VOL. 30, NO. 12 FEBRUARY 1960

Public Roads

A JOURNAL OF HIGHWAY RESEARCH

PUBLISHED
BIMONTHLY BY THE
BUREAU OF
PUBLIC ROADS,
U.S. DEPARTMENT
OF COMMERCE,
WASHINGTON

A recently completed Federal-aid primary facility through Rio Piedras, south of San Juan, Puerto Rico.

Public Roads

A JOURNAL OF HIGHWAY RESEARCH

Published Bimonthly

Vol. 30, No. 12 *February 1960*

E. A. Stromberg, *Acting Editor*
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BUREAU OF PUBLIC ROADS

Washington 25, D.C.

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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, March 28, 1958.

Contents of this publication may be reprinted. Mention of source is requested.

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U.S. DEPARTMENT OF COMMERCE
FREDERICK H. MUELLER, Secretary

BUREAU OF PUBLIC ROADS
BERTRAM D. TALLAMY, Administrator
ELLIS L. ARMSTRONG, Commissioner

Forecasts of Population, Motor-Vehicle Registrations, Travel, and Fuel Consumption

BY THE OFFICE OF RESEARCH
BUREAU OF PUBLIC ROADS

Reported by THOMAS R. TODD, Head, Revenue Planning Section, Highway Needs and Economy Division

According to forecasts made by the several State highway departments (excluding Alaska and Hawaii), there will be 230 million people living in the United States in 1976. During that year, these people are expected to register 114 million motor vehicles, which will travel 1.2 billion vehicle-miles. The estimates thus predict a 37-percent increase in population over 1956, the base year of the forecasts; increases of 75 percent in motor-vehicle registrations and 93 percent in travel are expected. The forecasts, prepared by the States for the Bureau of Public Roads Highway Cost Allocation Study, are based, in general, upon the continuation of recent trends in population, living standards, density of motor-vehicle ownership, and characteristics of motor-vehicle use. Significant changes in any of these basic trends during the period involved could be expected to have marked effects upon the accuracy of these forecasts.

THE Highway Cost Allocation Study, undertaken by the Bureau of Public Roads at the request of Congress pursuant to section 210 of the Highway Revenue Act of 1956, has as its objectives an assessment of highway needs and the collection and analysis of other information. On the basis of these assessments, Congress may determine what taxes for highway improvement should be imposed by the Federal Government and how they may be equitably distributed among beneficiaries of Federal-aid highways. State and nationwide forecasts of motor-vehicle registrations and travel and of motor-fuel consumption were needed as a basis for forecasting highway needs and revenues. In order that such predictions might be prepared from a sound background, it was also necessary that population forecasts be developed. Such forecasts of population, motor vehicles and their use, and fuel consumption, as prepared by the States, are presented in this article.

The national summaries, compiled from the estimates made by the States, constitute what is believed to be a reasonably accurate prediction of what the future use of the Nation's highways will be. Forecasts by some of the States might be considered as being too conservative; forecasts of others as too optimistic. Perhaps a more critical appraisal could be taken of the conservative forecasts than of the optimistic ones. When considered on a national scale, however, divergencies are probably largely cancelled out.

Since Alaska and Hawaii had not achieved statehood when these studies were originated, predictions for those jurisdictions were not included in the summary trend forecasts presented here. However, Hawaii, as well as Puerto Rico, provided projections, which are included in all tables depicting individual State forecasts.

Forecast Methods

In conformity with the needs of the Highway Cost Allocation Study, and preparatory to estimating highway needs, the State highway departments were requested to prepare year-by-year forecasts of highway travel through 1976 with extrapolations to 1981, 1986, and 1991.[1] Suggestions and guides concerning the preparation of forecasts were distributed to the States by the Bureau of Public Roads. Various aids to forecasting, such as the Bureau of the Census estimates of future population by States, were also provided the highway departments. However, the only requirements imposed upon the States were that the forecasts submitted be reasonable in the light of past and current trends, and that State highway officials be prepared to stand behind them.

The method used to prepare the forecasts were, in general, the same as had been used in preparing those requested for the Nationwide Highway Finance Study of 1954.[2] Consequently, the projections prepared in 1957 were similar to those prepared for the earlier study, though generally somewhat higher—and, it should be noted, the newer forecasts

[1] Extensive data for 1957, and summaries of the forecasts, have been published in the *Third Progress Report of the Highway Cost Allocation Study*, House Doc. No. 91, 86th Cong., 1st sess.

[2] *Needs of the Highway Systems, 1955–84*, House Doc. No. 120, 84th Cong., 1st sess., 1955.

Table 1.—Population, motor-vehicle registrations, travel, and motor-fuel consumption in the United States (excludes Alaska and Hawaii), 1921–56 and State forecasts for selected years, 1961–91 [1]

Year	Population [2]	Motor vehicles registered [3]	Vehicle-miles traveled	Gallons of motor fuel consumed
	Thousands	*Thousands*	*Millions*	*Millions*
1921	104, 541	10, 494	56, 681	3, 935
1922	110, 055	12, 274	68, 340	4, 841
1923	111, 950	15, 102	84, 045	6, 078
1924	114, 113	17, 613	102, 423	7, 497
1925	115, 832	20, 069	119, 057	8, 749
1926	117, 399	22, 200	135, 905	10, 064
1927	119, 038	23, 303	150, 533	11, 331
1928	120, 501	24, 689	167, 317	12, 361
1929	121, 770	26, 705	188, 617	14, 139
1930	123, 077	26, 750	199, 263	14, 754
1931	124, 040	26, 094	203, 777	15, 457
1932	124, 840	24, 391	190, 728	14, 339
1933	125, 579	24, 159	188, 784	14, 348
1934	126, 374	25, 262	204, 070	15, 415
1935	127, 250	26, 546	215, 428	16, 345
1936	128, 053	28, 507	235, 205	18, 099
1937	128, 825	30, 059	253, 818	19, 455
1938	129, 825	29, 814	257, 087	19, 612
1939	130, 880	31, 010	271, 379	20, 714
1940	131, 954	32, 453	288, 155	22, 001
1941	133, 417	34, 894	312, 307	24, 192
1942	134, 670	33, 004	259, 990	19, 940
1943	134, 697	30, 888	207, 887	16, 004
1944	134, 075	30, 479	213, 066	16, 430
1945	133, 387	31, 035	245, 145	19, 149
1946	140, 678	34, 373	328, 431	25, 649
1947	144, 261	37, 704	360, 689	28, 244
1948	146, 421	40, 960	387, 209	30, 447
1949	148, 578	44, 448	413, 597	32, 456
1950	150, 910	48, 945	451, 771	35, 604
1951	153, 440	51, 643	484, 582	38, 207
1952	155, 957	52, 966	512, 689	40, 592
1953	158, 572	55, 939	539, 199	42, 809
1954	161, 087	58, 219	558, 801	44, 322
1955	164, 360	62, 343	595, 856	47, 780
1956	167, 250	65, 119	622, 932	50, 011
1961	180, 656	77, 002	753, 764	60, 690
1966	195, 353	89, 161	898, 691	72, 605
1971	211, 653	101, 240	1, 051, 412	85, 073
1976	229, 758	113, 642	1, 200, 263	97, 144
1991	-------	-------	1, 733, 602	------

[1] Data are summaries of estimates prepared by the States for population, registrations, and fuel consumption for 1947–76 and for travel for 1921–91.
[2] Excludes armed forces overseas.
[3] Includes publicly owned vehicles.

were made with much greater care. It was believed that the higher levels forecasted were justified by the fact that actual figures for motor-vehicle registrations, travel, and fuel consumption that had become available for 3 years (1955–57) since the earlier forecasts were prepared had been, in almost every instance, slightly higher than the corresponding values previously forecasted. Other factors believed to justify more optimistic forecasts were higher population estimates made by the Bureau of the Census and the inclusion in the new forecasts of estimates for publicly owned vehicles.

Summarization of the individual State forecasts made for the Highway Cost Allocation Study produced reasonable nationwide estimates, as table 1 and figure 1 indicate. Each of these forecasts of population, vehicle registrations, motor-vehicle travel, and motor-fuel consumption, when coupled with historical data for the same comparable series for 1921 through 1956, indicates a trend commensurate with that exhibited in recent years.

Population Forecasts

Forecasts of population made by the States indicate that the 1976 population of the United States, excluding Alaska and Hawaii, will be about 230 million inhabitants. This forecast, considered rather optimistic in 1957, has been made to appear reasonably conservative by later projections prepared by the Bureau of the Census.[3] The four Census projections range from a high of 244 million to a low of 216 million for 1975. This places the forecast used in this report at about the midpoint of the Census Bureau projections. It is also anticipated that by 1976 there will be 154 million persons in the driver age group, 15–74. As this estimate is somewhat less, on a percentage basis, in respect to total population than the 1956 estimate, it also must be considered as being reasonably conservative. Therefore, forecasts by the States of both total population and potential drivers for 1976 appear to qualify as reasonably reliable foundations on which to base estimates of motor-vehicle ownership ratios and registrations.

Trends by census divisions

Table 2 summarizes the State population forecasts by census divisions for 1956 and 1976. Figure 2 portrays graphically the population estimates from 1947 to 1976. Detailed forecasts by States are included in table 3.

The Pacific division shows the largest expected increase during the 20-year period, both numerically (16.5 million) and relatively (95 percent). The Mountain division is expected to have the second highest percentage increase (65), although the numerical increase (4.0 million) is relatively small. The South Atlantic (South) division is the only other geographic area in which the anticipated percentage increase (49) is above the national average of 37 percent. The East South Central division is expected to have a population increase of only 12 percent (1.4 million persons) during the forecast period. The West North Central division is next in order with an anticipated 17-percent increase.

Although, large numerical increases in population are expected in each of the three major regions of the Nation, only the Western region is expected to gain in relative position, from 14.1 percent of the total population in 1956 to 19.2 percent in 1976, an increase of 36 percent. The Northern region is expected to change from 54.9 percent of the total population in 1956 to 50.9 percent in 1976, a decline of 7 percent. A more moderate change in the Southern region, from 31.0 to 29.9 percent of the total, represents a decline of 4 percent. The Northern region includes the New England, Middle Atlantic, East North Central, and West North Central census divisions; the Southern region consists of the South Atlantic (North), South Atlantic (South), East South Central, and West South Central census divisions; and the Mountain and Pacific divisions make up the Western region.

[3] *Current Population Reports*, Bureau of the Census, Population Estimates, Series P-25, No. 187, November 1958, p. 2.

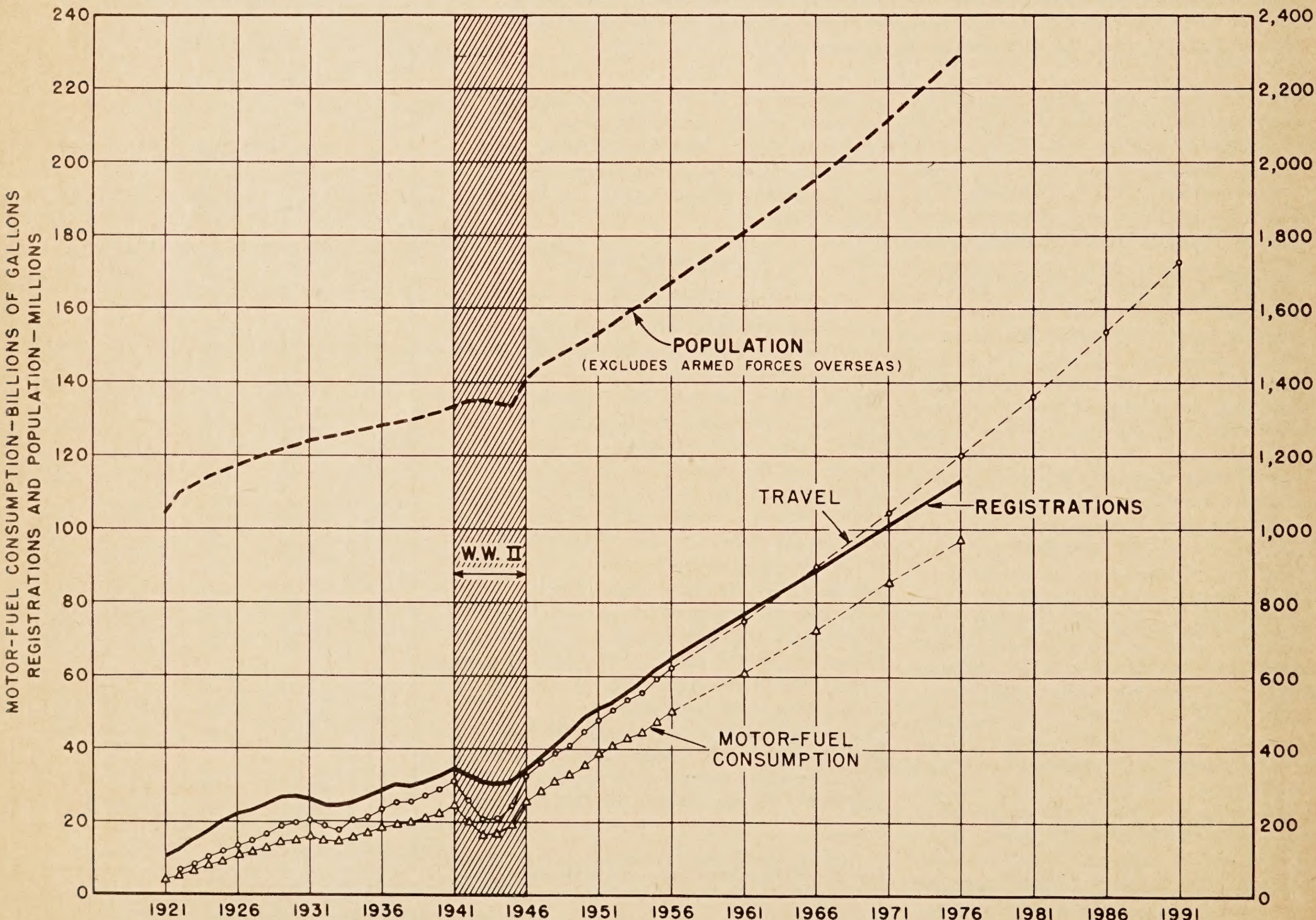

Figure 1.—State estimates of population, motor-vehicle registrations, travel, and motor-fuel consumption in the United States (excludes Alaska and Hawaii) for selected years.

Table 2.—State estimates of total population and population 15 to 74 years of age in the United States (excludes Alaska and Hawaii) by census division, 1956 and 1976

Census division	1956 population				1976 population							
	All ages		Driving age, 15–74		All ages				Driving age, 15–74			
	Persons	Percent of total	Persons	Percent of total	Persons	Percent of total	Ratio: 1976/1956	Numerical increase, 1956–76	Persons	Percent of total	Ratio: 1976/1956	Numerical increase, 1956–76
	Thousands		*Thousands*		*Thousands*			*Thousands*	*Thousands*			*Thousands*
New England	9, 881	5. 9	6, 812	6. 0	12, 171	5. 3	1. 23	2, 290	8, 060	5. 2	1. 18	1, 248
Middle Atlantic	32, 669	19. 5	22, 849	20. 2	41, 231	17. 9	1. 26	8, 562	28, 139	18. 2	1. 23	5, 290
South Atlantic (North)	9, 701	5. 8	6, 673	5. 9	12, 560	5. 5	1. 29	2, 859	8, 401	5. 5	1. 26	1, 728
South Atlantic (South)	14, 326	8. 6	9, 443	8. 3	21, 346	9. 3	1. 49	7, 020	14, 099	9. 1	1. 49	4, 656
East North Central	34, 185	20. 4	23, 247	20. 5	45, 967	20. 0	1. 34	11, 782	31, 601	20. 5	1. 36	8, 354
East South Central	11, 833	7. 1	7, 715	6. 8	13, 251	5. 8	1. 12	1, 418	8, 777	5. 7	1. 14	1, 062
West North Central	15, 022	9. 0	9, 915	8. 7	17, 634	7. 7	1. 17	2, 612	11, 397	7. 4	1. 15	1, 482
West South Central	16, 017	9. 6	10, 457	9. 2	21, 469	9. 3	1. 34	5, 452	14, 020	9. 1	1. 34	3, 563
Mountain	6, 118	3. 7	3, 976	3. 5	10, 084	4. 4	1. 65	3, 966	6, 482	4. 2	1. 63	2, 506
Pacific	17, 498	10. 4	12, 333	10. 9	34, 045	14. 8	1. 95	16, 547	23, 344	15. 1	1. 89	11, 011
All census divisions	167, 250	100. 0	113, 420	100. 0	229, 758	100. 0	1. 37	62, 508	154, 320	100. 0	1. 36	40, 900

The projections reported in table 2 show that the ratio of persons in the driver age group to the total population is expected to remain almost constant on a nationwide basis during the forecast period; two out of three persons in the total population are in the potential drivers group in both study years.

A comparison of relative change by census divisions shows that the largest gain in potential drivers is expected in the Pacific division. This gain is offset by losses anticipated in the Middle Atlantic, East South Central, and West North Central divisions.

Trends by States

The forecasts by the individual States (table 3) show that by 1976 the population is expected to more than double in California, Florida, and New Mexico. Three other States—Arizona, Nevada, and Utah—are expected to have increases of between 80 and 100 percent. No State expects to experience a net population decrease during the 20-year period, but the distribution of the percentage increases in population anticipated by the several States reveals that West Virginia and Kentucky expect only a 5-percent increase, and Arkansas and the District of Columbia expect increases of only 9 percent. The majority of the States (33) anticipate population increases ranging from 10 to 40 percent.

Motor-Vehicle Registrations

According to the forecasts prepared by the States, approximately 114 million motor vehicles will be using the Nation's highways in 1976. This forecast represents an increase of 49 million vehicles, or 75 percent, over 1956 registrations. Implicit in such a prediction is a fairly substantial increase in the density of motor-vehicle ownership. Figure 3 portrays the motor-vehicle registration projections by census divisions. Data for the two selected study years are compared in table 4, and detailed data by census divisions and States are shown in table 5.

It may be noted that the motor-vehicle registration figures for 1956 shown in this article differ slightly from those published in *Highway Statistics 1956*.[4] Although there are several reasons for the slight variation, the major one was the use of preliminary data for this study by many States.

Forecasts by census divisions

A comparison of the State motor-vehicle registration forecasts by census divisions (table 4) indicates that the 1976 registrations for the Pacific division will be more than double the 1956 figure, an increase of 9.8 million vehicles, or 116 percent. This anticipated registration increase, like the population forecast for this division, is the greatest found in any division. In the Mountain division an increase of 2.9 million motor vehicles is expected during the period which represents a 100-percent increase over 1956. In the South Atlantic (South) division the expected increase is 5.3 million vehicles, or 98 percent. The remaining divisions are expected to increase at a somewhat lower rate than the national average of 75 percent, with the West North Central division showing an increase of only 44 percent.

Registration forecasts by States

In the forecasts of motor-vehicle registrations by individual States (table 5), New Mexico anticipates the greatest percentage increase during the 20-year period, 180 percent, followed by Utah, Florida, and California. Iowa, West Virginia, and Nebraska predict the lowest State percentage increases; Iowa's increase for the 20-year period being only 22 percent. The District of Columbia anticipates an increase of only 15 percent.

Numerically, California expects to have 14.6 million registered motor vehicles in 1976, or 13 percent of the national total, as compared with the 6.5 million and 10 percent of the total in 1956. New York anticipates a registration total of 8.0 million while Pennsylvania, Ohio, and Texas each expects over 6 million motor vehicles to be registered in their States in 1976.

Density of motor-vehicle ownership

Table 6 shows the 1956 and 1976 State estimates of motor vehicles registered per 100 persons in the total population and the potential driver age group for each census division.

In 1951 there were 33.7 registered motor vehicles per 100 persons; by 1956 there were 38.9; and in 1976 there are expected to be 49.5 vehicles per 100 persons. The 1976 estimate

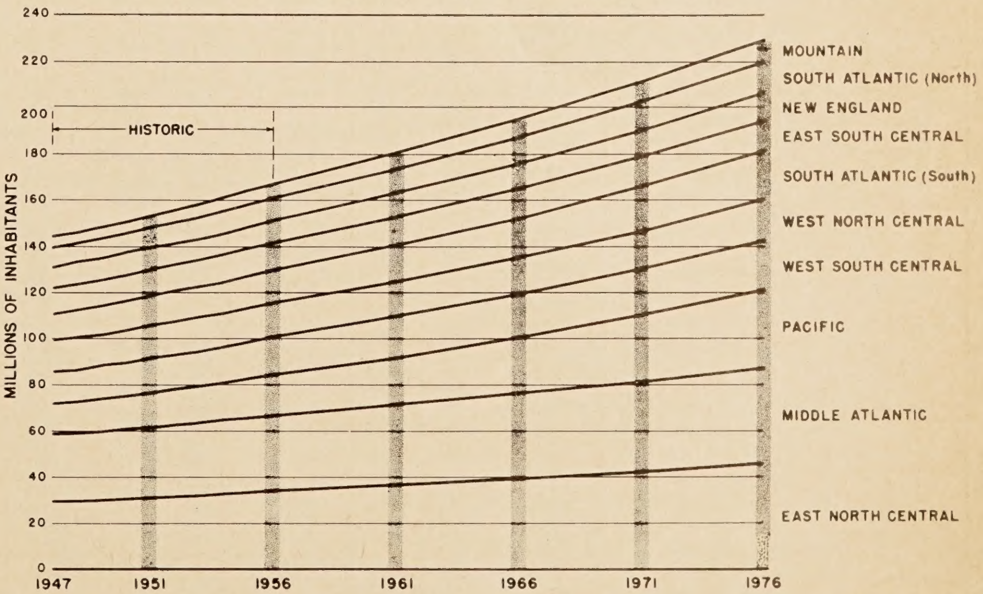

Figure 2.—State estimates of population in the United States by census divisions for selected years, 1947–76.

[4] *Highway Statistics 1956*, Bureau of Public Roads, table MV-1, p. 13.

of approximately 1 motor vehicle for every 2 persons in the total population, and 3 motor vehicles for every 4 persons in the driver age group, appears reasonable when the historic trend from 1951 to 1956 is considered. The density of motor-vehicle registrations for the historic period as well as the projected trend is as follows:

Year	*Persons per vehicle*
1951	2.97
1952	2.94
1953	2.83
1954	2.76
1955	2.63
1956	2.57
1961	2.35
1966	2.19
1971	2.09
1976	2.02

The Mountain division is expected to have the highest density of motor-vehicle ownership, 57.6 vehicles per 100 persons by 1976, and the Middle Atlantic and South Atlantic (North) divisions are expected to have the lowest, the values being 44.0 and 44.5.

As is to be expected, the census divisions having the highest density of motor-vehicle ownership in relation to total population also have the highest densities of motor-vehicle ownership in the driver age group. However, the divisions having the highest densities of ownership in 1956 are expected to experience the lowest percentage increase. On the other hand, in the East South Central division a 52-percent increase in motor vehicles registered per 100 persons during the 20-year period is anticipated, moving that division from the lowest of the 10 census divisions in ownership density in 1956 to fifth in 1976. This is the result of a combination of the lowest forecast of population increase (12 percent) and a relatively high (69 percent) projected increase in registrations. The Pacific division is expected to show the smallest percentage increase.

The 1976 Mountain division forecast of almost 9 motor vehicles for every 10 persons in the driver age group is the highest density forecast of all divisions. The West North Central and Pacific divisions are second and third with ratios of 82.4 and 77.9, respectively. The Middle Atlantic and South Atlantic (North) divisions, with 64.4 and 66.5 motor vehicles per 100 persons of driving age, respectively, rank lowest.

