

## **Analysis of Accident Patterns in Lebanon**

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**ABSTRACT**

An estimated 1.2 million people worldwide are estimated to be killed and 50 million injured in road traffic accidents each year. Statistics reveal that every 3 minutes a child is killed on the world's roads, and more than 80% of road deaths occur in low and middle income countries. According to some estimates, it is expected that, in the year 2020:

- road deaths will increase by 80%;
- road traffic deaths and injuries will rise by 65%;
- road traffic deaths and injuries will see a reduction of 28% in high income countries, compared to an increase of road traffic deaths and injuries in low and middle income countries due to escalating motorization.

There is a growing international recognition of this major public health challenge, and perhaps nowhere more so than in Lebanon, a developing country in the Mediterranean region. This article looks at the land transport sector in Lebanon, and briefly discusses its negative consequences. It then looks at the road traffic accident situation in this country and proposes measures to alleviate it.

## 1. INTRODUCTION

Road traffic accidents - the leading cause of death by injury and the tenth-leading cause of all deaths globally - now make up a surprisingly significant portion of the worldwide burden of ill-health. An estimated 1.2 million people are killed in road traffic accidents each year, and as many as 50 million are injured, occupying 30 percent to 70 percent of orthopedic beds in developing countries' hospitals. And, if present trends continue, road traffic injuries are predicted to be the third-leading contributor to the global burden of disease and injury by 2020 [1].

Developing countries bear a large share of the burden, accounting for 85 percent of annual deaths and 90 percent of the disability-adjusted life years (DALYs) lost because of road traffic injury. And, since road traffic injuries affect mainly males (73 percent of deaths) and those between 15 and 44 years old, this burden is creating enormous economic hardship due to the loss of family breadwinners. Moreover, the disability burden for this age group accounts for 60 percent of all DALYs lost because of road traffic accidents. The costs and consequences of these losses are significant. Three-quarters of all poor families who lost a member to road traffic accidents reported a decrease in their standard of living, and 61 percent reported they had to borrow money to cover the expenses following their loss. The World Bank estimates that road traffic injuries cost 1 to 2 percent of the gross national product (GNP) of developing countries, or twice the total amount of development aid received worldwide by developing countries [2-4].

Although car sales and usage continue to grow in many parts of the world, many cities and states, including a good number in the Mediterranean region, are realizing that this cannot continue unabated and are attempting to gradually move away from the private car to mass transit systems. The consensus is growing that public transportation is not only an economic and environmental necessity, but a means of restoring cultural vitality to urban areas.

The privately owned car as a means of mass transportation has had unparalleled negative effects in the last fifty years on cities throughout the world, and perhaps nowhere more so than in Lebanon, a developing country in the Mediterranean region. Car dependency in Lebanon drains the national economy of wealth and natural resources, encourages the reduction of 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.

This article looks at the land transport sector in Lebanon, and briefly discusses its negative consequences. It then looks at the road traffic accident situation and proposes measures to alleviate it.

## **2. THE LAND TRANSPORT SECTOR IN LEBANON**

Lebanon's urban culture has in great measure followed western patterns before and after the civil war (1975-90). With regard to transportation, however, its paradigm has been particularly and almost exclusively American; that is, favoring the private automobile over the establishment of public transport systems.

Passenger cars have become mass consumer goods in Lebanon. Since the mid 1970s, the total number of vehicles in Lebanon rose from about 250,000 to nearly 1,600,000; an increase of about 540 per cent, with private cars making up about 86 per cent of the total number of vehicles. Today, there are 300 private passenger cars per one thousand people in Lebanon. Commercial investment in cars as a mass transportation system in Lebanon, including the import of vehicles, replacement parts, fuel and related costs, was estimated to be well over \$820 million, or about 7.5 per cent of the GDP. Consistently, since the end of the war period, private cars have constituted 10 per cent of total imports to Lebanon. The average Lebanese household spends 13.85 per cent of its income on cars. Congestion on roads was estimated to cost Lebanon \$2000 million per year (approximately 15 per cent of the GDP). Traffic accidents in Lebanon were estimated to cost the national economy about 1.5 per cent of its GDP [5].

As an importer of cars and their accompaniments, Lebanon pays for its car dependency with an unsustainable cash flow abroad. Beyond the loss of foreign exchange, Lebanon's natural and social capital - in the form of limited urban and rural resources - is steadily being sacrificed to feed the car culture habit. The paradoxical result is the cultural and economic impoverishment of an inherently rich land.

