

# AN OVERVIEW OF ROAD SAFETY IN LEBANON

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## ABSTRACT

Road traffic injuries are a growing public health and development problem. According to the World Health Organization (WHO), 1.2 million people are killed in road traffic crashes around the world each year. Most of those killed are in the prime of their lives. The road traffic deaths represent a picture of the total waste of human and societal resources from road injuries. Between 20 and 50 million people are injured or disabled by road crashes around the world (WHO, 2012).

In Lebanon, a Middle Eastern country, over 1000 people are killed every year, with nearly one-third involving vulnerable road users like pedestrians and motorcyclists. More than twice as many are permanently disabled by their injuries. These statistics need to be multiplied and seen in the context of deep family tragedy, of unimaginable grief and anguish, and of tremendous health and economic and disability costs.

**Keywords:** land transport; driving behavior; road infrastructure; accident characteristics; Lebanon

## INTRODUCTION

Lebanon, or known officially as the Republic of Lebanon is located at the juncture of the Mediterranean Basin and the Arabian hinterland, and is surrounded by Israel to the south and Syria to the east and north (see Figure 1). The Lebanese population is estimated at approximately 4

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million inhabitants (about 380 individuals per square kilometer) with the majority (85%) living in urban regions. There is a strong transition at the demographic level, with 25% of the population below the age of 15 and 10% older than 65, indicating that almost half of the population is active with a dependency rate of 52%. Moreover, the fertility rate of 1.9 is relatively low. Life expectancy is 74 years, ranging between 71 years for men and 77 years for women, and the national growth rate is 1.8% (IGSPS, 2012).



Figure 1. Map of Lebanon

(<http://www.lonelyplanet.com/maps/middle-east/lebanon/>)

According to the World Health Organization, Lebanon ranks 43 out of 178 countries in terms of poor road safety. In a country where 40 percent of road accidents involve foot traffic, compared with 10 percent in developed countries, NGOs have been lobbying for some time to increase public awareness of road safety and pedestrian walkways (Anderson, 2011). Unfortunately, road safety is hardly a priority for the government in cash-strapped Lebanon.

This paper provides an overview of the land transport sector in Lebanon, with special emphasis on driving and traffic safety, as well as recommendations to alleviate the problems facing road safety.

#### LAND TRANSPORT IN LEBANON

The land transport fleet in Lebanon consists of more than 1.5 million registered vehicles. The lack of an efficient, reliable and wide public transport system has necessitated a reliance and eventual dependence on the personal car as the main means of transport within the country. The rate of car ownership of 2.7 persons for every car is amongst the highest in the world (Choueiri et al., 2010). By all means, car dependency in Lebanon drains the national economy of wealth and natural resources, encourages the reduction of the quality and quantity of public social space in cities, creates sprawl and far-flung sub-urbanization, and destroys culture. It is quickly becoming recognized as a global social and environmental problem.

#### DRIVING IN LEBANON

By all means, driving in Lebanon can be an adventure, and most accidents that happen on the streets of Lebanon are caused by irresponsible driving, and negligence on the part of drivers as well as pedestrians. Many will agree that driving two ways on a one-way street, driving against traffic even on major roads, and driving large (cargo) trucks that carry everything from livestock

to petroleum, uncontrollably, with no regard to anyone else on the road, are all habits that most likely result in some sort of accident. Almost all drivers and pedestrians in Lebanon show no respect for the law and simply do as they please; yet they get furious if they have an accident, and blame the officials for not imposing the rules. This really does not make sense. True, there are other factors that result in people getting into road-related incidents, such as unfit road structures, poorly planned street designs, and more largely the poor condition of a considerable number of vehicles running the streets of Lebanon. Other bloody-minded behavior includes an excessive use of the horn, and a fabulously cavalier approach to parking. It should be noted that the majority of drivers in Lebanon lack proper traffic education, possess a driver's license but without having ever been subjected to a proper road test as we see in developed countries, do not undergo strict medical supervision and mandatory periodic examination of their eyesight and health. As it stands now, drivers, pedestrians, and unorthodox vehicles have to compete for the same badly maintained and poorly designed roads; agitation, frustration, and various deliberate obstructions, obscene gestures and verbal abuse are commonplace, and this, in turn, spawns incidents ranging from often extreme acts of aggression, physical assault and of course road traffic accidents (Choueiri et al., 2010).

