for every internal trip recorded, the survey data show not only why the traveler went to his destination (purpose to), but also why he had been at the point of origin (purpose from). The purposes (both to and from) were originally ten: work, business, medical-dental, school, social-recreational, eat meal, shop, change mode of travel, serve passenger, and home. However, as with modes of travel, some of the trip purposes have been combined.

Household characteristics include the numbers of persons, dwelling units, and automobiles owned, and persons 5 years of age and over. Dwelling unit is used in the sense of the Bureau of the Census—"In general, . . . a group of rooms or a single room occupied or intended for occupancy as separate living quarters by a family or other group of persons living together or by a person living alone."

SCOPE OF ARTICLE

Although at the time of this analysis over one hundred comprehensive urban traffic surveys had been completed, trip purpose-to-purpose tabulations had been prepared in only 50 cities with sufficient uniformity to permit summarizing the results by city groups. These 50 cities seem to provide a sufficiently good distribution among the population groups studied so that the data are representative.

Figure 1 shows the geographical distribution of the selected cities by population groups. The 50 cities accounted for 10.8 percent of the total United States population

Table 2.—Distribution by population groups of all urbanized areas, of urban areas where origin and destination studies have been made, and of urban areas included in the present study

Urban area population groups	All urbanized areas, 1950 census		Urban areas with completed O & D studies		Urban areas included in this study	
	Number	Percent	Number	Percent	Number	Percent
Over 1,000,000	12	7.6	6	5.9	4	8.0
500,000-1,000,000	13	8.3	11	10.9	6	12.0
250,000-500,000	24	15.3	9	8.9	3	6.0
100,000-250,000	70	44.6	43	42.6	20	40.0
50,000-100,000	38	24.2	22	21.8	12	24.0
Less than 50,000	-----	-----	10	9.9	5	10.0
Total	157	100.0	101	100.0	50	100.0

in 1950, and 16.8 percent of the urban population. As Table 2 indicates, the distribution of the 50 cities by population groups among the 157 urbanized areas of the 1950 census is only fair, but it follows very closely the group distribution of the 101 cities from which origin-destination traffic survey data were available.

The present analyses have been limited to two questions: how and why residents make their trips within an urban area. It does not consider two other important questions which relate to the origin and destination of trips within the area. Although these data are available for each city, records of trips from place to place within a city cannot justifiably be combined for more than one city at a time, because it is difficult to relate areas when so little is known about their land-use characteristics.

The process of summarizing data to discover travel patterns, related to purpose of trip and mode of travel, began with the cities where the surveys were made. In each of the 50 cities the procedures recommended in the "Manual of Procedures for Home Interview Traffic Study" were generally followed, and tables were compiled in which trips were classified uniformly by mode of travel and purpose of trip. One tabulation was prepared for each mode of travel, showing the number of trips from each purpose to each purpose. However, the number of travel modes reported in different cities varied; trips by train passengers were reported only in two cities and trips by "other" passengers were reported only in five cities. A typical example of the basic tabulations for an individual city is presented in Table 3.

In the course of assembling and combining the data from different cities it became evident that certain less significant trip purposes and travel modes might advantageously be combined. On the average, the five least important trip purposes accounted for less than 12 percent of the total number of trips, and not one of these purposes accounted for as much as 4 percent. These categories were combined to form a miscellaneous group.

Minor trip purposes and the percentages of trips accounted for by each were as follows: to serve passenger, 3.4 percent; change mode of travel, 3.3 percent; school, 2.3 percent; eat meal, 1.7 percent; and medical-dental, 1.1 percent.

In addition, since business trips amounted to less than 5 percent of all internal trips and were often difficult to dissociate from work trips, the two were combined as work

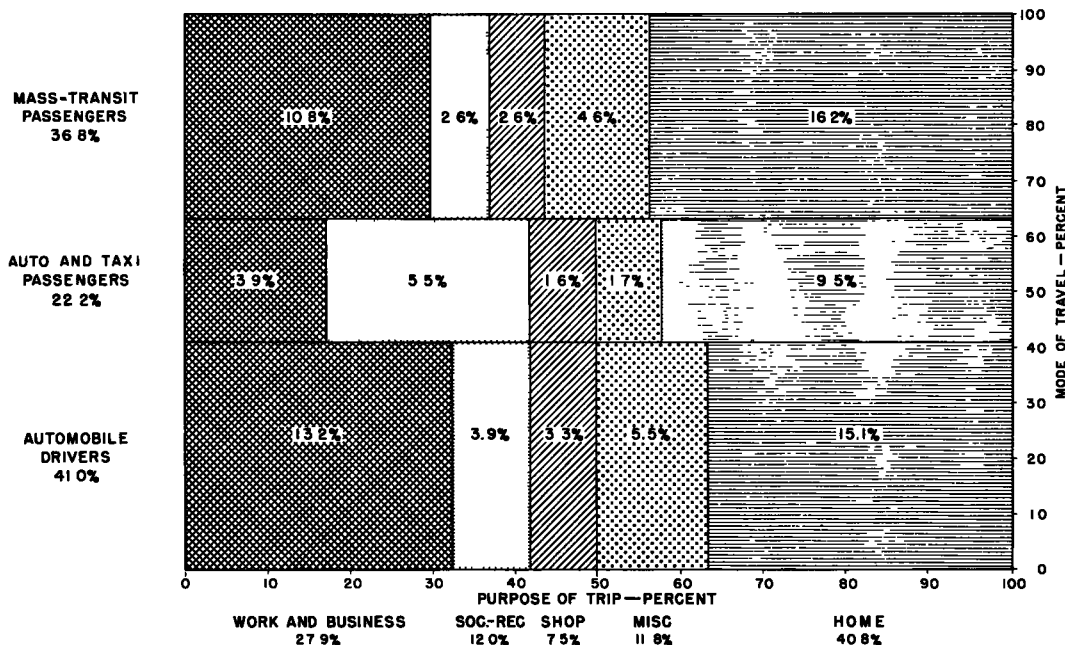


Figure 2. Percentage distribution of trips according to purpose, and further classified by mode of travel.

Table 3.—Number of trips by each mode of travel in Madison, Wis., classified according to trip purpose

Trips from--	Trips to--										
	Work	Business	Medical-dental	School	Social-recreation	Eat meal	Shop	Change mode of travel	Serve passengers	Home	Total
AUTOMOBILE DRIVERS											
Work.....	8,008	663	89	41	522	3,717	990	-----	1,242	11,214	26,486
Business.....	623	828	10	30	301	190	468	-----	210	2,164	4,824
Medical-dental.....	49	20	10	-----	31	9	119	-----	60	271	559
School.....	72	20	10	119	139	290	40	-----	150	1,092	1,832
Social-recreation.....	142	190	40	20	1,377	258	401	10	1,206	6,395	10,039
Eat meal.....	3,167	171	-----	169	290	-----	101	-----	439	791	5,128
Shop.....	270	251	29	31	598	139	1,365	11	321	5,333	8,348
Change mode of travel.....	-----	10	10	-----	10	20	21	-----	20	148	289
Serve passengers.....	1,924	300	70	209	926	349	620	20	1,776	5,827	12,021
Home.....	12,648	2,624	341	1,331	5,749	691	4,234	99	6,953	-----	34,670
Total.....	26,903	5,077	609	1,950	9,943	5,663	8,359	140	12,367	33,235	104,246
AUTOMOBILE PASSENGERS											
Work.....	191	63	30	-----	203	503	196	71	-----	3,971	5,228
Business.....	41	217	30	10	184	20	153	-----	-----	725	1,380
Medical-dental.....	-----	21	-----	10	62	-----	72	-----	-----	303	458
School.....	20	52	53	82	256	188	20	-----	-----	871	1,842
Social-recreation.....	92	82	10	89	3,739	297	451	-----	-----	10,048	14,608
Eat meal.....	441	10	-----	267	251	-----	20	-----	101	660	1,679
Shop.....	29	63	-----	11	535	62	708	-----	-----	2,673	4,101
Change mode of travel.....	30	-----	10	-----	20	10	22	10	-----	271	363
Serve passengers.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Home.....	4,583	901	313	2,676	9,384	558	2,421	285	-----	-----	21,071
Total.....	5,377	1,409	446	3,145	14,624	1,638	4,063	477	-----	19,552	50,731
STREETCAR AND BUS PASSENGERS											
Work.....	130	69	20	10	140	504	220	175	-----	7,429	8,697
Business.....	30	60	-----	20	30	-----	50	10	-----	805	1,005
Medical-dental.....	-----	10	-----	10	20	-----	-----	20	-----	300	360
School.....	161	40	20	90	180	553	201	60	-----	5,213	6,518
Social-recreation.....	20	41	20	20	159	40	70	41	-----	3,268	3,669
Eat meal.....	434	20	-----	454	40	-----	20	-----	-----	363	1,331
Shop.....	110	49	10	50	131	-----	150	40	-----	2,522	2,992
Change mode of travel.....	40	10	-----	59	70	10	59	40	-----	161	519
Serve passengers.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Home.....	8,153	1,118	382	5,556	3,238	361	1,730	210	-----	-----	20,748
Total.....	9,078	1,417	482	6,269	4,008	1,468	2,500	596	-----	20,051	45,839
TAXI PASSENGERS											
Work.....	41	20	50	-----	30	10	10	-----	-----	413	574
Business.....	10	10	-----	10	20	10	-----	-----	-----	149	209
Medical-dental.....	10	-----	-----	-----	10	-----	-----	-----	-----	131	151

School.....	21	11	10	11	20	11	121	162		
Social-recreation.....	20	11	10	79	20	10	481	612		
Eat meal.....	30	10	10	10	40	10	40	80		
Shop.....	10	20	20	20	40	110	80	160		
Change mode of travel.....	804	139	110	239	500	60	102	89		
Serve passengers.....										
Home.....										
Total.....	946	180	160	259	680	120	162	89	1,535	4,131

TRUCK PASSENGERS

Work.....	92								31	123
Business.....										
Medical-dental.....										
School.....										
Social-recreation.....									10	10
Eat meal.....										
Shop.....										
Change mode of travel.....										
Serve passengers.....										
Home.....	11				10					21
Total.....	103				10				41	154

ALL MODES OF TRAVEL

Work.....	8,462	815	189	51	895	4,734	1,416	246	1,242	23,058	41,108
Business.....	704	1,115	40	70	535	220	671	10	210	3,843	7,418
Medical-dental.....	59	51	10	20	113	9	191	20	50	1,005	1,528
School.....	253	112	83	301	586	1,051	261	60	150	7,297	10,154
Social-recreation.....	275	324	70	129	5,354	615	922	152	1,206	20,192	29,239
Eat meal.....	4,062	201	49	890	591	201	151	61	439	1,884	8,218
Shop.....	369	363	10	92	1,264	40	2,263	20	321	10,618	15,601
Change mode of travel.....	150	26	10	59	120	40	102	50	20	690	1,261
Serve passengers.....	1,924	300	70	209	926	349	620	20	1,776	5,827	12,021
Home.....	26,149	4,782	1,146	9,802	18,881	1,670	8,487	683	6,953	78,553	205,101
Total.....	42,407	8,083	1,667	11,623	29,265	8,889	15,084	1,302	12,367	74,414	205,101

Table 4.—Number and percentage of trips by each mode of travel in 50 cities, classified according to trip purpose

Mode of travel	Trip purpose											
	Work and business		Social and recreation		Shop		Miscellaneous		Home		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Automobile drivers.....	3,679,848	13.2	1,079,942	3.9	910,831	3.3	1,524,373	5.5	4,187,918	15.1	11,382,912	41.0
Automobile and taxi passengers.....	1,065,361	3.9	1,520,382	5.5	458,798	1.6	480,546	1.7	2,634,629	9.5	6,195,716	22.2
Mass-transit passengers.....	3,014,103	10.8	736,487	2.6	690,435	2.6	1,270,461	4.6	4,487,541	16.2	10,199,027	36.8
Total.....	7,759,312	27.9	3,336,811	12.0	2,060,064	7.5	3,281,380	11.8	11,310,088	40.8	27,777,655	100.0