## **3. THE IMPACT OF CAR DEPENDENCY IN LEBANON**

In order to better understand the land transport situation in Lebanon, one should note the following [5]:

- 25% of CO<sub>2</sub> emissions come from the land transport sector.
- Cars produce a substantial noise pollution, due to dense traffic, old vehicle engines and excessive hooting.
- The total morbidity and mortality cost of air pollution amounts to US \$150 millions per year.
- The car ownership rate is about one car for every three persons. This ownership rate is one of the highest in the world, even amongst the developed countries.
- There are about 1 million cars that are relatively old and poorly maintained, and have an average age of 14 years.
- The road transport sector consumes about 45% of the total petroleum products imported.

- There are about 3 million daily-motorized trips within the greater Beirut area (the capital of Lebanon), of which about two-thirds are made by cars; this percentage of car usage is very high, even for developed countries, where it should not exceed 50%.
- Daily motorized trips within the greater Beirut area are expected to increase to about 5 millions by 2015.
- In some areas of the greater Beirut area, the total suspended particles (TSP) concentration ranges from 102 to 291  $\mu\text{g}/\text{m}^3$ , whereas the safe level of TSP is 75  $\mu\text{g}/\text{m}^3$ .
- In some areas of the greater Beirut area, noise levels, on average, exceed 75 dB(A), whereas the standard level is 72 dB(A).

#### **4. DRIVING IN LEBANON**

Driving in Lebanon can be an adventure. Motorists here are constantly the victim - and perpetrator - of careless, over-aggressive, and inattentive driving (the latter often linked to the constant use of the mobile phone). Other bloody-minded behavior includes driving against the flow of traffic, excessive use of the horn, and a fabulously cavalier approach to parking. It should be noted that the majority of drivers in Lebanon lack a proper traffic education, possess a driver's license but without having ever been subjected to a proper road test, do not undergo strict medical supervision and mandatory periodic examination of their eyesight and health.

Drivers, pedestrians, and unorthodox vehicles have to compete for the same badly maintained and poorly designed roads; agitation and frustration, and various deliberate obstruction, obscene gestures and verbal abuse are commonplace. This, in turn, spawns incidents ranging from often extreme acts of aggression, physical assault and - of course - road traffic accidents.

The lack of focus on the driver, the vehicle, and traffic management has hurt the country financially, touristically, and socially. Above all, the absence of traffic management and control, driver education, and law enforcement is underutilizing the current capacity of the existing roads and wasting the huge investments done in the past decade in road development in Beirut and in Lebanon as a whole. Due to a lack of education and enforcement, drivers are not taught how to best utilize the road in order to maximize its efficiency. When drivers do not stick to their lanes and meander from one lane to another on the highway, they reduce the speeds of the trailing vehicles, and consequently reduce the capacity of the road. The government, on the other hand, has dearly invested in augmenting the capacity of the road to meet the traffic needs, only to find out that the absence of traffic laws and driver education has diminished it.

## 5. ROAD TRAFFIC ACCIDENTS IN LEBANON

Due to the fact that there exist considerable discrepancies in the collection of road traffic accident statistics in Lebanon, between those collected by the police and the ones assembled by the Lebanese Red Cross, this article makes use of data collected by MedNet Liban, an administrator of insurance companies, in order to better understand the status of the road traffic accident situation in Lebanon. The data were collected by medical officers working for MedNet Liban who filled out road traffic accident surveys for 801 hospitalized victims of road traffic accidents [6]. The “Road Accident Survey” entailed twenty-one questions, covering a variety of issues. In the following sections, the results of the survey are presented.

### 5.1 *Victims Profile*

- The majority of victims of road traffic accidents are the drivers themselves (48%). Pedestrians account for 25% of the victims, followed by front-seat passengers (17%) and back-seat passengers (10%) (see Figure 1). 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, pedestrian crossings, and to ignorance on the part of drivers regarding the rights of pedestrians while on the road.
- Even though the Lebanese population is almost equally divided between males and females, and despite the fact that the insured population with MedNet Liban is equally subdivided between males and females, nearly two-thirds of the victims of road traffic accidents were male (see Figure 2), 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 negative consequences that they might encounter.

Excluding drivers, male victims nearly always outnumbered female victims, as back seat passengers, front seat passengers, and as pedestrians.

- About one half of road traffic accident victims were under 30 years of age, with those between the ages of 20 and 29 accounting for 31%, followed by those in the age group 10 to 19 with 13%, and under 10 with 7% (see Figure 3).