Lebanese legislations set speed limits on urban roads nationally at 100 km/h and allowed local authorities to set lower limits. However, the enforcement of speed limits is only effective at a rate of 4 to 10 (or 40%) which is low but is much more effective than the enforcement of the drink-driving law. The legal limit in the latter is set at 0.05g/dl but barely has any efficacy when it comes to enforcement. Random breath testing and/or police checkpoints are occasionally set but there is no tracking of data related to road deaths caused by alcohol consumption. The seat-belt wearing rate remains low; the Lebanese Internal Security Forces reported that only 15% of the population buckled up in 2007. Enforcement effectiveness scores low too. On the other hand, Lebanon has not yet introduced a child restraints law. As for helmet wearing rates, no data are available. Despite a motorcycle helmet law, helmet standards are not mandated and weakly enforced (Choueiri et al., 2010).

#### ROAD SAFETY IN LEBANON

In the following, a review of the problem of road traffic accidents (RTA) in Lebanon in 2011 is presented. The review concerns 4447 accidents in 2011, which resulted in 508 fatalities and 6040 injuries at the scene of the accident, as reported by the Internal Security Forces (ISF, 2011); thus, if an injured person dies a few days later from injuries sustained in a traffic accident, then that person is not included in the injury statistics on deaths from traffic accidents. It should be noted that the international definition of 30-days traffic fatality is not used in Lebanon and, therefore, the traffic fatality figures that are reported by ISF, on which the following analyses are based, are far below the actual ones that are reported, for example, by the Lebanese Red Cross (LRC). It should be noted that LRC compiles statistics

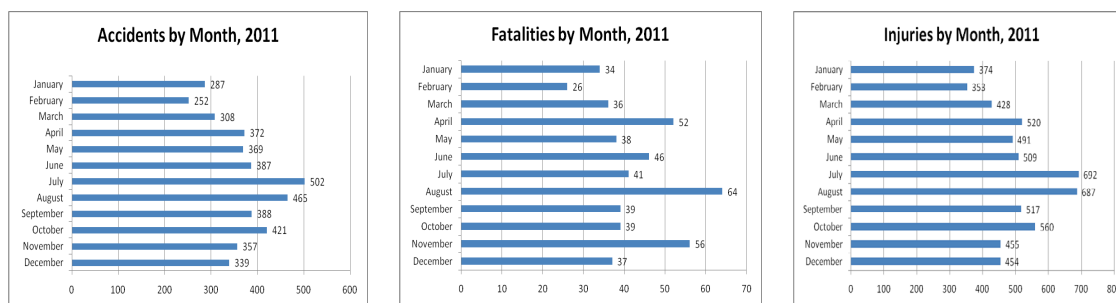


Figure 2. Road Accidents by Month

from accidents it responds to following calls from participants or witnesses, does not coordinate with the ISF, and would not even venture a guess as to why there is such a discrepancy between its statistics and those reported by the ISF. Furthermore, the accident reports do not clearly describe the accident location. As a result, it is usually very difficult to accurately determine the black spots that are in need of treatment.

*Road accidents by month*

A review of road traffic accidents by month in 2011 yielded the data shown in Figure 2, which gives the total number of accidents, fatalities and injuries that were sustained in road traffic accidents. As can be seen, the data reveal considerable variations throughout the year from month to month, with the highest values being during the summer month of July (for accidents and injuries), and in August for fatalities; the odds of a fatal accident are increased throughout July and August because there are more people driving during these months than at many other times of the year due principally to the fact that roads fill up with both commuters and vacationers, especially Lebanese who come from abroad, and sea-lovers; the lowest values corresponded to the winter month of February.