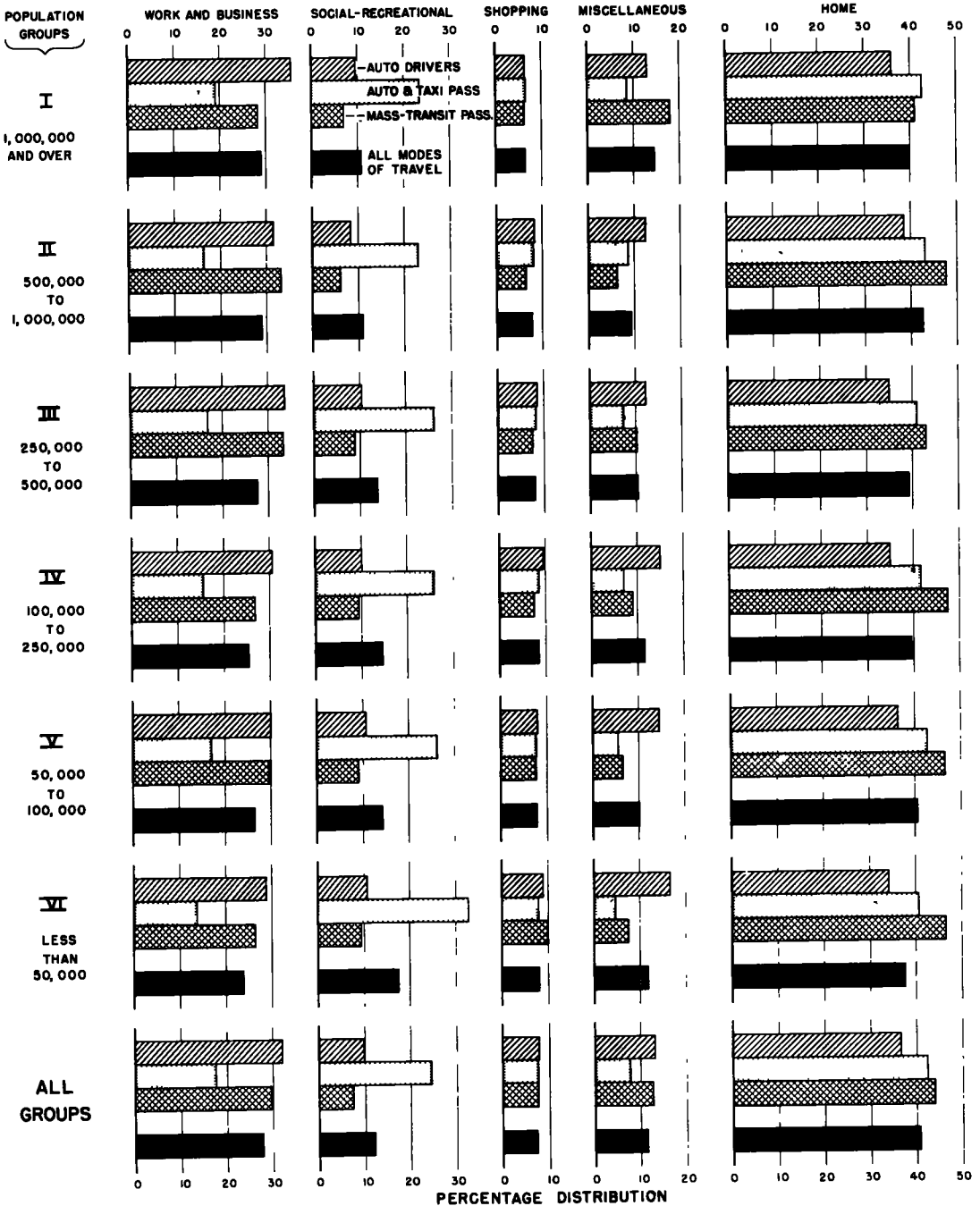


Figure 3. Percentage distribution of trips according to purpose, and further classified by mode of travel and population group.

SUMMARY FOR 50 CITIES

All of the internal trips by residents of the 50 urban areas have been combined in Table 4 and classified according to the five purposes and three modes of travel. Of the total trips numbering almost 28 million, trips by automobile drivers accounted for the largest share and were followed in order by mass-transit passengers and automobile

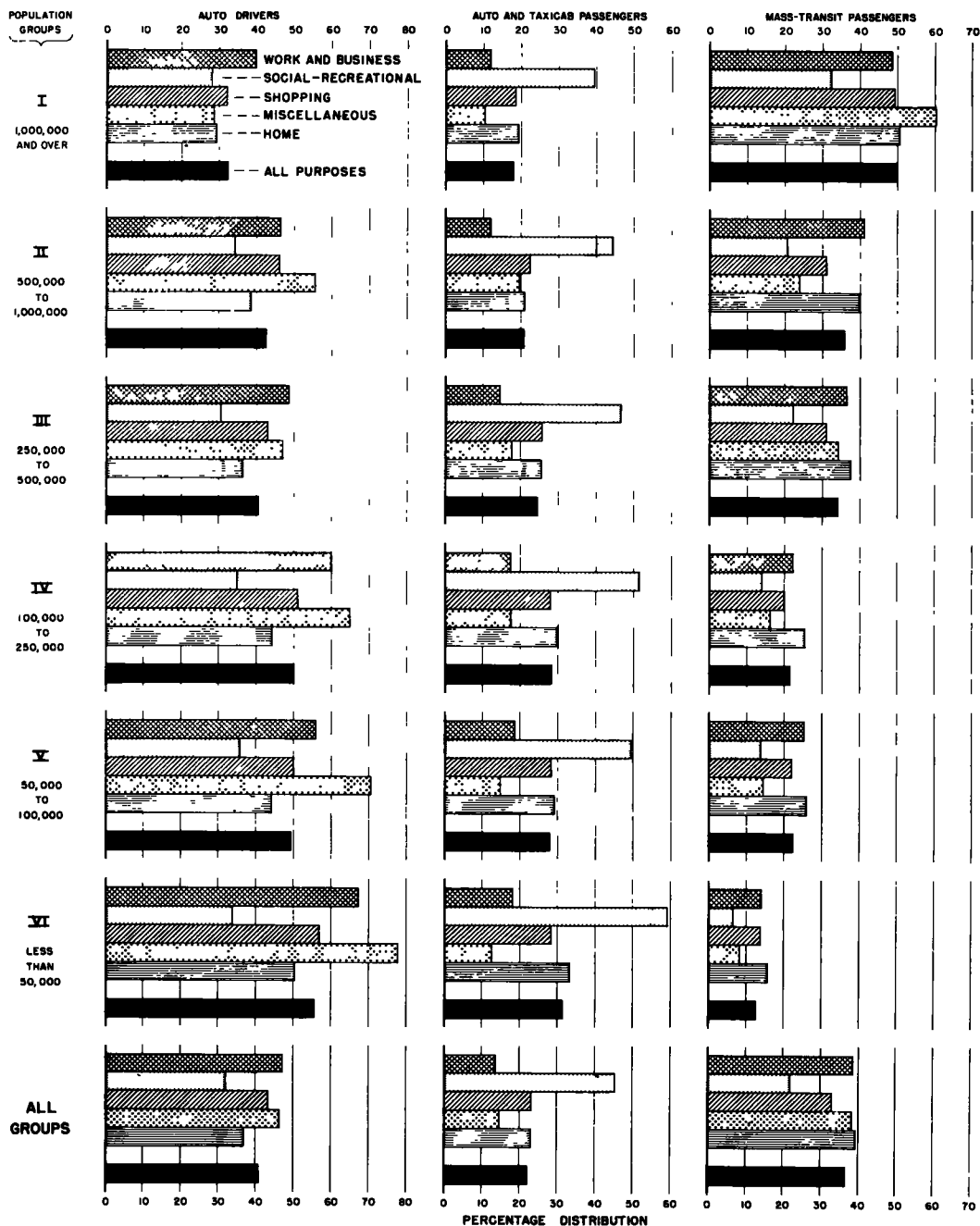


Figure 4. Percentage distribution of trips according to mode of travel, and further classified by purpose and population group.

and taxi passengers. Homeward-bound trips predominated among the five major trip purposes; work and business trips ranked second, and were followed by social-recreational, miscellaneous, and shopping trips in that order.

Although automobile drivers represented the predominant travel mode, mass-transit passengers traveling home constituted the largest mode-purpose category, accounting

Table 9.—Number of trips by automobile drivers and automobile and taxi passengers in each of 50 cities in six population groups, classified according to trip purpose

City	Population group	Number of automobile-driver trips made for purposes of—						Number of automobile- and taxi-passenger trips made for purposes of—					
		Work and business	Social and recreation	Shop	Miscellaneous	Home	Total	Work and business	Social and recreation	Shop	Miscellaneous	Home	Total
Philadelphia, Pa.-----	1,000,000 and over.	301,490	69,502	32,648	72,655	253,419	729,714	76,711	94,494	23,336	45,475	180,142	420,158
San Francisco, Calif.-----		423,673	113,942	86,146	208,899	388,421	1,221,081	117,717	163,363	47,283	51,975	260,284	640,622
Newark, N. J.-----		223,849	56,575	36,654	47,579	278,601	643,248	65,513	66,022	21,021	20,164	154,154	326,874
Washington, D. C.-----		194,301	60,873	45,886	85,263	145,210	631,553	84,072	96,660	25,047	33,706	174,892	414,377
Total.....		1,143,303	300,892	201,334	414,396	1,165,651	3,225,576	344,013	420,539	116,687	151,320	769,472	1,802,031
St. Louis, Mo.-----	500,000-1,000,000.	167,001	31,195	21,747	18,806	216,635	455,384	30,253	12,054	4,526	2,931	45,719	95,483
St. Paul-Minneapolis, Minn.-----		249,043	85,221	53,954	109,868	285,156	783,242	56,491	128,090	31,694	22,648	178,663	417,586
Baltimore, Md.-----		138,682	30,395	21,055	22,263	136,185	348,580	44,871	35,016	13,278	18,845	91,386	203,386
Houston, Tex.-----		283,079	82,573	114,278	161,984	348,703	1,030,617	83,945	112,089	60,187	69,110	242,110	567,441
Dallas, Tex.-----	148,116	45,630	61,217	89,696	208,231	552,890	40,814	68,188	22,573	33,700	115,969	281,244	
Seattle, Wash.-----	124,257	34,461	24,318	35,910	135,261	354,207	33,336	46,603	12,901	9,224	79,670	181,734	
Total.....		1,110,178	309,475	296,569	438,527	1,370,171	3,524,920	289,710	402,040	145,159	156,448	753,517	1,746,874
Portland, Oreg.-----	250,000-500,000	143,170	41,536	37,772	55,454	140,772	418,704	34,619	60,522	20,424	9,722	89,206	223,493
Norfolk, Va.-----		80,240	26,500	19,080	24,220	92,710	242,750	30,960	31,990	12,940	18,180	70,360	164,430
San Juan, P. R.-----		10,948	4,098	1,389	5,004	9,384	30,823	5,305	8,639	1,411	3,554	12,630	31,539
Total.....		234,358	72,134	58,241	84,678	242,866	692,277	70,884	110,151	34,775	31,456	172,196	419,462
Wichita, Kans.-----	250,000-500,000	109,142	26,936	37,051	67,088	131,879	372,096	41,478	32,520	19,857	21,355	84,004	199,214
Grand Rapids, Mich.-----		89,493	34,859	34,889	39,578	111,094	309,913	22,531	57,674	18,282	9,177	77,351	185,015
Honolulu, T. H.-----		40,100	29,282	14,118	27,595	63,209	174,704	15,335	43,022	9,644	11,707	64,443	144,151
Sacramento, Calif.-----		67,802	16,968	21,702	48,760	69,840	215,072	18,328	21,922	10,078	6,801	41,130	98,259
Salt Lake City, Utah.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
Wilmington, Del.-----		37,525	11,243	7,275	15,877	48,551	110,481	15,446	17,014	3,815	6,384	23,029	75,688
Phoenix, Ariz.-----		62,481	21,784	32,252	42,374	78,069	236,960	17,834	31,533	16,397	12,997	49,599	128,360
Tacoma, Wash.-----		47,948	13,381	8,118	14,595	40,439	115,471	8,843	13,892	3,986	3,294	21,744	51,759
Portland, Me.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
San Antonio, Tex.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
San Diego, Calif.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
San Jose, Calif.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
San Francisco, Calif.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
San Jose, Calif.-----		44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594
San Jose, Calif.-----	44,212	15,343	8,499	13,073	51,126	132,253	15,728	23,765	5,590	3,173	37,338	85,594	