Table 3.—State forecasts of population in the United States by census division and State for selected years, 1956–76

Census division and State	1956		1961			1966			1971			1976		
	Total	Driving age group, 15–74	Total	Ratio: 1961/1956	Driving age group, 15–74	Total	Ratio: 1966/1956	Driving age group, 15–74	Total	Ratio: 1971/1956	Driving age group, 15–74	Total	Ratio: 1976/1956	Driving age group, 15–74
	Thousands	*Thousands*	*Thousands*		*Thousands*	*Thousands*		*Thousands*	*Thousands*		*Thousands*	*Thousands*		*Thousands*
United States	**167,250**	**113,420**	**180,656**	**1.08**	**121,041**	**195,353**	**1.17**	**131,360**	**211,653**	**1.27**	**142,858**	**229,758**	**1.37**	**154,320**
New England	**9,881**	**6,812**	**10,338**	**1.05**	**7,075**	**10,917**	**1.10**	**7,441**	**11,535**	**1.17**	**7,772**	**12,171**	**1.23**	**8,060**
Connecticut	2,313	1,619	2,429	1.05	1,712	2,627	1.14	1,806	2,853	1.23	1,900	3,114	1.35	1,994
Maine	934	644	968	1.04	668	1,002	1.07	691	1,036	1.11	715	1,070	1.15	738
Massachusetts	4,890	3,362	5,140	1.05	3,480	5,410	1.11	3,673	5,680	1.16	3,827	5,920	1.21	3,946
New Hampshire	558	376	586	1.05	391	615	1.10	415	650	1.16	439	692	1.24	459
Rhode Island	815	573	838	1.03	586	878	1.08	611	918	1.13	636	958	1.18	658
Vermont	371	238	377	1.02	238	385	1.04	245	398	1.07	255	417	1.12	265
Middle Atlantic	**32,669**	**22,849**	**34,554**	**1.06**	**23,874**	**36,413**	**1.11**	**25,022**	**38,641**	**1.18**	**26,520**	**41,231**	**1.26**	**28,139**
New Jersey	5,420	3,784	5,890	1.09	4,088	6,350	1.17	4,420	6,910	1.27	4,739	7,500	1.38	5,100
New York	16,256	11,487	17,203	1.06	12,025	18,136	1.12	12,500	19,244	1.18	13,325	20,533	1.26	14,300
Pennsylvania	10,993	7,578	11,461	1.04	7,761	11,927	1.08	8,102	12,487	1.14	8,456	13,198	1.20	8,739
South Atlantic (North)	**9,701**	**6,673**	**10,327**	**1.06**	**7,041**	**11,015**	**1.14**	**7,422**	**11,753**	**1.21**	**7,873**	**12,560**	**1.29**	**8,401**
Delaware	418	275	449	1.07	305	502	1.20	342	564	1.35	384	632	1.51	424
District of Columbia	844	626	864	1.02	618	884	1.05	622	903	1.07	634	923	1.09	635
Maryland	2,747	1,932	3,010	1.10	2,069	3,310	1.20	2,177	3,615	1.32	2,363	3,940	1.43	2,661
Virginia	3,635	2,522	3,914	1.08	2,720	4,205	1.16	2,916	4,537	1.25	3,110	4,912	1.35	3,303
West Virginia	2,057	1,318	2,090	1.02	1,329	2,114	1.03	1,365	2,134	1.04	1,382	2,153	1.05	1,378
South Atlantic (South)	**14,326**	**9,443**	**16,046**	**1.12**	**10,510**	**17,784**	**1.24**	**11,721**	**19,562**	**1.37**	**12,950**	**21,346**	**1.49**	**14,099**
Florida	3,885	2,774	4,885	1.26	3,488	5,885	1.51	4,202	6,885	1.77	4,916	7,885	2.03	5,630
Georgia	3,700	2,363	3,913	1.06	2,469	4,117	1.11	2,637	4,345	1.17	2,819	4,579	1.24	2,955
North Carolina	4,412	2,820	4,754	1.08	2,962	5,096	1.16	3,168	5,438	1.23	3,369	5,780	1.31	3,535
South Carolina	2,329	1,486	2,494	1.07	1,591	2,686	1.15	1,714	2,894	1.24	1,846	3,102	1.33	1,979
East North Central	**34,185**	**23,247**	**36,779**	**1.08**	**24,888**	**39,660**	**1.16**	**27,038**	**42,713**	**1.25**	**29,342**	**45,967**	**1.34**	**31,601**
Illinois	9,418	6,555	10,006	1.06	6,804	10,607	1.13	7,213	11,301	1.20	7,685	12,110	1.29	8,114
Indiana	4,418	2,953	4,858	1.10	3,243	5,298	1.20	3,533	5,738	1.30	3,823	6,178	1.40	4,143
Michigan	7,516	5,162	7,911	1.05	5,516	8,580	1.14	6,155	9,329	1.24	6,861	10,162	1.35	7,547
Ohio	9,064	6,089	9,957	1.10	6,727	10,850	1.20	7,365	11,742	1.30	8,003	12,635	1.39	8,641
Wisconsin	3,769	2,488	4,047	1.07	2,598	4,325	1.15	2,772	4,603	1.22	2,970	4,882	1.30	3,156
East South Central	**11,833**	**7,715**	**12,138**	**1.03**	**7,867**	**12,494**	**1.06**	**8,195**	**12,855**	**1.09**	**8,533**	**13,251**	**1.12**	**8,777**
Alabama	3,127	1,969	3,204	1.02	1,997	3,262	1.04	2,066	3,337	1.07	2,129	3,451	1.10	2,183
Kentucky	3,020	1,943	3,059	1.01	1,944	3,080	1.02	1,978	3,118	1.03	2,011	3,178	1.05	2,020
Mississippi	2,176	1,430	2,195	1.01	1,444	2,300	1.06	1,530	2,400	1.10	1,615	2,500	1.15	1,708
Tennessee	3,510	2,373	3,680	1.05	2,482	3,852	1.10	2,621	4,000	1.14	2,778	4,122	1.17	2,866
West North Central	**15,022**	**9,915**	**15,576**	**1.04**	**10,099**	**16,159**	**1.08**	**10,489**	**16,844**	**1.12**	**10,982**	**17,634**	**1.17**	**11,397**
Iowa	2,704	1,764	2,772	1.03	1,771	2,838	1.05	1,822	2,903	1.07	1,872	2,970	1.10	1,886
Kansas	2,090	1,392	2,190	1.05	1,432	2,293	1.10	1,492	2,417	1.16	1,586	2,571	1.23	1,674
Minnesota	3,246	2,104	3,391	1.04	2,170	3,558	1.10	2,284	3,755	1.16	2,426	3,971	1.22	2,570
Missouri	4,235	2,890	4,404	1.04	2,951	4,576	1.08	3,075	4,786	1.13	3,216	5,030	1.19	3,333
Nebraska	1,414	930	1,442	1.02	928	1,478	1.05	946	1,522	1.08	980	1,577	1.12	1,004
North Dakota	646	397	669	1.04	411	690	1.07	424	712	1.10	438	733	1.13	451
South Dakota	687	438	708	1.03	436	726	1.06	446	749	1.09	464	782	1.14	479
West South Central	**16,017**	**10,457**	**17,186**	**1.07**	**11,118**	**18,520**	**1.16**	**12,083**	**19,930**	**1.24**	**13,117**	**21,469**	**1.34**	**14,020**
Arkansas	1,815	1,143	1,857	1.02	1,175	1,899	1.05	1,196	1,941	1.07	1,219	1,983	1.09	1,241
Louisiana	2,976	1,880	3,186	1.07	1,982	3,398	1.14	2,140	3,641	1.22	2,327	3,888	1.31	2,455
Oklahoma	2,315	1,586	2,416	1.04	1,655	2,645	1.14	1,812	2,800	1.21	1,918	2,960	1.28	2,028
Texas	8,911	5,848	9,727	1.09	6,306	10,578	1.19	6,935	11,548	1.30	7,653	12,638	1.42	8,296
Mountain	**6,118**	**3,976**	**7,016**	**1.15**	**4,455**	**7,957**	**1.30**	**5,085**	**8,978**	**1.47**	**5,786**	**10,084**	**1.65**	**6,482**
Arizona	1,055	726	1,293	1.23	830	1,519	1.44	978	1,745	1.65	1,132	1,971	1.87	1,290
Colorado	1,579	1,052	1,741	1.10	1,144	1,912	1.21	1,266	2,108	1.34	1,406	2,327	1.47	1,536
Idaho	620	389	657	1.06	404	693	1.12	431	737	1.19	463	788	1.27	493
Montana	634	409	663	1.05	419	692	1.09	438	721	1.14	461	750	1.18	476
Nevada	245	172	298	1.22	206	350	1.43	244	408	1.67	284	474	1.93	328
New Mexico	844	517	1,058	1.25	642	1,301	1.54	803	1,559	1.85	983	1,834	2.17	1,155
Utah	825	507	967	1.17	595	1,129	1.37	694	1,312	1.59	807	1,521	1.84	935
Wyoming	316	204	339	1.07	215	361	1.14	231	388	1.23	250	419	1.33	269
Pacific	**17,498**	**12,333**	**20,696**	**1.18**	**14,114**	**24,434**	**1.40**	**16,864**	**28,842**	**1.65**	**19,983**	**34,045**	**1.95**	**23,344**
California	13,116	9,392	15,758	1.20	10,821	18,933	1.44	13,136	22,746	1.73	15,831	27,328	2.08	18,810
Oregon	1,730	1,160	1,957	1.13	1,305	2,195	1.27	1,483	2,420	1.40	1,642	2,636	1.52	1,774
Washington	2,652	1,781	2,981	1.12	1,988	3,306	1.25	2,245	3,676	1.39	2,510	4,081	1.54	2,760
Hawaii	523	364	566	1.08	398	590	1.13	420	613	1.17	442	629	1.20	459
Puerto Rico	2,441	-------	2,625	1.08	-------	2,807	1.15	-------	2,982	1.22	-------	3,146	1.29	-------
Grand Total	**170,214**	**113,784**	**183,847**	**1.08**	**121,439**	**198,750**	**1.17**	**131,780**	**215,248**	**1.26**	**143,300**	**233,533**	**1.37**	**154,779**

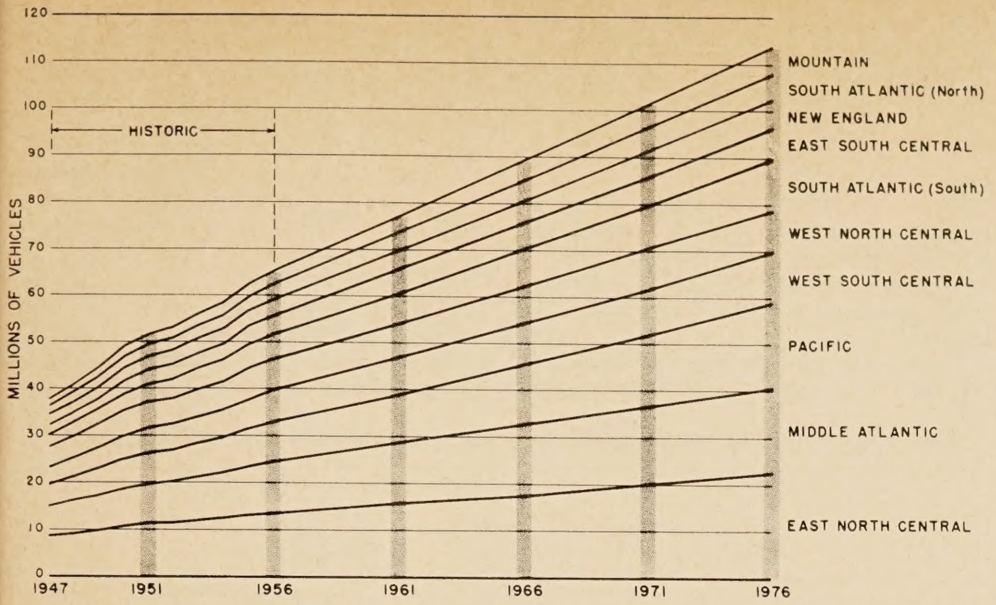

Figure 3.—State estimates of motor-vehicle registrations in the United States by census divisions for selected years, 1947–76.

Density of ownership generally tends to be greatest in the more rural States and least in those that are highly urbanized. Wyoming anticipates the highest density of motor-vehicle ownership in 1976, with 75 vehicles per hundred persons. Montana, with 70, is next highest, and is followed by Idaho, Kentucky, and Kansas. The lowest prediction among the States, reported by West Virginia, is 35 motor vehicles per hundred persons, and New York, with 39, is the second lowest.

The percentage increases in ownership densities for the 1956–76 period show that Massachusetts, in spite of its low ranking of 48 vehicles for every 100 persons, anticipates a substantial increse of 44 percent whereas Wyoming anticipates only a 35-percent increase. Kentucky, because of an extremely low forecast of population increase combined with a fairly high forecast of registrations, expects a 78-percent increase in ownership density. A similar situation exists in Alabama and Arkansas.

Population and registration gains compared

Very substantial gains in both population and registrations are expected in the Mountain and Pacific divisions during the forecast period. The same situation prevails to a somewhat lesser degree in the South Atlantic (South) d'vision. This trend is in agreement with the growth in industrial and economic stature which these geographical areas have been experiencing in the past and are expected to experience in the future. The East North Central and Middle Atlantic divisions are expected to have the greatest number of inhabitants in 1976, but they will be seriously challenged by the Pacific division. In motor-vehicle registrations, the Pacific division is expected to equal the Middle Atlantic division and to be exceeded only by the East North Central division.

Trucks and buses

In 1956 the combined total of trucks and buses registered was reported to be 10.6 million which was 16.3 percent of the reported 65.1 million motor vehicles registered (table 5). For 1976, the estimated total of trucks and buses was 18.7 million. This number represents 16.4 percent of the 113.6 million motor vehicles expected to be registered in that year.

At first it would appear that the forecasters expected the ratio of trucks and buses to total registered vehicles to remain at about the same level for the 20-year period. Closer examination of the forecasts by census divisions and States reveals, however, that this nationwide relationship is only a coincidental one reflecting the combination of differing trends among the census divisions. The percentage of trucks and buses to total motor vehicles is expected to decline in 7 of the 10 geographic areas, while gains of 1.9 percentage points in the South Atlantic (North), 2.0 in the West North Central, and 4.1 in the Pacific division are indicated. The range of decreases, in contrast with the three divisions showing increases, is much lower. The East North Central and East South Central each estimated a 0.2-percentage point decrease from 1956 to 1976, while New England predicted the greatest decrease, 2.2 percentage points.

The reasons underlying these varying projected changes are not immediately evident. The forecasts by several States reflect continuation of recently observed trends, but whether the existing trends can be expected to continue throughout the 20-year period is, of course, conjectural. A regional pattern of truck and bus ownership was revealed and is expected to continue, with some exceptions, to 1976. Thus, the New England, Middle Atlantic, and East North Central divisions reported considerably lower levels of truck and bus registrations in 1956 than did any of the other divisions except the Pacific; these three divisions—which are, in general, the most urban—expect to have even less trucks proportionally in 1976 than they had in 1956. The three divisions in the Southeast showed little relative change in truck and bus registrations from 1956 to 1976. The three divisions exhibiting the highest proportion of truck and bus registrations—the West North Central, West South Central, and Mountain divisions—are expected to occupy the same position in 1976. Only the Pacific division shows a pronounced shift in position, from among the lowest in percentage of total trucks and buses in 1956, to somewhat above the national average in 1976.

In considering the relative position of trucks and buses to total registrations, it should be borne in mind that in no case was the number of such vehicles registered expected to decline. Even in the New England and Middle Atlantic States, where the greatest percentage decline in relation to total registrations of trucks and buses is forecast, the actual number registered is expected to increase by more than 40 percent.

Table 4.—State estimates of motor-vehicle registrations in the United States (excludes Alaska and Hawaii) by census division, 1956 and 1976

Census division	1956		1976		
	Total vehicle registrations	Percent of total	Total vehicle registrations	Percent of total	Ratio: 1976/1956
	Thousands		*Thousands*		
New England	3, 598	5. 5	6, 076	5. 3	1. 69
Middle Atlantic	10, 950	16. 8	18, 125	15. 9	1. 66
South Atlantic (North)	3, 231	5. 0	5, 588	4. 9	1. 73
South Atlantic (South)	5, 381	8. 3	10, 650	9. 4	1. 98
East North Central	13, 547	20. 8	22, 236	19. 6	1. 64
East South Central	3, 932	6. 0	6, 664	5. 9	1. 69
West North Central	6, 516	10. 0	9, 386	8. 3	1. 44
West South Central	6, 617	10. 1	10, 919	9. 6	1. 65
Mountain	2, 908	4. 5	5, 807	5. 1	2. 00
Pacific	8, 439	13. 0	18, 191	16. 0	2. 16
All census divisions	65, 119	100. 0	113, 642	100. 0	1. 75

Motor-Vehicle Travel

Total motor-vehicle travel, as forecast by the States, is expected to reach an annual figure of 1.2 trillion vehicle-miles in 1976, representing an increase of 577 billion vehicle-miles, or 93 percent, over 1956. The travel trends, as predicted by the States, are somewhat higher than previous forecasts used in reports on the nation's highway needs, especially for the later years of the forecast period. Two of these reports [5] predicted that

[5] *A Ten-year National Highway Program*, A Report to the President, The President's Advisory Committee on a National Highway Program, January 1955, p. 6. *Needs of the Highway Systems, 1955–84*, House Document No. 120, Government Printing Office, March 1955.

81 million motor vehicles would travel 814 billion vehicle-miles in 1965. Estimates prepared for the Highway Cost Allocation Study indicate that in 1965 there will be 870 billion vehicle-miles traveled by 87 million motor vehicles. The differences in the forecasts become more apparent in the extended forecast period. For 1976, Highway Cost Allocation Study forecasts are 14 percent higher than the 1955 Nationwide Highway Finance Study; for 1991 they are 28 percent higher. The higher projection of traffic means, of course, that the highway needs will be greater. Increased travel is, however, only one of many factors influencing greater needs.

Historical data for 1947, 1951, and 1956, and forecasts of total travel for selected years through 1976 are shown by census divisions in figure 4, and a comparison of motor-vehicle travel for 1956 and 1976 is made in table 7. Detailed information for the individual States is contained in table 8.

Historically, total motor-vehicle travel has consistently increased at a more rapid rate than motor-vehicle registrations (table 1). This evidence was substantiated by the record of the consumption of motor fuel used on the highways.

The trend lines for highway travel and highway use of motor fuel have closely paralleled each other throughout the historical period, and have rather consistently run above the trends in motor-vehicle registrations. It seems reasonable to expect that total travel and motor-fuel consumption trends will continue in the near future, but that increases in the density of motor-vehicle ownership may be expected to put somewhat of a "brake" on their running ahead of the registration curve.

Forecasts by census divisions

A review of the travel forecasts by census divisions presented in table 7 and figure 4 shows that in the Pacific division a 149-percent increase during the forecast period is antic-

Table 5.—State forecasts of motor-vehicle registrations by census division and State for selected years, 1956–76