In order to test whether there are statistically significant differences in monthly accidents, fatalities, and injuries, use was made of chi-square test for goodness of fit. The results are shown in Table 1. This table reveals calculated chi-square values of 149.6 for accidents, 28.6 for fatalities, and 244.3 for injuries. Since the calculated chi-square values are all greater than the critical chi-square value of 19.675 using a 0.05 level of significance, the null hypotheses, i.e. accidents, fatalities and injuries are uniformly distributed over months (January through December), are therefore rejected. In other words, accidents, fatalities and injuries do not have statistically a uniform distribution over months.

Table 2. Chi-squared goodness-of-fit test, for months

Month	Accidents				Fatalities		Injuries	
	Observed Value	df	Critical Chi-square (0.05 level of significance)	Calculated Chi-square	Observed Value	Calculated Chi-square	Observed Value	Calculated Chi-square
January	287				34		374	
February	252				26		353	
March	308				36		428	
April	372				52		520	
May	369				38		491	
June	387	11	19.675	149.6	46	28.6	509	244.3
July	502				41		692	
August	465				64		687	
September	388				39		517	
October	421				39		560	
November	357				56		455	
December	339				37		454	

*Road Accidents by Weekday*

A review of road traffic accidents by weekday and weekend, referred to in the following as simply weekday, in 2011 yielded the data shown in Figure 3, which gives the total number of accidents, fatalities, and injuries that were sustained in road traffic accidents. As can be seen, the data reveal considerable

variations throughout the week, from day to day, with the highest values being on Sunday (for accidents, fatalities and injuries). By all means, the weekends are typically worse for driver safety because people tend to be out more, run more errands and potentially drive home while intoxicated more often over the weekend. By contrast, Tuesday is the day people are least likely to die in a crash. Monday is comparable or only slightly more deadly than Tuesday due to the fact that most Lebanese tend to drive to the capital Beirut on Monday to take care of their businesses, or simply getting back from somewhat a long weekend in their respective hometowns.

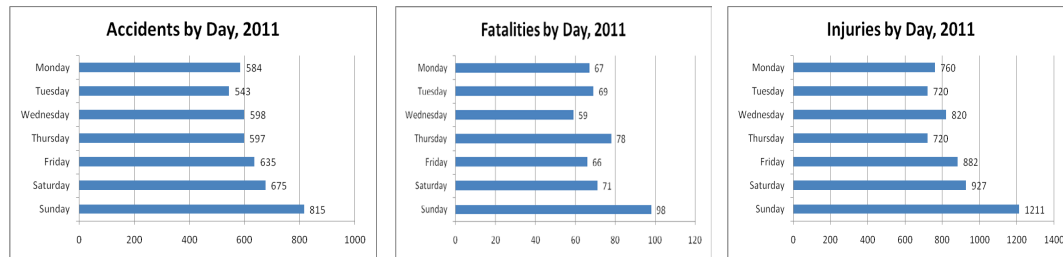


Figure 3. Traffic Accidents by Weekday

In order to test whether there are statistically significant differences in weekday road accidents, fatalities, and injuries, use was made again of chi-square test for goodness of fit. The results are shown in Table 2. This table reveals calculated chi-square values of 75.4 for accidents, 159.7 for fatalities, and 207.4 for injuries. Since the calculated chi-square values are all greater than the critical chi-square value of 12.592 using a 0.05 level of significance, the null hypotheses, i.e. accidents, fatalities and injuries are uniformly distributed over weekdays (Monday through Sunday), are therefore rejected. In other words, accidents, fatalities and injuries do not have statistically a uniform distribution over weekdays.