Spokane, Wash.....	100,000-250,000	32,262	9,028	5,064	7,748	42,510	97,512	8,706	10,201	3,974	3,070	22,087	48,038
Spartan, Pa.....		17,326	5,278	2,817	4,422	21,926	51,769	5,795	10,249	3,430	962	18,151	38,587
Duluth, Minn., Superior, Wis.....		34,449	10,559	7,424	13,089	31,458	96,979	9,230	23,006	5,183	2,582	26,015	66,016
Chester, Pa.....		15,279	4,860	4,023	4,843	21,601	50,606	6,694	6,057	3,029	1,243	15,022	32,045
Tucson, Ariz.....		45,830	14,340	17,110	23,720	53,510	154,510	11,565	20,942	9,387	8,144	31,832	81,870
Lansing, Mich.....		46,857	12,212	14,461	23,259	46,800	143,589	10,893	19,009	5,421	5,192	25,683	66,198
Reading, Pa.....		24,896	4,177	2,818	7,993	21,022	60,906	6,579	4,229	1,676	2,002	11,928	26,414
Albuquerque, N. Mex.....		38,940	14,575	10,769	19,888	45,287	129,459	11,258	27,045	4,753	4,085	33,137	80,278
Rockford, Ill.....		47,261	17,592	11,932	13,891	65,040	155,716	12,988	22,768	8,353	2,179	37,307	83,595
Saginaw, Mich.....		40,051	10,614	16,068	25,296	50,860	142,880	11,176	18,900	7,311	4,539	30,063	71,989
Madison, Wis.....		31,980	9,943	8,359	20,720	33,235	104,246	8,015	15,314	4,225	6,334	21,124	55,016
Harrisburg, Pa.....		25,130	6,057	5,121	9,474	25,130	70,912	6,222	9,757	2,405	1,527	15,804	35,715
Total.....		888,964	287,031	270,770	433,692	1,042,586	2,923,043	264,644	428,819	146,796	116,747	696,795	1,653,801
Johnstown, Pa.....	50,000-100,000	13,488	4,356	4,944	3,984	13,956	40,728	3,061	6,183	2,415	1,166	9,639	22,464
Altoona, Pa.....		16,224	6,296	5,423	6,186	20,940	55,069	3,936	9,054	3,512	856	13,811	31,169
Muskegon, Mich.....		24,158	12,721	6,969	11,359	32,209	87,416	8,896	21,526	3,975	2,109	25,787	62,295
Pontiac, Mich.....		22,089	5,809	5,582	13,195	27,648	74,323	9,690	9,669	3,162	2,603	19,326	44,450
Columbus, Ga.....		17,602	5,507	5,882	7,212	25,658	84,861	8,377	4,227	1,928	2,929	13,393	30,854
Racine, Wis.....		25,117	8,384	7,303	16,775	27,210	84,789	5,642	11,721	3,385	3,366	15,862	39,976
Macon, Ga.....		17,645	1,953	2,549	6,137	21,233	49,517	8,413	3,711	2,214	1,477	14,275	30,090
York, Pa.....		33,651	7,777	5,381	13,841	26,755	87,405	9,377	9,080	3,477	2,264	16,999	41,197
Charleston, S. C.....		13,227	5,957	3,718	4,222	18,720	45,844	6,203	8,662	2,435	1,071	15,493	33,864
Kalamazoo, Mich.....		24,162	10,237	5,329	10,141	29,911	79,780	6,424	11,464	3,223	2,757	17,568	41,436
Bay City, Mich.....		21,430	13,660	9,085	16,461	32,834	93,470	6,313	18,884	4,132	3,169	22,988	55,486
Williamsport, Pa.....		13,772	5,304	2,908	8,198	17,890	48,072	3,362	5,902	2,083	1,088	10,140	22,575
Total.....			242,565	87,961	65,073	117,711	294,964	808,274	79,696	120,083	35,941	24,855	195,281
Fargo, N. Dak., Moor- head, Minn.....	Less than 50,000.	22,435	7,795	3,996	12,797	22,502	69,525	6,286	18,315	2,286	1,747	17,950	46,584
Sharon-Farrell, Pa.....		12,103	5,267	4,848	7,209	15,503	44,935	3,174	8,364	2,306	698	10,916	25,458
Norristown, Pa.....		7,097	3,158	1,754	3,310	11,949	27,308	3,046	2,927	886	801	6,464	14,124
Appleton, Wis.....		13,309	4,277	6,058	7,929	14,945	46,518	2,506	6,895	3,056	1,154	8,631	22,242
Wisconsin Rapids, Wis.....		5,536	1,912	2,188	4,124	6,776	20,536	1,402	2,249	906	1,320	3,407	9,284
Total.....		60,480	22,449	18,844	35,369	71,680	208,822	16,414	38,750	9,440	5,720	47,368	117,892
Grand total.....	All groups.....	3,679,848	1,079,942	910,831	1,524,373	4,187,918	11,382,912	1,065,361	1,520,382	488,798	486,546	2,634,629	6,195,716

Table 10.—Number of trips by mass-transit passengers and by all modes of travel in each of 50 cities in six population groups, classified according to trip purpose

City	Population group	Number of mass-transit passenger trips made for purposes of—						Number of trips by all modes of travel for purposes of—					
		Work and business	Social and recreation	Shop	Miscellaneous	Home	Total	Work and business	Social and recreation	Shop	Miscellaneous	Home	Total
Philadelphia, Pa.	1,000,000 and over.	583,557	135,154	126,102	692,382	861,013	2,398,208	961,758	299,150	182,086	810,512	1,294,574	3,548,080
San Francisco, Calif.		296,825	79,652	66,397	86,241	414,667	943,782	838,215	356,957	199,826	347,115	1,063,372	2,805,485
Newark, N. J.		284,434	78,023	78,313	54,244	453,361	948,375	573,786	200,620	135,988	121,987	886,116	1,918,497
Washington, D. C.		237,164	52,699	38,872	51,167	298,058	677,960	515,537	210,232	109,805	170,136	718,160	1,723,870
Total		1,401,980	345,528	309,684	884,034	2,027,099	4,968,325	2,889,296	1,066,959	627,705	1,449,750	3,062,222	9,995,932
St. Louis, Mo.	500,000–1,000,000.	428,806	69,134	70,793	30,495	562,209	1,161,437	626,060	112,383	97,066	52,232	824,563	1,712,304
St. Paul-Minneapolis, Minn.		137,017	29,327	33,728	30,394	201,235	431,701	442,551	242,638	119,376	162,910	665,054	1,632,529
Baltimore, Md.		201,560	44,773	42,922	46,233	307,263	642,751	385,113	110,184	77,255	87,331	534,834	1,194,717
Houston, Tex.		66,022	8,630	14,227	44,125	119,265	252,289	433,046	188,692	275,219	750,078	1,850,327	
Dallas, Tex.		68,066	7,421	12,317	22,299	95,968	206,071	256,996	121,239	96,107	145,695	420,168	1,040,205
Seattle, Wash.	81,675	25,713	27,015	16,532	132,308	283,243	239,268	64,234	61,666	347,239	819,184		
Total	983,146	184,998	201,002	190,078	1,418,248	2,977,472	2,383,034	896,513	642,730	785,053	3,541,936	8,249,266	
Portland, Oreg.	250,000–500,000	75,407	27,190	24,837	10,838	110,779	249,051	253,196	138,248	83,033	76,014	340,757	891,248
Norfolk, Va.		40,920	8,230	7,180	6,060	55,350	117,740	152,120	66,720	39,200	48,460	218,420	524,920
San Juan, P. R.		59,449	16,889	10,040	43,450	85,142	214,970	75,702	29,626	12,840	52,008	107,156	277,332
Total	175,776	52,309	42,057	60,348	251,271	581,761	481,018	234,594	135,073	176,482	666,333	1,693,500	
Wichita, Kans.	250,000–500,000	18,508	3,484	5,349	8,927	31,441	67,709	169,128	62,940	62,257	97,370	247,324	639,019
Grand Rapids, Mich.		23,407	6,942	5,704	3,331	34,176	73,560	135,431	99,475	58,875	52,086	222,621	568,488
Honolulu, T. H.		34,179	18,845	9,064	17,751	82,366	162,205	89,614	91,149	32,826	57,453	210,018	481,060
Sacramento, Calif.		14,517	3,708	3,917	8,770	27,344	58,256	100,647	42,598	35,697	54,331	138,314	371,587
Salt Lake City, Utah		21,079	7,642	6,332	3,735	35,060	73,848	81,019	46,750	20,421	19,981	123,524	291,695
Wilmington, Del.		28,532	9,317	5,451	7,244	46,242	97,886	81,503	37,574	17,641	29,505	117,832	284,055
Phoenix, Ariz.		15,863	5,046	5,484	10,897	34,028	71,318	96,178	58,363	54,133	66,268	161,696	436,638
Tacoma, Wash.		14,967	4,724	4,742	5,340	25,400	55,173	61,758	29,997	16,846	23,229	87,573	219,403

Spokane, Wash.....	14,915	4,979	6,177	5,057	32,090	63,218	55,883	24,208	16,115	15,875	96,687	208,768
Scranton, Pa.....	15,765	9,282	14,017	1,960	40,238	81,262	38,886	24,809	20,264	7,344	89,315	171,618
Duluth, Minn., Superior, Wis.....	17,648	7,244	4,953	2,468	27,658	59,971	61,327	40,809	17,560	18,139	85,131	222,966
Chester, Pa.....	8,197	1,922	2,311	3,057	12,680	28,167	30,170	12,839	9,363	9,143	49,303	110,818
Tucson, Ariz.....	7,310	2,490	2,640	5,590	16,290	34,320	64,705	37,772	29,137	37,454	101,632	270,700
Lansing, Mich.....	8,543	2,719	2,583	3,797	14,478	32,120	66,293	33,940	22,465	32,248	86,961	241,907
Reading, Pa.....	23,717	4,907	4,731	3,552	32,885	69,792	55,192	13,313	9,225	13,547	65,835	157,112
Albuquerque, N. Mex.....	8,668	3,597	3,069	2,266	15,290	32,890	58,866	45,217	18,591	26,239	93,714	242,627
Rockford, Ill.....	10,911	3,059	6,749	1,354	20,484	42,557	71,160	43,419	27,034	17,424	122,831	281,868
Saginaw, Mich.....	6,217	2,074	1,427	871	9,471	20,060	57,444	31,588	24,806	30,706	90,394	234,938
Madison, Wis.....	10,495	4,008	2,500	8,785	20,051	45,839	50,490	29,265	15,084	35,848	74,414	205,101
Harrisburg, Pa.....	26,782	9,578	5,861	3,299	38,592	84,112	58,134	25,392	13,387	14,300	79,526	190,739
Total.....	330,220	115,567	104,161	108,051	596,264	1,254,263	1,483,828	831,417	521,727	658,490	2,335,645	5,831,107
Johnstown, Pa.....	11,424	3,924	3,132	1,176	17,940	37,596	27,973	14,463	10,491	6,326	41,535	100,788
Altoona, Pa.....	6,107	1,823	2,391	946	10,300	21,567	26,267	17,173	11,326	7,988	45,051	107,805
Muskegon, Mich.....	6,373	4,022	2,307	574	11,360	24,636	39,429	38,269	13,251	14,042	69,356	174,347
Pontiac, Mich.....	7,122	1,949	1,648	4,813	12,768	28,300	35,901	17,427	10,392	20,611	59,742	147,073
Columbus, Ga.....	21,645	2,894	3,765	4,024	30,903	63,231	47,624	12,628	11,575	14,165	69,954	155,946
Raon, Wis.....	7,653	2,916	2,390	2,832	11,257	27,048	38,412	23,021	13,078	22,973	54,329	151,813
Macon, Ga.....	20,549	4,418	5,006	2,915	33,154	66,042	46,607	10,082	9,769	10,529	68,662	145,649
York, Pa.....	4,281	1,377	1,496	1,345	6,537	15,035	47,309	18,234	10,354	17,450	50,291	143,638
Charleston, S. C.....	10,498	5,068	2,261	789	15,885	34,501	29,928	19,687	8,414	6,082	50,098	114,209
Kalamazoo, Mich.....	7,189	2,546	2,247	3,031	11,144	26,157	37,775	24,247	10,799	15,929	58,623	147,373
Bay City, Mich.....	4,955	1,978	1,259	1,337	7,017	16,526	32,698	34,522	14,456	20,967	62,839	165,482
Williamsport, Pa.....	2,401	781	896	498	3,971	8,547	19,535	11,987	5,887	9,784	32,001	79,194
Total.....	110,197	33,696	28,778	24,280	172,236	369,187	432,458	241,740	129,792	166,846	662,481	1,633,317
Fargo, N. Dak., Moor- head, Minn.....	3,543	1,690	1,310	885	5,994	13,422	32,264	27,800	7,592	15,429	46,446	129,531
Sharon-Farrell, Pa.....	4,229	1,489	2,021	585	7,688	16,012	19,506	15,120	9,175	8,492	34,112	86,405
Norristown, Pa.....	3,908	842	973	1,759	6,527	14,009	14,051	6,967	3,613	5,870	24,940	55,441
Appleton, Wis.....	1,052	356	445	325	1,994	4,172	16,867	11,528	9,559	9,408	25,570	72,932
Wisconsin Rapids, Wis.....	52	12	4	116	220	404	6,990	4,173	3,098	5,560	10,403	30,224
Total.....	12,784	4,389	4,753	3,670	22,423	48,019	89,678	65,588	33,037	44,759	141,471	374,533
Grand total.....	All groups... 3,014,103	736,487	690,435	1,270,461	4,487,541	10,199,027	7,759,312	3,336,811	2,090,064	3,281,380	11,310,088	27,777,655

