# Epidemiology of Traffic Accidents

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## SUMMARY

**The epidemiology of traffic accidents is studied. Various factors include the nature of fatal injuries, the racial, sex and age distribution, the scene of accident, the weather and the time, the different categories of commuters and the trip purpose, the types of vehicles and motorways involved.**

**The establishment of a traffic accident assessment team is recommended.**


*S. Afr. Med. J.*, **48**, 599 (1974).

In so far as this brief study is concerned, the epidemiology of traffic accidents begins at the hospital or mortuary, and ends at the commencement of the journey.

Whether a traffic accident casualty ends up by being discharged from a hospital or by being buried from a mortuary, depends primarily upon the severity of the injuries, or upon certain sequelae, such as lung shock, and often upon the time-lag between the accident and hospital treatment. The general nature of the injuries sustained is much the same in both instances—it is merely a matter of degree of severity.

It is considered that traffic accidents, when compared with other forms of accidental injury, are in a category by themselves, in that they are largely 'projectile' episodes, the victim being projected in several directions from a stationary position before finally coming forcibly to rest.

## NATURE AND DISTRIBUTION OF FATAL TRAFFIC ACCIDENTS

Out of some 10 000 postmortem examinations performed at the Durban Police Mortuary during the 5-year period 1965 - 1969 on persons who had died from unnatural causes, approximately 1 700 or 17% were due to traffic accidents—which is not really a high figure were it not for the fact that almost two-thirds (62%) were between the ages of 20 and 50 years—the most productive years of life.

It was noted that over half (51,5%) of these traffic accident victims suffered multiple injuries—which is an indication of the severity of traffic accidents—and over one-third (35,5%) suffered head injuries. In 64% of these cases, more than one internal organ was directly damaged, indicating the severity of soft-tissue injuries sustained, and in 59% more than one skeletal system was directly involved, again indicating the severity of bone injuries sustained.

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### Racial Distribution of Fatal Traffic Accidents

An analysis of approximately 1 700 cases of fatal traffic accidents gave the following results: Blacks—55,5%; Whites—21,5%; Indians—18,5%; Coloureds—4,5%; total non-Whites—78,5%. The percentage of Whites (who are the chief motorists) fatally injured in traffic accidents was just over one-fifth (21,5%), while the percentage of Blacks (who are the chief pedestrians) was well over half (55,5%). The lowest incidence was among the Coloureds—only 4,5%.

### Sex Distribution of Fatal Traffic Accidents

An analysis of some 2 100 fatal traffic accidents gave the following results: males—79%; females—21%; a ratio of 4:1. The high proportion of males to females killed in traffic accidents may be due to the fact that (*a*) more males commute daily in private and commercial vehicles; (*b*) more females commute daily in public transport; and (*c*) females are generally more careful, considerate and responsible drivers than men—especially men under the age of 25 years.

Fatal traffic accidents among children of all 4 racial groups follow the same pattern. An analysis of 340 deaths among children of all racial groups during a period of 13 years showed that 72% were boys—a ratio of 2,6 boys to 1 girl. This may be due to boys being more venturesome than girls; and this fatality rate is much in excess of nature's normal provision of 106 males to every 100 female babies born.

### Age Distribution of Fatal Traffic Accidents

Analysis of approximately 2 155 fatal traffic accidents showed that 19,25% were 20 years and under; 8,75% 60 years and over; and 72% 20 - 59 years—that is, almost three-quarters of these fatal road accidents affected the economically active or working section of the population.

### Scene of Fatal Traffic Accidents

Fatal traffic accidents occur on all sorts and conditions of roads, at all times of the day and night, in various ways and under varying weather conditions.

Of some 357 fatal traffic accidents recorded over a 12-year period (1958 - 1969), 180 or 50,4% occurred on unidirectional traffic flow motorways (one-way streets), and 177 or 49,6% on bidirectional traffic flow motorways. Thus there appears to be no statistical difference between one-way and multiple-way traffic flow in respect of fatal traffic accidents, although rear-on collisions appear to be

more common in the former, and head-on collisions in the latter.

It is of interest that the highest percentage of fatal traffic accidents (44%) occurred on motorways with the widest effective carriageway, namely 15 metres and over, while the lowest (8%) occurred on those motorways with the narrowest effective carriageway, namely under 6 metres. Perhaps this indicates more efficient, careful, slower and safe driving factors exhibited by both drivers and pedestrians, combined with lower traffic densities and inability to overtake.

An analysis of 858 fatal traffic accidents gave the following results: at intersections—45,5%; on open straight roads—38,2%; and on open curved roads—16,3%. It would thus appear that 'X', 'T' or 'V' intersections are the scene of most fatal traffic accidents (Tables I - III).

Tables I - III give details of the types of fatal traffic accidents.