Table 3. Chi-squared goodness-of-fit test, for weekdays

Weekday	Accidents				Fatalities		Injuries	
	Observed Value	df	Critical Chi-square (0.05 level of significance)	Calculated Chi-square	Observed Value	Calculated Chi-square	Observed Value	Calculated Chi-square
Monday	584				67		760	
Tuesday	543				69		720	
Wednesday	598				59		820	
Thursday	597	6	12.592	75.4	78	159.7	720	207.4
Friday	635				66		882	
Saturday	675				71		927	
Sunday	815				98		1211	

#### Road Accidents by Time of Day

A review of road traffic accidents by time of day in 2011 yielded the data shown in Figure 4, which gives the total number of accidents, fatalities and injuries that were sustained in traffic accidents. As can be seen, the data reveal considerable variations throughout the time of day, with the highest values being in late afternoons and early evenings in general; that is, between 15 and 18 pm, followed by 18 to 21 pm. It is no surprise that the lowest values corresponded to the time between 3 and 5:59 am, when most people are snuggled in their beds.

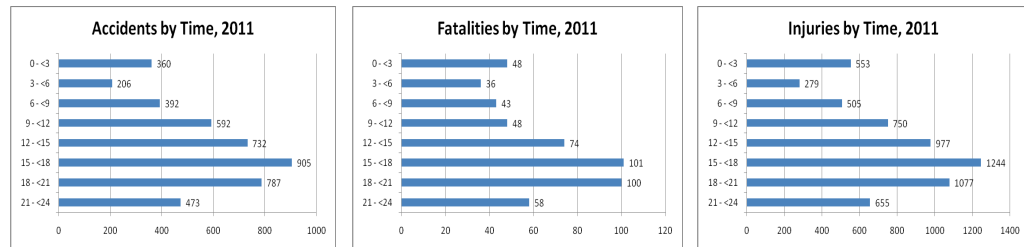


Figure 4. Traffic Accidents by Time of Day

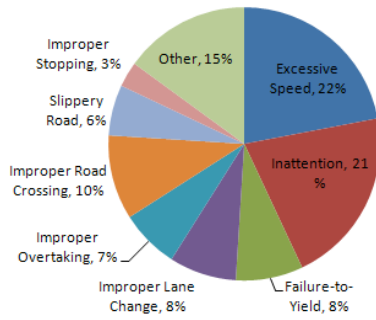
In order to test whether there are statistically significant differences in time of day accidents, fatalities, and injuries, use was made again of chi-square test for goodness of Fit. The results are shown in Table 3. This table reveals calculated chi-square values of 723.4 for accidents, 71.4 for fatalities, and 969.5 for injuries. Since the calculated chi-square values are all greater than the critical chi-square value of 14.067 using a 0.05 level of significance, the null hypotheses, i.e. accidents, fatalities and injuries are uniformly distributed over daytimes, are therefore rejected. In other words, accidents, fatalities and injuries do not have statistically a uniform distribution over daytimes.

Table 3. Chi-squared goodness-of-fit test, for daytimes

Daytime	Accidents				Fatalities		Injuries	
	Observed Value	df	Critical Chi-square (0.05 level of significance)	Calculated Chi-square	Observed Value	Calculated Chi-square	Observed Value	Calculated Chi-square
0 - <3	360				48		553	
3 - <6	206				36		279	
6 - <9	392				43		505	
9 - <12	592	7	14.067	723.4	48	71.4	750	969.5
12 - <15	732				74		977	
15 - <18	905				101		1244	
18 - <21	787				100		1077	
21 - <24	473				58		655	

#### Road Accidents by Cause

The major causes of traffic accidents in Lebanon during 2011 are detailed in Figure 5. The largest single cause of accidents was excessive speeding for prevailing conditions, such as the weather, road, light, traffic, etc., which contributed to 22% of all accidents. Carelessness of drivers, such as using mobile phones while driving, close following or tailgating, not stopping at red lights, etc., took the second rank, accounting for 21% of the accidents. Other causes, such as disregarding traffic priority rules, using incorrect lanes, bad turns, reversing, and sudden stopping, caused about 26% of the accidents. Inappropriate crossing maneuvers by pedestrians contributed to about 10% of the accidents.