With some minor exceptions, this trend occurred among trips in each purpose category.

The mode-of-travel pattern by population groups is shown in Figure 4. For all purposes combined, the proportion of trips by mass-transit passengers ranged from 50 percent in the cities with over 1 million population to 13 percent in the less than 50,000 population group. On the other hand, trips by automobile drivers ranged from 32 to 56 percent, and automobile and taxi passengers, from 18 to 31 percent. On the basis of individual trip purposes, the ranges among population groups were much greater in some cases, as seen in Table 7.

It is evident from Figure 4 that the privately owned automobile, considering both drivers and passengers, was the predominant choice for trips to all purposes in cities of less than 1 million population. Automobile travel was also greatly preferred for social and recreational trips by residents of cities in the 1 million or more population group.

Average Trips per City

Table 8 contains the number of internal trips made by residents by each mode of travel and for each trip purpose in the average city within each population group. Although the figures are pure arithmetic means of the total trips made in the cities within each population group, the volumes are indicative of what might be expected in other cities of similar size. Of special note is the regularly increasing volume of trips for each trip purpose from the smallest to the largest population group for each mode of travel.

However, there appears to be a near maximum volume of automobile-driver trips for shopping purposes when cities reach the 500,000-1,000,000 population size. In cities of 1 million population and over, trips made by automobile drivers for shopping purposes exceeded those in the 500,000-1,000,000 population group by less than 2 percent. This is reflected in Table 6 which shows that automobile drivers made only 32 percent of the shopping trips in the largest cities as compared with 46 percent in the next smaller population group. This difference may be explained partly by the inability

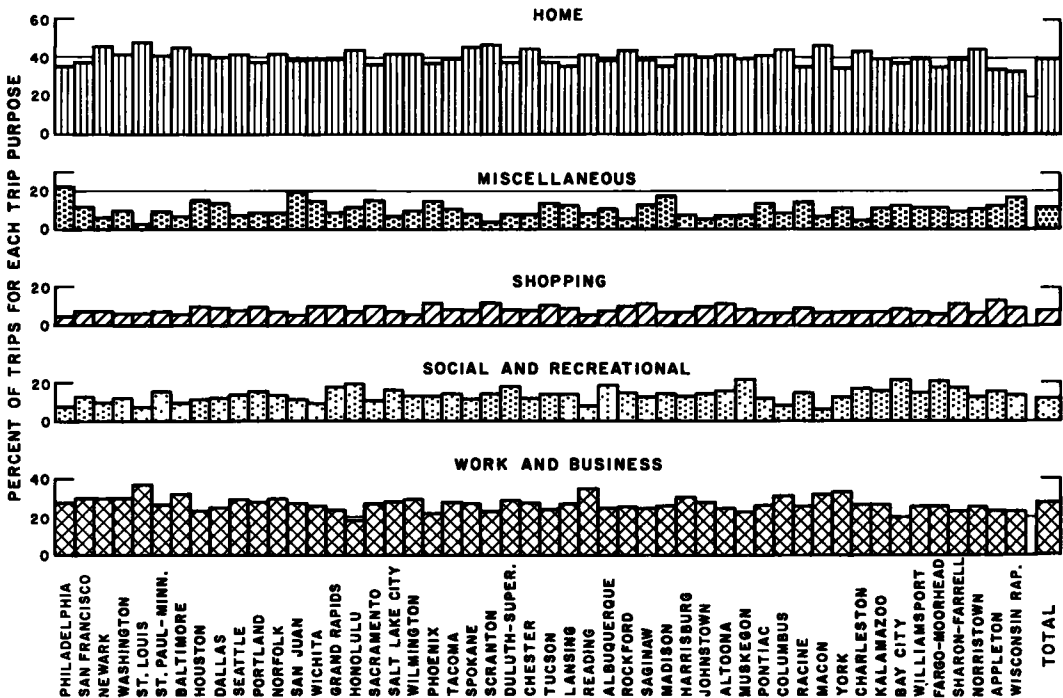


Figure 5. Percentage distribution of trips in each city, according to purpose.

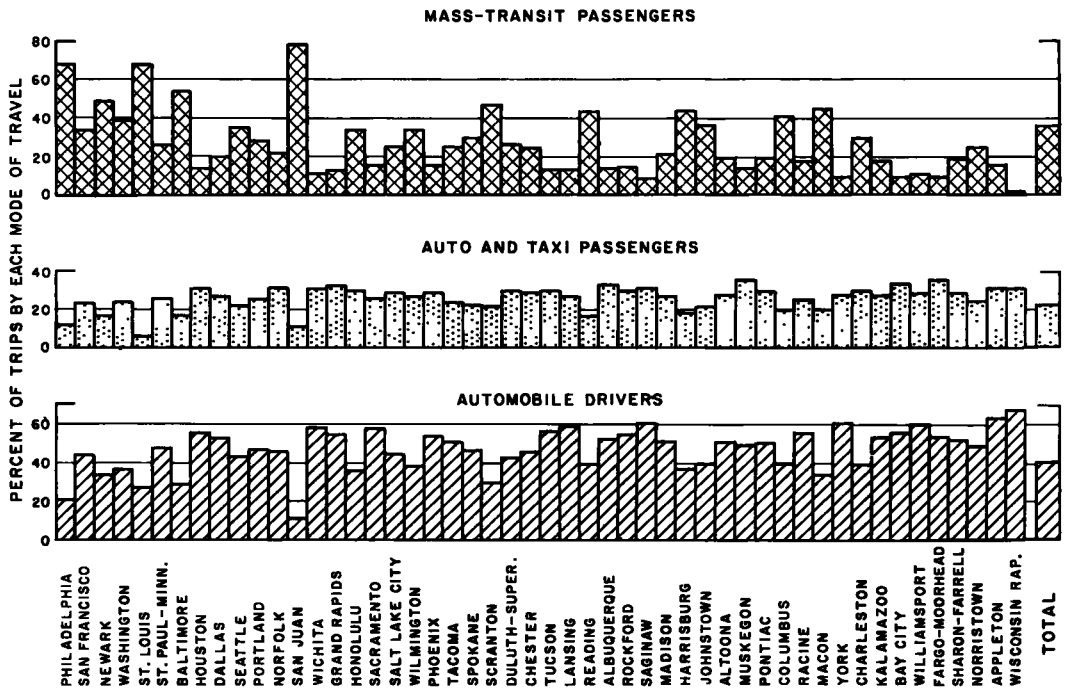


Figure 6. Percentage distribution of trips in each city, according to mode of travel.

of the downtown shopping districts of very large cities to accommodate automobile drivers and partly by the increased availability of transit facilities and taxicabs, particularly around the densely populated areas in the vicinity of the central business district.

DISTRIBUTION OF TRIPS BY INDIVIDUAL CITIES

The number of trips by residents according to purpose in each of the 50 urban areas are presented in Tables 9 and 10 for automobile drivers, automobile and taxi passengers, mass-transit passengers, and for all modes of travel. In these tables the cities are listed in descending order of population size at the time of the basic survey. The general tendency for a greater volume of trips in the more populous urban areas agrees with the same relationship already mentioned in the discussion of population groups, but in the case of individual cities several exceptions are apparent. The more obvious exceptions are readily noticed.

The residents of San Juan made far fewer automobile-driver and automobile- and taxi-passenger trips than persons living in mainland cities of the same size. This relatively small number of trips existed throughout all the major purposes, but applied particularly to shopping trips. The abnormally high number of trips made in Philadelphia for miscellaneous purposes may be related to the large number of mass-transit passenger trips for the intermediate purpose of changing mode of travel. In the St. Paul-Minneapolis area, an unusually large number of trips for social and recreational purposes were made by automobile.

The high volume of mass-transit passenger trips in Philadelphia, St. Louis, and Honolulu is noteworthy, and conversely the relatively small number of automobile-driver and automobile- and taxi-passenger trips in the same cities. In Houston there was an exceptionally large volume of trips by modes other than mass transit, particularly for shopping and miscellaneous purposes. A large number of automobile trips for all purposes is noted in Grand Rapids and Wichita. However, the relative stability of work and business trips and homeward-bound trips is significant throughout all cities.

Table 11.—Range in percentage of trips for each trip purpose by each mode of travel in 50 cities

Mode of travel	Percentage range, by mode of travel, in trips made for purposes of—				
	Work and business	Social and recreation	Shop	Miscellaneous	Home
Automobile drivers:					
Maximum.....	41.3	16.8	13.6	20.1	47.6
Minimum.....	22.9	4.0	4.5	4.1	30.4
Automobile and taxi passengers:					
Maximum.....	31.7	39.3	13.7	12.2	47.9
Minimum.....	10.6	12.3	4.5	2.5	36.7
Mass-transit passengers:					
Maximum.....	36.9	16.3	17.3	28.9	54.5
Minimum.....	12.9	3.0	1.0	2.3	35.9
All modes of travel:					
Maximum.....	36.6	22.0	13.1	22.8	48.2
Minimum.....	18.6	6.9	4.6	3.1	34.4

Purpose Distribution

The percentages of trips for each purpose in each of the 50 urban areas are presented in Figure 5. Although generally displaying a pattern of uniformity in the percentage distribution of trip purposes within each city, this chart reveals several proportional trip variations which are not readily apparent in the tables of absolute trip volumes.