Census division and State	1956					1961						1966					
	Motor vehicles registered		Passenger cars	Trucks and buses		Motor vehicles registered			Passenger cars	Trucks and buses		Motor vehicles registered			Passenger cars	Trucks and buses	
	Total	Per 100 persons		Number	Percent of total	Total	Ratio: 1961/1956	Per 100 persons		Number	Percent of total	Total	Ratio: 1966/1956	Per 100 persons		Number	Percent of total
	Thousands		*Thousands*	*Thousands*		*Thousands*			*Thousands*	*Thousands*		*Thousands*			*Thousands*	*Thousands*	
United States	**65,119**	**38.9**	**54,535**	**10,584**	**16.3**	**77,002**	**1.18**	**42.6**	**64,405**	**12,597**	**16.4**	**89,161**	**1.37**	**45.6**	**74,640**	**14,521**	**16.3**
New England	**3,598**	**36.4**	**3,130**	**468**	**13.0**	**4,217**	**1.17**	**40.8**	**3,698**	**519**	**12.3**	**4,847**	**1.35**	**44.4**	**4,282**	**565**	**11.7**
Connecticut	955	41.3	842	113	11.8	1,155	1.21	47.6	1,027	128	11.1	1,355	1.42	51.6	1,212	143	10.6
Maine	340	36.4	270	70	20.6	375	1.10	38.7	300	75	20.0	410	1.21	40.9	328	82	20.0
Massachusetts	1,619	33.1	1,429	190	11.7	1,908	1.18	37.1	1,698	210	11.0	2,210	1.37	40.9	1,984	226	10.2
New Hampshire	225	40.3	184	41	18.2	266	1.18	45.4	217	49	18.4	302	1.34	49.1	248	54	17.9
Rhode Island	318	39.0	280	38	11.9	355	1.12	42.4	314	41	11.5	396	1.25	45.1	352	44	11.1
Vermont	141	38.0	125	16	11.3	158	1.12	41.9	142	16	10.1	174	1.23	45.2	158	16	9.2
Middle Atlantic	**10,950**	**33.5**	**9,561**	**1,389**	**12.7**	**12,965**	**1.18**	**37.5**	**11,361**	**1,604**	**12.4**	**14,805**	**1.35**	**40.7**	**13,057**	**1,748**	**11.8**
New Jersey	2,250	41.5	1,937	313	13.9	2,670	1.19	45.3	2,296	374	14.0	3,020	1.34	47.6	2,597	423	14.0
New York	4,810	29.6	4,279	531	11.0	5,725	1.19	33.3	5,150	575	10.0	6,475	1.35	35.7	5,875	600	9.3
Pennsylvania	3,890	35.4	3,345	545	14.0	4,570	1.17	39.9	3,915	655	14.3	5,310	1.37	44.5	4,585	725	13.7
South Atlantic (North)	**3,231**	**33.3**	**2,694**	**537**	**16.6**	**3,784**	**1.17**	**36.6**	**3,120**	**664**	**17.5**	**4,408**	**1.36**	**40.0**	**3,620**	**788**	**17.9**
Delaware	164	39.2	127	37	22.6	209	1.27	46.5	163	46	22.0	252	1.54	50.2	198	54	21.4
District of Columbia	198	23.5	174	24	12.1	200	1.01	23.1	176	24	12.0	210	1.06	23.8	185	25	11.9
Maryland	984	35.8	849	135	13.7	1,134	1.15	37.7	981	153	13.5	1,349	1.37	40.8	1,167	182	13.5
Virginia	1,315	36.2	1,091	224	17.0	1,604	1.22	41.0	1,324	280	17.5	1,910	1.45	45.4	1,561	349	18.3
West Virginia	570	27.7	453	117	20.5	637	1.12	30.5	476	161	25.3	687	1.21	32.5	509	178	25.9
South Atlantic (South)	**5,381**	**37.6**	**4,406**	**975**	**18.1**	**6,733**	**1.25**	**42.0**	**5,524**	**1,209**	**18.0**	**8,075**	**1.50**	**45.4**	**6,655**	**1,420**	**17.6**
Florida	1,783	45.9	1,517	266	14.9	2,408	1.35	49.3	2,047	361	15.0	3,033	1.70	51.5	2,578	455	15.0
Georgia	1,273	34.4	1,017	256	20.1	1,579	1.24	40.4	1,251	328	20.8	1,868	1.47	45.4	1,494	374	20.0
North Carolina	1,516	34.4	1,212	304	20.1	1,769	1.17	37.2	1,415	354	20.0	2,044	1.35	40.1	1,635	409	20.0
South Carolina	809	34.7	660	149	18.4	977	1.21	39.2	811	166	17.0	1,130	1.40	42.1	948	182	16.1
East North Central	**13,547**	**39.6**	**11,711**	**1,836**	**13.6**	**15,581**	**1.15**	**42.4**	**13,439**	**2,142**	**13.7**	**17,775**	**1.31**	**44.8**	**15,361**	**2,414**	**13.6**
Illinois	3,408	36.2	2,984	424	12.4	3,960	1.16	39.6	3,479	481	12.1	4,500	1.32	42.4	3,979	521	11.6
Indiana	1,849	41.9	1,516	333	18.0	2,174	1.18	44.8	1,783	391	18.0	2,499	1.35	47.2	2,049	450	18.0
Michigan	3,138	41.8	2,747	391	12.5	3,439	1.10	43.5	2,992	447	13.0	3,837	1.22	44.7	3,338	499	13.0
Ohio	3,706	40.9	3,271	435	11.7	4,309	1.16	43.3	3,793	516	12.0	4,986	1.35	46.0	4,389	597	12.0
Wisconsin	1,446	38.4	1,193	253	17.5	1,699	1.17	42.0	1,392	307	18.1	1,953	1.35	45.2	1,606	347	17.8
East South Central	**3,932**	**33.2**	**3,229**	**703**	**17.9**	**4,777**	**1.21**	**39.4**	**3,923**	**854**	**17.9**	**5,514**	**1.40**	**44.1**	**4,537**	**977**	**17.7**
Alabama	1,084	34.7	873	211	19.5	1,313	1.21	41.0	1,064	249	19.0	1,517	1.40	46.5	1,229	288	19.0
Kentucky	1,061	35.1	848	213	20.1	1,344	1.27	43.9	1,081	263	19.6	1,614	1.52	52.4	1,304	310	19.2
Mississippi	662	30.4	600	62	9.4	775	1.17	35.3	708	67	8.6	860	1.30	37.4	794	66	7.7
Tennessee	1,125	32.1	908	217	19.3	1,345	1.20	36.5	1,070	275	20.4	1,523	1.35	39.5	1,210	313	20.6
West North Central	**6,516**	**43.4**	**5,140**	**1,376**	**21.1**	**7,267**	**1.12**	**46.7**	**5,679**	**1,588**	**21.9**	**8,012**	**1.23**	**49.6**	**6,230**	**1,782**	**22.2**
Iowa	1,201	44.4	975	226	18.8	1,287	1.07	46.4	1,035	252	19.6	1,364	1.14	48.1	1,092	272	19.9
Kansas	1,066	51.0	812	254	23.8	1,196	1.12	54.6	911	285	23.8	1,327	1.24	57.9	1,011	316	23.8
Minnesota	1,411	43.5	1,163	248	17.6	1,631	1.16	48.1	1,337	294	18.0	1,850	1.31	52.0	1,513	337	18.2
Missouri	1,544	36.5	1,235	309	20.0	1,717	1.11	39.0	1,348	369	21.5	1,910	1.24	41.7	1,484	426	22.3
Nebraska	659	46.6	502	157	23.8	729	1.11	50.6	550	179	24.6	785	1.19	53.1	589	196	25.0
North Dakota	307	47.5	210	97	31.6	344	1.12	51.4	232	112	32.6	379	1.23	54.9	252	127	33.5
South Dakota	328	47.7	243	85	25.9	363	1.11	51.3	266	97	26.7	397	1.21	54.7	289	108	27.2
West South Central	**6,617**	**41.3**	**5,124**	**1,493**	**22.6**	**7,757**	**1.17**	**45.1**	**6,030**	**1,727**	**22.3**	**8,914**	**1.35**	**48.1**	**6,955**	**1,959**	**22.0**
Arkansas	608	33.5	420	188	30.9	663	1.09	35.7	455	208	31.4	760	1.25	40.0	516	244	32.1
Louisiana	1,006	33.8	795	211	21.0	1,249	1.24	39.2	994	255	20.4	1,493	1.48	43.9	1,194	299	20.0
Oklahoma	1,055	45.6	782	273	25.9	1,210	1.15	50.1	896	314	26.0	1,425	1.35	53.9	1,056	369	25.9
Texas	3,948	44.3	3,127	821	20.8	4,635	1.17	47.7	3,685	950	20.5	5,236	1.33	49.5	4,189	1,047	20.0
Mountain	**2,908**	**47.5**	**2,192**	**716**	**24.6**	**3,589**	**1.23**	**51.2**	**2,711**	**878**	**24.5**	**4,295**	**1.48**	**54.0**	**3,254**	**1,041**	**24.2**
Arizona	432	40.9	324	108	25.0	564	1.31	43.6	420	144	25.5	697	1.61	45.9	515	182	26.1
Colorado	770	48.8	600	170	22.1	882	1.15	50.7	688	194	22.0	1,006	1.31	52.6	785	221	22.0
Idaho	345	55.6	256	89	25.8	417	1.21	63.5	309	108	25.9	475	1.38	68.5	352	123	25.9
Montana	347	54.7	239	108	31.1	386	1.11	58.2	266	120	31.1	432	1.24	62.4	298	134	31.0
Nevada	128	52.2	99	29	22.7	167	1.30	56.0	129	38	22.8	205	1.60	58.6	159	46	22.4
New Mexico	348	41.2	260	88	25.3	485	1.39	45.8	369	116	23.9	625	1.80	48.0	481	144	23.0
Utah	362	43.9	294	68	18.8	473	1.31	48.9	383	90	19.0	607	1.68	53.8	492	115	18.9
Wyoming	176	55.7	120	56	31.8	215	1.22	63.4	147	68	31.6	248	1.41	68.7	172	76	30.6
Pacific	**8,439**	**48.2**	**7,348**	**1,091**	**12.9**	**10,332**	**1.22**	**49.9**	**8,920**	**1,412**	**13.7**	**12,516**	**1.48**	**51.2**	**10,689**	**1,827**	**14.6**
California	6,452	49.2	5,652	800	12.4	7,929	1.23	50.3	6,869	1,060	13.4	9,708	1.50	51.3	8,293	1,415	14.6
Oregon	808	46.7	730	78	9.7	989	1.22	50.5	895	94	9.5	1,168	1.45	53.2	1,055	113	9.7
Washington	1,179	44.5	966	213	18.1	1,414	1.20	47.4	1,156	258	18.2	1,640	1.39	49.6	1,341	299	18.2
Hawaii	188	35.9	160	28	14.9	218	1.16	38.5	185	33	15.1	238	1.27	40.3	201	37	15.5
Puerto Rico	123	5.0	80	43	35.0	175	1.42	6.7	122	53	30.3	196	1.59	7.0	147	49	25.0
Grand total	**65,430**	**38.4**	**54,775**	**10,655**	**16.3**	**77,395**	**1.18**	**42.1**	**64,712**	**12,683**	**16.4**	**89,595**	**1.37**	**45.1**	**74,988**	**14,607**	**16.3**

ipated. An increase of 118 percent is expected in the Mountain division. The South Atlantic (North) and South Atlantic (South) divisions are the only other divisions with percentage increases above the national average of 93 percent. The lowest increase, 65 percent, was reported in the West North Central division.

In spite of the wide variations in expected rates of increase, the Nation's overall travel pattern with respect to geographic areas is not expected to change greatly in the next 20 years. Thus, the New England, Middle Atlantic, and East North Central divisions, which accounted for 43.1 percent of total travel in 1956, are expected to account for 40.4 percent in 1976. The South Atlantic (North), South Atlantic (South), and East South Central divisions are expected to account for exactly the same proportion of total travel, 20.2 percent, in 1976 as was estimated for 1956. The West North Central and West South Central divisions, where population and registration increases are expected to be rather moderate, are predicted to account for only 17.8 percent of total travel in 1976 as compared to the 1956 estimate of 19.4 percent. Finally, the Mountain and Pacific divisions are expected to have 21.6 percent of the 1976 total travel, representing a 25-percent increase over the 1956 estimate of 17.3 percent.

Travel forecasts by States

Nevada, with an anticipated increase in total travel of 188 percent, has the highest relative forecast for any State. California and New Mexico are next highest with 165 percent each, followed closely by Utah with 162 percent. Maine anticipates the lowest percentage increase, 39 percent, with West Virginia and Vermont having the next two lowest (table 8).

Average travel per vehicle

The percentage increase in total travel as predicted by the States for the 1956–76 period was 93 percent (table 7). This percentage,

Table 5.—State forecasts of motor-vehicle registrations by census division and State for selected years, 1956–76—(*Continued*)

Census division and State	1971						1976					
	Motor vehicles registered			Passenger cars	Trucks and buses		Motor vehicles registered			Passenger cars	Trucks and buses	
	Total	Ratio: 1971/1956	Per 100 persons		Number	Percent of total	Total	Ratio: 1976/1956	Per 100 persons		Number	Percent of total
	Thousands			*Thousands*	*Thousands*		*Thousands*			*Thousands*	*Thousands*	
United States	**101,240**	**1.55**	**47.8**	**84,716**	**16,524**	**16.3**	**113,642**	**1.75**	**49.5**	**94,958**	**18,684**	**16.4**
New England	**5,465**	**1.52**	**47.4**	**4,853**	**612**	**11.2**	**6,076**	**1.69**	**49.9**	**5,419**	**657**	**10.8**
Connecticut	1,555	1.63	54.5	1,397	158	10.2	1,755	1.84	56.4	1,582	173	9.9
Maine	443	1.30	42.8	354	89	20.1	476	1.40	44.5	381	95	20.0
Massachusetts	2,510	1.55	44.2	2,267	243	9.7	2,810	1.74	47.5	2,551	259	9.2
New Hampshire	332	1.48	51.1	272	60	18.1	360	1.60	52.0	295	65	18.1
Rhode Island	437	1.37	47.6	391	46	10.5	477	1.50	49.8	428	49	10.3
Vermont	188	1.33	47.2	172	16	8.5	198	1.40	47.5	182	16	8.1
Middle Atlantic	**16,469**	**1.50**	**42.6**	**14,596**	**1,873**	**11.4**	**18,125**	**1.66**	**44.0**	**16,145**	**1,980**	**10.9**
New Jersey	3,380	1.50	48.9	2,907	473	14.0	3,750	1.67	50.0	3,225	525	14.0
New York	7,169	1.49	37.3	6,550	619	8.6	7,985	1.66	38.9	7,350	635	8.0
Pennsylvania	5,920	1.52	47.4	5,139	781	13.2	6,390	1.64	48.4	5,570	820	12.8
South Atlantic (North)	**5,020**	**1.55**	**42.7**	**4,107**	**913**	**18.2**	**5,588**	**1.73**	**44.5**	**4,552**	**1,036**	**18.5**
Delaware	296	1.80	52.5	234	62	20.9	340	2.07	53.8	269	71	20.9
District of Columbia	219	1.11	24.3	193	26	11.9	228	1.15	24.7	201	27	11.8
Maryland	1,587	1.61	43.9	1,374	213	13.4	1,809	1.84	45.9	1,566	243	13.4
Virginia	2,190	1.67	48.3	1,771	419	19.1	2,456	1.87	50.0	1,965	491	20.0
West Virginia	728	1.28	34.1	535	193	26.5	755	1.32	35.1	551	204	27.0
South Atlantic (South)	**9,386**	**1.74**	**48.0**	**7,746**	**1,640**	**17.5**	**10,650**	**1.98**	**49.9**	**8,798**	**1,852**	**17.4**
Florida	3,658	2.05	53.1	3,109	549	15.0	4,283	2.40	54.3	3,640	643	15.0
Georgia	2,157	1.69	49.6	1,725	432	20.0	2,439	1.92	53.3	1,952	487	20.0
North Carolina	2,306	1.52	42.4	1,845	461	20.0	2,543	1.68	44.0	2,034	509	20.0
South Carolina	1,265	1.56	43.7	1,067	198	15.7	1,385	1.71	44.6	1,172	213	15.4
East North Central	**20,001**	**1.48**	**46.8**	**17,315**	**2,686**	**13.4**	**22,236**	**1.64**	**48.4**	**19,257**	**2,979**	**13.4**
Illinois	5,050	1.48	44.7	4,490	560	11.1	5,581	1.64	46.1	4,967	614	11.0
Indiana	2,824	1.53	49.2	2,316	508	18.0	3,149	1.70	51.0	2,582	567	18.0
Michigan	4,257	1.36	45.6	3,704	553	13.0	4,706	1.50	46.3	4,094	612	13.0
Ohio	5,663	1.53	48.2	4,985	678	12.0	6,340	1.71	50.2	5,581	759	12.0
Wisconsin	2,207	1.53	47.9	1,820	387	17.5	2,460	1.70	50.4	2,033	427	17.4
East South Central	**6,153**	**1.56**	**47.9**	**5,064**	**1,089**	**17.7**	**6,664**	**1.69**	**50.3**	**5,484**	**1,180**	**17.7**
Alabama	1,738	1.60	52.1	1,408	330	19.0	1,939	1.79	56.2	1,571	368	19.0
Kentucky	1,825	1.72	58.5	1,479	346	19.0	1,985	1.87	62.5	1,611	374	18.8
Mississippi	940	1.42	39.2	867	73	7.8	1,010	1.53	40.4	932	78	7.7
Tennessee	1,650	1.47	41.3	1,310	340	20.6	1,730	1.54	42.0	1,370	360	20.8
West North Central	**8,710**	**1.34**	**51.7**	**6,736**	**1,974**	**22.7**	**9,386**	**1.44**	**53.2**	**7,222**	**2,164**	**23.1**
Iowa	1,424	1.19	49.1	1,134	290	20.4	1,471	1.22	49.5	1,165	306	20.8
Kansas	1,462	1.37	60.5	1,114	348	23.8	1,597	1.50	62.1	1,217	380	23.8
Minnesota	2,044	1.45	54.4	1,668	376	18.4	2,232	1.58	56.2	1,817	415	18.6
Missouri	2,088	1.35	43.6	1,606	482	23.1	2,249	1.46	44.7	1,716	533	23.7
Nebraska	842	1.28	55.3	627	215	25.5	905	1.37	57.4	670	235	26.0
North Dakota	414	1.35	58.1	272	142	34.3	449	1.46	61.3	292	157	35.0
South Dakota	436	1.33	58.2	315	121	27.8	483	1.47	61.8	345	138	28.6
West South Central	**9,911**	**1.50**	**49.7**	**7,756**	**2,155**	**21.7**	**10,919**	**1.65**	**50.9**	**8,548**	**2,371**	**21.7**
Arkansas	844	1.39	43.5	568	276	32.7	1,044	1.72	52.6	696	348	33.3
Louisiana	1,736	1.73	47.7	1,394	342	19.7	1,980	1.97	50.9	1,593	387	19.5
Oklahoma	1,578	1.50	56.4	1,169	409	25.9	1,693	1.60	57.2	1,254	439	25.9
Texas	5,753	1.46	49.8	4,625	1,128	19.6	6,202	1.57	49.1	5,005	1,197	19.3
Mountain	**5,024**	**1.73**	**56.0**	**3,819**	**1,205**	**24.0**	**5,807**	**2.00**	**57.6**	**4,428**	**1,379**	**23.7**
Arizona	829	1.92	47.5	611	218	26.3	962	2.23	48.8	707	255	26.5
Colorado	1,155	1.50	54.8	901	254	22.0	1,330	1.73	57.2	1,037	293	22.0
Idaho	503	1.46	68.2	374	129	25.6	538	1.56	68.3	400	138	25.7
Montana	479	1.38	66.4	331	148	30.9	525	1.51	70.0	362	163	31.0
Nevada	244	1.91	59.8	189	55	22.5	283	2.21	59.7	220	63	22.3
New Mexico	787	2.26	50.5	614	173	22.0	976	2.80	53.2	771	205	21.0
Utah	745	2.06	56.8	603	142	19.1	878	2.43	57.7	711	167	19.0
Wyoming	282	1.60	72.7	196	86	30.5	315	1.79	75.2	220	95	30.2
Pacific	**15,101**	**1.79**	**52.4**	**12,724**	**2,377**	**15.7**	**18,191**	**2.16**	**53.4**	**15,105**	**3,086**	**17.0**
California	11,886	1.84	52.3	9,986	1,900	16.0	14,550	2.26	53.2	12,005	2,545	17.5
Oregon	1,339	1.66	55.3	1,205	134	10.0	1,503	1.86	57.0	1,353	150	10.0
Washington	1,876	1.59	51.0	1,533	343	18.3	2,138	1.81	52.4	1,747	391	18.3
Hawaii	260	1.38	42.4	219	41	15.8	277	1.47	44.0	234	43	15.5
Puerto Rico	209	1.70	7.0	157	52	24.9	220	1.79	7.0	165	55	25.0
Grand total	**101,709**	**1.55**	**47.3**	**85,092**	**16,617**	**16.3**	**114,139**	**1.74**	**48.9**	**95,357**	**18,782**	**16.5**

Table 6.—State estimates of motor vehicles registered per 100 persons of all ages and of driving age 15–74, by census division, 1956 and 1976

Census division	Motor vehicles per 100 persons, total population		Percentage increase	Motor vehicles per 100 persons, age group 15–74		Percentage increase
	1956	1976		1956	1976	
New England	36.4	49.9	37.1	52.8	75.4	42.8
Middle Atlantic	33.5	44.0	31.3	47.9	64.4	34.4
South Atlantic (North)	33.3	44.5	33.6	48.4	66.5	37.4
South Atlantic (South)	37.6	49.9	32.7	57.0	75.5	32.5
East North Central	39.6	48.4	22.2	58.3	72.7	24.7
East South Central	33.2	50.3	51.5	51.0	75.9	48.8
West North Central	43.4	53.2	22.6	65.7	82.4	25.4
West South Central	41.3	50.9	23.2	63.3	77.9	23.1
Mountain	47.5	57.6	21.3	73.1	89.6	22.6
Pacific	48.2	53.4	10.8	68.4	77.9	13.9
All census divisions	38.9	49.5	27.2	57.4	73.6	28.2

substantially higher than the anticipated 75-percent increase in registrations, implies an increase in the average annual travel per registered motor vehicle. The 1956 average annual travel per vehicle, derived by dividing total travel by total registrations, was estimated to be 9,566 miles; the average is expected to be 10,562 by 1976, an increase of 10 percent. Although this is a relatively small percentage increase there are many who have doubts as to the validity of such a forecast. Such doubts are based largely on the belief that a family owning one vehicle and driving it 10,000 miles per year will not, on becoming a "two-car" or "car-and-truck" family, drive each vehicle 10,000 miles per year. Although this consideration is a valid one, there are several other factors which may have considerable weight in determining future rates of travel per vehicle. Among these factors are the expected continuing accelerated development of suburban areas; the development and expansion of the highway transportation industry; the anticipated growth in the Nation's economy, wealth, and population; and increased leisure time brought about by great increases in per capita productivity.

An examination of the State forecasts of average annual travel per registered vehicle shows a wide variation, not only for the two study years, but also among the States. The travel per registered vehicle—which is derived from the total travel of all motor vehicles, resident and nonresident, expected within the State, divided by total vehicle registrations of the State—is definitely affected by the State's geographic size and its location in connection with the major traffic streams of the nation. A State through which a major traffic corridor passes may be expected to show a rather high average travel per registered vehicle. To some extent, the States having special attractions for tourists will show similar travel patterns. Other factors, such as the percentage of trucks and buses to total registrations, will also have an appreciable affect on travel averages for the individual States. On a census division or national basis, however, the figures given may be considered entirely reasonable.

In 1956, the South Atlantic (North) division had the highest average annual travel per registered motor vehicle, 10,874 miles, followed by the South Atlantic (South) division with 10,081 miles. The lowest annual travel, 9,085 miles per registered vehicle was in the West North Central division. The 1976 projections show the South Atlantic (North) division as still the highest, with an estimated average annual travel of 12,442 miles per registered vehicle. Second highest, with 10,887 miles, was the Pacific census division. The lowest average annual travel, 9,800 miles per vehicle, was anticipated in the East South Central division, and the next lowest was the New England division estimate of 10,133 miles.

The annual average travel per registered motor vehicle points up, probably more than any other single item, the variations of the State forecasts. For example, the South Atlantic (South) division ranked second in 1956 but is expected to rank eighth in 1976; only a 1-percent increase is anticipated over the 20-year period, the smallest increase for any of the census divisions. The Pacific division, having the greatest annual travel rate increase, is expected to rise from seventh ranking to second in 1976. The West South Central division, ninth in 1956, is predicted to be third in 1976, and the New England division is expected to drop from fifth to ninth place.

For 1956, Virginia had the highest average annual travel per registered motor vehicle, with an estimate of 11,802 miles. New Mexico was next highest with 11,710 miles, followed by Georgia with 11,703 miles per vehicle. Montana reported the lowest annual travel, 7,660 miles per registered motor vehicle, and North Dakota's estimate of 7,697 miles was second lowest.

For 1976, the three highest State estimates were those for Nevada, Maryland, and New Jersey, ranging from 14,611 to 12,907 miles per registered vehicle. Louisiana's average vehicle travel in 1976 of 8,406 miles was the lowest among the States, and the next lowest estimates were for Montana (8,741) and North Dakota (8,820).

As noted in the discussion of the divisions, there appear to be some variations in the trends of average annual travel among the States. For example, the travel forecasts for

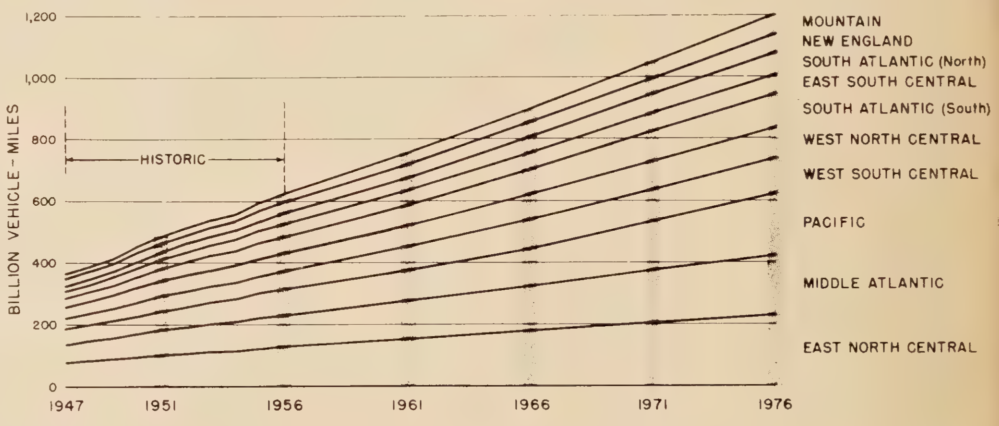

Figure 4.—State estimates of motor-vehicle travel in the United States by census divisions for selected years, 1947–76.

