

# Death and injury from motor vehicle crashes in Colombia

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## ABSTRACT

We report data on the distribution and determinants of road deaths and injuries for all victims in Colombia, with the aim of defining targets and priorities for highway death prevention in that country and other rapidly urbanizing nations. Using information from Colombia's Fund for the Prevention of Road Injury and the national death registry, we studied data on deaths and injuries from 1991 to 1995 for the nation as a whole and for the country's two largest cities, Santa Fe de Bogotá and Medellín. Deaths and injuries are rising in the nation as a whole. Of the deaths, 75% occur in urban areas, and 80% are in males. Pedestrians aged 15-34 are a peak subgroup. Thirty-four percent of deaths are attributable to speeding and/or alcohol consumption. Death tolls are highest at night and on weekends. Specific priority targets for intervention are indicated by the fact that 75% of road deaths in Colombia occur in urban areas and that 80% of all victims are males.

Colombia has a population of some 35 million people, approximately 120000 kilometers of roads, and around two million registered vehicles. Among males below age 35 in the country, motor vehicle injuries are the second ranking cause of death, after violence. Official sources for all motor vehicle crashes for 1995 reported 7 874 dead and 52 527 injured (Table 1) (1). The reported risk of death based on

kilometers traveled is 18 times the risk in the United States of America and 5 times that of Europe (2).

In 1993, the Government of Colombia instituted a mandatory vehicle insurance law for all licensed drivers and also standardized the road injury report system. Between 1991 and 1995, the number of reported deaths nearly doubled, the number of persons injured almost tripled (1), and there was a sharp rise in the number of insurance policy claims.

This paper is the first epidemiologic review of the distribution and determinants of road deaths and injuries in Colombia. We suggest that a relatively simple database for road deaths and injury trends in a developing country can be used to quickly define a staged, sequential strategy for prevention activities. The goal of this strategy is to achieve a large, swift drop in casualties using simple, cost-effective, sustain-

able countermeasures in urban and interurban settings. We believe the case fatality rate is particularly useful in monitoring trends in crash speeds and in the effectiveness of speed control measures. The difficult problems Colombia has with violence, terrorism, and killings are well known, and they serve as a background for the findings and recommendations of this paper.

## METHODS

We employed a descriptive method based on data from Colombia's Fund for the Prevention of Road Injury. The Fund receives police reports of motor vehicle accidents and casualties. In 1993, a National Insurance Law introduced a newly standardized reporting system that led to the increased reporting of less-severe vehicle crash injuries. In Colombia, a motor vehicle

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**TABLE 1. Reported deaths and other injuries from motor vehicle crashes, Colombia, 1991–1995**

Year	Deaths	Nondeath injuries	CFR <sup>a</sup>
1991	4 199	18 182	18.8%
1992	4 620	21 280	17.8%
1993	5 628	33 083	14.5%
1994	6 989	45 940	13.2%
1995	7 874	52 527	13.0%

<sup>a</sup> CFR = case fatality rate (deaths as a proportion of both fatal and nonfatal injuries in crashes).

accident is defined as a crash or collision involving at least one motor vehicle and causing at least one injury or death to an occupant of the vehicle or to a pedestrian, within 30 days of the accident. Injuries are reported only if they involve hospitalization, but those reports often lack data on severity. Standardized injury severity scales are not yet in use. This paper reports data from 1991 through 1995.

Data on kilometers traveled in urban and interurban roads are reported by the Government of Colombia and are based on total annual fuel consumption, estimated fuel consumption for different types of vehicles, and periodic interurban monitoring of traffic volume. In the absence of a universally accepted definition of a road, for the purpose of this paper a road is defined as a surface, whether in an urban or rural environment, designated for the travel of vehicles. The classification of “urban roads” includes major highways and other types of roads within cities. “Rural roads” are all the roadways outside of urban areas.

## RESULTS

### Nationwide trends in crashes, deaths, and injuries

Reported motor vehicle crashes, deaths, and nondeath injuries rose steadily from 1991 through 1995. From 1993 to 1995, reported deaths rose from 5 628 to 7 874, an increase of 40%, and

other reported injuries climbed from 33 083 to 52 527, a rise of 59% (Table 1). Over that same period, mortality rates per billion vehicle-kilometers traveled increased from 155.2 to 196.0, while the case fatality rate—deaths as a proportion of both fatal and nonfatal injuries in crashes—dropped from 14.5% to 13.0%.