The large percentage of trips for miscellaneous purposes in Philadelphia again reflects the volume of trips made by mass-transit passengers for the purpose of changing mode of travel. In Wisconsin Rapids the high percentage of miscellaneous trips may be explained by the fact that over 90 percent of the miscellaneous transit trips in this small Wisconsin city were to school. Madison, Wis., a university city, also had a relatively large proportion of trips to school. The percentage of work and business trips is especially high in St. Louis, particularly among automobile and taxi passengers. This is undoubtedly due in part to the time of the survey which was begun just before the end of World War II. There are other extremes of more or less importance, such as the relatively small proportion of work and business trips in Honolulu, Muskegon, and Bay City, which, in a sense, are somewhat offset by social and recreational trips. However, in spite of these variations among individual cities, the over-all effect is to reemphasize the essentially uniform pattern of trip purposes among the population groups.

Though not shown in this article, similar data also were developed for each separate mode of travel. In most cities the combination of work-business and home trips accounted for about 70 percent of all automobile-driver trips as well as mass-transit passenger trips, with social-recreational and shopping trips each accounting for another 7 to 10 percent. On the other hand, trips by automobile and taxi passengers were more frequently made for a social or recreational purpose rather than work or business. Social and recreational trips generally amounted to one-fourth of the total trips by passengers in automobiles and taxis.

Among automobile drivers, trips to home comprised the major portion of the travel in 41 cities. Work and business trips ranked second in these cities and

Table 12.—Range in percentage of trips by each mode of travel for each trip purpose in 50 cities

Purpose of trip	Percentage range, by purpose of trip, in trips made by—		
	Automobile drivers	Automobile and taxi passengers	Mass-transit passengers
Work and business:			
Maximum.....	79.2	24.9	78.5
Minimum.....	14.5	4.8	.7
Social and recreation:			
Maximum.....	45.9	65.9	61.5
Minimum.....	13.8	10.7	.3
Shop:			
Maximum.....	70.6	35.4	78.2
Minimum.....	10.8	4.7	.1
Miscellaneous:			
Maximum.....	84.9	37.5	85.4
Minimum.....	9.0	5.6	2.1
Home:			
Maximum.....	65.1	38.7	79.5
Minimum.....	8.8	5.6	2.1
All purposes:			
Maximum.....	67.9	35.7	77.5
Minimum.....	11.1	5.6	1.3

Table 13.—Number and percentage of trips by each mode of travel in 50 cities from each purpose to each purpose

Trips from—	Trips to—											
	Work and business		Social and recreation		Shop		Miscellaneous		Home		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
AUTOMOBILE DRIVERS												
Work and business.....	1,137,747	4.1 ✓	69,070	0.2 ✓	103,456	0.4	338,619	1.2	2,042,042	7.4 ✓	3,691,834	13.3
Social and recreation.....	31,001	1	135,366	.5 ✓	43,584	.2 ✓	93,036	.3	774,633	2.8 ✓	1,077,920	3.9
Shop.....	43,624	.2	46,590	.2	138,449	.5	43,602	.2	628,494	2.2	900,759	3.3
Miscellaneous.....	340,199	1.2	93,187	.3	74,324	.2	237,668	.9	741,549	2.7	1,486,927	5.3
Home.....	2,127,277	7.6 ✓	735,729	2.7 ✓	551,018	2.0	811,448	2.9	-----	-----	4,225,472	15.2
Total.....	3,679,848	13.2	1,079,942	3.9	910,831	3.3	1,524,373	5.5	4,187,918	15.1	11,382,912	41.0
AUTOMOBILE AND TAXI PASSENGERS												
Work and business.....	117,942	0.4 ✓	42,639	0.2 ✓	36,541	0.1	61,531	0.2	837,854	3.0 ✓	1,096,507	3.9
Social and recreation.....	21,597	.1 ✓	305,659	1.1 ✓	40,438	.1 ✓	38,734	.1	1,159,437	4.2 ✓	1,565,865	5.6
Shop.....	12,575	.1	41,213	.1	73,229	.2	9,402	-----	351,404	1.3	487,823	1.7
Miscellaneous.....	48,862	.2	51,781	.2	17,394	.1	26,310	.1	285,934	1.0	430,281	1.6
Home.....	864,385	3.1 ✓	1,079,090	3.9 ✓	321,196	1.1	350,569	1.3	-----	-----	2,615,240	9.4
Total.....	1,065,361	3.9	1,520,382	5.5	488,798	1.6	486,546	1.7	2,634,629	9.5	6,195,716	22.2
MASS-TRANSIT PASSENGERS												
Work and business.....	118,402	0.4	35,234	0.1	38,464	0.2	233,567	0.9	2,533,978	9.1	2,959,645	10.7
Social and recreation.....	9,086	-----	35,688	.1	12,298	-----	39,639	.2	598,636	2.2	695,257	2.5
Shop.....	13,399	-----	21,087	.1	23,085	.1	44,347	.2	590,706	2.1	692,624	2.5
Miscellaneous.....	237,287	.9	52,453	.2	53,753	.2	189,914	.6	764,221	2.8	1,297,628	4.7
Home.....	2,635,929	9.5	592,025	2.1	562,925	2.1	762,994	2.7	-----	-----	4,553,873	16.4
Total.....	3,014,103	10.8	736,487	2.6	690,435	2.6	1,270,461	4.6	4,487,541	16.2	10,199,027	36.8
ALL MODES OF TRAVEL												
Work and business.....	1,374,081	4.9	146,943	0.5	178,461	0.7	633,717	2.3	5,414,774	19.5	7,747,986	27.9
Social and recreation.....	61,684	.2	475,713	1.7	96,230	.3	171,409	.6	2,533,006	9.2	3,339,042	12.0
Shop.....	69,598	.3	108,890	.4	234,763	.9	97,351	.4	1,570,604	5.6	2,081,206	7.5
Miscellaneous.....	626,348	2.3	197,421	.7	145,471	.5	453,892	1.6	1,791,704	6.5	3,214,836	11.6
Home.....	5,627,591	20.2	2,406,844	8.7	1,435,139	5.2	1,925,011	6.9	-----	-----	11,394,585	41.0
Total.....	7,759,312	27.9	3,336,811	12.0	2,090,064	7.5	3,231,380	11.8	11,310,083	40.8	27,777,655	100.0

were foremost in the other nine cities.

Homeward-bound trips also ranked first among automobile and taxi passengers in all cities except one. In the Fargo-Moorhead area, social and recreational trips ranked first for this mode of travel. In all but 10 of the remaining 49 cities, social-recreational trips ranked second and were followed by work and business trips. This order was reversed in the remaining 10 cities.

The pattern of trip purposes for mass-transit passengers resembled the automobile-driver pattern more than that of automobile and taxi passengers, but among transit passengers, home trips predominated in all cities without exception. Work and business trips ranked second in all but two cities, Philadelphia and Wisconsin Rapids, where changing-mode-of-travel and school trips caused the miscellaneous group to exceed work and business trips.

The composite of all modes of travel followed the pattern of mass-transit passengers with home trips predominating in all cities, followed by work and business trips in all but Honolulu and Bay City, where social-recreational trips ranked second.

These consistencies in trip patterns suggest the possibility of utilizing the present data in making estimates in cities where surveys have not been completed. Although the ranking of trip purposes is fairly uniform, the limits of the individual percentages show wide variations not directly related to the size of city and indicate that such a basis would provide only a rude forecast at best.

The ranges in percentages of trips for each trip purpose by each mode of travel are shown in Table 11. Despite the wide range between the maximum and minimum percentages, it is seen later that for any particular urban area it is possible to make a fairly reasonable forecast of the absolute volume of trips from which percentages may be computed.

Mode Distribution

The percentage distribution of trips in the 50 individual cities by mode of travel is presented in Figure 6. The most noticeable difference from the previous distribution by trip purpose is the relative lack of uniformity among the several cities when considering travel mode. While not included in this article, similar percentages were developed for each trip purpose and a variable pattern was found in each case. The ranges in the percentage of trips by each mode of travel for each trip purpose and for all purposes are shown in Table 12.

Besides being small in absolute volumes, trips by automobile drivers and automobile and taxi passengers were also few on a relative basis in San Juan, where seven out of nine persons making trips traveled as mass-transit passengers, largely in "publicos" (privately owned public conveyances, usually station wagons, which generally operate over established routes but with no fixed schedule). On the other hand, exceptionally high percentages of automobile trips were observed for each trip purpose in cities of Texas, New Mexico, Arizona, California, Washington, Michigan, and Wisconsin.

It may be that these variations are related to the period during which the basic studies were made or to the geographical area in which the cities are located. Some of the studies where mass-transit facilities played an important role were made during or shortly after World War II when automobile driving was restricted. Also, other evidence indicates that the preference for automobile travel has increased progressively over the decade during which the studies were made in the various cities. Insofar as location is concerned, it is not unusual to find a particularly high proportion of auto-

Table 14.—Percentage of trips for each mode of travel in 50 cities, classified according to purpose at both origin and destination

Purpose	Mode of travel ¹			
	Auto- mobile drivers	Auto- mobile and taxi passen- gers	Mass- transit passen- gers	All modes of travel
Home.....	73.9	84.7	88.6	81.8
Work and business.....	64.8	34.9	58.6	55.8
Social-recrea- tion.....	19.0	49.8	14.0	24.0
Miscellaneous.....	26.4	14.8	25.2	23.4
Shopping.....	15.9	15.8	13.6	15.0
Total.....	200.0	200.0	200.0	200.0

¹ Percentages add to 200 for each mode of travel because the purpose of each trip is considered twice, at place of origin (purpose from) and at place of destination (purpose to).

mobile-driver trips in the Southwestern and Pacific States, and certain states in the Great Lakes region where automobile ownership and travel are relatively high.

In spite of the noticeable lack of uniformity as far as mode of travel for each trip purpose is concerned, there was an over-all trend for a larger percentage of automobile trips in smaller cities as would be expected. Conversely, there seemed to be a general trend toward a larger percentage of mass-transit passenger trips in the larger cities. Mass transit was the predominant mode of travel in the largest cities, but automobile drivers comprised over half of the vehicular trips by residents in most of the medium-size and smaller cities. These trends appeared among trips for each purpose.

TRIPS FROM PURPOSE TO PURPOSE

All of the previous discussion has dealt with the purpose of trips in connection with their point of destination. This section considers the purpose from which the trips were made at points of origin, as related to the destination purpose. This type of in-