Table 7.—State estimates of total motor-vehicle travel in the United States (excludes Alaska and Hawaii) by census division, 1956 and 1976

Census division	1956			1976				
	Total travel, vehicle-miles	Percent of total	Travel per registered vehicle	Total travel, vehicle-miles	Percent of total	Travel per registered vehicle	Ratio: total travel 1976/1956	Ratio: travel per registered vehicle 1976/1956
	Millions		*Miles*	*Millions*		*Miles*		
New England	34,375	5.5	9,554	61,569	5.1	10,133	1.79	1.06
Middle Atlantic	103,637	16.7	9,465	191,513	16.0	10,566	1.85	1.12
South Atlantic (North)	35,134	5.6	10,874	69,528	5.8	12,442	1.98	1.14
South Atlantic (South)	54,248	8.7	10,081	108,521	9.0	10,190	2.00	1.01
East North Central	130,170	20.9	9,609	231,025	19.3	10,390	1.77	1.08
East South Central	36,979	5.9	9,405	65,306	5.4	9,800	1.77	1.04
West North Central	59,197	9.5	9,085	97,479	8.1	10,386	1.65	1.14
West South Central	61,762	9.9	9,334	116,610	9.7	10,680	1.89	1.14
Mountain	27,808	4.5	9,563	60,667	5.1	10,447	2.18	1.09
Pacific	79,622	12.8	9,435	198,045	16.5	10,887	2.49	1.15
All census divisions	622,932	100.0	9,566	1,200,263	100.0	10,562	1.93	1.10

Table 8.—State forecasts of travel in the United States by census division and State for selected years, 1947–76

Census division and State	1947 travel			1951 travel			1956 travel		1961 travel			1966 travel			1971 travel			1976 travel		
	Total vehicle-miles	Ratio: 1947/1956	Per registered vehicle	Total vehicle-miles	Ratio: 1951/1956	Per registered vehicle	Total vehicle-miles	Per registered vehicle	Total vehicle-miles	Ratio: 1961/1956	Per registered vehicle	Total vehicle-miles	Ratio: 1966/1956	Per registered vehicle	Total vehicle-miles	Ratio: 1971/1956	Per registered vehicle	Total vehicle-miles	Ratio: 1976/1956	Per registered vehicle
	Millions		*Miles*	*Millions*		*Miles*	*Millions*	*Miles*	*Millions*		*Miles*	*Millions*		*Miles*	*Millions*		*Miles*	*Millions*		*Miles*
United States	360,689	0.58	9,566	484,582	0.78	9,383	622,932	9,566	753,764	1.21	9,789	898,691	1.44	10,079	1,051,412	1.69	10,385	1,200,263	1.93	10,562
New England	**21,682**	**.63**	**9,215**	**27,031**	**.79**	**9,156**	**34,375**	**9,554**	**41,359**	**1.20**	**9,808**	**48,299**	**1.41**	**9,965**	**55,088**	**1.60**	**10,080**	**61,569**	**1.79**	**10,133**
Connecticut	5,262	.59	8,829	6,795	.76	8,882	8,912	9,332	11,080	1.24	9,593	13,200	1.48	9,742	15,320	1.72	9,852	17,440	1.96	9,937
Maine	2,492	.67	10,383	2,993	.81	10,844	3,710	10,912	4,077	1.10	10,872	4,441	1.20	10,832	4,806	1.30	10,849	5,170	1.39	10,861
Massachusetts	9,660	.65	9,226	11,900	.80	8,834	14,896	9,201	18,100	1.22	9,486	21,400	1.44	9,683	24,700	1.66	9,841	27,800	1.87	9,893
New Hampshire	1,413	.56	9,235	1,938	.77	10,767	2,522	11,209	3,098	1.23	11,647	3,623	1.44	11,997	4,101	1.63	12,352	4,519	1.79	12,553
Rhode Island	1,830	.63	8,756	2,170	.75	8,314	2,910	9,151	3,370	1.16	9,493	3,810	1.31	9,621	4,160	1.43	9,519	4,490	1.54	9,413
Vermont	1,025	.72	9,491	1,235	.87	10,041	1,425	10,106	1,634	1.15	10,342	1,825	1.28	10,489	2,001	1.40	10,644	2,150	1.51	10,859
Middle Atlantic	**60,002**	**.58**	**9,286**	**80,269**	**.77**	**9,208**	**103,637**	**9,465**	**126,880**	**1.22**	**9,786**	**148,138**	**1.43**	**10,006**	**169,648**	**1.64**	**10,301**	**191,513**	**1.85**	**10,566**
New Jersey	12,710	.53	10,152	17,320	.72	10,200	24,000	10,667	30,500	1.27	11,423	35,900	1.50	11,887	41,900	1.75	12,396	48,400	2.02	12,907
New York	25,881	.62	8,983	33,562	.80	8,763	42,042	8,741	52,050	1.24	9,092	61,928	1.47	9,564	72,238	1.72	10,076	83,183	1.98	10,417
Pennsylvania	22,011	.59	9,198	29,387	.78	9,215	37,595	9,665	44,330	1.18	9,700	50,310	1.34	9,475	55,510	1.48	9,377	59,930	1.59	9,379
South Atlantic (North)	**17,192**	**.49**	**9,354**	**25,241**	**.72**	**10,084**	**35,134**	**10,874**	**43,084**	**1.23**	**11,386**	**51,677**	**1.47**	**11,723**	**60,540**	**1.72**	**12,060**	**69,528**	**1.98**	**12,442**
Delaware	840	.44	10,500	1,250	.66	10,684	1,900	11,585	2,288	1.20	10,947	2,675	1.41	10,615	3,063	1.61	10,348	3,450	1.82	10,147
District of Columbia	1,124	.57	7,114	1,598	.81	8,455	1,975	9,975	2,379	1.20	11,895	2,759	1.40	13,138	3,167	1.60	14,461	3,496	1.77	15,333
Maryland	4,880	.49	9,037	7,031	.70	9,618	10,023	10,186	12,338	1.23	10,880	15,576	1.55	11,546	19,557	1.95	12,323	23,734	2.37	13,120
Virginia	6,757	.44	9,504	10,665	.69	10,838	15,519	11,802	19,459	1.25	12,132	23,467	1.51	12,286	27,121	1.75	12,384	30,748	1.98	12,520
West Virginia	3,591	.63	10,289	4,697	.82	9,745	5,717	10,030	6,620	1.16	10,392	7,200	1.26	10,480	7,632	1.33	10,484	8,100	1.42	10,728
South Atlantic (South)	**26,844**	**.49**	**10,337**	**38,833**	**.72**	**10,113**	**54,248**	**10,081**	**67,803**	**1.25**	**10,070**	**82,063**	**1.51**	**10,163**	**95,853**	**1.77**	**10,212**	**108,521**	**2.00**	**10,190**
Florida	7,490	.47	10,685	10,882	.68	9,929	16,054	9,004	22,194	1.38	9,217	28,333	1.76	9,342	34,473	2.15	9,424	39,988	2.49	9,336
Georgia	7,446	.50	11,316	10,680	.72	11,022	14,898	11,703	17,600	1.18	11,146	20,900	1.40	11,188	24,300	1.63	11,266	27,600	1.85	11,316
North Carolina	7,475	.50	9,559	10,890	.72	9,646	15,070	9,941	17,899	1.19	10,118	20,825	1.38	10,188	23,520	1.56	10,199	25,942	1.72	10,201
South Carolina	4,433	.54	9,721	6,381	.78	9,878	8,226	10,168	10,110	1.23	10,348	12,005	1.46	10,624	13,560	1.65	10,719	14,991	1.82	10,824
East North Central	**76,879**	**.59**	**9,261**	**104,338**	**.80**	**9,444**	**30,170**	**9,609**	**154,175**	**1.18**	**9,895**	**180,141**	**1.38**	**10,135**	**208,958**	**1.61**	**10,447**	**231,025**	**1.77**	**10,390**
Illinois	20,312	.61	9,933	29,013	.88	10,403	33,039	9,695	39,600	1.20	10,000	45,000	1.36	10,000	50,500	1.53	10,000	56,000	1.69	10,034
Indiana	9,934	.53	8,661	13,833	.74	9,271	18,597	10,058	22,432	1.21	10,318	26,267	1.41	10,511	30,102	1.62	10,659	33,937	1.82	10,777
Michigan	17,612	.59	9,650	23,483	.78	9,191	30,044	9,574	35,500	1.18	10,323	43,500	1.45	11,337	54,000	1.80	12,685	57,750	1.92	12,272
Ohio	20,027	.58	8,730	26,830	.78	9,046	34,579	9,331	40,000	1.16	9,283	46,000	1.33	9,226	52,250	1.51	9,227	58,500	1.69	9,227
Wisconsin	8,994	.65	9,085	11,179	.80	8,972	13,911	9,620	16,643	1.20	9,796	19,374	1.39	9,920	22,106	1.59	10,016	24,838	1.79	10,097
East South Central	**20,450**	**.55**	**10,174**	**28,548**	**.77**	**9,658**	**36,979**	**9,405**	**45,078**	**1.22**	**9,436**	**52,494**	**1.42**	**9,520**	**59,275**	**1.60**	**9,634**	**65,306**	**1.77**	**9,800**
Alabama	4,890	.49	9,939	7,101	.71	9,727	10,008	9,232	12,048	1.20	9,176	13,836	1.38	9,121	15,804	1.58	9,093	17,568	1.76	9,060
Kentucky	5,620	.55	10,181	7,590	.75	9,256	10,130	9,548	12,650	1.25	9,412	15,200	1.50	9,418	17,060	1.68	9,348	18,550	1.83	9,345
Mississippi	3,847	.65	10,716	5,319	.90	10,429	5,935	8,965	7,250	1.22	9,355	8,475	1.43	9,855	9,575	1.61	10,186	10,500	1.77	10,396
Tennessee	6,093	.56	10,038	8,538	.78	9,529	10,906	9,694	13,130	1.20	9,762	14,983	1.37	9,838	16,836	1.54	10,204	18,688	1.71	10,802
West North Central	**38,684**	**.65**	**8.901**	**50,432**	**.85**	**8.876**	**59,197**	**9,085**	**69,961**	**1.18**	**79,627**	**79,827**	**1.35**	**9.963**	**89.543**	**1.51**	**10.280**	**97.479**	**1.65**	**10.386**
Iowa	7,574	.73	9,192	9,696	.93	8,815	10,382	8,644	12,400	1.19	9,635	14,100	1.36	10,337	16,100	1.55	11,306	17,500	1.69	11,897
Kansas	6,300	.64	8,962	8,167	.83	9,146	9,822	9,214	11,460	1.17	9,582	13,060	1.33	9,842	14,660	1.49	10,027	16,260	1.66	10,182
Minnesota	7,641	.62	8,713	9,909	.80	8,327	12,379	8,773	14,588	1.18	8,944	16,796	1.36	9,079	19,005	1.54	9,298	21,161	1.71	9,481
Missouri	9,737	.64	9,372	12,728	.83	9,679	15,290	9,903	18,329	1.20	10,675	20,901	1.37	10,943	22,951	1.50	10,992	23,890	1.56	10,622
Nebraska	3,932	.66	8,348	5,150	.86	8,456	6,000	9,105	6,960	1.16	9,547	7,925	1.32	10,096	8,890	1.48	10,558	9,790	1.63	10,818
North Dakota	1,576	.67	7,399	2,185	.92	7,776	2,363	7,697	2,775	1.17	8,067	3,180	1.35	8,391	3,592	1.52	8,676	3,960	1.68	8,820
South Dakota	1,924	.65	8,785	2,597	.88	8,833	2,961	9,027	3,449	1.16	9,501	3,865	1.31	9,736	4,345	1.47	9,966	4,918	1.66	10,182
West South Central	**34,254**	**.55**	**9,776**	**48,012**	**.78**	**9,128**	**61,762**	**9,334**	**75,738**	**1.23**	**9,764**	**91,577**	**1.48**	**10,273**	**105,612**	**1.71**	**10,656**	**116,610**	**1.89**	**10,680**
Arkansas	3,375	.53	9,427	4,865	.76	9,730	6,388	10,507	7,590	1.19	11,448	9,102	1.42	11,976	10,615	1.66	12,577	12,127	1.90	11,616
Louisiana	4,709	.53	9,893	6,452	.72	8,707	8,953	8,900	11,046	1.23	8,844	12,926	1.44	8,658	14,782	1.65	8,515	16,644	1.86	8,406
Oklahoma	5,543	.56	8,926	7,552	.77	8,721	9,855	9,341	11,699	1.19	9,669	14,229	1.44	9,985	16,265	1.65	10,307	17,993	1.83	10,628
Texas	20,627	.56	10,067	29,143	.80	9,243	36,566	9,262	45,403	1.24	9,796	55,320	1.51	10,565	63,950	1.75	11,116	69,846	1.91	11,262
Mountain	**15,634**	**.56**	**10,368**	**21,452**	**.77**	**9,822**	**27,808**	**9,563**	**35,244**	**1.27**	**9,820**	**43,318**	**1.56**	**10,086**	**51,937**	**1.87**	**10,338**	**60,667**	**2.18**	**10,447**
Arizona	2,359	.54	12,351	3,380	.77	11,536	4,367	10,109	5,688	1.30	10,085	7,009	1.60	10,056	8,330	1.91	10,048	9,651	2.21	10,032
Colorado	3,813	.57	8,930	5,187	.77	8,762	6,733	8,744	8,426	1.25	9,553	10,168	1.51	10,107	11,910	1.77	10,312	13,652	2.03	10,265
Idaho	1,969	.66	10,309	2,429	.82	8,833	2,977	8,629	3,371	1.13	8,084	3,814	1.28	8,029	4,315	1.45	8,579	4,789	1.61	8,901
Montana	1,560	.59	7,879	2,156	.81	7,783	2,658	7,660	3,140	1.18	8,135	3,624	1.36	8,389	4,108	1.55	8,576	4,589	1.73	8,741
Nevada	722	.50	12,667	1,059	.74	12,607	1,435	11,211	2,069	1.44	12,389	2,759	1.92	13,459	3,476	2.42	14,246	4,135	2.88	14,611
New Mexico	2,008	.49	12,709	2,988	.73	11,764	4,075	11,710	5,203	1.28	10,728	6,659	1.63	10,654	8,546	2.10	10,859	10,800	2.65	11,066
Utah	2,057	.59	11,179	2,695	.77	10,365	3,506	9,685	4,807	1.37	10,163	6,246	1.78	10,290	7,742	2.21	10,392	9,191	2.62	10,468
Wyoming	1,146	.56	11,235	1,558	.76	10,456	2,057	11,688	2,540	1.23	11,814	3,039	1.48	12,254	3,510	1.71	12,447	3,860	1.88	12,254
Pacific	**48,468**	**.61**	**10,266**	**60,426**	**.76**	**9,295**	**79,622**	**9,435**	**94,442**	**1.19**	**9,141**	**121,157**	**1.52**	**9,680**	**154,958**	**1.95**	**10,261**	**198,045**	**2.49**	**10,887**
California	36,100	.59	10,383	45,200	.73	9,297	61,600	9,547	72,300	1.17	9,118	94,800	1.54	9,765	124,500	2.02	10,475	163,300	2.65	11,223
Oregon	5,192	.70	9,759	6,348	.86	9,187	7,370	9,121	9,600	1.30	9,707	11,650	1.58	9,974	13,550	1.84	10,119	15,400	2.09	10,246
Washington	7,176	.67	10,079	8,878	.83	9,365	10,652	9,035	12,542	1.18	8,870	14,707	1.38	8,968	16,908	1.59	9,013	19,345	1.82	9,048
Hawaii	1,026	.64	10,426	1,365	.85	8,922	1,608	8,553	1,870	1.16	8,578	2,129	1.32	8,945	2,388	1.49	9,185	2,646	1.65	9,552
Puerto Rico	762	.53	18,910	1,047	.72	15,997	1,450	11,789	1,963	1.35	11,217	2,436	1.68	12,429	2,843	1.96	13,603	3,157	2.18	14,350
Grand total	362,477	.58	9,579	486,994	.78	9,390	625,990	9,567	757,597	1.21	9,789	903,256	1.44	10,082	1,056,643	1.69	10,389	1,206,066	1.93	10,567

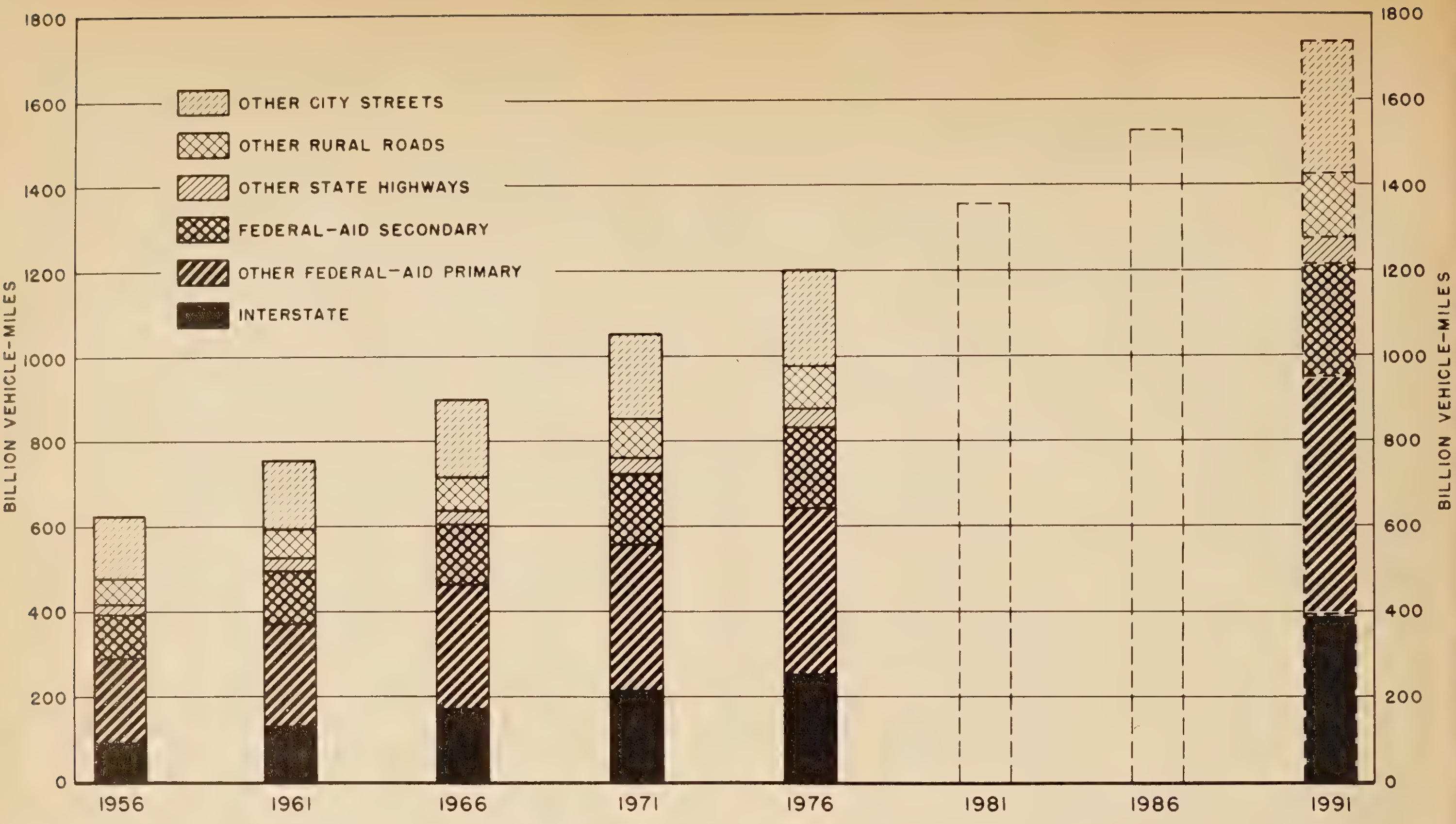

Figure 5.—State estimates of total travel in the United States by highway classifications for selected years, 1956–91.

10 States indicate less annual average travel per motor vehicle in 1976 than in 1956; the decreases ranging from 51 to 1,438 miles per registered vehicle. On the other hand, the travel forecasts for 38 States indicate increases over the 20-year period of up to 3,600 miles per registered motor vehicle.

Travel by road systems

The tabulations of future travel by highway classifications, as prepared by the States, show that a definite shift is expected to occur in the percentage of total travel on the various classes of highways during the forecast period. This information is presented in figure 5 and tables 9 and 10.

In 1956, the Interstate and other Federal-aid primary systems carried 46.6 percent of the Nation's total highway travel. By 1976, travel on these two systems is expected to amount to approximately 54 percent of the total. By far the largest percentage increase in travel will occur on the Interstate System, a growth of from 15 percent in 1956 to 21 percent in 1976.

The percentages of total travel occurring on the Federal-aid secondary system and on State highways not a part of any Federal-aid system are expected to decrease slightly during the forecast period. Much more material decreases are expected to occur on local rural roads and city streets, however. In 1956, travel on local rural roads amounted to 9.9 percent of total travel, and travel on city streets amounted to 23.0 percent of the total. By 1976, these percentages are expected to be 8.6 and 18.4, respectively.

It is not anticipated, however, that there will be any decrease in total vehicle-miles of travel on any class of highways during the 20-year period. In fact, the forecast increases in terms of vehicle-miles are indeed impressive, as may be seen in figure 5 and table 9.

Travel on the Interstate System is expected to almost triple the 1956 figure by 1976, and to be more than four times as great by 1991 (table 9). This increase is the highest anticipated for any of the several highway classifications during the forecast period. On the Federal-aid primary system, excluding the Interstate System, the 1956 travel estimate is expected to almost be doubled by 1976.

Estimates of total travel on all roads and streets show that the States anticipate an increase of 93 percent during the 20-year period, 1956–76. By 1991, total travel is expected to be 2.8 times that reported in 1956.