It should be noted that infants and toddlers up to 6 years of age made up about 5.5% of all road traffic accident victims and about 28% of all young victims. Fifty three percent (53%) of the toddlers were back-seat passengers and 47% were pedestrians. With respect to young children (7 to 12 years old), about

56% were pedestrians. The majority of victims in the age group over 64 years were pedestrians, accounting for about 53%.

### **5.2 Road Conditions**

- As Figure 4 indicates, 50% of road traffic accidents occurred on two-way undivided roads. The least number of road traffic accidents (21%) occurred on divided roads.
- More than two-thirds of the road traffic accidents occurred on dry roads. This is to be expected since Lebanese roads remain dry for the most part of the year (see Figure 5). Wet roads due to rain or snow account for most of the road traffic accidents during the winter season. It is important to note that about 74% of road traffic accidents occur on clear days (see Figure 6).
- About three quarters of the road traffic accidents in Lebanon take place on urban roads (see Figure 7), due to the fact that, with a centralized government, people are forced to drive to major cities to take care of their businesses.
- This probably explains why more than 61% of the road traffic accidents occur during the day (see Figure 8). It is interesting to note that road traffic accidents during darkness account for about 25% of the accidents, probably due to the fact that most roads in Lebanon are not lit at night or lack the proper lighting systems. Dusk/Dawn road traffic accidents accounted for 13% of all accidents.

### **5.3 Vehicle Conditions**

- Passenger cars made up 84% of all vehicles involved in road traffic accidents; followed by trucks (9%) and motorcycles (7%) (see Figure 9). This is probably understandable since, as noted earlier, passenger cars make up about 86% of all road vehicles in Lebanon.
- Passenger cars come in various makes and models. Since Lebanon does not have a car industry, therefore all cars in circulation in Lebanon are imported, with European cars accounting for the vast majority of vehicles operating on Lebanese roads. The results of the “Road Accident Survey” revealed that the accident percentages according to car make were subdivided as follows: Mercedes (18%), BMW (13%), Renault (7%) and Golf (3%). Japanese cars accounted for about 16% of all road traffic accidents (see Figure 10).
- Few defects or problems, like defective brakes, tires, or steering, were reported in the vehicles involved in the road traffic accidents. This probably explains why more than 98% of the vehicles involved in the road traffic accidents were reported to have been free of defects or problems (see Figure 11).

#### **5.4 Driver Profile**

- Fifty four percent of the drivers involved in road traffic accidents were between the ages of 18 to 29 years, and about 14% were older than 50 years of age (see Figure 12). Of all young drivers (18 to 29 years), 64% were male compared to 36% who were female.
- Only three percent of the drivers involved in road traffic accidents were learners (see Figure 13).
- The results shown in Figure 14 reveal that 82% of the drivers involved in the road traffic accidents were regarded as being normal. The remaining 18%, were reported to have been below the legal driving age of 18 (15.5%), fatigued (0.7%), or under the influence of alcohol (0.4%).

#### **5.5 Safety Devices**

The mandatory use of seatbelts by drivers and front-seat passengers in Lebanon became a law in June 2001. Prior to that date, the use of the seatbelt was left to the discretion of the individual driver.

According to the Road Traffic Accident Survey, the rate of seatbelt use amongst drivers was 33% prior to 2001. From 2001 on, the rate of seatbelt use increased to 75%. The highest rate of 79% was recorded in 2002.

The rate of use has probably gone down since 2002 since, as everything goes in Lebanon, the law goes into effect for some time and then fades away until someone brings it back to life.

As for motorcycle riders, only 55% percent reported wearing helmets (head protective gear) (see Figure 15).

#### **5.6 Severity of Road Traffic Accidents**

All of the reported road traffic accidents resulted in some type of injury. The injuries were reported to be minor in 66% of the cases, major in 33% of the cases, and fatal in 1% of the cases (see Figure 16).

Eighty three percent (83%) of the road traffic accident victims had to stay for at least one day at the hospital. About 28% spent 1 day only, 37% between 2 and 5 days, 9% between 6 and 10 days, and 9% for 11 days or more (see Figure 17).

The most frequent injured body parts, in order of the most frequent, were: Head (20%), Knee (15.6%), Face (12.6%), Elbow, Chest and Shoulders (with about 10% each), Hip and Neck (between 6 and 7%), and Abdomen (4.2%). Back injuries accounted for over 4% of the total injuries (see Figure 18).



