

Traffic-Accident Trends

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● IN New York City in September, 1899, H. H. Bliss stepped off a street car and then turned to assist a woman off the car. A passing automobile struck him, and despite first aid by a doctor who was a passenger in the car, Bliss died in Roosevelt Hospital the following day.

That is the earliest recorded motor-vehicle traffic death, and practically the full story as available today. In fact, it is probably almost the full story as recorded by officials in that September of 1899.

Some 52 yr. and 3 mo. later, December, 1951, the millionth motor-vehicle traffic death occurred. No one will ever know just who the victim was, or where or when the accident happened. The facts of the accident are recorded, however, along with thousands of other cases, in official records.

This half century of motor-vehicle accidents, which is coincident with the motor vehicle itself, has seen the problem of traffic safety rise to one of national importance, both in a social and an economic sense. It seems important therefore to look at the trends over this period, especially in relation to highways and motor-vehicle use.

It is unfortunately necessary to measure accident trends in terms of deaths. Reporting of deaths is assumed to be complete, because of established procedures in the vital-statistics field. Non-fatal accidents, on the other hand, are probably not completely reported in any jurisdiction even today and are very poorly reported in some jurisdictions. Certainly over the period under discussion no reliance can be placed on anything but fatal-accident data.

During the early years of the century, data are fragmentary. The earliest year for which the National Safety Council has made an estimate is 1906, when about 400 deaths occurred from motor-vehicle accidents. This represented a population death rate of 0.5 per 100,000 population, hardly enough to arouse any concern.

In that year, however, there were only 108,100 vehicles registered in the country. Thus 400 deaths meant a registration death rate of approximately 37 deaths per 10,000 vehicles. No estimate of mileage exists for this early period, so a mileage rate cannot be calculated.

By 1910, deaths had increased to 1,900 and the population rate to 2.0. With 468,500 vehicles registered, the registration rate was 40.5, up about 10 percent in four years.

By 1920, when there were over 9 million vehicles registered, deaths totaled 12,500. The population rate had risen to 11.7, and the registration rate had dropped to 13.5.

An estimate of the gasoline consumed on highways is available for 1920. The Bureau of Public Roads has published a figure of 3.3 billion gal., which would produce a mileage death rate of between 25 and 30 deaths per 100,000,000 vehicle-miles. (Mileage rates are usually considered to be unavailable prior to 1925, so this figure for 1920 is only a rough estimate based on a consumption rate of 14 mi. per gal.)

Better figures are available for 1925, when the mileage death rate was 17.9 deaths per 100,000,000 vehicle-miles. The registration rate had fallen slightly to 11.0 per 10,000 vehicles and the population rate had risen to 19.1 per 100,000,000 population. Deaths in 1925 totalled 21,900, almost as many as in 1943.

The end of that decade saw 32,900 deaths for 1930, a mileage rate of 16.0 deaths per 100,000,000 vehicle miles and a registration rate of 12.4 per 10,000 vehicles.

Despite a slight drop in 1932 and 1933, when travel decreased for reasons too well known for comment, deaths increased steadily until 1937, reaching a peak then of 39,643. The registration rate that year was 13.3 per 10,000 vehicles, up from 1930. The mileage rate was 14.7 per

100,000,000 vehicle-miles, continuing a slight downward trend.

In 1938, deaths were 32,582, a decrease of nearly 18 percent. The registration rate fell to 11.1 per 10,000 vehicles and the mileage rate to 12.0 per 100,000,000 vehicle-miles. No completely satisfactory explanation has ever been offered for this sharp decline, though many groups or projects have a claim for partial credit.