Among the census divisions (table 10), travel on the Interstate System will constitute a larger percentage of total travel in 1976 than in 1956, varying from 34.2 percent in

Table 9.—State estimates of motor-vehicle travel in the United States (excludes Alaska and Hawaii) by highway classifications for years, 1956, 1976, and 1991

Highway classification	1956		1976			1991		
	Million vehicle-miles	Percent of total	Million vehicle-miles	Percent of total	Ratio: 1976/1956	Million vehicle-miles	Percent of total	Ratio: 1991/1956
Interstate:								
Rural	58, 685	9. 4	163, 640	13. 6	2. 79	243, 315	14. 0	4. 15
Urban	32, 973	5. 3	92, 244	7. 7	2. 80	150, 450	8. 7	4. 56
Total	91, 658	14. 7	255, 884	21. 3	2. 79	393, 765	22. 7	4. 30
Federal-aid Primary:								
Rural	142, 510	22. 9	267, 341	22. 3	1. 88	370, 434	21. 4	2. 60
Urban	56, 148	9. 0	120, 669	10. 0	2. 15	186, 535	10. 7	3. 32
Total	198, 658	31. 9	388, 010	32. 3	1. 95	556, 969	32. 1	2. 80
Federal-aid Secondary:								
Rural	86, 294	13. 8	155, 426	12. 9	1. 80	215, 854	12. 5	2. 50
Urban	16, 620	2. 7	33, 018	2. 8	1. 99	48, 306	2. 8	2. 91
Total	102, 914	16. 5	188, 444	15. 7	1. 83	264, 160	15. 3	2. 57
Other State Highways:								
Rural	14, 177	2. 3	25, 140	2. 1	1. 77	34, 982	2. 0	2. 47
Urban	10, 431	1. 7	18, 655	1. 6	1. 79	28, 240	1. 6	2. 71
Total	24, 608	4. 0	43, 795	3. 7	1. 78	63, 222	3. 6	2. 57
Other Roads and Streets:								
Rural roads	61, 539	9. 9	103, 402	8. 6	1. 68	149, 601	8. 6	2. 43
City streets	143, 555	23. 0	220, 728	18. 4	1. 54	305, 885	17. 7	2. 13
Total	205, 094	32. 9	324, 130	27. 0	1. 58	455, 486	26. 3	2. 22
All highways	622, 932	100. 0	1, 200, 263	100. 0	1. 93	1, 733, 602	100. 0	2. 78

Table 10.—Percentage distribution of travel estimated by the States (excludes Alaska and Hawaii) by highway classification and census division, 1956 and 1976

Census division	Percentage distribution of travel								
	Federal-aid systems			Not on Federal-aid systems			Total	All roads and streets	
	Interstate	Other Federal-aid primary	Federal-aid secondary	State highways	Local rural roads	City streets		Rural	Urban
New England:									
1956	12.8	30.2	15.2	10.2	10.5	21.1	100.0	49.6	50.4
1976	20.1	27.5	15.2	9.8	9.8	17.6	100.0	50.2	49.8
Middle Atlantic:									
1956	10.1	31.5	15.3	6.1	13.1	23.9	100.0	50.1	49.9
1976	16.7	32.8	14.6	5.7	12.0	18.2	100.0	50.4	49.6
South Atlantic (North):									
1956	14.8	35.4	22.9	3.1	7.0	16.8	100.0	65.2	34.8
1976	24.6	32.9	19.9	2.7	6.0	13.9	100.0	67.2	32.8
South Atlantic (South):									
1956	12.9	35.3	22.7	4.2	7.4	17.5	100.0	68.6	31.4
1976	21.8	33.9	20.5	3.5	5.7	14.6	100.0	69.8	30.2
East North Central:									
1956	14.7	28.3	13.4	3.5	9.3	30.8	100.0	52.2	47.8
1976	19.8	29.4	13.3	3.1	7.5	26.9	100.0	55.0	45.0
East South Central:									
1956	17.7	35.4	18.4	2.1	8.8	17.6	100.0	67.7	32.3
1976	23.1	36.0	19.0	.6	6.7	14.6	100.0	68.7	31.3
West North Central:									
1956	11.6	40.2	14.6	.5	9.9	23.2	100.0	66.2	33.8
1976	21.8	37.0	14.7	.4	6.5	19.6	100.0	67.5	32.5
West South Central:									
1956	15.8	34.1	18.8	4.3	7.1	19.9	100.0	64.2	35.8
1976	24.4	33.3	16.5	3.6	5.5	16.7	100.0	64.5	35.5
Mountain:									
1956	27.6	30.9	16.9	1.9	8.4	14.3	100.0	74.5	25.5
1976	34.2	31.8	15.6	2.5	5.1	10.8	100.0	77.1	22.9
Pacific:									
1956	18.5	26.0	15.4	3.2	12.4	24.5	100.0	52.2	47.8
1976	20.0	31.7	14.6	3.8	13.4	16.5	100.0	53.2	46.8
All census divisions:									
1956	14.7	31.9	16.5	4.0	9.9	23.0	100.0	58.3	41.7
1976	21.3	32.3	15.7	3.7	8.6	18.4	100.0	59.6	40.4

the Mountain division to 16.7 in the Middle Atlantic division.

For the forecast period, the West North Central division predicts the largest relative increase of travel on the Interstate System, rising from 11.6 percent of all travel in 1956 to 21.8 percent in 1976. The Pacific division estimates the smallest increase, rising from 18.5 to 20.0 percent, during the forecast period.

Moderate fluctuations appear in the distribution of travel on the Federal-aid primary routes, excluding the Interstate System, over the 20-year period. Half of the census divisions estimate a percentage decrease from 1956 to 1976 in the amount of travel, while the other half predict a percentage increase. The Pacific division is expected to have an increase of 5.7 percentage points, whereas a decrease of 3.2 percentage points is predicted for the West North Central division. It will be noted that these two divisions occupied practically opposite positions in the 1976 travel estimates for the Interstate System. For all census divisions a slight percentage increase is anticipated for travel on the other Federal-aid primary routes.

The proportion of total travel on the Federal-aid secondary system is expected to decrease in seven of the census divisions, increase in two divisions, and remain the same in the New England division. For all census divisions, 15.7 percent of all travel for 1976 will be on the Federal-aid secondary system. In percentage points, this represents a 0.8 decrease from the 1956 travel estimate.

In the Mountain and Pacific divisions it is expected that State highways not on the Federal-aid system will carry a larger percentage of total travel in 1976 than they did in 1956, while in the other eight divisions percentage decreases are expected. This class of highways is expected to carry as much as 9.8 percent of the 1976 total travel in the New England division and as little as 0.4 percent in the West North Central division. The extent to which Federal-aid and State highway mileages coincide in an individual State is, of course, an important factor in determining how much travel will be performed on State highways not a part of any Federal-aid system.

Of the 10 census divisions, only in the Pacific division is it anticipated that local rural roads not on the Federal-aid systems will carry a larger percentage of total travel in 1976 than in 1956—a rise from 12.4 to 13.4 percent. This latter percentage figure for local road travel in relation to total travel is predicted to be the greatest among the census divisions in 1976. Estimates for the other nine divisions show percentage point decreases in local road travel ranging from 3.4 in the West North Central to 0.7 in New England. The smallest percentage of travel in 1976 on local rural roads, 5.1 percent, is anticipated in the Mountain division.

In 1976, as compared to 1956, the percentage of total travel on city streets which are not a part of the Federal-aid systems is expected to decrease in all census divisions. The decreases range from 8.0 percentage points in the Pacific division to 2.9 in both the South Atlantic (North) and South Atlantic (South) divisions. The expected range of travel on city streets is from 26.9 percent of total travel in the East North Central division to only 10.8 percent of the travel in the Mountain division.

Of the total 1956 travel on all classes of highways 58.3 percent took place on the rural roads, and 41.7 percent of the travel was carried on urban roads and streets. The forecasts of 1976 travel show that there will be little change in these percentage distributions of travel. However, it appears that there will be a substantial shift of travel from city streets not on any Federal-aid system to those which are a part of the Federal-aid systems.

Motor-Fuel Consumption

According to the State estimates, as summarized by census divisions in table 11 and figure 6, consumption of motor fuel is expected to increase 94 percent during the 1956–76 period, an increase of 47 billion gallons.

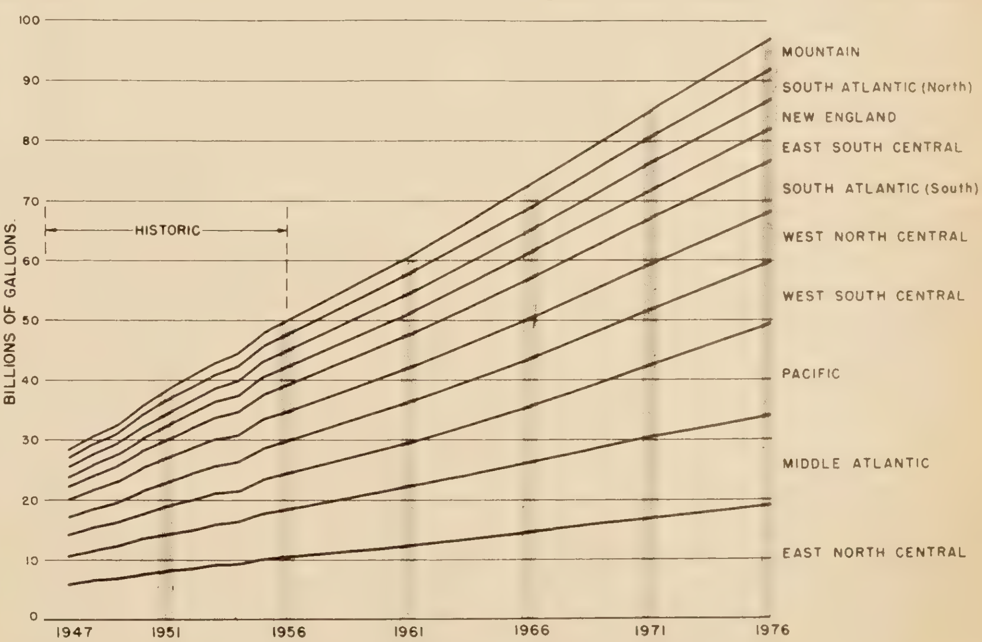

Figure 6.—State estimates of motor-fuel consumption in the United States by census divisions for selected years, 1947–76.

Table 11.—State estimates of motor-fuel consumption in the United States (excludes Alaska and Hawaii) by census division, 1956 and 1976

Census division	1956				1976					
	Total gallons	Percent of total	Gallons per registered vehicle	Miles per gallon	Total gallons	Percent of total	Ratio: 1976/1956	Gallons per registered vehicle	Ratio: 1976/1956	Miles per gallon
	Millions				*Millions*					
New England	2,730	5.5	759	12.59	4,874	5.0	1.79	802	1.06	12.63
Middle Atlantic	7,997	16.0	730	12.96	14,916	15.4	1.87	823	1.13	12.84
South Atlantic (North)	2,713	5.4	840	12.95	5,111	5.3	1.88	915	1.09	13.60
South Atlantic (South)	4,347	8.7	808	12.48	8,703	9.0	2.00	817	1.01	12.47
East North Central	10,356	20.7	764	12.57	19,078	19.6	1.84	858	1.12	12.11
East South Central	3,109	6.2	791	11.89	5,189	5.3	1.67	779	.98	12.59
West North Central	4,894	9.8	751	12.10	8,299	8.5	1.70	884	1.18	11.75
West South Central	5,340	10.7	807	11.57	10,314	10.6	1.93	945	1.17	11.31
Mountain	2,345	4.7	806	11.86	5,210	5.4	2.22	897	1.11	11.64
Pacific	6,180	12.3	732	12.88	15,450	15.9	2.50	849	1.16	12.82
All census divisions	50,011	100.0	768	12.46	97,144	100.0	1.94	855	1.11	12.36

The magnitudes of such figures are difficult to comprehend. Visualize a lake 1 mile square filled with motor fuel to a depth of about 240 feet, and this would be the gallons of motor fuel consumed in 1956; fill the same lake to a depth of about 465 feet and you would have the gallonage which is expected to be consumed in 1976.

The estimated percentage increase in motor-fuel consumption is but one percentage point greater than the anticipated increase in total travel. The closeness of the two forecasts indicates that there is expected to be very little change in the overall miles-per-gallon value during the forecast period. In 1956, the estimated average miles-per-gallon value was 12.46; in 1976, the average value is expected to be 12.36 miles per gallon. There is

Table 12.—State forecasts of motor-fuel consumption in the United States by census division and State for selected years, 1947–76

Census division and State	1947				1951				1956			1961			
	Total gallons	Ratio: 1947/1956	Gallons per registered vehicle	Miles per gallon	Total gallons	Ratio: 1951/1956	Gallons per registered vehicle	Miles per gallon	Total gallons	Gallons per registered vehicle	Miles per gallon	Total gallons	Ratio: 1961/1956	Gallons per registered vehicle	Miles per gallon
	Millions				*Millions*				*Millions*			*Millions*			
United States	**28,244**	**0.56**	**749**	**12.8**	**38,207**	**0.76**	**740**	**12.7**	**50,011**	**768**	**12.4**	**60,690**	**1.21**	**788**	**12.4**
New England	**1,694**	**.62**	**720**	**12.8**	**2,131**	**.78**	**722**	**12.7**	**2,730**	**759**	**12.6**	**3,262**	**1.19**	**774**	**12.7**
Connecticut	405	.59	680	13.0	523	.76	684	13.0	685	717	13.0	852	1.24	738	13.0
Maine	190	.67	792	13.1	228	.81	826	13.1	283	832	13.1	309	1.09	824	13.2
Massachusetts	769	.62	734	12.6	979	.79	727	12.2	1,234	762	12.1	1,480	1.20	776	12.2
New Hampshire	108	.61	706	13.1	134	.76	744	14.5	176	782	14.3	220	1.25	827	14.1
Rhode Island	141	.61	675	13.0	167	.72	640	13.0	231	726	12.6	262	1.13	738	12.9
Vermont	81	.67	750	12.7	100	.83	813	12.4	121	858	11.8	139	1.15	880	11.8
Middle Atlantic	**4,583**	**.57**	**702**	**13.2**	**6,126**	**.77**	**703**	**13.1**	**7,997**	**730**	**13.0**	**9,752**	**1.22**	**752**	**13.0**
New Jersey	947	.53	756	13.4	1,306	.73	769	13.3	1,792	796	13.4	2,272	1.27	851	13.4
New York	1,943	.59	674	13.3	2,560	.77	668	13.1	3,313	689	12.7	4,070	1.23	711	12.8
Pennsylvania	1,693	.59	707	13.0	2,260	.78	709	13.0	2,892	743	13.0	3,410	1.18	746	13.0
South Atlantic (North)	**1,440**	**.53**	**783**	**11.9**	**2,047**	**.75**	**818**	**12.3**	**2,713**	**840**	**13.0**	**3,269**	**1.20**	**864**	**13.2**
Delaware	68	.48	850	12.4	98	.70	838	12.8	141	860	13.5	181	1.28	866	12.6
District of Columbia	153	.78	968	7.3	201	1.02	1,063	8.0	197	995	10.0	203	1.03	1,015	11.7
Maryland	375	.49	694	13.0	541	.70	740	13.0	771	784	13.0	940	1.22	829	13.1
Virginia	567	.50	797	11.9	830	.73	843	12.8	1,140	867	13.6	1,418	1.24	884	13.7
West Virginia	277	.60	794	13.0	377	.81	782	12.5	464	814	12.3	527	1.14	827	12.6
South Atlantic (South)	**2,149**	**.49**	**827**	**12.5**	**3,130**	**.72**	**815**	**12.4**	**4,347**	**808**	**12.5**	**5,449**	**1.25**	**809**	**12.4**
Florida	591	.47	843	12.7	868	.69	792	12.5	1,265	709	12.7	1,749	1.38	726	12.7
Georgia	540	.48	821	13.8	778	.69	803	13.7	1,124	883	13.3	1,355	1.21	858	13.0
North Carolina	682	.52	872	11.0	997	.76	883	10.9	1,309	863	11.5	1,550	1.18	876	11.5
South Carolina	336	.52	737	13.2	487	.75	754	13.1	649	802	12.7	795	1.22	814	12.7
East North Central	**6,034**	**.58**	**727**	**12.7**	**8,088**	**.78**	**732**	**12.9**	**10,356**	**764**	**12.6**	**12,436**	**1.20**	**798**	**12.4**
Illinois	1,569	.60	767	12.9	2,161	.83	775	13.4	2,606	765	12.7	3,125	1.20	789	12.7
Indiana	837	.53	730	11.9	1,165	.74	781	11.9	1,581	855	11.8	1,869	1.18	860	12.0
Michigan	1,345	.59	737	13.1	1,762	.77	690	13.3	2,278	726	13.2	2,660	1.17	773	13.3
Ohio	1,589	.56	693	12.6	2,128	.75	717	12.6	2,832	764	12.2	3,494	1.23	811	11.4
Wisconsin	694	.66	701	13.0	872	.82	700	12.8	1,059	732	13.1	1,288	1.22	758	12.9
East South Central	**1,629**	**.52**	**810**	**12.6**	**2,262**	**.73**	**765**	**12.6**	**3,109**	**791**	**11.9**	**3,687**	**1.19**	**772**	**12.2**
Alabama	404	.48	821	12.1	582	.70	797	12.2	834	769	12.0	1,004	1.20	765	12.0
Kentucky	431	.56	781	13.0	572	.74	698	13.3	771	727	13.1	960	1.25	714	13.2
Mississippi	317	.56	883	12.1	442	.78	867	12.0	565	853	10.5	688	1.22	888	10.5
Tennessee	477	.51	786	12.8	666	.71	743	12.8	939	835	11.6	1,035	1.10	770	12.7
West North Central	**3,014**	**.62**	**694**	**12.8**	**4,001**	**.82**	**704**	**12.6**	**4,894**	**751**	**12.1**	**5,849**	**1.20**	**805**	**12.0**
Iowa	567	.63	688	13.4	750	.83	682	12.9	899	749	11.5	1,116	1.24	867	11.1
Kansas	455	.61	647	13.8	590	.79	661	13.8	744	698	13.2	910	1.22	761	12.6
Minnesota	583	.60	665	13.1	733	.75	616	13.5	977	692	12.7	1,153	1.18	707	12.7
Missouri	803	.58	773	12.1	1,127	.82	857	11.3	1,380	894	11.1	1,620	1.17	944	11.3
Nebraska	331	.67	703	11.9	429	.87	704	12.0	492	747	12.2	585	1.19	802	11.9
North Dakota	126	.66	592	12.5	176	.92	626	12.4	191	622	12.4	226	1.18	657	12.3
South Dakota	149	.71	630	12.9	196	.93	667	13.3	211	643	14.0	239	1.13	658	14.4
West South Central	**2,802**	**.52**	**800**	**12.2**	**4,017**	**.75**	**764**	**12.0**	**5,340**	**807**	**11.6**	**6,573**	**1.23**	**847**	**11.5**
Arkansas	277	.56	774	12.2	383	.77	766	12.7	498	819	12.8	598	1.20	902	12.7
Louisiana	381	.48	800	12.4	537	.68	725	12.0	788	783	11.4	948	1.20	759	11.7
Oklahoma	439	.56	707	12.6	605	.77	699	12.5	789	748	12.5	937	1.19	774	12.5
Texas	1,705	.52	832	12.1	2,492	.76	790	11.7	3,265	827	11.2	4,090	1.25	882	11.1
Mountain	**1,254**	**.53**	**832**	**12.5**	**1,726**	**.74**	**790**	**12.4**	**2,345**	**806**	**11.9**	**3,010**	**1.28**	**839**	**11.7**
Arizona	177	.48	927	13.3	252	.69	860	13.4	367	850	11.9	478	1.30	848	11.9
Colorado	293	.56	686	13.0	393	.75	664	13.2	524	681	12.8	665	1.27	754	12.7
Idaho	169	.63	885	11.7	214	.79	778	11.4	270	783	11.0	327	1.21	784	10.3
Montana	141	.59	712	11.1	195	.81	704	11.1	240	692	11.1	284	1.18	736	11.1
Nevada	66	.44	1,158	10.9	94	.63	1,119	11.3	150	1,172	9.6	216	1.44	1,293	9.6
New Mexico	155	.46	981	13.0	232	.69	913	12.9	335	963	12.2	444	1.33	915	11.7
Utah	162	.55	880	12.7	216	.74	831	12.5	293	809	12.0	394	1.34	833	12.2
Wyoming	91	.55	892	12.6	130	.78	872	12.0	166	943	12.4	202	1.22	940	12.6
Pacific	**3,645**	**.59**	**772**	**13.3**	**4,679**	**.76**	**720**	**12.9**	**6,180**	**732**	**12.9**	**7,403**	**1.20**	**717**	**12.8**
California	2,735	.58	787	13.2	3,505	.74	721	12.9	4,741	735	13.0	5,564	1.17	702	13.0
Oregon	387	.65	727	13.4	504	.84	729	12.6	598	740	12.3	768	1.28	777	12.5
Washington	523	.62	735	13.7	670	.80	707	13.3	841	713	12.7	1,071	1.27	757	11.7
Hawaii	73	.63	745	14.0	97	.84	634	14.1	115	612	14.0	134	1.17	615	14.0
Puerto Rico	64	.52	1,600	12.0	87	.71	1,338	12.0	123	1,000	11.8	164	1.33	937	12.0
Grand total	**28,381**	**.56**	**750**	**12.8**	**38,391**	**.76**	**740**	**12.7**	**50,249**	**768**	**12.5**	**60,988**	**1.21**	**788**	**12.4**

speculation, of course, on what effect the growing number of compact cars will have on motor-fuel consumption, but it is believed by some that any effect will be slight and will cause only minor variations in the average miles-per-gallon value.

Forecasts by divisions and States

A comparison of the State estimates of motor-fuel consumption by census divisions (table 11) shows that consumption in States of the Pacific division is expected to be 2½ times as much in 1976 as in 1956. The Mountain and South Atlantic (South) divisions anticipate at least doubling their motor-fuel consumption during the 20-year period. These estimated increases generally parallel the growth in the population and economy of these areas. The lowest rate of increase, 67 percent, is expected to occur in the East South Central division, followed in order by the West North Central (70 percent) and the New England (79 percent) divisions. Again, these anticipated increases are generally in line, possibly not with the future industrial growth of these areas, but certainly with the forecasts of population.

A review of the motor-fuel consumption forecasts prepared by individual States (table 12) shows a wide divergence in the predicted percentage increases, ranging from a high of 175 percent predicted by New Mexico and Nevada to a low of 39 percent predicted by West Virginia. The lowest predicted increase, however, was submitted by the District of Columbia, which expects only a 17-percent rise in fuel consumption. The estimated percentage increases in total travel for the two highest States, Nevada, 188 percent and New Mexico, 165 percent, are reasonably well-alined with the fuel consumption forecasts. California, Utah, and Florida are the next highest in anticipated percentage increases in motor-fuel consumption, the percentage increases agreeing exactly with their travel projections.