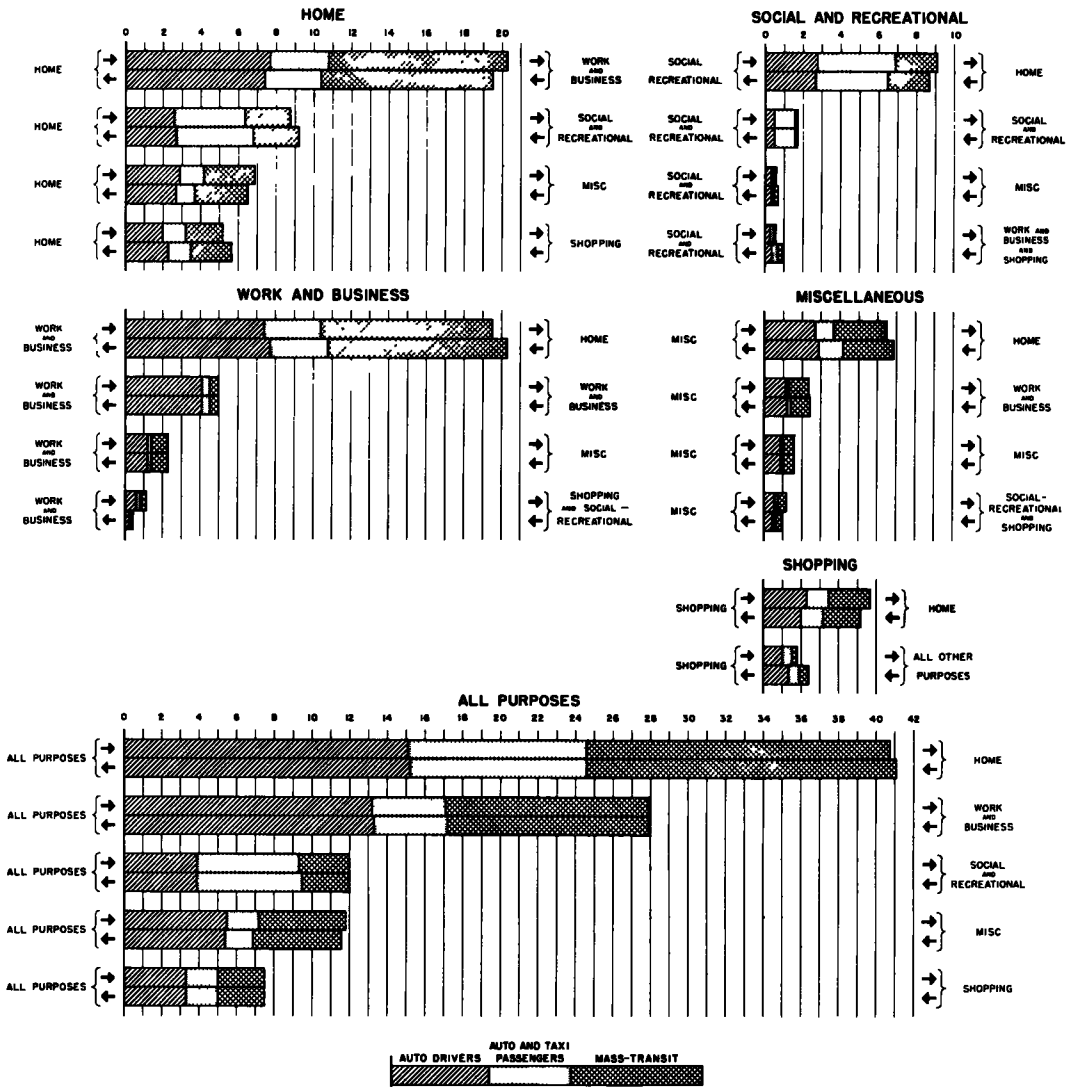


Figure 7. Percentage distribution of trips from each purpose to each purpose, by mode of travel.

formation is presented only in summary form for all 50 urban areas, although detailed data are available from individual city reports. The number of trips made by persons "from" a purpose "to" a purpose are included. This somewhat unusual phraseology is used to express an idea that could not otherwise be expressed precisely in so few words. It describes not only why a person made a trip to his destination, but why he was at the place he left.

Table 13 shows the volume of trips in all 50 urban areas from each purpose to each purpose for each mode of travel. The predominant purposes of trips by all modes of travel were from home to work and business, followed closely by trips from work and business to home. These same trips were dominant among mass-transit passengers and automobile drivers, but ranked second among automobile and taxi passengers. The trips from work or business to home did not quite equal the volume of trips in the reverse direction because of the intermediate trips from work or business for some other purpose prior to returning home. For instance, some of this difference was accounted for by the excess of trips from social-recreational purposes to home, over and above the number of trips from home for social and recreational purposes. Also pedestrian trips, not included in the basic surveys, could have accounted for some of the apparent discrepancies.

Trips between home and social-recreational activities were the next most important category (after the home and work-business cycle) among the trips by all modes of travel combined, but they were the most important purpose-to-purpose category among automobile and taxi passengers. Trips between home and miscellaneous purposes ranked second for automobile drivers and mass-transit passengers, third for all modes of travel combined, and fourth for automobile and taxi passengers. The third ranking category among automobile drivers and mass-transit passengers was home trips to and from social-recreational purposes. Trips between home and shopping ranked third with automobile and taxi passengers, and fourth with each of the other modes of travel and with all modes combined. The only other significant purpose-to-purpose categories were the automobile- and taxi-passenger trips from one social or recreational purpose to another, trips from work or business to work or business by automobile drivers, and trips between work or business and miscellaneous purposes by each mode of travel.

Table 13 also shows the percentage distribution of trips from each purpose to each purpose for all travel modes. Trips from home to work and business by mass-transit passengers were the foremost type of internal trips by residents of the 50 urban areas. These trips accounted for nearly 10 percent of the total trips by all modes for all purposes. Trips either to or from home were the most numerous of all. The only other categories of trips accounting for 1 percent or more of the total were trips by automobile drivers for work or business and miscellaneous purposes, and social-recreational trips by automobile and taxi passengers.

Table 13 is the basis for Figure 7 which presents the percentage distribution of trips from each purpose to each purpose, and that proportion attributable to each mode

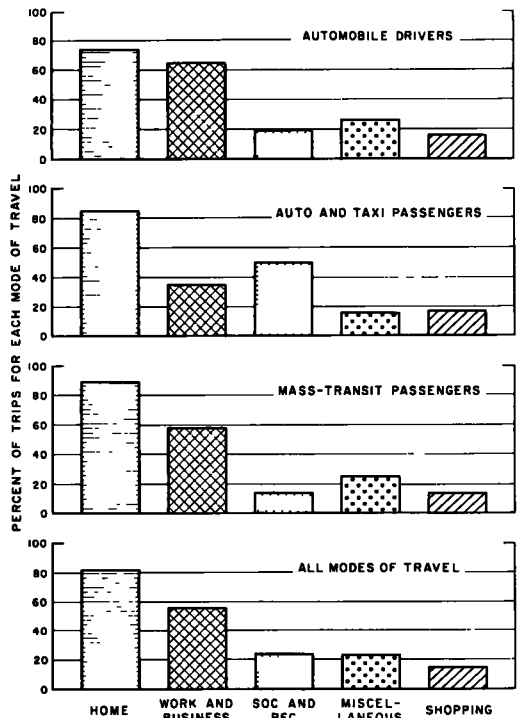


Figure 8. Percentage distribution of trips, both from and to each purpose, by mode of travel.

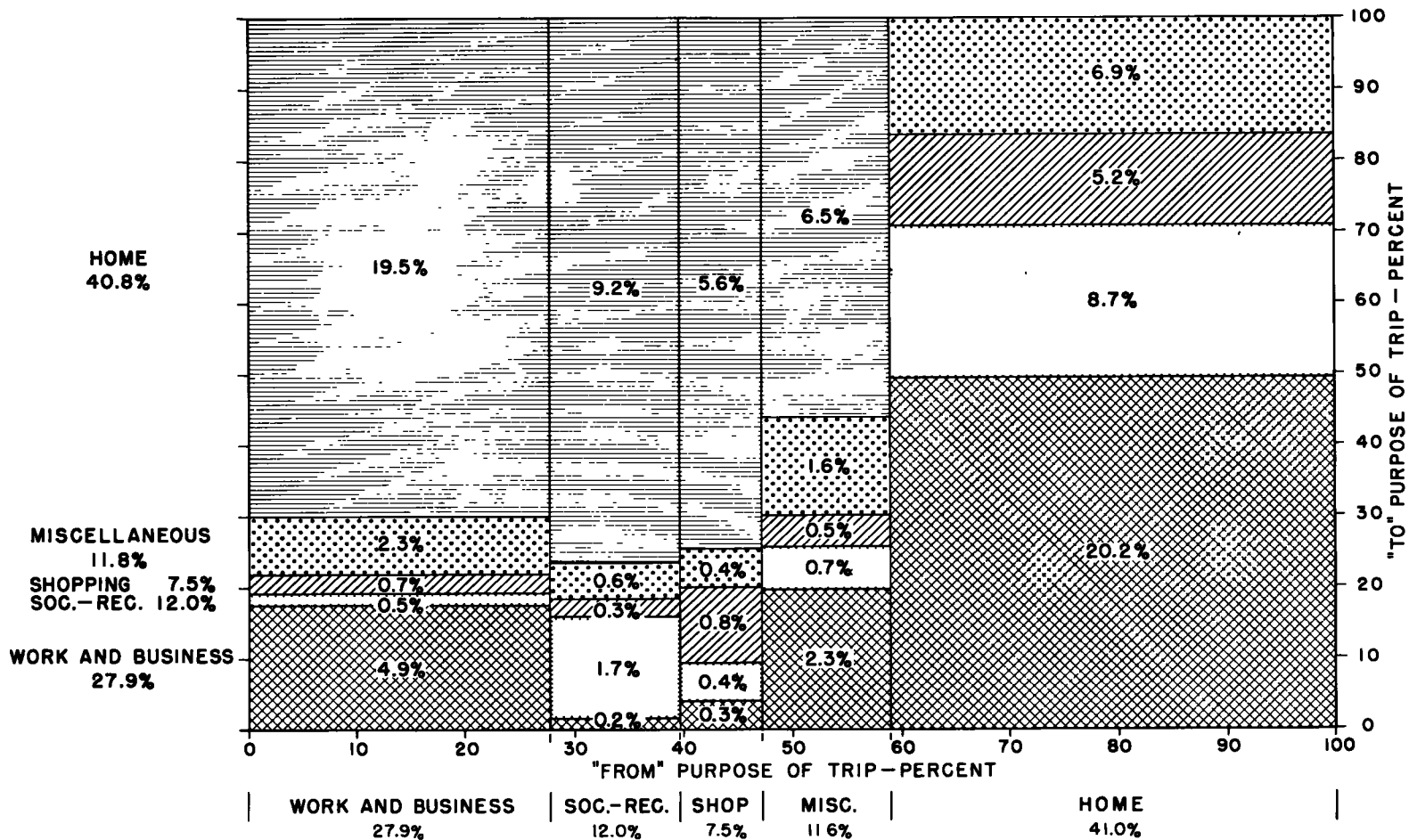


Figure 9. Percentage distribution of trips from each purpose to each purpose.

of travel. Since trips are grouped first by trip purpose and then by all purposes, each trip is represented at least twice in this chart. The arrows indicate the direction of trip purpose. In the upper left-hand corner of the chart, for instance, under the home category, it may be seen that trips in connection with work and business accounted for the largest proportion of home trips. Trips from home to work and business slightly exceeded those in the reverse direction (20.3 percent as compared with 19.5 percent). Mass-transit passengers ranked first in these trips, and automobile and taxi pas-

Table 15.—Selected household characteristics in each of 50 cities in 6 population groups

City	Population group	Number of dwelling units	Number of passenger cars owned	Number of persons, all ages	Number of persons, 5 years of age and older	
Philadelphia, Pa.	1,000,000 and over	659,165	257,907	2,233,531	2,048,388	
San Francisco, Calif.		554,200	317,400	1,468,933	1,348,835	
Newark, N. J.		436,886	245,151	1,456,947	1,345,138	
Washington, D. C.		336,181	203,464	1,109,860	992,644	
Total		1,986,432	1,023,922	6,269,271	5,735,005	
St. Louis, Mo.	500,000-1,000,000	294,757	143,415	974,545	878,377	
St. Paul-Minneapolis, Minn.		299,510	226,815	915,960	825,625	
Baltimore, Md.		275,778	123,998	912,809	830,909	
Houston, Tex.		272,722	256,300	878,629	765,942	
Dallas, Tex.		168,066	153,777	533,606	471,064	
Seattle, Wash.		188,732	118,622	518,563	471,911	
Total	1,499,565	1,022,927	4,734,112	4,243,828		
Portland, Oreg.	250,000-500,000	152,586	103,245	453,128	412,358	
Norfolk, Va.		108,000	61,480	335,910	293,270	
San Juan, P. R.		63,131	8,011	312,069	267,726	
Total	323,717	172,736	1,101,107	973,354		
Wichita, Kans.	100,000-250,000	79,534	75,888	238,302	206,529	
Grand Rapids, Mich.		65,170	52,795	220,977	199,209	
Honolulu, T. H.		51,422	32,692	214,236	184,141	
Sacramento, Calif.		79,100	53,900	201,345	179,778	
Salt Lake City, Utah		57,103	38,851	196,571	172,557	
Wilmington, Del.		49,903	30,190	181,445	162,503	
Phoenix, Ariz.		48,221	36,372	161,567	145,198	
Tacoma, Wash.		48,008	35,175	138,700	125,002	
Spokane, Wash.		48,517	29,644	138,381	124,952	
Scranton, Pa.		41,362	22,093	137,089	126,541	
Duluth, Minn., Superior, Wis.		42,550	25,596	130,847	119,056	
Chester, Pa.		35,206	24,449	127,408	114,709	
Tucson, Ariz.		38,690	32,910	126,900	113,730	
Lansing, Mich.		35,821	30,252	122,776	110,269	
Reading, Pa.		37,910	17,184	119,850	112,504	
Albuquerque, N. Mex.		34,884	27,469	116,056	100,817	
Rockford, Ill.		36,200	33,100	116,000	102,500	
Saginaw, Mich.		31,915	27,028	112,902	101,438	
Madison, Wis.		33,365	26,328	104,074	94,300	
Harrisburg, Pa.		31,599	16,363	103,303	96,100	
Total		926,480	667,279	3,008,729	2,691,833	
Johnstown, Pa.		50,000-100,000	23,130	13,828	87,509	80,351
Altoona, Pa.			24,060	16,758	85,347	77,477
Muskegon, Mich.			23,507	18,941	83,724	75,099
Pontiac, Mich.			22,251	17,808	79,431	71,851
Columbus, Ga.			20,307	8,808	79,192	70,621
Racine, Wis.	23,280		18,483	78,033	69,508	
Macon, Ga.	20,089		9,529	77,665	69,966	
York, Pa.	25,310		20,473	77,350	69,387	
Charleston, S. C.	20,258		7,179	73,205	65,390	
Kalamazoo, Mich.	22,645		17,198	72,024	65,945	
Bay City, Mich.	19,561		15,927	69,231	61,454	
Williamsport, Pa.	17,016		14,715	55,216	48,675	
Total	261,414		179,647	917,927	825,724	
Fargo, N. Dak., Moorhead, Minn.	Less than 50,000		15,617	12,688	49,852	44,030
Sharon-Farrell, Pa.		13,657	9,442	48,432	44,310	
Norristown, Pa.		10,282	7,466	39,485	36,106	
Appleton, Wis.		11,769	11,073	39,172	33,923	
Wisconsin Rapids, Wis.		4,700	4,660	16,504	14,428	
Total	56,025	45,329	193,445	172,797		
Grand total	5,053,633	3,111,840	16,224,591	14,642,541		