TABLE 1

MOTOR-VEHICLE DEATHS AND DEATH RATES IN THE UNITED STATES 1906-1951

Year	Deaths	Death Rates		
		Per 100,000 population	Per 10,000 motor vehicles	Per 100,000,000 vehicle-miles
1906	400	0.5	37.0	-
1907	700	0.8	48.9	-
1908	800	0.9	40.3	-
1909	1,300	1.4	41.7	-
1910	1,900	2.0	40.6	-
1911	2,300	2.5	36.0	-
1912	3,100	3.3	32.8	-
1913	4,200	4.4	33.4	-
1914	4,700	4.8	26.6	-
1915	6,600	6.6	26.5	-
1916	8,200	8.1	22.7	-
1917	10,200	10.0	19.9	-
1918	10,700	10.3	17.3	-
1919	11,200	10.7	14.8	-
1920	12,500	11.7	13.5	-
1921	13,900	12.9	13.3	-
1922	15,300	13.9	12.5	-
1923	18,400	16.5	12.2	-
1924	19,400	17.1	11.0	-
1925	21,900	19.1	11.0	17.9
1926	23,400	20.1	10.6	16.6
1927	25,800	21.8	11.2	16.3
1928	28,000	23.4	11.4	16.2
1929	31,200	25.7	11.8	15.8
1930	32,900	26.7	12.4	16.0
1931	33,700	27.2	13.0	15.6
1932	29,500	23.6	12.2	14.7
1933	31,363	25.0	13.2	15.6
1934	36,101	28.6	14.4	15.7
1935	36,369	28.6	13.9	15.9
1936	38,089	29.7	13.5	15.1
1937	39,643	30.8	13.3	14.7
1938	32,582	25.1	11.1	12.0
1939	32,386	24.7	10.6	11.3
1940	34,501	26.1	10.8	11.4
1941	39,969	30.1	11.6	12.0
1942	28,309	21.2	8.7	10.6
1943	23,823	17.8	7.8	11.5
1944	24,282	18.3	8.1	11.5
1945	28,076	21.3	9.2	11.3
1946	33,411	23.9	9.8	9.8
1947	32,697	22.8	8.7	8.8
1948	32,259	22.1	7.9	8.1
1949	31,701	21.3	7.2	7.5
1950	35,000	23.1	7.2	7.6
1951	37,300	24.3	7.1	7.6

The following year, 1939, was about the same. Then began another steady increase in deaths to the all-time high of 39,969, reached in 1941. Registration and travel were also up, so the registration rate for 1941 was 11.6 per 10,000 vehicles and the mileage rate was 12.0 per 100,000,000 vehicle-miles. The population rate of 30.0 per 100,000 population was exceeded only by the 1937 rate of 30.8.

During the years of World War II, travel fell off sharply and so did deaths. The registration rate fell too, but the mileage rate changed but little. In 1945, the latter was 11.3 per 100,000,000 vehicle-miles. With the end of the war, travel shot up and, in 1947, was higher than in 1941. Deaths, however, did not rise proportionately, and the mileage death rate fell to 8.8 per 100,000,000 vehicle-miles. The registration rate dropped slightly to 8.7 per 10,000 vehicles.

The years of 1948 and 1949 saw similar death records and continuing declines in the rates. In 1950, however, deaths were up, and again in 1951. It appears now that 1952 will be up slightly. Registration and travel both increased during this period so that the registration and mileage rates are nearly constant for the past four years.

TABLE 2

MOTOR-VEHICLE DEATHS AND DEATH RATES IN THE UNITED STATES, 1931 AND 1951

Year	Deaths	Death Rates		
		Per 100,000 population	Per 10,000 motor vehicles	Per 100,000,000 vehicle miles
1931	33,700	27.2	13.0	15.6
1951	37,300	24.3	7.1	7.6
Percentage Changes				
1931-	+11%	-11%	-45%	-51%
1951				

The 50-odd years of motor vehicles have produced a death total of over a million persons. It seems obvious that we have not adjusted ourselves very well to the automobile but are making some progress, slow though it may be. Just 20 yr. ago, we killed one person every 6,400,000 mi. of vehicle operation. Today we drive 13,200,000 mi. per death, more than twice as far. We have experienced very little change on a population basis during these 20 yr. but almost as much improvement on a vehicle-registration basis as on a mileage basis.

During the entire period under discussion, the physical plant — the road system of the country — has not grown in proportion to vehicle registration and use, though it has changed greatly in character. The road census of 1904 showed a total rural mileage of 2,151,379 mi., of which 153,530 mi. were surfaced. In 1931 there was reported a total rural mileage of 3,036,000 mi., a figure which has not changed much for 1951. By

1931, however, surfaced rural roads totaled 830,000 mi. and that has doubled today so that half of our rural mileage is surfaced. Since city-street mileage amounts to only about 10 percent of rural mileage today, it is clear that the important change in highway characteristics has been in the improvement of rural roads.

This is reflected in accident data and is of great importance today to those concerned with accident prevention. In the years prior to 1937, no separation is available between urban and rural deaths. Data are at hand, however, for deaths in cities over 10,000 population and for deaths in smaller cities and rural areas, and these figures show the trend quite clearly. In 1924, for instance, there were 9,300 deaths in cities over 10,000 population and 10,100 in small towns and rural areas. Thus 48 percent of the deaths resulted from accidents in cities over 10,000 population and 52 percent from accidents in smaller cities and rural areas.