Fuel consumption per vehicle

Estimates of motor-fuel consumption per registered vehicle are shown in table 11 by census division and in table 12 for the individual

Table 12.—State forecasts of motor-fuel consumption in the United States by census division and State for selected years, 1947–76—(*Continued*)

Census division and State	1966				1971				1976				
	Total gallons	Ratio: 1966/1956	Gallons per registered vehicle	Miles per gallon	Total gallons	Ratio: 1971/1956	Gallons per registered vehicle	Miles per gallon	Total gallons	Ratio: 1976/1956	Gallons per registered vehicle	Ratio: 1976/1956	Miles per gallon
	Millions				*Millions*				*Millions*				
United States	72,605	1.45	814	12.4	85,073	1.70	840	12.4	97.144	1.94	855	1.11	12.4
New England	3,811	1.40	786	12.7	4,351	1.59	796	12.7	4,874	1.79	802	1.06	12.6
Connecticut	1,015	1.48	749	13.0	1,178	1.72	758	13.0	1,341	1.96	764	1.07	13.0
Maine	338	1.19	824	13.1	365	1.29	824	13.2	395	1.40	830	1.00	13.1
Massachusetts	1,750	1.42	792	12.2	2,020	1.64	805	12.2	2,275	1.84	810	1.06	12.2
New Hampshire	260	1.48	861	13.9	294	1.67	886	13.9	325	1.85	903	1.15	13.9
Rhode Island	293	1.27	740	13.0	324	1.40	741	12.8	355	1.54	744	1.02	12.6
Vermont	155	1.28	891	11.8	170	1.40	904	11.8	183	1.51	924	1.08	11.7
Middle Atlantic	11,420	1.43	771	13.0	13,187	1.65	801	12.9	14,916	1.87	823	1.13	12.8
New Jersey	2,675	1.49	886	13.4	3,122	1.74	924	13.4	3,606	2.01	962	1.21	13.4
New York	4,875	1.47	753	12.7	5,795	1.75	808	12.5	6,700	2.02	839	1.22	12.4
Pennsylvania	3,870	1.34	729	13.0	4,270	1.48	721	13.0	4,610	1.59	721	.97	13.0
South Atlantic (North)	3,878	1.43	880	13.3	4,498	1.66	896	13.5	5,111	1.88	915	1.09	13.6
Delaware	215	1.52	853	12.4	249	1.77	841	12.3	284	2.01	835	.97	12.1
District of Columbia	213	1.08	1,014	13.0	222	1.13	1,014	14.3	231	1.17	1,013	1.02	15.1
Maryland	1,175	1.52	871	13.3	1,461	1.89	921	13.4	1,756	2.28	971	1.24	13.5
Virginia	1,698	1.49	889	13.8	1,950	1.71	890	13.9	2,196	1.93	894	1.03	14.0
West Virginia	577	1.24	840	12.5	616	1.33	846	12.4	644	1.39	853	1.05	12.6
South Atlantic (South)	6.595	1.52	817	12.4	7,691	1.77	819	12.5	8,703	2.00	817	1.01	12.5
Florida	2,233	1.77	736	12.7	2,717	2.15	743	12.7	3,151	2.49	736	1.04	12.7
Georgia	1,611	1.43	862	13.0	1,868	1.66	866	13.0	2,123	1.89	870	.99	13.0
North Carolina	1,803	1.38	882	11.6	2,036	1.56	883	11.6	2,246	1.72	883	1.02	11.6
South Carolina	948	1.46	839	12.7	1,070	1.65	846	12.7	1,183	1.82	854	1.06	12.7
East North Central	14,690	1.42	826	12.3	17,138	1.65	857	12.2	19,078	1.84	858	1.12	12.1
Illinois	3,552	1.36	789	12.7	3,986	1.53	789	12.7	4,420	1.70	792	1.04	12.7
Indiana	2,189	1.38	876	12.0	2,509	1.59	888	12.0	2,828	1.79	898	1.05	12.0
Michigan	3,260	1.43	850	13.3	4,047	1.78	951	13.3	4,327	1.90	919	1.27	13.3
Ohio	4,172	1.47	837	11.0	4,851	1.71	857	10.8	5,529	1.95	872	1.14	10.6
Wisconsin	1,517	1.43	777	12.8	1,745	1.65	791	12.7	1,974	1.86	802	1.10	12.6
East South Central	4,276	1.38	775	12.3	4,787	1.54	778	12.4	5,189	1.67	779	.98	12.6
Alabama	1,153	1.38	760	12.0	1,317	1.58	758	12.0	1,464	1.76	755	.98	12.0
Kentucky	1,141	1.48	707	13.3	1,283	1.66	703	13.3	1,395	1.81	703	.97	13.3
Mississippi	789	1.40	917	10.7	867	1.53	922	11.0	934	1.65	925	1.08	11.2
Tennessee	1,193	1.27	783	12.6	1,320	1.41	800	12.8	1,396	1.49	807	.97	13.4
West North Central	6,734	1.38	840	11.9	7,578	1.55	870	11.8	8,299	1.70	884	1.18	11.7
Iowa	1,298	1.44	952	10.9	1,496	1.66	1,051	10.8	1,624	1.81	1,104	1.47	10.8
Kansas	1,079	1.45	813	12.1	1,222	1.64	836	12.0	1,355	1.82	848	1.21	12.0
Minnesota	1,329	1.36	718	12.6	1,504	1.54	736	12.6	1,676	1.72	751	1.09	12.6
Missouri	1,834	1.33	960	11.4	2,013	1.46	964	11.4	2,154	1.56	958	1.07	11.1
Nebraska	666	1.35	848	11.9	747	1.52	887	11.9	823	1.67	909	1.22	11.9
North Dakota	259	1.36	683	12.3	294	1.54	710	12.2	325	1.70	724	1.16	12.2
South Dakota	269	1.27	678	14.4	302	1.43	693	14.4	342	1.62	708	1.10	14.4
West South Central	7,998	1.50	897	11.4	9,286	1.74	937	11.4	10,314	1.93	945	1.17	11.3
Arkansas	722	1.45	950	12.6	849	1.70	1,006	12.5	978	1.96	937	1.14	12.4
Louisiana	1,108	1.41	742	11.7	1,268	1.61	730	11.7	1,428	1.81	721	.92	11.7
Oklahoma	1,139	1.44	799	12.5	1,302	1.65	825	12.5	1,441	1.83	851	1.14	12.5
Texas	5,029	1.54	960	11.0	5,867	1.80	1,020	10.9	6,467	1.98	1,043	1.26	10.8
Mountain	3.707	1.58	863	11.7	4,444	1.90	885	11.7	5,210	2.22	897	1.11	11.6
Arizona	589	1.60	845	11.9	700	1.91	844	11.9	811	2.21	843	.99	11.9
Colorado	803	1.53	798	12.7	940	1.79	814	12.7	1,078	2.06	811	1.19	12.7
Idaho	384	1.42	808	9.9	442	1.64	879	9.8	499	1.85	928	1.19	9.6
Montana	328	1.37	759	11.0	371	1.55	775	11.1	415	1.73	790	1.04	11.1
Nevada	282	1.88	1,376	9.8	347	2.31	1,422	10.0	413	2.75	1,459	1.24	10.0
New Mexico	568	1.70	909	11.7	728	2.17	925	11.7	921	2.75	944	.98	11.7
Utah	515	1.76	848	12.1	642	2.19	862	12.1	765	2.61	871	1.08	12.0
Wyoming	238	1.43	960	12.8	274	1.65	972	12.8	308	1.86	978	1.04	12.5
Pacific	9,496	1.54	759	12.8	12,113	1.96	802	12.8	15,450	2.50	849	1.16	12.8
California	7,298	1.54	752	13.0	9,574	2.02	805	13.0	12,559	2.65	863	1.17	13.0
Oregon	932	1.56	798	12.5	1,084	1.81	810	12.5	1,226	2.05	816	1.10	12.6
Washington	1,266	1.51	772	11.6	1,455	1.73	776	11.6	1,665	1.98	779	1.09	11.6
Hawaii	152	1.32	639	14.0	171	1.49	658	14.0	189	1.64	682	1.11	14.0
Puerto Rico	203	1.65	1,036	12.0	237	1.93	1,134	12.0	263	2.14	1,195	1.20	12.0
Grand total	72,960	1.45	814	12.4	85,481	1.70	840	12.4	97,596	1.94	855	1.11	12.4

Table 13.—State forecasts of motor-fuel consumption per capita, based on total population and persons 15 to 74 years of age for selected years, 1947–76

Year	Gallons of motor fuel consumed	All ages: Persons	All ages: Per capita: Gallons of motor fuel consumed	All ages: Per capita: Index, 1956=100	Driving age, 15–74: Persons	Driving age, 15–74: Per capita: Gallons of motor fuel consumed	Driving age, 15–74: Per capita: Index, 1956=100
	Millions	*Thousands*			*Thousands*		
1947	28, 244	144, 261	196	65. 6	100, 542	281	63. 7
1951	38, 207	153, 440	249	83. 3	105, 974	361	81. 9
1956	50, 011	167, 250	299	100. 0	113, 420	441	100. 0
1961	60, 690	180, 656	336	112. 4	121, 041	501	113. 6
1966	72, 605	195, 353	372	124. 4	131, 360	553	125. 4
1971	85, 073	211, 653	402	134. 4	142, 858	596	135. 1
1976	97, 144	229, 758	423	141. 5	154, 320	629	142. 6

States. Since these figures were derived by dividing the estimated total motor-fuel consumption by the estimated motor-vehicle registrations, they are subject to the same reservations that were expressed in connection with the figures for average annual travel per registered vehicle. Again, the census division and national figures may be considered as entirely reasonable.

In 1956, the average fuel consumption per registered motor vehicle in the South Atlantic (North) division was 840 gallons, the highest among the 10 census divisions. The lowest figure, 730 gallons, was in the Middle Atlantic division. By 1976, the West South Central division is expected to have the highest consumption rate per registered vehicle, 945 gallons. While this represents a 17-percent increase over 1956, the West North Central division will have a slightly greater increase of 18 percent during the forecast period—highest of all the divisions. In the East South Central division an actual decline in the gallons consumed per vehicle was indicated, from 791 to 779 gallons. The latter was the lowest 1976 value reported for the divisions.

Among the individual States, the 1956 motor-fuel consumption per registered vehicle varied from 1,172 gallons in Nevada to 622 gallons in North Dakota. By 1976 the variations are expected to range from 1,459 gallons, again in Nevada, to 703 in Kentucky.

The changing figures for average motor-fuel consumption reveal an actual decline in fuel consumption per vehicle in 9 States. A decrease of 62 gallons per vehicle during the forecast period is indicated in Louisiana. Eleven States show increases of 50 gallons or less per vehicle; 11 other States, increases of 51 to 100 gallons; and 17 States, increases of over 100 gallons per vehicle. Iowa's forecasts indicate a usage of 355 more gallons of fuel per registered vehicle in 1976 than in 1956.

Total travel in the District of Columbia, recognizedly in an unusual situation since it is a city rather than a State, will increase 77 percent during the 20-year forecast period as compared with a 17-percent increase in fuel consumption. The results of relating these two forecasts are reflected in a 51-percent increase in the miles-per-gallon value, from 10.0 in 1956 to 15.1 in 1976. It seems obvious that this increase is an artificial value. The motor-fuel consumption forecast prepared by the District was based on historic data of motor-fuel taxed and motor-vehicles registered in the District, and the recognition that an increasing proportion of the motor-fuel consumed in traveling on the District's highways is being purchased outside of the District. A somewhat parallel situation exists with regard to the figures for annual travel per registered vehicle in the District of Columbia.

Per capita consumption rate

Probably the most noteworthy increase in motor-fuel consumption is expected to occur in the consumption-per-capita values, shown in table 13. The anticipated increase for the forecast period (1956–76) of 124 gallons per person, or 42 percent, may seem rather optimistic, but on a percentage basis it is less than the 53-percent increase from 1947 to 1956. Similar results are obtained when the per capita consumption rates for the driver age group are compared.

Area distribution expected to shift

As noted in the discussions concerning forecasts of population and registrations, the changing figures for total motor-fuel consumption within each geographical area indicate a definite shift westward during the 20-year period. In 1956, the 26 States (and the District of Columbia) located east of the Mississippi River accounted for 62.5 percent of the total motor-fuel consumption; by 1976, this value is expected to be 59.6 percent.

A review of the motor-fuel estimates by census divisions establishes that there may be a very close relationship between the levels of motor-fuel consumption and population, registrations, and travel, both in 1956 and 1976. Table 14 shows the percentages of national totals for each division for each of the above-mentioned items for the two study years. It is to be expected that these items would be closely related, since population must always be considered as the key factor in future highway use and planning. The movement of people and the movement of the goods and services are the predominant factors of traffic generation.

Interdependence of Basic Forecasting Factors

The interdependence of the various related factors used by the States in making their projections can be partially demonstrated by the distribution of motor-fuel consumption per vehicle, which is derived from a State's estimates of total fuel consumption, registrations, and travel. If a large increase is shown for the fuel consumption per vehicle, then in all probability it will be found that the State has a declining miles-per-gallon rate, a substantial increase in annual travel per vehicle, and only moderate increases in registrations and travel. For example, Iowa's forecast of motor-fuel consumption indicates a usage of 355 more gallons per vehicle in 1976 than in 1956. A review of the Iowa projection shows the miles-per-gallon value decreasing from 11.5 to 10.8, annual travel per vehicle increasing 38 percent, with registrations increasing only 22 percent, and total travel, 69 percent.

Similarly, a decline in a State's motor-fuel consumption per vehicle rate will in all probability show an increase in the miles-per-gallon value, a decreasing rate of annual average travel per vehicle, and very optimistic forecasts of registrations and total travel for that State. A review of the Louisiana projection shows a decline in the gallons of fuel consumed, whereas an 86-percent increase of total travel, a 97-percent increase in registrations, a 6-percent decrease in annual average travel per vehicle, and an increase in mile-per-gallon values from 11.4 in 1956 to 11.7 in 1976 are anticipated. The above observations are rather general, and exceptions to them can be expected.

(*Continued on page 282*)

Table 14.—Percentage distribution of population, motor-vehicle registrations, travel, and motor-fuel consumption in the United States (excludes Alaska and Hawaii) by census division, 1956 and 1976

Census division	1956: Population	1956: Motor-vehicle registrations	1956: Motor vehicle travel	1956: Motor-fuel consumption	1976: Population	1976: Motor-vehicle registrations	1976: Motor-vehicle travel	1976: Motor-fuel consumption
New England	5. 9	5. 5	5. 5	5. 5	5. 3	5. 3	5. 1	5. 0
Middle Atlantic	19. 5	16. 8	16. 7	16. 0	17. 9	15. 9	16. 0	15. 4
South Atlantic (North)	5. 8	5. 0	5. 6	5. 4	5. 5	4. 9	5. 8	5. 3
South Atlantic (South)	8. 6	8. 3	8. 7	8. 7	9. 3	9. 4	9. 0	9. 0
East North Central	20. 4	20. 8	20. 9	20. 7	20. 0	19. 6	19. 3	19. 6
East South Central	7. 1	6. 0	5. 9	6. 2	5. 8	5. 9	5. 4	5. 3
West North Central	9. 0	10. 0	9. 5	9. 8	7. 7	8. 3	8. 1	8. 5
West South Central	9. 6	10. 1	9. 9	10. 7	9. 3	9. 6	9. 7	10. 6
Mountain	3. 7	4. 5	4. 5	4. 7	4. 4	5. 1	5. 1	5. 4
Pacific	10. 4	13. 0	12. 8	12. 3	14. 8	16. 0	16. 5	15. 9
Total	100. 0	100. 0	100. 0	100. 0	100. 0	100. 0	100. 0	100. 0

Estimated Travel by Motor Vehicles in the United States, 1958

BY THE DIVISION OF HIGHWAY PLANNING
BUREAU OF PUBLIC ROADS

Reported by ALEXANDER FRENCH,
Highway Research Engineer

TOTAL motor-vehicle travel in 1958 amounted to 664.7 billion vehicle-miles, an increase of 2.7 percent over the 647.0 billion figure for 1957. For 1959 the total is estimated at 696 billion vehicle-miles, based on reports for the first three quarters of the 1959 calendar year.

Of the 1958 travel, 40 percent was on main rural roads, which constitute 14 percent of the Nation's 3.5 million miles of roads and streets. Another 14 percent of the travel was on local rural roads, which comprise 75 percent of all mileage. The remaining 46 percent of travel was on urban streets, which include only 11 percent of the total mileage.

The average motor vehicle traveled 9,658 miles in 1958, almost half of it in cities, and averaged 12.44 miles per gallon of fuel. Compared to 1957,[1] it appears that the average motor vehicle traveled 87 miles further with no significant change in the miles per gallon of fuel consumed.

In 1958, passenger cars represented 83 percent of the vehicles and performed 82 percent of the travel; the same percentages as reported for the preceding year. The average passenger car in 1958 traveled 9,494 miles, an increase of 1.1 percent over the 9,391-mile average in 1957; and consumed 664 gallons of fuel at a rate of 14.30 miles per gallon, indicating a slight increase in the rate of fuel consumption compared to the previous year.

[1] See previous articles on motor-vehicle travel data in PUBLIC ROADS; the most recent article, for 1957, appears in vol. 30, No. 10, October 1959.

Table 1.—Estimate of motor-vehicle travel in the United States, by vehicle types, in the calendar year 1958

Vehicle type	Motor-vehicle travel: Main rural road travel	Local rural road travel	Total rural travel	Urban travel	Total travel	Number of vehicles registered	Average travel per vehicle	Motor-fuel consumption: Total	Average per vehicle	Average travel per gallon of fuel consumed
	Million vehicle-miles	*Million vehicle-miles*	*Million vehicle-miles*	*Million vehicle-miles*	*Million vehicle-miles*	*Thousands*	*Miles*	*Million gallons*	*Gallons*	*Miles/gal.*
Passenger cars [1]	208, 365	72, 888	281, 253	263, 620	544, 873	57, 392	9, 494	38, 095	664	14. 30
Buses:										
Commercial	910	150	1, 060	1, 854	2, 914	84	34, 690	618	7, 357	4. 72
School and nonrevenue	567	574	1, 141	255	1, 396	186	7, 505	191	1, 027	7. 31
All buses [2]	1, 477	724	2, 201	2, 109	4, 310	270	15, 963	809	2, 996	5. 33
All passenger vehicles	209, 842	73, 612	283, 454	265, 729	549, 183	57, 662	9, 524	38, 904	675	14. 12
Trucks and combinations	55, 355	18, 775	74, 130	41, 340	115, 470	11, 159	10, 348	14, 514	1, 301	7. 96
All motor vehicles	265, 197	92, 387	357, 584	307, 069	664, 653	68, 821	9, 658	53, 418	776	12. 44

[1] Includes taxicabs and light trailer combinations pulled by passenger cars.
[2] Bus registration adjusted for estimated additional non-revenue buses included with commercial bus registrations.

Trucks and combinations accounted for 16 percent of the vehicles and 17 percent of the travel. The average truck or combination traveled 10,348 miles in 1958, or about 9 percent more than the average passenger car; but it consumed twice as much fuel, 1,301 gallons, at a rate of 7.96 miles per gallon. These averages for trucks and combinations are almost identical with those for 1957.

The average truck or combination traveled 55,355 million vehicle-miles on main rural roads in 1958, or about 48 percent of all travel by this vehicle type, whereas 38 percent of the passenger car travel was on main rural roads. The 1958 truck travel represents an increase of only 0.2 percent on these highways.

Buses, which accounted for the remaining 1 percent of the vehicles and 1 percent of the travel, experienced an actual decrease in total travel during 1958 despite an increase of 3 percent in school and nonrevenue bus travel. A decrease of more than 4 percent in commercial bus travel more than outweighed the school bus travel increase.

Common-Carrier Passenger and Freight Services Available to Communities on the Interstate Highway System

HIGHWAY COST ALLOCATION STUDY
OFFICE OF RESEARCH
BUREAU OF PUBLIC ROADS

Reported by ARTHUR K. BRANHAM,
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Transportation Economist

The National System of Interstate and Defense Highways will undoubtedly permit increased and more extensive common-carrier highway freight hauling and intercity bus services, thereby perhaps influencing the availability of alternative modes of common-carrier transportation and the distribution of traffic among the several competing agencies. This article reports on a study made to determine the current situation with regard to the number of communities located on the Interstate System and the availability of the several forms of common-carrier passenger and freight services to them.

IN ORDER to assess the service potentialities of the National System of Interstate and Defense Highways in comparison with parallel services offered by other transportation media, a brief survey was conducted by the Bureau of Public Roads in 1958 to determine the number of communities served by the system and the types of common-carrier passenger and freight transportation service facilities available to them.

The study did not obtain information as to the quality or quantity of the available services; it was limited simply to the availability of such service. Common-carrier passenger service included that by highway, railway, airway, and waterway; common-carrier freight service included the same four modes of transportation and also service by crude petroleum pipeline and petroleum product pipeline.

Trends in Freight and Passenger Services

Before reporting the study and the information collected by it, a brief discussion of intercity passenger and freight movement will be useful in establishing the scope and nature of transportation in the United States as a whole.[1] The importance of the Interstate System in the picture is evidenced by the forecast that by 1971 this 41,000-mile system, comprising little more than 1 percent of all road and street mileage in the nation, will be carrying almost 21 percent of all motor-vehicle travel.

In 1956, on the highways of the Nation, an estimated 253.8 billion ton-miles of cargo, representing 19 percent of the Nation's 1,360.1 billion ton-miles of intercity freight hauling, were transported by truck. Highway freight hauling had increased to nearly five times the 1939 level (52.8 billion ton-miles), when less than 10 percent of the total intercity freight was carried by this method.

The growth in highway passenger travel, essentially attributed to the automobile, has been the major contributor in recent years to the increase in total passenger travel. From 1949 through 1956, total intercity passenger travel by all modes of transportation increased 55 percent, from 450.2 to 698.9 billion passenger-miles. Automobile travel increased 64 percent, from 376.3 to 617.7 billion passenger-miles, whereas total common-carrier passenger travel increased only 10 percent, from 73.9 to 81.2 billion passenger-miles. Thus, automobile travel accounted for 97 percent of the increase in total intercity passenger travel during this period. Concurrently, intercity bus travel declined nearly 10 percent, from 27.9 to 25.2 billion passenger-miles. As a result of the upsurge in automobile travel during the 8-year period, total highway passenger travel (automobile and bus combined) increased 59 percent, and its share of total intercity passenger travel increased from 89.8 to 92.0 percent.

By 1980, the population of the United States is expected to be at least 245 million and the

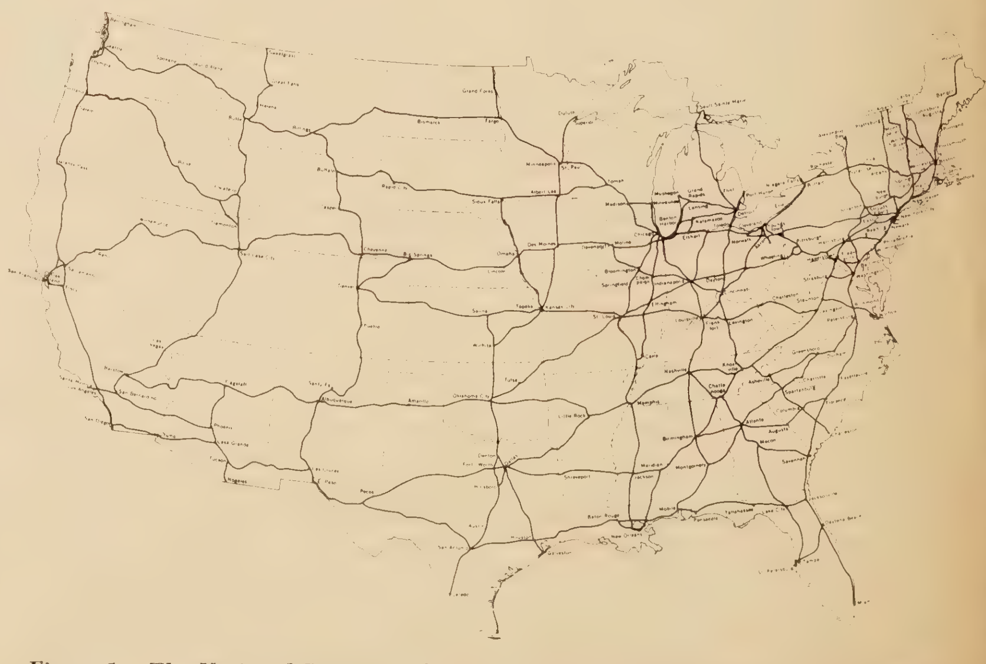

Figure 1.—The National System of Interstate and Defense Highways, December 1957.

[1] Data on ton-miles of freight carried and passenger-miles traveled are taken from the *72d Annual Report of the Interstate Commerce Commission, Fiscal Year 1958*, pp. 9–15, and Statements Nos. 568 and 580 of the Interstate Commerce Commission.

gross national product, expressed in today's purchasing power, is estimated to approach $900 billion. An extrapolation of recent transportation trends also shows that annual intercity freight hauling may exceed 3 trillion ton-miles and intercity passenger travel may approximate 1.8 trillion passenger-miles. Thus, the prospect for the future is for an expanding economy and greater demand for the movement of goods and people; consequently, increasing demands will be placed on the highway system.

Study Procedure

In January 1958, the Bureau of Public Roads field offices were requested to report the number of communities located on the Interstate System as designated on December 31, 1957. Communities were defined as incorporated places with a population of at least 1,000, according to the 1950 census. In addition, since legislation governing Federal aid for highways defines urban areas as municipalities or other urban places having a population of 5,000 or more, the study definition of communities also included all unincorporated places with 5,000 or more inhabitants. Communities were to be grouped in accordance with standard population classes used by the U.S. Bureau of the Census.[2]

To determine which communities were located on the Interstate System, a 10-mile-wide strip or corridor was used as the criterion by the field offices. The midpoint of the corridor was to approximate the location of the Interstate System. If the location had not been approved as of December 31, 1957, the tentative location or projected location was to be used, in that order of preference. A community was considered to be located on the Interstate System if any part of its area fell within the corridor.