sengers ranked third behind automobile drivers.

Home trips that were linked with social and recreational purposes were fewer than those involving work and business. Their pattern differed from the latter in that trips from home to social-recreational activities were fewer than the reverse trips. Also, in this case, automobile- and taxi-passenger trips were the most numerous, and were followed by automobile-driver and mass-transit passenger trips. As a matter of fact, home trips linked with work and business were made less often by automobile and taxi passengers than home trips linked with a social-recreational purpose. Figure 7 is adaptable similarly to an analysis of trips associated with other or with all to and from purposes.

Table 14 shows the percentage of trips made both to and from each purpose for each mode of travel. Since for each single trip there are two purposes, one from and one to, the totals add to 200 percent. This table formed the basis for Figure 8, from which it is apparent that first home and then work and business were the top-ranking purposes among all modes except one. Automobile and taxi passengers traveled more frequently from or to a social-recreational purpose (50 percent) than a work or business purpose (35 percent). Work and business trips were relatively more significant among the automobile drivers, since 65 percent of their trips were for that purpose. Mass-transit passengers were the group most likely to be traveling from or to home. The fact that this purpose accounted for almost 89 percent of their trips may be related to the greater possibility that intermediate trips by these persons were made by walking than in the case of automobile drivers and automobile and taxi passengers. Miscellaneous trips accounted for about one-fourth of the trips by both mass-transit passengers and by automobile drivers. Trips to or from shopping amounted to approximately 15 percent of the trips by each mode of travel.

The percentage distribution of trips from each purpose to each purpose is presented in Figure 9 for all modes of travel combined. This chart was constructed in a manner similar to Figure 2. It shows, for instance, that trips from home to work and business predominated, accounting for almost 50 percent of the trips from home and over 20 percent of all trips. The reverse trips from work and business to home also accounted for about one-fifth of all trips, but they comprised 70 percent of the trips from work and business. Trips to home accounted for three-fourths of the trips from social-recreational and from shopping purposes, but in comparison with total trips, they represented only 9 and 6 percent, respectively. The large proportion of trips both to and from home, 82 percent, is particularly apparent in Figure 9.

HOUSEHOLD CHARACTERISTICS

In addition to data concerning the daily trips of residents, the basic origin and destination surveys of the home-interview type provided information concerning the numbers of dwelling units, automobiles owned, residents, and persons 5 years of age and older. Some of these household characteristics for the 50 urban areas are recorded in Table 15. By and large they varied directly with population. This pattern is more

Table 16.—Average number of dwelling units, passenger cars owned, and residents per city for each of six population groups

Population group	Number of cities	Average number (in thousands) of—			
		Dwelling units	Passenger cars owned	Persons, all ages	Persons, 5 years of age and older
1,000,000 and over.....	4	497	256	1,567	1,434
500,000-1,000,000.....	6	250	170	789	707
250,000-500,000.....	2	130	82	395	353
100,000-250,000.....	20	46	33	150	135
50,000-100,000.....	12	22	15	76	69
Less than 50,000.....	5	11	9	39	35
All groups.....	49	102	64	325	294

Table 17.—Average ratios per city between number of trips by each mode of travel and selected household characteristics in six population groups

Population group	Trips per dwelling unit by mode of travel			Trips per automobile owned by mode of travel			Trips per person by mode of travel					
	Auto- mobile driver	Auto- mobile and taxi passenger	Mass- transit passenger	Total	Auto- mobile driver	Auto- mobile and taxi passenger	Mass- transit passenger	Total	Auto- mobile driver	Auto- mobile and taxi passenger	Mass- transit passenger	Total
1,000,000 and over.....	1.62	0.91	2.50	5.03	3.15	1.76	4.85	9.76	0.51	0.29	0.79	1.59
500,000-1,000,000.....	2.35	1.16	1.99	5.50	3.45	1.70	2.91	8.06	0.74	0.37	0.63	1.74
250,000-500,000.....	2.54	1.49	1.41	5.44	4.02	2.35	2.22	8.59	0.84	0.49	0.46	1.79
100,000-250,000.....	3.15	1.79	1.35	6.29	4.38	2.48	1.88	8.74	0.97	0.55	0.42	1.94
50,000-100,000.....	3.09	1.75	1.41	6.25	4.50	2.54	2.05	9.09	0.88	0.50	0.40	1.78
Less than 50,000.....	3.73	2.10	1.85	6.60	4.61	2.60	1.06	8.27	1.08	0.61	0.25	1.94

apparent in Table 16, which compares the mean averages for each of six population groups. In this table and in all of the following analyses San Juan, Puerto Rico, was omitted because of the significant differences from the pattern of travel in the continental United States.

TRIPS RELATED TO HOUSEHOLD CHARACTERISTICS

The ratios of trips by each travel mode to household characteristics are shown in Table 17 for the average city in each population group. The ratios of total trips and automobile trips tended to vary inversely with population, while mass-transit trip ratios varied directly with population, as seen in Figure 10. The sharp upturn in the pattern for total trips per automobile owned in the highest population group was due to the relatively low automobile ownership ratios in cities of the 1 million or more population group and the greater incidence of mass-transit trips in these cities. The reverse situation caused the low point in this pattern for cities of less than 50,000 population. Some of the other variations of the patterns in the 500,000 to

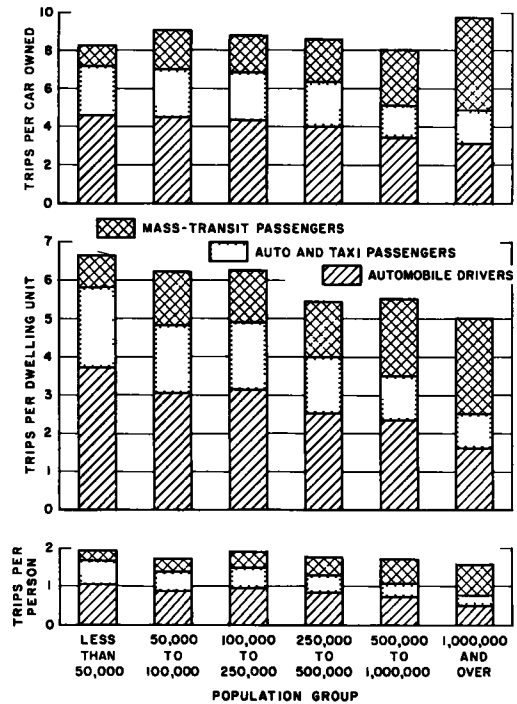


Figure 10. Relation of trips per person, trips per dwelling unit, and trips per automobile to population size of cities.

1,000,000 and 50,000 to 100,000 population groups would be smoothed out by eliminating surveys conducted during World War II.

The basic Tables 9 and 10, giving trip purpose and mode of travel in each of the 50 cities, and the household characteristics shown in Table 15 may be used to develop similar individual city ratios for each mode of travel and each trip purpose. For each trip purpose there appears to be an inverse linear correlation between population and trips per dwelling unit or trips per person for the automobile travel modes; that is, the larger cities have smaller trip ratios. In the case of trips by mass-transit passengers, the correlations generally appear to be direct for each trip purpose.

The relations existing between a few of these trip ratios and the number of automobiles per dwelling unit are shown in Figure 11. It is noted that in areas of high automobile-ownership ratios, the total trips per person and the automobile trips per person

Table 18.—Correlation coefficients computed for certain types of trips and related household characteristics in 49 cities¹

Mode of travel or purpose of trip	Household characteristic	Correlation coefficient
Mode of travel:		
All modes.....	Dwelling units.....	0.987
Automobile driver.....	Automobiles owned.....	.975
Mass-transit passenger.....	Persons 5 years of age and over.....	.941
Purpose of trip.		
Work and business.....	Dwelling units.....	.989
Social and recreation.....	Automobiles owned.....	.968
Shop.....	do.....	.979
Miscellaneous.....	Persons 5 years of age and over.....	.916
Home.....	Dwelling units.....	.985

¹ Scatter diagrams, except for social-recreational, miscellaneous, and home trip purposes, are presented in figures 12-16.

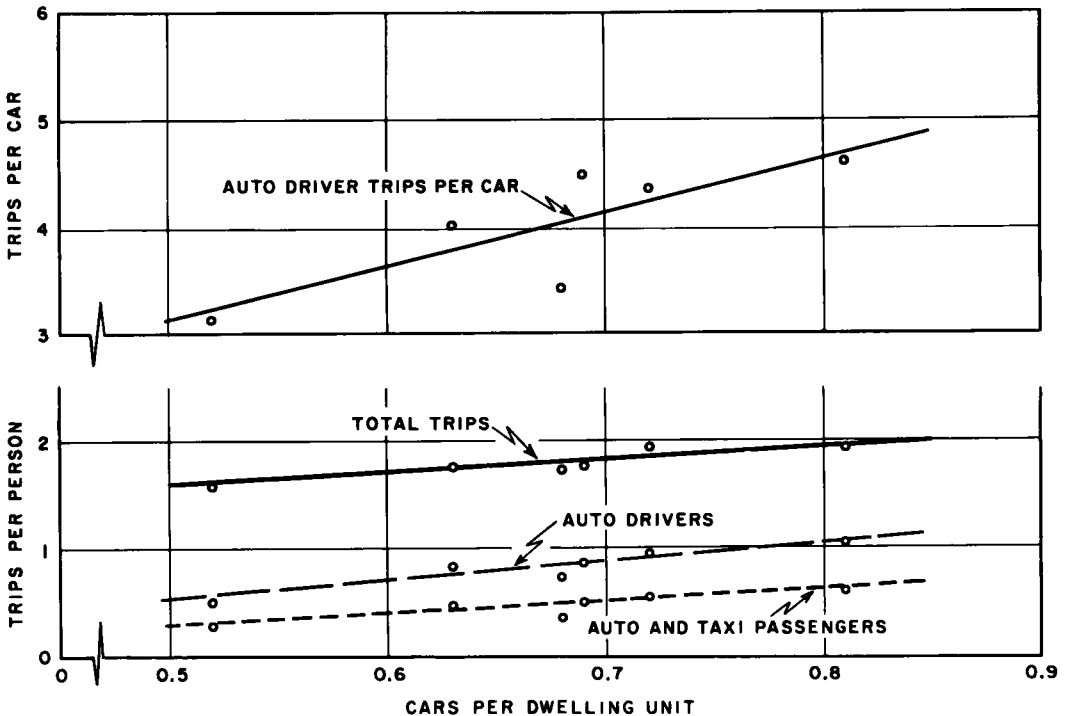


Figure 11. Trips per person and trips per automobile related to automobiles owned per dwelling unit.