**TABLE I. ANALYSIS OF 239 FATAL MOTOR VEHICLE ACCIDENTS**

| Manner of accident | Number | Percentage |
|---|---|---|
| Head-on collision | 55 | 23 |
| Rear-on collision | 50 | 21 |
| Turning collision | 35 | 14,5 |
| Reversing collision | 23 | 10 |
| Loss of control | 18 | 7,5 |
| Collision with fixed object | 13 | 5,5 |
| Skid accidents | 13 | 5,5 |
| Shattered windscreen | 9 | 4 |
| Collision with animals | 7 | 3 |
| Collision with pedestrians | 3 | 1,5 |
| Miscellaneous collisions | 13 | 5,5 |

**TABLE II. ANALYSIS OF 972 COMMUTER FATALITIES**

| Manner of traffic accident | Percentage |
|---|---|
| Knocked down on roadway and killed | 65 |
| Killed in vehicle during collision | 23 |
| Fell from vehicle and killed | 12 |

**TABLE III. ANALYSIS OF 521 PEDESTRIAN AND VEHICULAR COMMUTER FATALITIES**

| Manner of traffic accident | Percentage |
|---|---|
| **Pedestrian commuters** | |
| Knocked down from the right (moving) | 35 |
| Knocked down from the left (moving) | 19 |
| Run down by motor vehicle (stationary) | 12,3 |
| **Vehicular commuters** | |
| Fell from moving vehicle | 11,7 |
| Rolled-over and left-the-road accidents | 8 |
| Head-on and rear-on collisions | 7,5 |
| Side-on collisions | 6,5 |

Being knocked down from the right usually means that the pedestrian had stepped off the pavement into the face of on-coming traffic, or had dashed out into the carriageway from between parked vehicles. Being knocked down from the left usually means that the pedestrian had almost reached the opposite pavement but had miscalculated the speed of oncoming traffic in relation to his own speed.

Of the 521 fatal traffic accidents analysed (Table III), 11,7% were due to persons falling from moving vehicles—some were due to passengers attempting to alight from moving buses, while others fell from lorries inadequately provided with guard rails.

## Weather, Time of Day, etc. and Fatal Traffic Accidents

Weather and the time of day taken together have a considerable influence upon traffic accidents. Included are such factors as the hour of day, light and darkness, hours of sunshine and rain, day of the week, month of the year, and the seasons. Fifty-four per cent of fatal traffic accidents occurred during hours of darkness and 46% during daylight hours. This shows a difference of 8% in favour of the hours of darkness. This might indicate that improved street lighting in urban areas would be an advantage; it is also perhaps indicative of decreased visibility in relation to speed at night.

Pedestrian commuter rush hours are chiefly from 0600 to 0800 and from 1600 to 1800 while motorist commuter rush hours are between 0700 and 0900 and between 1700 and 1800.

In this series of approximately 1 700 traffic fatalities the highest percentage of such fatal accidents (55%) occurred between 1600 and 2200, the peak period being between 1800 and 2000, which produced 25% of fatal traffic accidents. This analysis covered a period of 10 years, from 1958 to 1967.

Forty-six per cent of fatal traffic accidents occurred during working hours, i.e. 0600 - 1800, as compared with 54% which occurred during leisure hours, i.e. 1800 - 0600.

**TABLE IV. DAY OF THE WEEK IN RELATION TO 1 800 FATAL ACCIDENTS**

| Day of week | Percentage | |
|---|---|---|
| Monday | 12,6 | |
| Tuesday | 10,6 | |
| Wednesday | 10,0 | |
| Thursday | 12,6 | 4 days — 45,8% |
| Friday | 15,0 | |
| Saturday | 24,2 | |
| Sunday | 15,0 | 3 days — 54,2% |

It will be observed from Table IV that the weekends (3 days) accounted for more than half the fatal traffic accidents analysed (54,2%). It would appear that workday tensions account for fewer fatal traffic accidents (45,8%) than do holiday inattentions (54,2%), a difference of 8,4%.

The lower percentage of fatal traffic accidents during the summer months may perhaps be due to the longer hours of daylight—13,41 as against 11,04 in the winter months—providing better visibility on roads. The main

factor would appear to be that of visibility, a difference of over 2⅓ hours.

## Purpose of Motor Trip

The object of a journey, whatever the duration, whether for business, work or pleasure, whether in private or public transport, whether on foot or in a motor vehicle, plays an important role in the causation of traffic accidents. We have already seen that holiday inattention appears to produce more fatal traffic accidents than does workday tension.

Of approximately 1 000 persons killed in traffic accidents, some two-thirds (65%) were pedestrians and one-third (35%) were motorists—a ratio of approximately 2:1. This would appear to indicate that commuting or 'walk-about' facilities for pedestrians, including motorists who become pedestrians after completion of motor trips or journeys, are inadequate and unsafe, or that pedestrian traffic behaviour is below traffic requirements, or both.