Information was also requested as to the types of common-carrier freight and passenger services available to each of the communities. Highway and rail passenger and freight services were considered available to a community if common-carrier stations or loading facilities were located within the incorporated limits of the community, and if an official timetable or other recognition of commitments for service was provided by the carrier or carriers. Schedules of carriers and records of State regulatory agencies aided in determining the availability of service. Service was considered available to all communities located in a metropolitan complex if the carrier or carriers provided service to any part of the metropolitan area.

Air service was considered available to a community if licensed air carriers made scheduled use, for the purpose of accepting or discharging passengers or freight, of airport facilities located not more than 20 miles from any point of the incorporated or urban area boundary.

Figure 2.—Routes of major railroads, 1957.

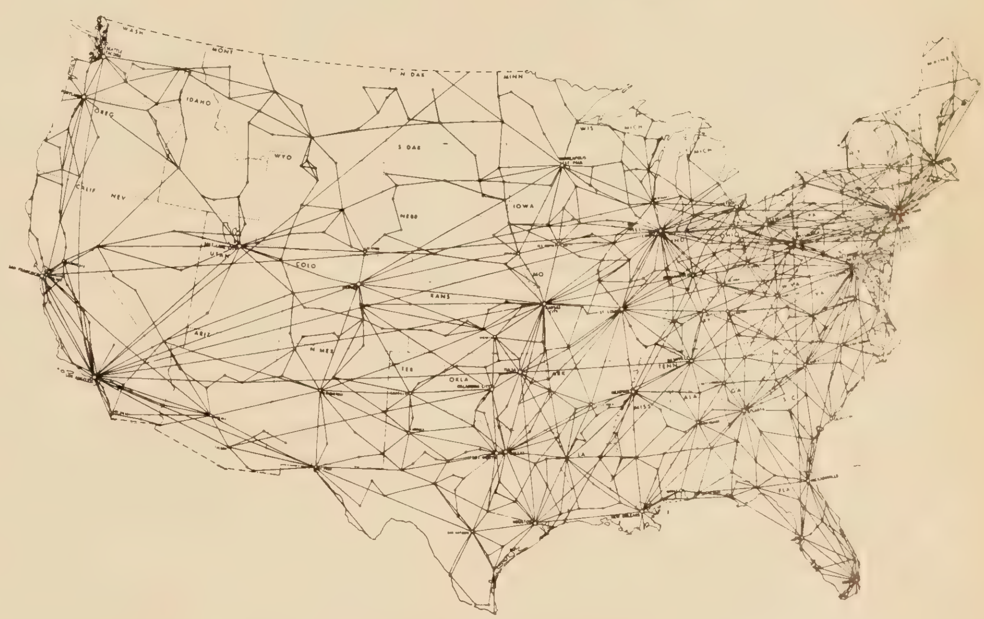

Figure 3.—Routes of scheduled airlines, 1957.

Water service availability was based on two premises: That facilities for dockage were available to vessels engaged in passenger or freight transportation on rivers, other inland waterways, or in coastal service; and that the facilities were within 5 miles of the closest point of the incorporated or urban area boundary.

Pipeline service was considered available if facilities for terminal reception or distribution of crude petroleum or petroleum products (exclusive of natural gas) served a given community directly. Direct service did not include the use of line-haul motor carriers, tank cars, or tankers to effect final distribution.

In determining the availabilities of the various forms of passenger and freight services, Bureau field office personnel were given considerable leeway in interpreting instructions for the study. This, of course, was necessary in order to make a realistic appraisal of services, particularly in the smaller communities. As a result, the data included in appendix tables A and B (pp. 280–281) are probably not strictly comparable on a State-by-State basis, but are as nearly so as is possible in a survey of this nature.

Transportation Networks

The general location of the Interstate System is shown in figure 1. Figure 2 depicts the networks of the major railroads, and figure 3, the routes of certified trunkline air carriers and those of the local service air carriers. In comparing these routes of highway, rail, and air transportation, it is immediately evident that considerable paralleling of services exists, and that the main routes of commerce and the heavily populated areas are well served by the three modes of transport.

Since pipeline and waterway facilities tend to be restricted, in the one case by source of

[2] It might seem that the number of communities for the New England and Middle Atlantic divisions are overstated in this study in comparison with the number of communities reported by the Bureau of the Census. The reason for this is that in some instances data reported for a State may include as communities two or more contiguous places which, in the Census reports, are considered as a single place.

Table 1.—Number and percentage of communities in the United States located on the Interstate System and their estimated populations, classified by population group

Population group	Total number of communities in the U.S.[1]	Communities on the Interstate System		Population of all communities in the U.S.[1]	Estimated population of communities on Interstate System [2]
		Number	Percent of total communities		
1,000–2,500	3,408	1,055	31.0	5,382,637	1,668,617
2,500–5,000	1,557	658	42.3	5,512,970	2,331,986
5,000–10,000	1,176	706	60.0	8,138,596	4,883,158
10,000–25,000	778	526	67.6	11,866,505	8,021,757
25,000–50,000	252	216	85.7	8,807,721	7,548,217
50,000–100,000	126	110	87.3	8,930,823	7,796,608
100,000–250,000	65	65	100.0	9,478,662	9,478,662
250,000–500,000	23	23	100.0	8,241,560	8,241,560
500,000–1,000,000	13	13	100.0	9,186,945	9,186,945
Over 1,000,000	5	5	100.0	17,404,450	17,404,450
All communities	7,403	3,377	45.6	92,950,869	76,561,960

[1] Census of Population: 1950, vol. I, table K, p. xxxii. For purposes of this study, incorporated places of 1,000 or more population, and unincorporated places with 5,000 or more population are referred to as communities.

[2] The study did not obtain data on the population of communities on the Interstate System. The estimates were derived, for each population group, by using the percentage relationship of communities on the System to total communities, applied against the total population.

product and in the other case by geography, they are not illustrated. In spite of the fact that pipelines are heavily concentrated in the West South Central and West North Central States, they do serve as distributors of crude petroleum and petroleum products to a considerable number of communities along the Interstate System. This is particularly evident in Illinois and Ohio. Navigable waterways provide many areas of the eastern half of the United States and the Pacific Coast States with good transportation service.

Communities Served by the Interstate System

The total number of communities in the United States, by population group, are compared in table 1 with the number of communities served by the Interstate System as of December 31, 1957. A State-by-State compilation of the number of communities served by the Interstate System, by population group, is provided in appendix table A. As previously defined, the term "community" refers to incorporated places with 1,000 or more population and unincorporated places with 5,000 or more population, according to the 1950 census.

Also presented in table 1 are the percentages of all communities in each population group that were served by the Interstate System, the aggregate population of all communities in each population group, and the estimated population[3] of communities in each population group that were served by the Interstate System. Of particular significance is the fact that over four-fifths of the people in all communities of the United States were served by the Interstate System.

At the time of the 1950 census, the number of communities in the United States with populations of 5,000 and over was 2,438; of these, 1,664 were served by the Interstate System. Similarly, of the 4,965 communities in the 1,000 to 5,000 population range, 1,713 were served. Thus, 3,377 communities or nearly 46 percent of all communities were located within the Interstate System corridor established for this study. All cities of at least 100,000 population, 93 percent of all cities with 50,000 population and over, 89 percent of all cities with 25,000 population and over, or 76 percent of all cities with 10,000 population and over were served by the Interstate System.

Common-Carrier Passenger Services

A distribution of the types of common-carrier passenger services available to the 3,377 communities located on the Interstate System is presented in table 2. Approximately 99 percent (all but 16 communities) were served by at least one of the common-carrier passenger services—highway, rail, air, or water. The 16 communities not having common-carrier service in 1957 were in the two smallest population groups.

[3] See footnote 2, table 1.

Bus service was the most prevalent type of common-carrier passenger transportation available to communities on the Interstate System. In general, the study shows that such service was available to almost all communities on the system, even the smallest. This statement can be given even wider application when considering all incorporated and unincorporated places, regardless of population and location with respect to the Interstate System. It has been estimated that the only intercity common-carrier passenger transportation available to 40,000 communities in the United States is bus service.[4]

Although the availability of each form of common-carrier passenger service diminished in the smaller communities located on the Interstate System, the availability of bus service diminished least. Among the 1,040 communities in the 1,000–2,500 population group having common-carrier passenger service in 1957, 92 percent had bus service, 73 percent had rail service, 54 percent had air service, and 11 percent had water service.

As expected, many of the communities on the Interstate System had more than one type of common-carrier passenger service. All four forms were available in the five cities with over 1 million population, and with each progressively smaller population group, the average number of services available declined from 3.69 to 2.30. For all population groups, the number of services averaged 2.66 per community.

Geographical distribution of passenger service

Availability of common-carrier passenger service to communities grouped according to census divisions is shown in table 3. Similar information on a State-by-State basis is presented in appendix table B. Bus transporta-

[4] *Bus Facts*, National Association of Motor Bus Operators, 27th ed., 1958, p. 6.

Table 2.—Availability of each mode of common-carrier passenger service to communities on the Interstate System, by population group

Population group	Total communities on Interstate System	Number of communities having common-carrier passenger service [1]	Number and percentage of communities having indicated common-carrier passenger service available								Total passenger services available	Ratio: total passenger services/total communities
			Highway (bus)		Rail		Air		Water			
			Number	Percent	Number	Percent	Number	Percent	Number	Percent		
1,000–2,500	1,055	1,040	961	92.4	763	73.4	560	53.8	110	10.6	2,394	2.30
2,500–5,000	658	657	630	95.9	509	77.5	432	65.8	112	17.0	1,683	2.56
5,000–10,000	706	706	691	97.9	600	85.0	488	69.1	150	21.2	1,929	2.73
10,000–25,000	526	526	521	99.0	471	89.5	417	79.3	134	25.5	1,543	2.93
25,000–50,000	216	216	215	99.5	206	95.4	200	92.6	48	22.2	669	3.10
50,000–100,000	110	110	108	98.2	106	96.4	107	97.3	27	24.5	348	3.16
100,000–250,000	65	65	65	100.0	65	100.0	65	100.0	19	29.2	214	3.29
250,000–500,000	23	23	23	100.0	23	100.0	23	100.0	8	34.8	77	3.35
500,000–1,000,000	13	13	13	100.0	13	100.0	13	100.0	9	69.2	48	3.69
Over 1,000,000	5	5	5	100.0	5	100.0	5	100.0	5	100.0	20	4.00
All communities	3,377	3,361	3,232	96.2	2,761	82.1	2,310	68.7	622	18.5	8,925	2.66

[1] 16 communities did not have common-carrier passenger service: 15 in the 1,000–2,500 population group, and 1 in the 2,500–5,000 population group.

Table 3.—Availability of each mode of common-carrier passenger service to communities on the Interstate System, by census division

Census division	Total communities on Interstate System [1]	Number and percentage of communities having indicated common-carrier passenger service available [2]							
		Highway (bus)		Rail		Air		Water	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
New England	389	376	96.7	252	64.8	369	94.9	33	8.5
Middle Atlantic	792	740	94.8	614	78.6	637	81.6	275	35.2
South Atlantic (North)	122	120	99.2	101	83.5	73	60.3	26	21.5
South Atlantic (South)	247	247	100.0	214	86.6	151	61.1	31	12.6
East North Central	720	653	91.1	608	84.8	479	66.8	217	30.3
East South Central	175	174	99.4	151	86.3	90	51.4	3	1.7
West North Central	282	273	96.8	249	88.3	129	45.7	-----	---
West South Central	243	243	100.0	231	95.1	114	46.9	1	.4
Mountain	173	173	100.0	151	87.3	84	48.6	-----	----
Pacific	234	233	100.0	190	81.5	184	79.0	36	15.5
All census divisions	3,377	3,232	96.2	2,761	82.1	2,310	68.7	622	18.5

[1] 16 communities did not have common-carrier passenger service: 11 in the Middle Atlantic division, 3 in the East North Central division, and 1 each in the South Atlantic (North) and Pacific divisions.
[2] Percentages relate to the number of communities having passenger services.

tion was available to all communities on the Interstate System having common-carrier passenger service in the South Atlantic (South), West South Central, Mountain, and Pacific census divisions. In the remaining six divisions, 91 to 99 percent of such communities were provided with bus service.

Intercity rail passenger transportation was offered extensively across the nation to communities on the Interstate System. The extent of such service ranged from 65 percent of the communities having common-carrier passenger service in the New England division to 95 percent of the communities in the West South Central division.

Air passenger service was relatively more available to communities on the Interstate System in New England than in other areas of the Nation. Ninety-five percent of the 389 communities located on the system in this census division were provided with air passenger service. A possible explanation for the high percentage might be that a comparatively larger proportion of communities in the New England division fell within the study corridor because of the limited area involved and the high density of population. By comparison, less than half of the communities on the Interstate System in the West North Central, West South Central, and Mountain divisions had air passenger service.

Passenger service by water was negligible in all areas of the country except for the Middle Atlantic and East North Central census divisions, where approximately one-third of the communities on the Interstate System having common-carrier passenger transportation were provided this service.

Common-Carrier Freight Services

All communities located on the Interstate System had one or more of the five common-carrier freight services: highway, rail, air, water, or pipeline. Highways provided common-carrier freight service to more communities than any other form of transportation. Table 4 shows that trucking service was available to 3,345 communities, or 99 percent of all communities located on the Interstate System. In comparison, intercity bus service was available to 96 percent of the communities.

Rail freight service was available to 94 percent of all communities on the Interstate System. This service applied to all communities over 25,000 population and to 93 percent of the communities under 25,000 population. As would be expected, the

Table 4.—Availability of each mode of common-carrier freight service to communities on the Interstate System, by population group

Population group	Total communities on Interstate System [1]	Number and percentage of communities having indicated common-carrier freight service available												Total freight services available	Ratio: total freight services/total communities
		Highway (truck)		Rail		Air		Water		Pipeline					
										Crude petroleum		Petroleum products			
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent		
1,000–2,500	1,055	1,031	97.7	940	89.1	555	52.6	200	19.0	68	6.4	130	12.3	2,924	2.77
2,500–5,000	658	653	99.2	616	93.6	427	64.9	186	28.3	43	6.5	87	13.2	2,012	3.06
5,000–10,000	706	703	99.6	679	96.2	485	68.7	246	34.8	49	6.9	99	14.0	2,261	3.20
10,000–25,000	526	526	100.0	510	97.0	412	78.3	212	40.3	55	10.5	85	16.2	1,800	3.42
25,000–50,000	216	216	100.0	216	100.0	198	91.7	93	43.1	22	10.2	39	18.1	784	3.63
50,000–100,000	110	110	100.0	110	100.0	104	94.5	51	46.4	14	12.7	29	26.4	418	3.80
100,000–250,000	65	65	100.0	65	100.0	64	98.5	38	58.5	10	15.4	20	30.8	262	4.03
250,000–500,000	23	23	100.0	23	100.0	23	100.0	14	60.9	10	43.5	13	56.5	106	4.61
500,000–1,000,000	13	13	100.0	13	100.0	13	100.0	13	100.0	7	53.8	7	53.8	66	5.08
Over 1,000,000	5	5	100.0	5	100.0	5	100.0	5	100.0	3	60.0	4	80.0	27	5.40
All communities	3,377	3,345	99.1	3,177	94.1	2,286	67.7	1,058	31.3	281	8.3	513	15.2	10,660	3.16

[1] All communities on the Interstate System had one or more common-carrier freight services.

Table 5.—Availability of each mode of common-carrier freight service to communities on the Interstate System, by census division

Census division	Total communities on Interstate System	Number and percentage of communities having indicated common-carrier freight service available											
		Highway (truck)		Rail		Air		Water		Pipeline			
										Crude petroleum		Petroleum products	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
New England	389	389	100.0	343	88.2	369	94.9	53	13.6	2	0.5	18	4.6
Middle Atlantic	792	790	99.7	745	94.1	637	80.4	456	57.6	16	2.0	31	3.9
South Atlantic (North)	122	120	98.4	113	92.6	56	45.9	46	37.7	1	.8	1	.8
South Atlantic (South)	247	243	98.4	244	98.8	151	61.1	39	15.8	-------	--------	52	21.1
East North Central	720	713	99.0	672	93.3	479	66.5	267	37.1	113	15.7	230	31.9
East South Central	175	174	99.4	164	93.7	88	50.3	40	22.9	6	3.4	6	3.4
West North Central	282	282	100.0	278	98.6	125	44.3	53	18.8	48	17.0	63	22.3
West South Central	243	227	93.4	236	97.1	114	46.9	24	9.9	63	25.9	62	25.5
Mountain	173	173	100.0	157	90.8	84	48.6	-------	--------	31	17.9	41	23.7
Pacific	234	234	100.0	225	96.2	183	78.2	80	34.2	1	.4	9	3.8
All census divisions	3,377	3,345	99.1	3,177	94.1	2,286	67.7	1,058	31.3	281	8.3	513	15.2

smallest communities were most dependent on highway transportation as indicated by the fact that 98 percent of the communities in the 1,000–2,500 population group had truck service whereas 89 percent had rail service.

At least 9 out of 10 communities had rail freight service; 9 out of 10 had truck service; slightly over two-thirds (2,286) were provided air freight service; about one-third (1,058) had access to freight shipping on domestic waterways. Approximately one-fifth of the communities were directly served by crude petroleum and/or petroleum products pipeline service, but no attempt was made to determine the number of communities having both services.

The large cities had both air and water common-carrier freight services, although the availability of air service was more extensive. The volume of air freight in ton-miles is small, however, in comparison with the volume of freight in ton-miles carried by water, the ratio being 1 to 386 in 1957.[5] All cities with 250,000 or more population were provided air freight service, but only 78 percent of the 41 cities within this group were provided water freight service. The proportion of communities served by air and/or water freight carriers decreased rapidly, however, in descending community population groups. In the lowest population group, about 53 percent of the communities on the Interstate System were served by air freight carriers, whereas only 19 percent were served by common carriers operating on the domestic waterways.

The restriction of pipeline facilities to one commodity group accounts for the limited availability of this mode of transportation to communities on the Interstate System. These facilities were available to four of the five cities with populations exceeding 1 million; New York City alone in this class did not have direct pipeline service. In the medium- and small-sized communities (below 50,000 population), only a limited number had pipeline service. Eight percent or only 281 communities of the 3,377 located on the Interstate System had facilities for terminal reception or distribution of crude petroleum, and 15 percent or 513 communities had facilities for terminal reception or distribution of petroleum products.

A combined total of 10,660 freight services were available to the 3,377 communities on the Interstate System, the average being 3.16 freight services per community. Excluding pipelines, the number of freight services offered per community becomes 2.92. This may be compared with 2.66 common-carrier passenger services available per community.

[5] See footnote 1, p. 276.

Table A.—Number of communities [1] on the Interstate System by census divisions, States, and population groups

Census division and State	Total communities on Interstate System	Population group, 1950 census									
		1,000–2,500	2,500–5,000	5,000–10,000	10,000–25,000	25,000–50,000	50,000–100,000	100,000–250,000	250,000–500,000	500,000–1,000,000	Over 1,000,000
United States	3, 377	**1, 055**	**658**	**706**	**526**	**216**	**110**	**65**	**23**	**13**	**5**
New England	389	**83**	**86**	**78**	**77**	**36**	**17**	**11**	--------	**1**	--------
Connecticut	96	22	21	17	15	15	2	4	--------	--------	--------
Maine	19	2	3	6	6	1	1	--------	--------	--------	--------
Massachusetts	201	38	49	38	43	16	10	6	--------	1	--------
New Hampshire	20	10	5	2	1	1	1	--------	--------	--------	--------
Rhode Island	31	3	4	8	10	2	3	1	--------	--------	--------
Vermont	22	8	4	7	2	1	--------	--------	--------	--------	--------
Middle Atlantic	792	**206**	**162**	**209**	**136**	**41**	**19**	**12**	**3**	**2**	**2**
New Jersey	215	36	38	62	46	20	7	4	2	--------	--------
New York	244	68	53	57	40	13	6	4	1	1	1
Pennsylvania	333	102	71	90	50	8	6	4	--------	1	1
South Atlantic (North)	122	**45**	**17**	**25**	**16**	**6**	**7**	**4**	--------	**2**	--------
Delaware	6	2	--------	3	--------	--------	--------	1	--------	--------	--------
District of Columbia	1	--------	--------	--------	--------	--------	--------	--------	--------	1	--------
Maryland	36	18	6	5	5	1	--------	--------	--------	1	--------
Virginia	50	11	6	14	8	4	4	3	--------	--------	--------
West Virginia	29	14	5	3	3	1	3	--------	--------	--------	--------
South Atlantic (South)	247	**89**	**52**	**42**	**32**	**15**	**11**	**5**	**1**	--------	--------
Florida	81	21	22	14	11	8	2	3	--------	--------	--------
Georgia	70	30	17	8	10	1	2	1	1	--------	--------
North Carolina	61	25	6	11	9	5	4	1	--------	--------	--------
South Carolina	35	13	7	9	2	1	3	--------	--------	--------	--------
East North Central	720	**261**	**139**	**127**	**99**	**50**	**26**	**9**	**4**	**3**	**2**
Illinois	251	97	51	50	31	12	8	1	--------	--------	1
Indiana	87	30	16	16	10	8	3	3	1	--------	--------
Michigan	121	45	15	15	25	11	7	2	--------	--------	1
Ohio	205	71	45	37	26	13	5	3	3	2	--------
Wisconsin	56	18	12	9	7	6	3	--------	--------	1	--------
East South Central	175	**60**	**42**	**31**	**19**	**11**	**4**	**5**	**3**	--------	--------
Alabama	49	17	9	10	6	3	1	2	1	--------	--------
Kentucky	46	16	12	9	4	2	2	--------	1	--------	--------
Mississippi	39	15	11	4	3	5	1	--------	--------	--------	--------
Tennessee	41	12	10	8	6	1	--------	3	1	--------	--------
West North Central	282	**119**	**56**	**44**	**34**	**13**	**7**	**4**	**3**	**2**	--------
Iowa	35	20	5	3	2	2	2	1	--------	--------	--------
Kansas	31	11	4	6	6	1	1	2	--------	--------	--------
Minnesota	72	31	13	12	10	3	--------	1	1	1	--------
Missouri	92	34	25	15	10	4	2	--------	1	1	--------
Nebraska	24	8	7	4	3	--------	1	--------	1	--------	--------
North Dakota	15	8	--------	3	2	2	--------	--------	--------	--------	--------
South Dakota	13	7	2	1	1	1	1	--------	--------	--------	--------
West South Central	243	**84**	**38**	**57**	**36**	**10**	**5**	**8**	**3**	**2**	--------
Arkansas	28	8	3	12	2	2	--------	1	--------	--------	--------
Louisiana	37	13	7	8	3	3	--------	2	--------	1	--------
Oklahoma	44	12	10	12	7	1	--------	2	--------	--------	--------
Texas	134	51	18	25	24	4	5	3	3	1	--------
Mountain	173	**63**	**37**	**36**	**20**	**11**	**3**	**2**	**1**	--------	--------
Arizona	21	7	6	6	--------	1	--------	1	--------	--------	--------
Colorado	23	9	2	5	4	1	1	--------	1	--------	--------
Idaho	23	7	7	2	5	2	--------	--------	--------	--------	--------
Montana	23	10	4	3	3	3	--------	--------	--------	--------	--------
Nevada	9	2	2	3	1	1	--------	--------	--------	--------	--------
New Mexico	20	6	2	7	3	1	1	--------	--------	--------	--------
Utah	40	18	10	9	--------	1	1	1	--------	--------	--------
Wyoming	14	4	4	1	4	1	--------	--------	--------	--------	--------
Pacific	234	**45**	**29**	**57**	**57**	**23**	**11**	**5**	**5**	**1**	**1**
California	161	19	13	43	49	18	11	3	3	1	1
Oregon	32	9	8	8	4	2	--------	--------	1	--------	--------
Washington	41	17	8	6	4	3	--------	2	1	--------	--------

[1] Includes all incorporated places with populations of 1,000 and over, and all unincorporated places with populations of 5,000 and over.