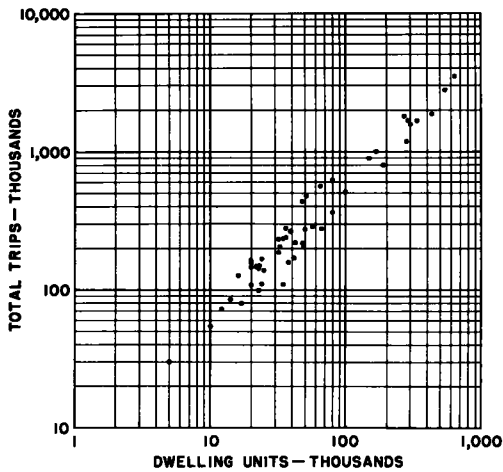


Figure 12. Number of trips related to number of dwelling units.

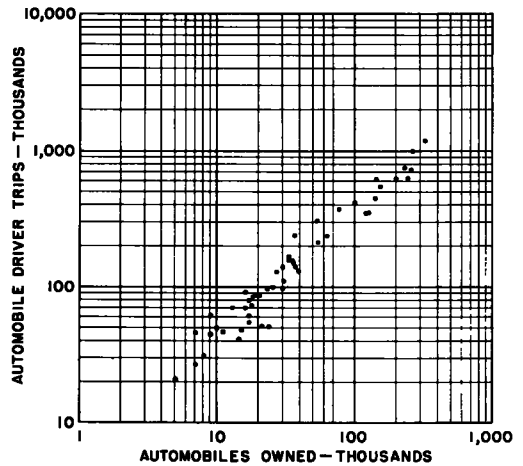


Figure 13. Number of automobile-driver trips related to number of automobiles owned.

were greater. Also, since automobile-driver trips per automobile tended to increase as automobile ownership increased, the number of trips per vehicle may be expected to increase as the ownership ratio of automobiles per family continues to grow. Whether mileage traveled per vehicle follows the same trend depends upon trip lengths. As in the case of Figure 10, these curves are also affected by the data from older studies and by the economic as well as the population characteristics of the cities studied.

Volume of trips and percentage of trips by individual purposes and modes of travel were associated with the ratios of automobiles per dwelling unit and persons per automobile. Although there was fairly good linear correlation between percentage of trips (by purpose and mode) and automobiles per dwelling unit, these correlations were not as high as others relating trips to the absolute household data in each urban area. In the latter case, better correlations were found between volume of trips (by purpose and mode) and the numbers of persons over 5 years of age, automobiles or dwelling units, than between percentage of trips (for a particular purpose or mode of travel) and any one of these variables.

The household characteristic which was most closely related to volume of trips

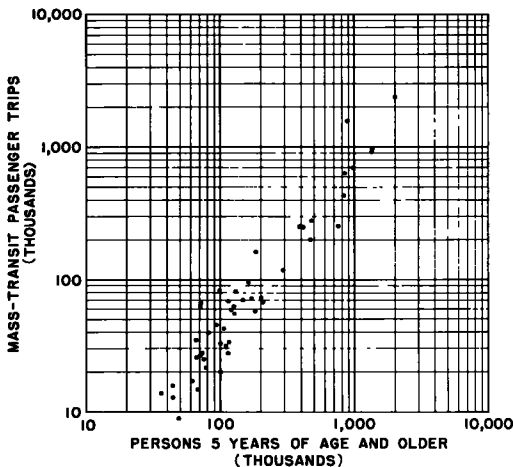


Figure 14. Number of mass-transit passenger trips related to number of persons 5 years of age and over.

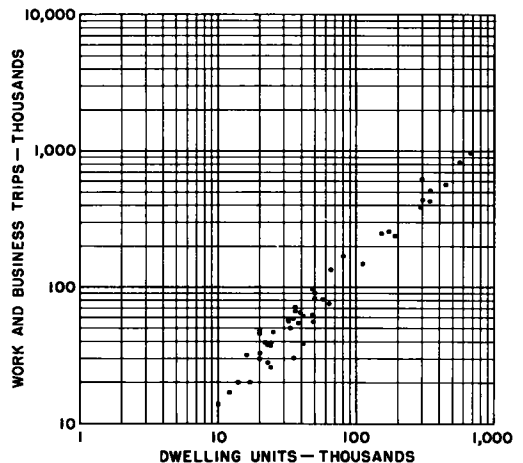


Figure 15. Number of work and business trips related to number of dwelling units.

varied, depending upon the mode of travel or purpose of trip. These relations are shown in Table 18, together with their respective correlation coefficients. These two-variable, linear correlations were deemed to be sufficiently high to forgo the need for testing correlations based upon second-degree equations or logarithms. However, for convenience of presentation the related scatter diagrams shown in Figures 12-16 have been plotted on logarithmic scales.

No attempt was made to associate all household characteristics with the volume of automobile- and taxi-passenger trips, but the scatter diagram in Figure 17 suggests that the number of automobiles owned in the area is a good factor.

The relatively low correlation for trips with miscellaneous purposes is not unusual because of the varying nature of such trips. A better correlation factor is hardly required, however, since there is less cause for estimating these miscellaneous trips due to their relatively small number—less than 12 percent of the total. More favorable multiple correlations might be developed if required. For instance, the addition of the factor automobiles owned to the number of persons over 5 years of age raised the correlation with mass-transit passengers from +0.941 to +0.987.

In view of the large number of automobile-driver trips made for the purpose of going to work and for transacting business, these particular trips were also associated with the several household factors. Although total work and business trips in an area were more closely related to dwelling units (a higher correlation coefficient) than total automobile-driver trips were related to automobiles owned, it was found that work and business trips made by automobile drivers were more closely associated to automobiles owned. In the latter comparison, which is illustrated in Figure 18, the correlation coefficient was +0.984.

In order to more precisely estimate the volume of trips by each mode of travel for each individual purpose, it would be necessary to determine by means of correlation

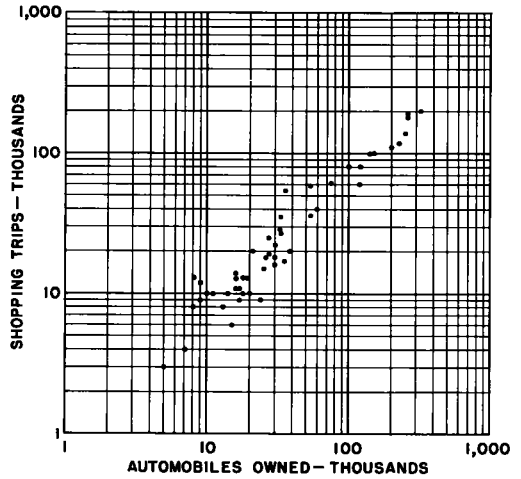


Figure 16. Number of shopping trips related to number of automobiles owned.

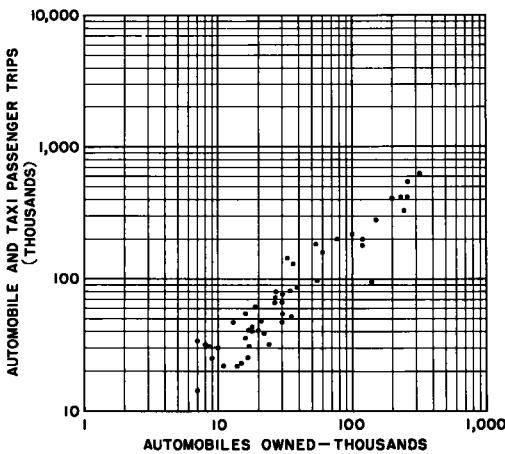


Figure 17. Number of automobile- and taxi-passenger trips related to number of automobiles owned.

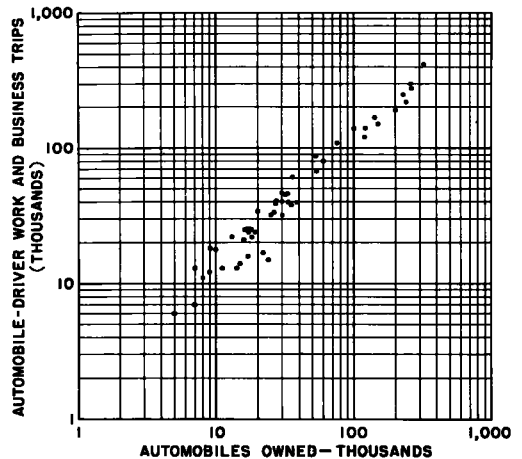


Figure 18. Number of automobile-driver work and business trips related to number of automobiles owned.

techniques similar maximum coefficients for the other modes and purposes. Of course, any application of estimates must be consistent with the resulting standard error. Further development is not attempted here, since this article is primarily concerned with existing conditions within the 50 urban areas. However, this discussion should be sufficiently indicative of the types of analysis which may be continued and expanded in an effort to develop predictive factors representative of local travel in typical urban areas.

Appendix

Up to this point, the discussion has dealt with several aspects of the travel pattern in 50 urban areas with regard to the five major trip purposes and the three most important modes of travel. It was mentioned, however, that the basic origin and destination surveys, which provided the data for these analyses, included information with respect to seven possible travel modes and ten trip purposes; and in certain cases some rather interesting and significant facets of the total urban travel complex were obscured as a result of the combining processes. Several of the more notable individual aspects are included here.

For all cities, medical-dental trips accounted for 5.5 percent of the trips by taxi passengers, and, conversely, taxi-passenger trips accounted for 4.2 percent of the trips for medical or dental purposes. Changing of mode accounted for 10 percent of the train-passenger trips and train passengers accounted for 2.2 percent of the trips to change mode of travel. Also, it is significant that 8.9 percent of the automobile drivers made trips for the purpose of serving passengers. All of the serve-passenger trips were made by drivers of automobiles.

In addition to the cases just cited, there are several interesting facts regarding individual cities, which were concealed when trip purposes and modes of travel were grouped. For example, in Columbus, Ga., Baltimore, Md., Charleston, S.C., Reading, Pa., and Grand Rapids, Mich., over 10 percent of the automobile-driver trips were for the purpose of transacting business. In Pontiac, Mich., and Sacramento, Calif., 14 percent of the automobile-driver trips were to serve passengers. The fact that 11 percent of the automobile-driver trips and 9 percent of the mass-transit trips in San Juan, P.R., were for the purpose of eating is due largely to the prevalent local custom of returning home for lunch at midday.

In the category of trips for the purpose of changing mode of travel, several unusual situations occurred in individual urban areas. These trips accounted for 10 and 25 percent of the total streetcar- and bus-passenger trips in Norristown and Philadelphia, Pa., respectively. Also, in Philadelphia, change-mode trips amounted to 60 percent of the subway- or elevated-railway passenger trips and 24 percent of the train-passenger trips.

Over 12 percent of the streetcar- and bus-passenger trips were to school in Madison, Wis., Pontiac, Mich., Sacramento, Calif., and in Phoenix and Tucson, Ariz. Trips to transact business accounted for 11 percent of all taxi-passenger trips in Charleston, S.C., and in Salt Lake City, Utah, and 13 percent in Seattle, Wash.

With regard to modes of travel, again there are individual city exceptions, which were absorbed in the grouping procedure. Among the more important variations which should be mentioned is the case of Washington, D.C., where taxi passengers accounted for almost 3 percent of all trips. Also truck and taxi passengers combined accounted for over 3 percent of the total trips in Baltimore, Md., and Macon, Ga. Finally, train-passenger trips amounted to 5 percent of the total trips in Newark, N.J., and 2 percent in Philadelphia.