This preponderance of deaths in small cities and rural areas has continued. By 1937, it had increased until 69 percent of the deaths occurred from accidents outside cities over 10,000 population.

In that same year, data were first available which classified accidents by all incorporated places as compared to rural areas outside corporate limits. Though far from being a completely satisfactory definition of "urban" and "rural," such a method probably gives a more accurate picture than the old break at 10,000 population.

The 1937 classification on the new basis shows 59 percent in rural areas. Since rural areas and places under 10,000 represented 69 percent of the total, it follows that cities under 10,000 population accounted for about 10 percent of the deaths.

By 1941 the rural percentage had grown to 64 percent, and the 10 percent for small cities remained constant.

After dropping during World War II, when rural travel declines so greatly, they have risen again until today 7 out of every 10 motor-vehicle deaths is the result of an accident in rural areas. In 1924, this ratio was about 4 out of 10. This reflects notable advances for safety in cities, where deaths have in actual

totals gone down from 16,300 in 1937 to 10,700 in 1951. At the same time it presents a tremendous challenge to those responsible for our rural roads and their operation.

The mileage death rate for urban areas has always been below that for rural areas, but though both have been cut, the urban rate has gone down farther than the rural figure. The earliest purely urban and rural rates are for 1937. Then the urban rate was 11.8 deaths per 100,000,000 vehicle-miles, and the rural rate was 17.7.

TABLE 3
U. S. MOTOR-VEHICLE DEATHS,
URBAN-RURAL LOCATION, 1924-1951

Year	Deaths				Percentage	
	Cities over 10,000 pop	All Cities	Cities under 10,000 & rural	Rural	In cities under 10,000	In rural & rural areas
1924	9,300		10,100		52%	-
1925	10,100		11,800		54%	-
1926	10,100		13,300		57%	-
1927	11,000		14,800		57%	-
1928	11,500		16,500		59%	-
1929	12,200		19,000		61%	-
1930	13,180		19,750		60%	-
1931	12,820		20,850		62%	-
1932	11,070		18,380		62%	-
1933	11,500		19,880		63%	-
1934	12,900		23,200		64%	-
1935	11,800		24,570		68%	-
1936	11,900		26,190		69%	-
1937	12,100	16,300	27,540	23,340	69%	59%
1938	9,650	13,050	22,930	19,530	70%	60%
1939	9,400	12,800	22,990	19,590	71%	61%
1940	9,800	13,500	24,700	21,000	72%	61%
1941	10,100	14,220	29,870	25,750	74%	64%
1942	8,750	11,650	19,560	16,660	69%	58%
1943	8,100	10,550	15,720	13,270	66%	56%
1944	7,600	10,620	16,680	13,660	69%	56%
1945	8,640	11,900	19,440	16,180	69%	58%
1946	8,670	12,400	24,750	21,020	74%	63%
1947	8,100	11,450	24,600	21,240	75%	65%
1948	-	10,600	-	21,660	-	67%
1949	-	9,650	-	22,050	-	70%
1950	-	10,200	-	24,800	-	71%
1951	-	10,700	-	26,600	-	71%

These rates decreased so that by 1941, the peak year for deaths, the urban rate was down 26 percent to 8.7 deaths per 100,000,000 vehicle-miles, and the rural rate was 15.2, off 14 percent. By 1951, the urban rate was 4.5 per 100,000,000 vehicle-miles, 62 percent below 1937, and 48 percent under 1941. The rural rate in 1951 was 10.5, which was 41 percent under 1937 and 31 percent under 1941.

These important decreases in mileage rates are the result of constantly increasing travel volumes, particularly on rural roads, coupled with accident prevention efforts in all areas. Again it would appear that safety had been more effective in cities, however, than in

rural areas.

Trends in types and circumstances of accidents reflect chiefly the increased proportion of rural accidents. Details are lacking prior to 1930, but in that year pedestrian deaths were 39 percent of the total. By 1940, pedestrians were still 37 percent of all fatal types, but in 1950 these cases were only 25 percent and, in 1951, 24 percent of the total. From 1930 to 1951, pedestrian deaths fell 30 percent and, from 1940 to 1951, 29 percent.

From 1940 to 1951, pedestrian deaths decreased 31 percent in urban areas, and all deaths dropped 21 percent. In rural areas during the same period, pedestrian deaths decreased 26 percent, and all deaths increased 27 percent.