Generally speaking, every reported road traffic accident resulted in an average of 1.95 injured body parts. Further, the severity of the injuries varied according to the use of the seatbelt by both drivers and passengers. A major injury was more likely to occur when the victims did not use a seatbelt. It is known that by not using a seatbelt the risk of a major injury increases by 44%.

### **5.7 The Cost of Road Traffic Accidents**

Road accidents result in a significant loss of productive days for workers, and in a significant loss of income for the families of the victims. And, while it is beyond the scope of this study to tackle the cost issue, it is nonetheless important for the readers to know that the victims of road traffic accidents in Lebanon spend an average of 1.76 days in the hospital with an average cost of \$600 per day. That is, every injury costs an average of \$1,056. Unofficially, available statistics in Lebanon place the number of injuries from road traffic accidents at around 3,400 per year. A simple calculation would then indicate that the direct medical cost of treating road traffic injuries is about 3.6 million U.S. dollars per year. As mentioned earlier, the economic cost of road traffic accidents was estimated by international sources at 1.5% of the Gross National Product (GNP), or 240 million U.S. Dollars; this poses a significant financial burden on the economy of a country where a sizeable portion of the population lives below the poverty line at less than \$2 per day.

## **6. COMPARISON WITH OTHER MIDDLE EASTERN COUNTRIES**

One of the leading causes of death and disability in the Middle East is road traffic injuries. The World Health Organization estimates that by 2020 road traffic injuries will be the third leading cause of disability adjusted years of life lost worldwide [7]. Analyses of the International Road Federation's world road statistics found that five countries in the Middle East are among the highest road traffic death rates in the world [8].

As Table 1 reveals, the United Arab Emirates, Oman, Saudi Arabia, Qatar and Kuwait all had more than 18 deaths per 100,000 people in 2000. With nearly 15 deaths per 100,000 people, Lebanon has a high road death rate, as compared to other countries of the world [5].

Death rates are higher in countries with more cars per 100,000 people [8]. As the countries of the Middle East motorize, their death rates will inevitably rise. Investigators in Middle Eastern countries should identify interventions to lower the death toll from traffic fatalities [9]. Above all, public health officials, road traffic designers, legislators, and the police should implement proved effective measures to lower the terrible toll of motor vehicle fatalities in the Middle East.

## 7. CONCLUSIONS AND RECOMMENDATIONS

The problems facing transportation engineers and planners over the past century have evolved from how best to accommodate the vehicles on the road to how best to manage them and make them flow smoothly in a traffic stream. In the 1920's and 1930's the focus of transportation engineers was on how to get the vehicles out of the mud and build a strong and durable pavement structure upon which the vehicles can ride. In the 1940's and 1950's the focus was on how best to geometrically design the road to safely accommodate the maneuverability of the vehicles in a growing user environment. From the 1960's and on, as the number of car ownerships mushroomed and the number of vehicles on the roads skyrocketed, the developed countries realized that building the roads is only one facet of how best to manage a transportation system that can efficiently move people and goods. They realized that it is equally important to manage the mobility of the users on these roads through effective signings, controls, driver education, vehicle worthiness certification, establishing traffic laws, and creating effective law enforcement programs. These realizations came from the simple notion that the road is only one component of the transport sector. The other components, which are equally important, are the driver and the vehicle, particularly in an over utilized transportation network [10].

The underdeveloped and the less developed countries did not reach these new realizations and were stuck in the early stages of road development, that of providing only a sufficient pavement structure and a proper road geometry. Lebanon is one of those countries, although its car ownership and its car utilization are among the developed country levels. The lack of focus on the driver, the vehicle, and on traffic management has hurt the country financially, touristically, and socially. Above all, the absence of traffic management and control, driver education, and law enforcement is underutilizing the current capacity of the existing roads and wasting the huge investments done in the past decade in road development in Beirut and in Lebanon as a whole. Due to a lack of education and enforcement, drivers are not taught how to best utilize the road in order to maximize its efficiency. When drivers do not stick to their lanes and meander from one lane to another on an autostrade (or a highway), they reduce the speeds of the trailing vehicles, and consequently reduce the capacity of the road. The government, on the other hand, has dearly invested in augmenting the capacity of the road to meet the traffic needs, only to find out that the absence of traffic laws and driver education has diminished it [10].