### Road Accidents by Type

In terms of accidents by type, multi-vehicle accidents accounted for 47% of the accidents (see Figure 6) and accounted for the majority of the victims in road traffic accidents (40% killed and 55% injured), see Figure 8. Pedestrian accidents accounted for 29% of the accidents and contributed to 33% killed and 20% injured. It should be noted that the high percentage of pedestrian victims is due to the fact that pedestrians have very often to share the road with road vehicles due to a lack of sidewalks (and even when there are sidewalks, many drivers often ignore parking rules and park their cars on the sidewalks) and pedestrian crossings, as well as to ignorance on the part of drivers regarding the rights of pedestrians whilst on the road.

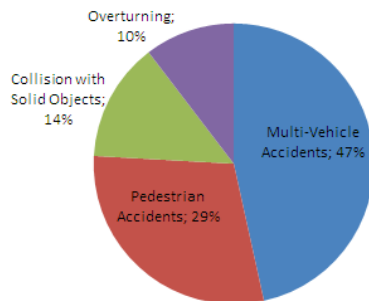


Figure 6: Road Accidents by Type

Although run-off-the-road/rollover accidents contributed to about 10% of the overall number of traffic accidents in Lebanon in 2011 (see Figure 6), they contributed to about 16% of road fatalities and 11% of road injuries (see Figure 7). In fact, most of these accidents could be attributed to excessive speeding, inattention, using cell phones, texting while driving, which is becoming quite a hazard on the roads of Lebanon, especially in the absence of an active role by the traffic police to identify and stop this deadly behavior. Finally, collisions with solid objects accounted for 14% of the accidents and contributed to 11% killed and 14% injured.

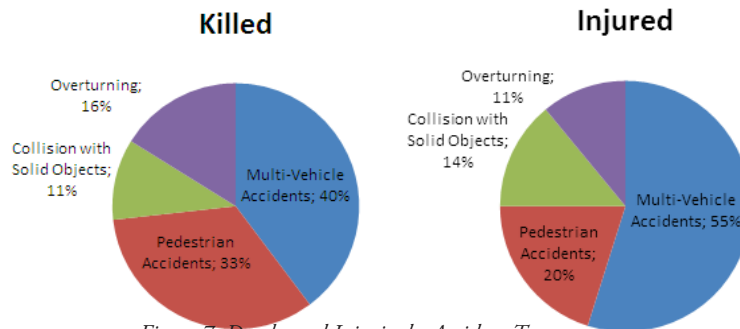


Figure 7: Deaths and Injuries by Accident Type

Of the vehicles involved in road traffic accidents, passenger cars accounted for 67%, trucks for

7%, and motorcycles (and bicycles) for 26%, see Figure 8. This is probably understandable since passenger cars make up about 86% of all road vehicles in Lebanon (Choueiri et al., 2010). Cyclists do not appear in Figure 8 because they only represent a tiny part of road users involved, given that bicycles are not so widely used in Lebanon for so many reasons, the most important of which is the absence of bike routes.

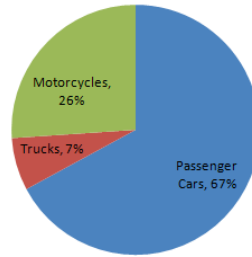


Figure 8: Traffic Accidents by Vehicles Involved

As can be deduced from Figure 9, accidents involving passenger cars contributed to 71% killed and 73% injured; accidents involving trucks resulted in 12% killed and 6% injured; and accidents involving motorcycles (and bicycles) accounted for 17% killed and 21% injured.