TABLE 4

U. S. MOTOR VEHICLE MILEAGE DEATH RATES, URBAN AND RURAL, 1937-1951

Year	Deaths per 100,000,000 vehicle-miles		Year	Deaths per 100,000,000 vehicle-miles	
	Urban	Rural		Urban	Rural
1937	11.8	17.7	1945	9.2	13.6
1938	9.6	14.5	1946	7.3	12.3
1939	9.0	13.7	1947	6.0	11.4
1940	9.0	13.8	1948	5.3	10.9
1941	8.7	15.2	1949	4.6	10.2
1942	8.4	12.9	1950	4.6	10.6
1943	9.7	13.6	1951	4.5	10.5
1944	9.6	13.5			

Collisions between two or more motor vehicles increased sharply from 1930, when they represented but 18 percent of the total death cases. In 1940 they were 29 percent of the total and were 35 percent in 1950 and 37 percent in 1951. In actual totals, deaths from this type increased 135 percent from 1930 to 1951. From 1940 to 1951, the increase was 37 percent.

Although no separate urban and rural totals are available for 1930, it appears from the trend in cities over 10,000 population (where two-vehicle collisions decreased from 1930 to 1940) that this increase occurred in rural areas. From 1940 to 1951, two-vehicle collisions in rural areas increased 47 percent, and decreased 2 percent in urban areas.

A possibly significant change has occurred in noncollision accidents, those cases in which a vehicle runs off the road or overturns in the road with no prior collision, or miscellaneous accidents without a collision in the roadway. From 1940 to 1951, this type increased

51 percent in rural areas. Data for cities under 10,000 population and rural areas combined appears to indicate, however, that the rural total in 1930 was much higher than in 1940, so the increase from 1930 to 1951 in rural non-collision deaths was only 10 or 15 percent.

The most-important change, therefore, seems to have taken place in rural two-vehicle collisions. In 1940, this classification accounted for 38 percent of rural deaths, and in 1951, for 44 percent. In 1930, it probably represented only about 20 percent of rural fatalities.

The major increase, at least from 1940 to 1951, came in collisions at intersections. In 1940, this type was 8 percent of all rural fatal cases, or a total of about 1,680 deaths. In 1951, these collisions were 12 percent of the rural fatal cases, or about 3,200 deaths.

A smaller increase occurred in the classification of "noncollision, ran off straight road." In 1940 this type was 13 percent of rural fatalities, or 2,730 deaths. In 1951, this type represented 16 percent, or 4,260 deaths.

Major decreases occurred in pedestrian nonintersection cases. In 1940, these were 21 percent of all rural fatalities, or 4,410 deaths. In 1951, these were 11 percent, or 2,930 deaths.

Little change is apparent in the information on circumstances of accidents in recent years. The violations reported for drivers remain about the same as 10 yr. ago. Ages of drivers in accidents are quite similar to those reported earlier.

The proportion of night accidents has increased some in recent years probably reflecting the growth of night-traffic volumes. In 1930, only 49 percent of fatal accidents occurred during hours of darkness. In 1951, 56 percent of fatal accidents happened during night hours. This is slightly below the 1941 record, however, when 58 percent were in darkness. Perhaps this absence of further change reflects better vehicle headlighting and increased highway lighting and reflectorization.

During recent years interest has been great in the so-called superhighways. Too little information is available on their accident experience, but enough is at hand to emphasize that the pattern on such highways does not fit the ordinary rural highway pattern.

Most obviously, pedestrian accidents are very infrequent, as are intersection accidents. The most prevalent type appears to be rear-end collisions, followed by running-off-roadway accidents. Both of these types would seem to point up the need for wide, surfaced shoulders to permit vehicles to pull off the road to stop and to allow them to accelerate before pulling back into the traffic lane and to provide a margin of safety for a driver who may run off or be forced off the traveled portion of the road.