**TABLE V. CATEGORIES OF MOTORISTS INVOLVED IN 1 093 FATAL TRAFFIC ACCIDENTS**

| Category of motorist | Percentage |
|---|---|
| Workers (drivers and passengers) | 33 |
| Leisure (drivers and families) | 27 |
| Transporters (professional drivers of commercial vehicles) | 35 |
| Unknown (hit-and-run drivers) | 5 |

Drivers of motor vehicles are arbitrarily divided into 3 categories: worker-drivers; professional drivers; and leisure drivers. Of approximately 1 100 fatal traffic accidents analysed in this connection, the leisure driver accounted for 27% (Table V).

## Type of Motor Vehicle

It will be seen from Table VI that the motor car accounted for two-thirds of fatal pedestrian traffic accidents (67%).

**TABLE VI. TYPE OF MOTOR VEHICLE INVOLVED IN 632 PEDESTRIAN FATALITIES**

| Motor vehicle involved | Percentage |
|---|---|
| Motor cars | 67 |
| Commercial motor vehicles | 26 |
| Motor cycles | 2 |
| Unknown motor vehicle | 5 |

## Type and Condition of Motorway

It would appear that adverse road conditions are not a primary cause of fatal pedestrian traffic accidents (Table VII). Motorists usually drive more carefully and reduce speed under poor road and weather conditions.

**TABLE VII. ANALYSIS OF 118 PEDESTRIAN FATALITIES ON MOTORWAYS**

| Location | No. of deaths | Percentage |
|---|---|---|
| Roadways with pavements | 89 | 75 |
| Roadways with no pavements | 29 | 25 |
| Street lighting adequate | 72 | 61 |
| Street lighting inadequate | 46 | 39 |
| Dry roadway: weather clear | 110 | 93 |
| Wet roadway: weather rainy | 8 | 7 |
| Pedestrian deaths: | | |
| Total good road conditions: 76,5% | | |
| Total adverse road conditions: 23,5% | | |

## Other Factors

There would appear to be no statistical difference between day and night fatal pedestrian traffic accidents.

Of the 4 racial groups, the Black pedestrian commuters show the highest proportion of those killed in traffic accidents (56,5%)—more than twice the total number of the other 3 racial groups together. More Black pedestrian commuters were killed during the hours of darkness (33%) than in daylight (23,5%). This may be due to their generally wearing dark clothing so that they are not readily visible at night, and to their propensity to be on traffic routes at night. Hence there is a need for motorists to have good, wide-spreading headlights and to reduce speed at night.

# CONCLUSIONS

Since pedestrians constitute approximately two-thirds of all fatal traffic accidents, any preventive measures must take the behaviour and the protection of the pedestrian commuter into consideration.

The nature of the injuries sustained in traffic accidents is directly proportional to the force of the impact.

Personality—the so-called 'human factor'—would appear to play an important role in the causation of traffic accidents, and hence, vice versa, an important role in the pre-

**TABLE VIII. SUGGESTED ASSESSMENT REPORT: FATAL OR SEVERE TRAFFIC ACCIDENTS**

1. Name and address, age, sex, racial group of casualty.
2. Scene/place of accident: time and date of accident.
3. Traffic officer's report.
4. Hospital/medical report: postmortem report.
5. Time and date of admission to hospital or mortuary.
6. Was casualty alive on admission to hospital? Blood alcohol report.
7. Police report.
8. Inquest report: court proceedings report.
9. Insurance company's assessor's report on vehicle.
10. Trip purpose: time and place of departure. Last stopping place prior to accident.
11. Weather conditions at place and time of accident.
12. Condition of motorway at site of accident: national or provincial or municipal roads' engineer's report.

vention of traffic accidents. Co-operative behaviour is essential at all times from everyone.

In view of the peculiar nature of traffic accidents, continued research into the safety performance and design of motor vehicles is of the utmost importance. Intensive research into the health, psychological, behavioural and social factors involved in the causation of traffic accidents is regarded as essential—not only as a scientific study or discipline, but also as an exercise in finding practical ways and means of preventing traffic accidents.

A traffic accident assessment team, consisting of an experienced medical practitioner, traffic engineer, traffic magistrate, and motor insurance excutive should be established. This assessment team should be full-time, have its own secretarial staff, its own computer, and its own vote. It could serve under the aegis of the Council for Scientific and Industrial Research, and submit annual reports and recommendations to the Minister of Transport and to the National Road Safety Council.

A simple traffic accident assessment report should be drawn up and completed in the case of every fatal and severe traffic accident and submitted to the traffic accident assessment team for processing, analysis and discussion. The main objective of these analyses will be to try to establish the various factors which cause the most traffic accidents with a view to their prevention.

A suggested traffic accident assessment report form, based on this article and in accordance with the traffic accident analysis scheme, is set out in Table VIII.

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