### Urban and rural trends

Over the years 1991–1995, the overwhelming majority of the deaths occurred on urban roads (Table 2). For example, in 1995 75% of all the vehicle crash deaths happened in urban areas. There was a steady upward trend in reported urban deaths from 1991 to 1995, from 3 003 to 5 903, a rise of 96.5%. In rural areas, death tolls also rose, from 1 116 to 1 971, an increase of 76.6%. During the years 1993 to 1995, the case fatality rate (CFR) dropped in urban areas from 14.7% to 12.3%, but rose in rural areas from 14.0% to 16.0%.

Colombia’s two largest cities, Santa Fe de Bogotá and Medellín, showed trends similar to those for all of Colombia’s urban areas. From 1991 to 1995, deaths rose from 1 089 to 1 387 in Bogotá and from 649 to 817 in Medellín despite a falling CFR in both cities (Table 3).

### Pedestrians

In 1995, more than half of the victims nationwide were pedestrians (4 180 of

**TABLE 2. Deaths and case fatality rates for roads in urban areas and rural areas of Colombia, 1991–1995**

Year	Urban areas		Rural areas	
	Deaths	CFR <sup>a</sup>	Deaths	CFR
1991	3 003	21.6%	1 116	13.3%
1992	3 330	19.8%	1 290	14.2%
1993	4 220	14.7%	1 408	14.0%
1994	5 204	12.5%	1 749	15.5%
1995	5 903	12.3%	1 971	16.0%

<sup>a</sup> CFR = case fatality rate (deaths as a proportion of both fatal and nonfatal injuries in crashes).

**TABLE 3. Reported deaths and other injuries from motor vehicle crashes, Bogotá and Medellín, Colombia, 1991–1995**

City/Year	Deaths	Other injuries	CFR <sup>a</sup>
<b>Bogotá</b>			
1991	1 089	4 055	21.3%
1992	1 284	5 086	20.3%
1993	1 261	11 505	10.0%
1994	1 341	13 392	9.1%
1995	1 387	15 906	8.0%
<b>Medellín</b>			
1991	649	7 291	8.3%
1992	664	9 467	6.7%
1993	737	13 202	5.3%
1994	719	17 437	4.0%
1995	817	17 149	4.6%

<sup>a</sup> CFR = case fatality rate (deaths as a proportion of both fatal and nonfatal injuries in crashes).

the 7 874 deaths; 53%). Of the pedestrian deaths in that year, 3 991 (95.5%) occurred in the cities. However, a higher proportion of pedestrians in cities survived after being hit that year; the reported CFR for pedestrians in rural areas was nearly double that in urban areas, 34% vs. 18%.

### Deaths by gender and age

In 1995, 80% of the motor vehicle crash deaths involved males. More than half of the dead were under age 35: 1–14 years, 798 deaths (10%); 15–34 years, 3 552 deaths (45%); 35–59 years, 2 309 deaths (29%); 60+ years, 1 215 deaths (15%). The CFR for those 60 and older, 27%, was about twice as high as the rates for the other age groups, which ranged from 10% to 15%.

### Deaths by time of day

In 1995, while the number of kilometers traveled at night was reported to be one-fifth of that for daytime (3), 3 937 of all reported deaths (50.0%) and 21 484 of all reported injuries (40.9%) occurred at night.

**TABLE 4. Attributed causes of reported motor vehicle crashes, Colombia, 1995**

Attributed cause	Motor vehicle crashes (No.)	Proportion of all crashes (%)
High speed	34 166	19
Driving under the influence of alcohol	26 973	15
Poor driving skills	12 587	7
Poor road conditions	8 991	5
Driving out of lane	5 395	3
Faulty brakes	5 395	3
Passing on a curve	3 596	2
No car lights	3 596	2
Others: pedestrian lapses (not crossing where permitted, not observing traffic), adverse weather conditions, falling asleep at the wheel, etc.	79 121	44
Total	179 820	100

### Driving too fast and under the influence of alcohol

Table 4 shows that in 1995, 61 139 of all the crashes and collisions (34%) were attributable to speeding and/or driving under the influence of alcohol.