TABLE 5

MOTOR-VEHICLE DEATHS BY TYPE OF ACCIDENT AND LOCATION, 1930-1951

Year	Total deaths	Deaths from collision with			Deaths from non-collision accidents
		Pedestrian	Other Motor Vehicle	Other vehicle or object	
<u>U S</u>					
1930	32,900	12,900	5,880	4,150	9,970
1940	34,501	12,700	10,100	3,900	7,800
1950	35,000	8,700	12,300	3,300	10,700
1951	37,300	9,000	13,800	3,400	11,100
<u>Urban</u>					
1930	No data available prior to 1937				
1940	13,500	8,100	2,150	1,750	1,500
1950	10,200	5,450	1,950	1,400	1,400
1951	10,700	5,600	2,100	1,400	1,600
<u>Rural</u>					
1930	No data available prior to 1937				
1940	21,000	4,600	7,950	2,150	6,300
1950	24,800	3,150	10,550	2,050	9,050
1951	26,600	3,400	11,700	2,000	9,500

Research in Michigan and Minnesota has indicated the important effect on accidents of roadside development and has thereby emphasized again the importance of controlling access. Even on superhighways, however, with a limited number of access points, the problem remains of getting vehicles safely into and out of the traffic stream. The parked or stopped vehicle beside the road needs its own individual access facility, too, which it does not now have in most instances.

All of the data we now have on accidents comes from state and city records, built from reports submitted by participants in accidents or by investigating authorities. In many instances, the investigation is, in reality, not an investigation but merely a reporting process. As a result, the information that is available on casual factors is of limited value. Even data on as important a fact as location may be inaccurate and of limited usefulness.

No discussion of accidents today can be complete without reference to these handicaps. The answer is still not clear, but as a result of the President's Highway Safety Conference in October, 1952, plans are underway to improve the situation.

In their simplest terms, they state that we must separate quantity of data from quality of data. We can hope to obtain information from drivers in a large number of cases, but the information must be of a nature easily reported by drivers with a reasonable degree of accuracy. The same requirements apply to reports from police or others who contact but do not truly investigate an accident.

The quality data (which we do not have in any substantial degree now) must come from specially trained police investigators who will report more accurately than now why the accident happened. Such information can be obtained on only a sample of the total accident experience, at least in the immediate future.

All highway engineers should welcome better causal data. In the past statements have sometimes been made in regard to the proportion of accidents in which the road was a factor. Usually such studies report a very low percentage, seldom over 15 percent.

It seems absurd to even consider such a study based on conventional accident records. Not one report in a thousand can be depended upon to answer the questions of adequate sight distance, proper radius of a horizontal curve, or adequate capacity for the volume carried. True, some reports list "highway defects," usually low shoulders, bumps, holes, and unlighted barricades, which are largely matters of maintenance. Only when we can greatly improve our system of reporting causal factors can we make categorical answers to questions of highway contributions to accidents.

SUMMARY

1. Traffic deaths have been a problem ever since the motor vehicle came into being, and have in general followed the trend of motor vehicle use.

2. Death rates have followed the following patterns:

Population. Gradually increasing to a high of 30.8 per 100,000 population

in 1937, then dropping to 17.8 in 1943, and climbing slowly to 24.3 in 1951.

Registration. Starting high and reaching a low of 10.6 per 10,000 vehicles in 1926, then up to 14.4 in 1934, then down to an all-time low in 1951 of 7.1.

Mileage (Earliest data for 1925). Starting high at 17.9 per 100,000,000 vehicle-miles, dropping sharply from 1937 to 1938, then decreasing steadily to 7.5 in 1949. In both 1950 and 1951, staying low at 7.6.

3. From 1930, when deaths were about evenly divided between urban and rural areas, to 1951 the trend has been toward a predominantly rural problem. In 1951 rural deaths were 71 percent of the total, and were up 60 percent from 1930 while urban deaths were down about a third.

4. The mileage death rate for rural areas has consistently been 50 percent greater than the urban rate, and is today more than twice the urban rate. Both rates have dropped substantially since 1937, when data were first available for their calculation.

5. Changes in the types and circumstances of accidents are primarily due to this urban-rural shift. Pedestrian deaths have decreased, and two-vehicle and

noncollision accidents have increased, as might have been expected.

6. The major change in rural fatalities, other than a general increase, has been in two-vehicle intersection collisions and in noncollision, ran-off-straight-road accidents, both of which have increased in the past 10 yr., and in pedestrian nonintersection accidents, which have substantially decreased.

7. Few changes can be found in the pattern of accident circumstances and conditions, although there has been a slight increase in night accidents (except that the night percentage has not increased in the last 10 yr.).

8. Major differences are apparent in the accident pattern for the most modern superhighways. Fewer pedestrian and intersection accidents but more rear-end collisions and running-off-roadway accidents are reported.

9. Current research and superhighway experience suggests the need for more attention to the control of access, even by vehicles parked on the shoulder.

10. Good causal information on accidents, particularly on the influence of the highway, must wait upon better accident information. Work is underway to develop this type of data.