Freight services offered per community ranged from 2.77 for communities under 2,500 population to 5.40 for cities exceeding 1 million population. The number of services provided the average community are based on six modes of transportation rather than five because of the two categories of pipelines.

Geographical distribution of freight services

The various forms of freight service available by geographic areas and by States are shown in table 5 and appendix table B. A greater number of communities on the Interstate System were served by truck common carriers than by any other form of freight transportation in all areas of the country except the South Atlantic (South) and the West South Central census divisions where rail freight service was more extensive. All communities in the New England, West North Central, Mountain, and Pacific divisions had truck service, and in the remaining six divisions, truck service was available to at least 93 percent of the communities.

Ninety-nine percent of the communities in the South Atlantic (South) and West North Central census divisions had rail freight service; at the other extreme, 88 percent of the communities in the New England division were provided such service.

Air freight service, which was available to about two-thirds of the communities on the Interstate System, was offered to a greater proportion of communities in the New England census division than in any other area of the country. Ninety-five percent of the communities in New England had such service, and following in order were the Middle Atlantic and Pacific divisions with 80 and 78 percent, respectively. Lowest on the scale were the West North Central and South Atlantic (North) divisions where air freight serviced 44 and 46 percent of the communities.

Only about one in three communities on the Interstate System had access to water freight service. The Middle Atlantic census division ranked highest with nearly 58 percent of the communities having such service. Next in order were the South Atlantic (North) and East North Central divisions with 38 and 37 percent of the communities so served.

Table B.—Availability of each mode of common-carrier transportation service to communities on the Interstate System, by census divisions and by States

Census division and State	Total communities on Interstate System	Number of communities having indicated passenger service				Total passenger services available	Number of communities having indicated freight service						Total freight services available
		Highway (bus)	Rail	Air	Water		Highway (truck)	Rail	Air	Water	Pipeline: Crude petroleum	Pipeline: Petroleum products	
United States	**3,377**	**3,232**	**2,761**	**2,310**	**622**	**8,925**	**3,345**	**3,177**	**2,286**	**1,058**	281	513	10,660
New England	**389**	**376**	**252**	**369**	**33**	**1,030**	**389**	**343**	**369**	**53**	2	18	1,174
Connecticut	96	87	59	89	2	237	96	82	89	3	------	------	270
Maine	19	19	19	17	2	57	19	19	17	10	2	9	76
Massachusetts	201	198	124	201	12	535	201	174	201	16	------	8	600
New Hampshire	20	19	14	14	------	47	20	16	14	1	------	------	51
Rhode Island	31	31	15	31	14	91	31	30	31	21	------	1	114
Vermont	22	22	21	17	3	63	22	22	17	2	------	------	63
Middle Atlantic	**792**	**740**	**614**	**637**	**275**	**2,266**	**790**	**745**	**637**	**456**	16	31	2,675
New Jersey	215	210	155	162	158	685	214	195	162	162	5	4	742
New York	[1] 244	213	218	205	95	731	244	240	205	192	8	9	898
Pennsylvania	[1] 333	317	241	270	22	850	332	310	270	102	3	18	1,035
South Atlantic (North)	**122**	**120**	**101**	**73**	**26**	**320**	**120**	**113**	**56**	**46**	1	1	337
Delaware	6	6	6	6	------	18	4	6	6	5	------	------	21
District of Columbia	1	1	1	1	1	4	1	1	1	1	1	1	6
Maryland	[1] 36	34	32	30	24	120	36	35	30	26	------	------	127
Virginia	50	50	43	19	1	113	50	49	19	14	------	------	132
West Virginia	29	29	19	17	------	65	29	22	------	------	------	------	51
South Atlantic (South)	**247**	**247**	**214**	**151**	**31**	**643**	**243**	**244**	**151**	**39**	------	52	729
Florida	81	81	78	61	27	247	77	81	61	30	------	------	249
Georgia	70	70	60	38	3	171	70	69	38	6	------	42	225
North Carolina	61	61	50	31	------	142	61	60	31	1	------	------	153
South Carolina	35	35	26	21	1	83	35	34	21	2	------	10	102
East North Central	**720**	**653**	**608**	**479**	**217**	**1,957**	**713**	**672**	**479**	**267**	113	230	2,474
Illinois	[1] 251	249	210	166	83	708	251	237	166	127	33	108	922
Indiana	[1] 87	85	54	48	12	199	87	85	48	12	8	32	272
Michigan	121	97	101	87	33	318	120	99	89	33	8	7	356
Ohio	205	170	196	141	72	579	199	196	139	72	63	77	746
Wisconsin	56	52	47	37	17	153	56	55	37	23	1	6	178
East South Central	**175**	**174**	**151**	**90**	**3**	**418**	**174**	**164**	**88**	**40**	6	6	478
Alabama	49	48	43	24	3	118	48	47	24	3	3	3	128
Kentucky	46	46	44	31	------	121	46	45	31	21	2	------	145
Mississippi	39	39	38	18	------	95	39	39	18	7	1	1	105
Tennessee	41	41	26	17	------	84	41	33	15	9	------	2	100
West North Central	**282**	**273**	**249**	**129**	------	**651**	**282**	**278**	**125**	**53**	48	63	849
Iowa	35	35	27	17	------	79	35	35	17	6	7	7	107
Kansas	31	30	31	12	------	73	31	31	12	5	16	16	111
Minnesota	72	72	65	40	------	177	72	72	35	29	24	27	259
Missouri	92	85	82	39	------	206	92	89	39	9	------	2	231
Nebraska	24	24	22	8	------	54	24	24	8	4	------	4	64
North Dakota	15	15	15	6	------	36	15	15	7	------	1	6	44
South Dakota	13	12	7	7	------	26	13	12	7	------	------	1	33
West South Central	**243**	**243**	**231**	**114**	**1**	**589**	**227**	**236**	**114**	**24**	63	62	726
Arkansas	28	28	28	7	------	63	20	28	7	1	------	1	57
Louisiana	37	37	36	18	1	92	29	37	18	10	6	4	104
Oklahoma	44	44	40	17	------	101	44	41	17	------	------	------	102
Texas	134	134	127	72	------	333	134	130	72	13	57	57	463
Mountain	**173**	**173**	**151**	**84**	------	**408**	**173**	**157**	**84**	------	31	41	486
Arizona	21	21	19	7	------	47	21	19	7	------	------	6	53
Colorado	23	23	22	12	------	57	23	23	12	------	8	8	74
Idaho	23	23	23	10	------	56	23	23	10	------	------	3	59
Montana	23	23	22	8	------	53	23	22	8	------	15	15	83
Nevada	9	9	8	6	------	23	9	9	6	------	------	2	26
New Mexico	20	20	17	4	------	41	20	18	4	------	2	2	46
Utah	40	40	27	31	------	98	40	30	31	------	1	------	102
Wyoming	14	14	13	6	------	33	14	13	6	------	5	5	43
Pacific	**234**	**233**	**190**	**184**	**36**	**643**	**234**	**225**	**183**	**80**	1	9	732
California	161	161	138	136	20	455	161	154	135	46	1	5	502
Oregon	32	32	21	24	7	84	32	32	24	13	------	2	103
Washington	[1] 41	40	31	24	9	104	41	39	24	21	------	2	127

[1] Common-carrier passenger services were not available to 16 communities located in the following States: New York, 5 communities; Pennsylvania, 6 communities; Maryland, 1 community; Illinois, 2 communities; Indiana, 1 community; and Washington, 1 community.

Haulage of bulk commodities on the inland waterways has been expanding rapidly in recent years, and with the development of the St. Lawrence Seaway, the tonnage on the Great Lakes and connecting waterways will increase and more communities on the Interstate System will be served, particularly in the East North Central and Middle Atlantic States.

Pipeline service was concentrated in four census divisions: East North Central, West North Central, West South Central, and Mountain. It is in these areas that most of the crude petroleum is produced and refined. They also serve as distributing centers for petroleum products. It is interesting to note that the South Atlantic (South) division, an area which does not have crude petroleum pipelines, serves as a distributing center for petroleum products. This, of course, indicates that crude petroleum is shipped into the area by other than pipeline facilities.

General Comments

Highways provided more extensive common-carrier passenger and freight services than any other medium of transport. Railroads ranked second, and were followed in order by airlines and waterways.

Of the 3,377 communities located on the Interstate System, 72 percent or 2,445 communities were located in States east of the Mississippi River. These States, which comprise 29 percent of the land area of the continental United States and 68 percent of the population, make up six census divisions: New England, Middle Atlantic, South Atlantic (North), South Atlantic (South), East North Central, and East South Central.

Nearly one-half of the Interstate System mileage is located in the six census divisions just enumerated. On this basis, there was an average of one community for each 8-mile length of the system. In the remaining four census divisions to the west of the Mississippi River, there were 932 communities located on the Interstate System, or an average of 1 community for each 22-mile length of the system.

The development of the Interstate System has had and should continue to have a significant effect on the quality and quantity of highway transport services offered to these communities, upon coordination of transportation services, and upon competition among the several modes of transportation.

Forecasts of Population, Motor-Vehicle Registrations, Travel, Fuel Consumption

(Continued from page 274)

The miles-per-gallon rates for the census divisions (table 11) showed only minor variations in 1956. The Middle Atlantic division reported the highest at 13.0 and the West South Central the lowest, 11.6, a variation of only 12 percent. The forecast values for 1976, however, present a different picture. A variation of 20 percent is predicted, ranging from 13.6 miles per gallon in the South Atlantic (North) division to 11.3 in the West South Central division. During the forecast period, three divisions expect increases from 0.04 to 0.70 miles per gallon, while the remaining seven anticipate decreases ranging from 0.01 to 0.46. It would appear that many of the States, aware of the several variables that must be considered in making forecasts of motor-fuel consumption and resulting revenues did not wish to introduce still another variable, that of changing miles-per-gallon values, into their forecasts. This can be considered usually as a prudent approach. The principal justification of the practice of using a fairly constant miles-per-gallon value in preparing forecasts is one of neutrality in the subsequent forecasts of revenues as a function of vehicle-miles traveled. A prediction of increased productivity per vehicle-mile through a lessened rate of fuel consumption results in introducing an extra, and possible unnecessary, variable into the forecasting procedures.

Comments on Forecasting Procedures

A review of the forecasts of travel and needs made in the past shows that, in practically all cases, the forecasts have fallen woefully short of reality. It is highly possible that such estimates were based on inadequate data, and the resulting needs and travel estimates were inevitably bound to be too low because the basic data were also too low. There has also occurred a series of events, within the period of time in which the development of highways has become so important in the American way of life, that has had a tendency to obscure the trends or at least introduce uncertainties into forecasting travel and needs. These events are well known to all—the depression of the 1930's, World War II, and the tremendous increase in travel and registrations accompanying the general economic expansion of the last decade. The forecasting of highway use was not the only facet of our future economy which was invariably pitched too low. So were the population forecasts, and the forecasts of gross national product and personal income, all key factors in estimating future highway travel and needs.

It was not until the apparent close relationship between gross national product (GNP) and total travel was observed that forecasts of travel were projected at a level considered as being realistic. There is reason to believe that this historic close relationship has led to a tendency to extend it into the future—to tie traffic forecasts rather closely to projections of GNP. In view of developments of the last decade, this procedure, which disregards the changing composition of the GNP, could quite possibly result in a too-conservative forecast of travel. Investigations of the trend growth in the two series since 1950 show that total travel is increasing at a more rapid rate than GNP. Whether it will continue to increase, relatively, is problematical, but the most conservative extension of the 1950–58 trend would result in a 1976 travel estimate considerably higher than the one developed in this report.

A review of the information submitted by the States shows that, in general, they did an excellent job in preparing their forecasts, although having limited data available in some areas. Probably the most critical areas in which background data were lacking were the classification of travel by rural-urban areas, the projected growth of metropolitan areas and their attendant traffic problems, and projections of economic and population growth in the States. All of the items mentioned have an important bearing on travel and highway needs. A dearth or absence of adequate information in these areas makes the task of projecting highway travel and needs difficult and its evaluation doubly so.

Because of rapidly changing events and technology, and because of the behavioral nature of many of the factors involved, no one can oraculate with finality about our future population, motor-vehicle registrations, highway traffic, and highway needs. There is, nevertheless, much to be done in this field of forecasting highway use and needs. The development of more accurate and adequate forecasting techniques would result in projections that could be used with greater assurance by highway administrators than those they now have available.

Surface and Subsurface Temperature Variations and Comparisons

Reported by **HAROLD L. BOEN** and **GERARD A. DeMARRAIS**
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There is a need for correlation of surface and subsurface temperature variations with moisture conditions and the performance of highway pavements, base courses, and subgrades. Information is also needed to aid in accurate predictions of frost penetration and subsurface temperature variations from weather reports. The gradual collection of such data for various parts of the country would be very helpful to highway engineers. This article presents temperature variation data collected in Idaho by the U.S. Weather Bureau.

THE U.S. Weather Bureau Office of Idaho Falls, Idaho, in the course of a series of applied meteorological studies,[1] conducted investigations concerned with soil-surface and subsurface temperature variations and comparisons which are of interest to highway engineers. The soil-surface study contained the quantitative results of temperature variations near the surface over a 4-year period. The 2-year subsurface temperature investigation dealt with a comparison of temperature to a depth of 7 feet beneath an asphalt road surface and under a nearby sandy surface.

Site Description and Pertinent Climatology

The temperature observations were taken at the National Reactor Testing Station, 50 miles west of Idaho Falls, Idaho. The station is located on the Snake River Plain which has an average elevation of 5,000 feet and is completely surrounded by mountains. The area has desert-like characteristics, a sandy surface with occasional lava rock outcroppings. Average daily temperatures for the station are somewhat lower than most of the U.S., ranging from 15° to 20° F. in winter to 60° and 70° F. in summer. Precipitation is light, approximately 7.5 inches annually. The ground surface is usually snow-covered in winter and dry the remainder of the year.

Temperature Near the Surface

Temperatures near the surface were obtained by using a copper probe (14 inches long and 1 inch in diameter) containing a thermistor connected to a thermograph recorder. The first year's data were collected with the probe unpainted and indicate temperatures that exposed metallic objects might attain. After the first year, the probe was painted black for 3 years and was representative of temperatures experienced on a blacktop surface such as an asphalt road. Calibration of the instrument showed that it was accurate to within 1° to 2° F. The probe seldom recorded the actual extreme temperature because of the very large lag and because the indicated temperature was an average of the surface area of the probe. The probe was supported one-half inch above the surface, and in that position its temperature was determined by radiation, conduction, and convection.

Table 1 shows the temperature variations of the probe and compares these with the free air temperature taken in a nearby weather instrument shelter at a height of 5 feet. As would be expected, direct exposure of the probe to the sun showed a considerably higher temperature than the shelter thermometer recorded, particularly during the warmer months of the year. Comparisons of the copper- and black-colored thermometer probe temperatures showed that painting the probe black resulted in raising the average daily high by as much as 19° F., while the low temperature generally differed by only small amounts.

Of particular interest are the maximum daily ranges of temperature using the black-

Table 1.—Temperature comparisons and variations of the probe thermometer and shelter thermometer (°F.)

Month	Average daily high temperature		Average daily low temperature		Absolute maximum temperature		Absolute minimum temperature		Average daily temperature range		Maximum daily temperature range[1]
	Probe	Shelter	Probe	Shelter	Probe	Shelter	Probe	Shelter	Probe	Shelter	
A.—Copper-Colored Thermometer Probe on Surface. January 1951–March 1952											
January	39	25	3	0	61	38	−19	−26	36	24	62
February	48	29	7	5	63	42	−20	−26	41	24	69
March	53	35	13	13	78	56	−5	−10	40	22	63
April	80	59	27	29	96	74	14	15	53	30	72
May	99	68	33	38	122	85	22	23	66	30	83
June	103	73	35	40	127	88	24	27	68	33	98
July	120	86	45	50	138	95	35	36	74	36	95
August	111	81	45	48	134	93	33	35	66	33	86
September	111	74	36	38	125	85	22	23	76	36	94
October	81	55	27	27	105	78	13	11	54	28	81
November	61	41	17	16	79	58	0	−2	44	25	60
December	36	25	5	5	49	38	−10	−18	31	20	55
B.—Black-Colored Thermometer Probe on Surface. April 1952–April 1955											
January	47	31	17	11	81	49	−11	−24	30	20	68
February	60	36	15	10	100	53	−7	−21	45	26	73
March	72	42	18	16	108	66	−4	−15	53	25	89
April	88	56	26	27	124	77	8	6	62	29	106
May	107	67	34	35	140	91	18	18	73	32	108
June	112	74	41	42	148	95	26	26	72	32	108
July	133	88	47	49	160	99	32	33	86	39	115
August	128	85	44	46	155	99	27	28	85	39	117
September	121	78	35	36	142	92	19	18	86	42	108
October	100	65	24	25	124	82	8	9	77	40	104
November	75	46	16	16	102	63	−8	−13	59	30	92
December	49	30	9	5	81	42	−9	−18	40	25	66
C.—Thermometer Probe Buried One Inch in the Ground. June 1955–May 1958											
January	27	29	19	5	35	46	5	−31	8	25	20
February	31	35	22	11	59	53	2	−29	8	24	30
March	45	44	28	20	65	63	20	−10	18	24	36
April	63	56	34	28	90	76	26	8	29	28	53
May	86	68	46	39	119	89	32	23	41	29	68
June	105	77	50	44	134	95	35	29	55	33	84
July	118	87	56	50	141	99	42	34	62	39	87
August	117	87	53	48	135	97	37	30	64	39	83
September	100	75	42	37	125	96	29	20	57	39	78
October	72	61	32	27	98	82	19	8	40	34	64
November	39	40	23	14	68	65	6	−2	16	27	43
December	30	35	21	12	42	45	10	−14	8	23	17

[1] Maximum temperature range measured in one day by the probe thermometer.

[1] The work described in this report was supported under contract to the Reactor Development Division, U.S. Atomic Energy Commission.

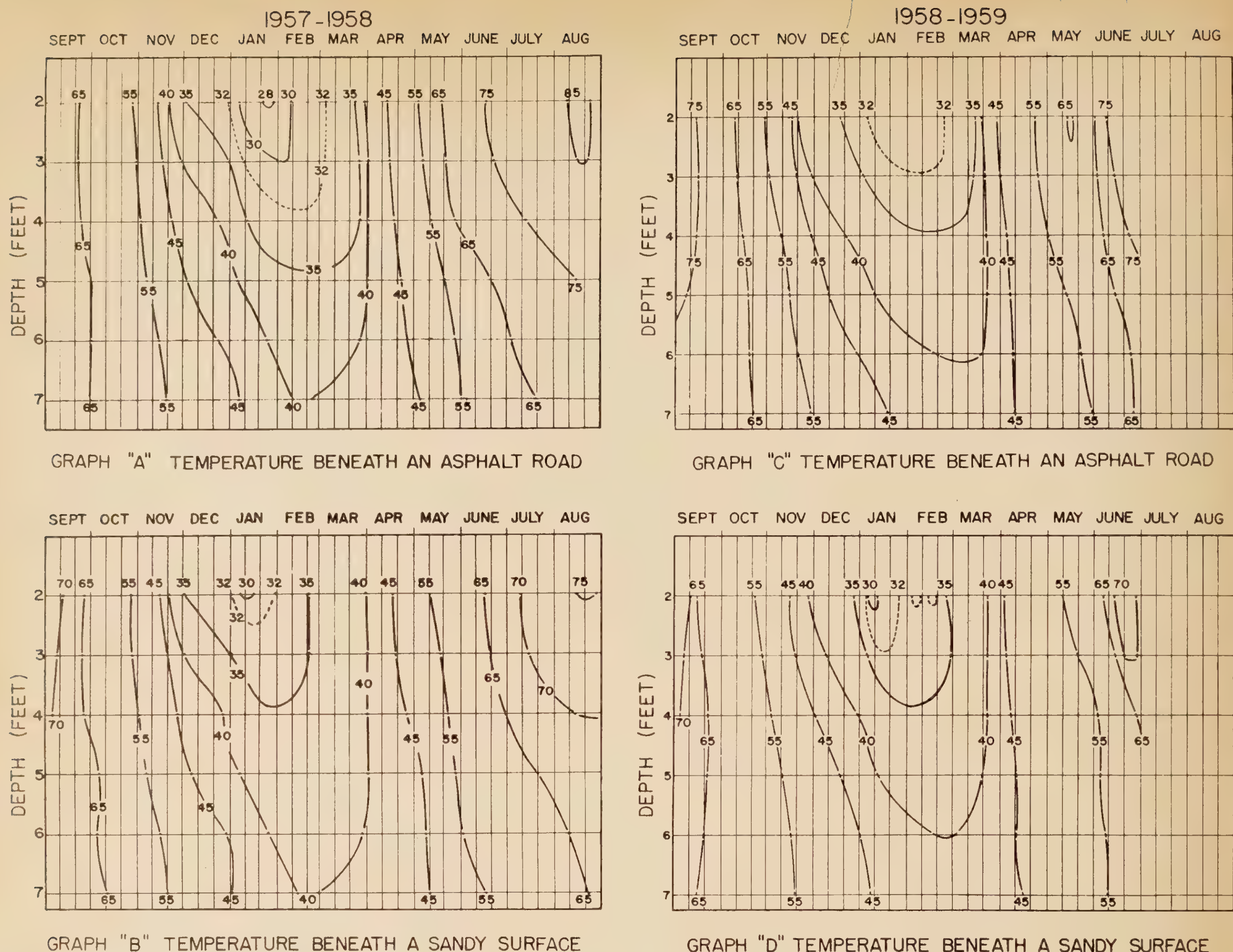

Figure 1.—A comparison of temperatures recorded at varying depths beneath two types of surface for a 3-year period.

colored probe. Since the probe might be compared to an asphalt surface, the asphalt surface could have daily fluctuations in temperature to over 100° F.

Subsurface Temperatures

The subsurface temperature study, inaugurated in 1957, compared the depth of the freezing level beneath an asphalt road surface to that beneath a sandy surface. Six thermistors were equally spaced at 1-foot depth intervals from 2- to 7-feet and connected to a recorder. One installation was located beneath an asphalt surface and the other installation beneath a nearby sandy surface.

Graphs A–D in figure 1 illustrate temperature profiles for the 2-year period. A comparison of graphs A and B (September 1957–August 1958) showed the freezing level extending to nearly 4 feet under the road surface (graph A), while under the sandy surface (graph B) the 3-foot level remained free of frost during the entire winter. Temperature extremes throughout the first year were greater down to a depth of 4 feet under the road, while below 4 feet the curves in the two graphs compare quite favorably. Graphs C and D, for the second year (September 1958–June 1959), showed the freezing level at nearly the same depth, although the sandy surface (graph D), down through the 2-foot level, showed intermittent periods of thawing. The short period of 30° F. temperatures in January 1959 was attributed to melting snow percolating into the ground and refreezing at air temperatures of near zero. Since both winters were milder than normal the freezing level would be expected to reach a deeper penetration in a normal year.

Editor's note: Highway Research Board Special Reports 18 and 22 concerning the WASHO Road Test contain data on the temperature of air, pavement, base, and subgrade of the test road near Malad, Idaho. The Weather Bureau data reported in this article, also collected in Idaho, are comparable to those reported at the test road site.

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