## DISCUSSION

Case fatality rates from vehicle crashes in Colombia declined from 18.8% to 13.0% between 1991 and 1995. Nevertheless, those rates were far above the levels of such countries as Israel (1.1%–1.6%) (4) and the United States of America (1.0%–1.1%) for the same period of time (1). It is almost certain that these much higher CFRs in Colombia can only be partially attributed to underreporting of less-severe injuries, especially after 1993, when the country's new insurance law mandated reporting as a condition for compensation.

The trends we report from Colombia draw attention to the rising tolls of dead and injured, especially among young men, from road crashes as motorization increases in rapidly growing third world cities. In Colombia, the target priorities for an intervention program are urban roadways and young men, given that the majority of the vehicle crash deaths in the country

involve young drivers in cities. Furthermore, urban areas are easier to reach than remote rural areas and are therefore a more accessible target site for effective solutions at lower cost.

### Urban areas

On urban streets with heavy pedestrian traffic, there is an urgent need to reduce vehicle travel speeds to 30 kilometers per hour (kph), the speed at which there is an abrupt increase in fatality risk for pedestrians struck by vehicles (4). Certain preventive measures have been shown to reduce deaths and injuries from road crashes by 50% to 80% and to be highly cost beneficial and cost effective (4). The use of roundabouts (small traffic circles) and road bumps can reduce speed; other environmental modifications can include bicycle paths, pedestrian crosswalks, and roadside speed cameras (5–10). Among other possible steps are improving high-risk points ("hot spots" or "black spots") so as to reduce road injuries, and adding more street lights, traffic lights, and reflectors on the midlines and sides of roads.

The inevitable increase in traffic congestion in urban areas is expected to lower average daytime speeds and CFRs. Nevertheless, it would be a mistake to rely on congestion alone as a

strategy for reducing the overall death toll.

### Drinking and driving

Breath tests for drivers suspected of drunk driving are a priority need in Colombia. It is not unusual in either Bogotá or Medellín to find young men racing through the main thoroughfares at extremely high speeds under the influence of alcohol and other drugs. The problem of night drinking and driving affirms the case for limits on bar hours or bans on the nighttime sale of alcoholic beverages (11).

### Rural areas

In rural areas in Colombia, death tolls and the CFR are steadily rising, probably the result of higher speeds on interurban roads, more truck travel, and a poorly developed emergency service system. Again, the use of electronic speed camera systems to enforce posted speed limits is suggested. Such systems have been shown to reduce speeds and deaths in rural areas by increasing detection levels to the point of deterrence (12). The camera systems can operate around-the-clock with limited manpower, and their evidence is irrefutable. Their impact can be monitored by watching trends in deaths and CFRs.

## CONCLUSIONS

The medical community should take a role in educating policymakers and the public on the importance of these preventive measures, which can achieve far more than medical care alone. We suggest the use of the Haddon matrix to list and categorize strategies to prevent road injuries (13–15). The Haddon matrix is a simple grid that classifies interventions by category (human, vehicle, physical environment, socioeconomic environment) and stage (precrash, crash, postcrash).

The effectiveness of these prevention measures could be improved with

further research on such issues as the impact that the economic and social environment and the instability endemic in Colombia have on young

males and crashes; the need for new laws; and the availability of lifesaving emergency care. We also suggest that Colombia could help other countries

in Latin America by sharing its experience in efforts to reduce motor vehicle deaths and injuries.

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## RESUMEN

### Muertes y lesiones por accidentes de tráfico en Colombia

Con el fin de definir objetivos y prioridades para la prevención de las muertes en carretera en Colombia y en otros países que se encuentran en rápido proceso de urbanización, presentamos datos sobre la distribución y determinantes de las muertes y lesiones por accidentes de tráfico en Colombia. Utilizando información del Fondo de Prevención Vial Nacional y del registro nacional de defunciones, estudiamos los datos correspondientes al período comprendido entre 1991 y 1995, tanto en la totalidad del país como en sus dos principales ciudades: Santa Fe de Bogotá y Medellín. En el ámbito nacional, las muertes y lesiones por esta causa están en aumento. En relación con las muertes, 75% ocurrieron en áreas urbanas y 80% de las víctimas fueron varones, cifras que señalan la existencia de objetivos prioritarios específicos para la intervención. El subgrupo más afectado fue el de los peatones de 15 a 34 años de edad. Treinta y cuatro por ciento de las muertes fueron atribuibles a exceso de velocidad o consumo de alcohol. El número de víctimas mortales fue más elevado por las noches y en los fines de semana.