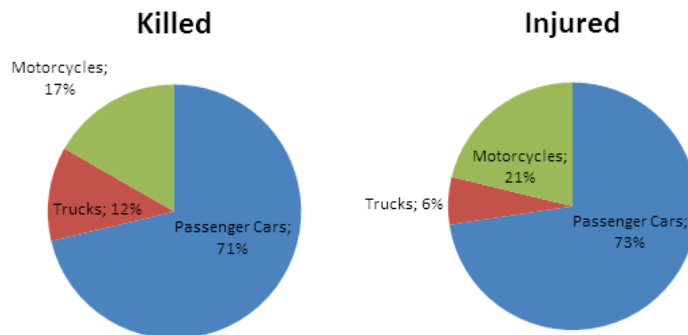


Figure 9: Deaths and Injuries by Vehicles Involved

#### Road Accidents by Gender

Even though the Lebanese population is almost equally divided between males and females, more than three-quarters of the victims of road traffic accidents (81% killed and 76% injured) are male (see Figure 10), mainly due to excessive speeding on the part of males in open areas, as well within residential and commercial areas. It should be noted that, due to a lack of playgrounds in Lebanon where young people could play, get together and relax, the car has become the means through which young drivers release their tensions whilst on the road, without due regard for the others and the negative consequences that they might encounter.

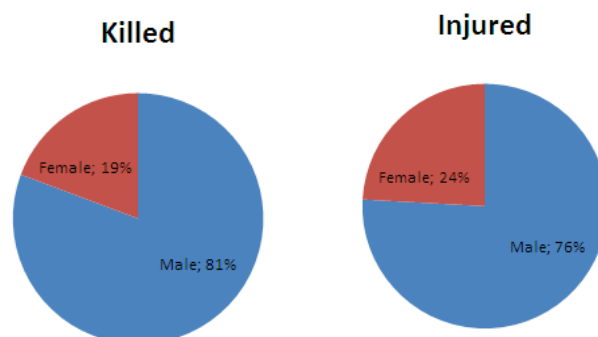


Figure 10: Deaths and Injuries by Gender



### Road Accidents by Age

About one half of road traffic accident victims are persons under 30 years of age, with those between the ages of 15 to 29 accounting for 35% and above, followed by those in the age group of 4 to 14 with 7% and above, and under 10 with about 5% (see Figure 11).

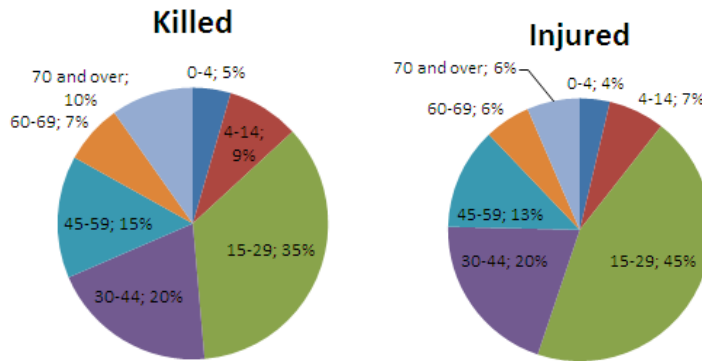


Figure 11: Deaths and Injuries by Age

### Road Accidents by Roadway Type and Condition

With respect to road accidents, Figure 12 provides a breakdown of road accidents by roadway type. As can be deduced from the figure, half of the road accidents (50%) occurred on undivided two-way roads, which make up the majority of roads in Lebanon. The least number of road traffic accidents (21%) occurred on divided roads.

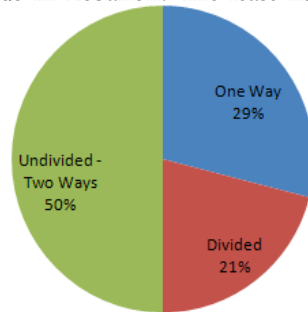


Figure 12: Road Accidents by Roadway Type

It should be noted that the Lebanese road network consists of about 22000 km of roads out of which about 6400 km (or nearly 30 percent) are classified as paved roads which are governed by the Ministry of Public Works and Transport (MOPW&T), and by the Council for Development and Reconstruction (CDR), while the remaining 70 percent are un-classified roads which are governed by municipalities (Choueiri et al., 2010; Choueiri et al., 2007). The road network suffers from inadequate maintenance, low traffic capacity leading to slow traffic flows and congestion, and poor road safety conditions. A classification of the Lebanese road network is shown in Figure 13.

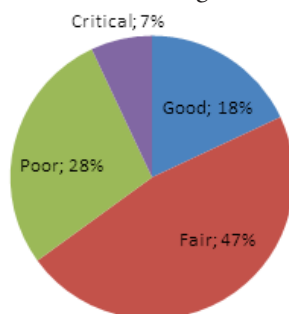


Figure 13: Classification of the Road Network

### *The Cost of Road Accidents*

Deaths and injuries sustained in traffic accidents in Lebanon generate enormous medical costs, estimated by some sources at almost 2% of the Gross National Product (GNP), or 750 million U.S. Dollars (Choueiri et al., 2010, 2007 & 2000; El-Zein, 2004). This amount poses a significant financial burden on the economy of a country where a sizeable proportion of the population lives below the poverty line of less than \$15 per day.

### CONCLUSIONS AND RECOMMENDATIONS

This paper assessed the magnitude of road safety in Lebanon. It reviewed the Internal Security Forces' records of traffic accidents for the year 2011. The review concerned 4447 traffic accidents in 2011, which resulted in 508 fatalities and 6040 injuries at the scene of the accident. Descriptive statistics and Chi-Squared goodness-of-fit test were used in the analysis. The main conclusions follow:

- accidents, fatalities and injuries do not have statistically a uniform distribution over months, weekdays, and daytimes;
- the largest single cause of accidents was excessive speeding for prevailing conditions, such as weather, road, light, traffic, etc., which contributed to 22% of all accidents. Carelessness of drivers, such as using mobile phones while driving, close following or tailgating, not stopping at red lights, etc., accounted for 21% of the accidents. Other causes, such as disregarding traffic priority rules, using incorrect lanes, bad turns, reversing, and sudden stopping, caused about 26% of the accidents. Inappropriate crossing maneuvers by pedestrians contributed to about 10% of the accidents.
- multi-vehicle accidents accounted for 47% of the accidents, and for the majority of the victims in road traffic accidents (40% killed and 55% injured);
- pedestrian accidents accounted for 29% of the accidents and contributed to 33% killed and 20% injured;
- run-off-the-road/rollover accidents accounted for about 10% of the overall number of traffic accidents, and contributed to about 16% of road fatalities and 11% of road injuries;
- collisions with solid objects accounted for 14% of the accidents and contributed to 11% killed and 14% injured;
- passenger cars accounted for 67% of the accidents, followed by trucks (7%) and motorcycles (and bicycles) (26%);
- accidents involving passenger cars contributed to 71% killed and 73% injured; accidents involving trucks resulted in 12% killed and 6% injured; and accidents involving motorcycles (and bicycles) accounted for 17% killed and 21% injured;
- even though the Lebanese population is almost equally divided between males and females, more than three-quarters of the victims of road traffic accidents (81% killed and 76% injured) are male.
- about one half of road traffic accident victims are persons under 30 years of age, with those between the ages of 15 to 29 accounting for 35% and above, followed by those in the age group of 4 to 14 with 7% and above, and under 10 with about 5%;
- half of the road accidents (50%) occurred on undivided two-way roads, which make up the majority of roads in Lebanon. The least number of road traffic accidents (21%) occurred on divided roads;
- deaths and injuries sustained in traffic accidents generate enormous medical costs, estimated by some sources at almost 2% of the Gross National Product (GNP), or 750 million U.S. dollars.

In conclusion, reversing the lack of road safety culture in Lebanon is the biggest challenge that Lebanese governments face in their efforts to make the roads safer to drive on. By all means, attitudes toward speeding, changing lanes without warning, dangerous overtaking, tailgating, mobile phone usage whilst driving, and ignoring traffic lights in many instances are only a few of the issues that the Lebanese government needs to address in order to keep the roads safer. In the meantime, efforts should be made to establish well-equipped trauma centers; suitable means of transfer of injured patients by ambulance from the accident scene to these facilities are also of paramount importance, because many patients develop serious irreversible damage during inappropriate and unsafe transfer. In addition, reliable traffic accident data are important in order to understand how road safety interventions and technology can be successfully transferred from (developed) countries where they have proven to be effective (Habibzadeh, 2012).

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