The recent recognition of these issues by the Lebanese Government, and particularly by the Ministry of Interior and Municipalities, is a great step forward. The intent to address these traffic issues through the following multi-tiered program is quite significant and in the right direction. The program includes the following seven elements:

- Traffic Law Enforcement
- Organization of the Car Mechanic Inspection Department
- Awareness Campaign to Change Drivers' Conduct/Behavior
- Modernization of Existing Traffic Laws
- Establishment of the Traffic Directorate
- Raising Traffic Awareness with Civic Organizations
- Easing Traffic Congestion through Planning and Road Safety

As stated earlier, most of these issues have been addressed and are well established in most of the developed countries. The function would be to then establish the proper mechanisms for the transfer of technology, knowledge, laws, and education from one country to another. However, such a transfer is not that simple because of the peculiarities in the Lebanese laws and in the local behavioral issues of the Lebanese drivers. Hence, the transfer of knowledge should be tailored and adapted to the Lebanese conditions and to the Lebanese culture. That is why it is important to combine the knowhow of advanced traffic management and operations issues with the knowhow of the country and its driver characteristics.

In the following sections, a brief description of each of the main elements is presented [10]. However, in order to make the presentation clearer and avoid overlapping discussions, the descriptions are grouped into two main factors: the vehicle and the driver, and road traffic management. The vehicle and the driver category includes traffic law enforcement, organization of the car mechanics department, an awareness campaign to change drivers' conduct and behavior, modernization of existing traffic laws, and raising traffic awareness in cooperation with civic organizations. The road traffic component includes the establishment of a traffic directorate and easing traffic congestion through planning and road safety.

### ***7.1 The Vehicle and the Driver***

All vehicles have to be inspected and certified for their worthiness of using the road in order to protect the driver and the safety of the public. In addition, trucks have to abide by the weight limit that they can carry to avoid breakdown and minimize the damage to the road. Also, open trucks that carry loose materials have to be covered in order to avoid spillage on the road and to prevent ensuing traffic accidents. Trucks carrying hazardous materials must have a special permit, and their operations on the road should be governed by special rules and regulations that limit their route choice, loading and unloading of hazardous materials, and parking to ensure public safety and security. Truck inspection procedures should be more rigorous in Lebanon than most other nations, because of the hilly terrain the trucks operate on and the lack of truck escape ramps on the highways due to geometric constraints in case of truck brake failures. These types of failures have in many instances caused several major crashes where hundreds of people lost their lives. These losses could have easily been avoided through proper inspection procedures. Buses should

equally pass tough inspection procedures, since they compose a major mode for moving people within and in between cities.

Violators to the vehicle inspection and operations laws should be caught and properly prosecuted. The enforcers of these laws in many nations are the police departments at all government levels. The police personnel should be well acquainted with these laws and feel confident and proud of accomplishing their missions. To ensure the success of such a process, police personnel must undergo continuous course education and training sessions on the status of the laws and how to handle violations and accidents. Certain procedures in Lebanon that handle traffic accidents should be reconsidered for its effectiveness and its overlapping administrative structure. As an example, privately licensed people (inspectors) handle assigning rights to the parties involved in an accident, while the police only handle the violations. In most developed countries the police handle both assignments because it saves time and money and usually the police are the first to arrive at the scene and are able to clear the accident as soon as the information is collected. Waiting for the private inspector to arrive at the accident site could be a hassle and usually delays the accident clearing process causing unnecessary traffic jams and conflicting duties at the accident site.

The driver is the most important element of the traffic system since he or she controls the operation of the vehicle on the road. Driver behavior is a complex issue and needs the proper mechanisms and tools to guide and control this behavior to achieve safe and efficient utilization of the road. In developed countries, this guidance and control is propagated through several mechanisms including driving laws, driver education programs, driver safety awareness programs, proper road controls and signing information, and adequate law enforcement. Upgrading the traffic laws in Lebanon is of paramount importance and requires in tandem a good education campaign to make it known to current and future drivers. The traffic laws are unclear and ambiguous to most drivers. The licensed drivers in Lebanon lack the adequate knowledge of the proper driving laws, techniques, and manners. For example, changing lanes without proper signaling, passing in a no-passing zone, and tailgating front vehicles are all driving violations in the US and most US drivers would know these facts. In Lebanon, most drivers would not consider these maneuvers to be illegal because they lack the knowledge of the driving laws or discard the basic driving information requirements. If a police officer stops a violating driver in the US, the officer usually starts by asking the violator why (s)he was stopped. Ninety percent of the time, the driver knows the correct answer because US drivers are well informed about the traffic laws and the reasons why they are established in the first place, which is to protect the safety of the driver and the public at large.

A two-fork strategy is needed to deal with the changing behavior of drivers in Lebanon. One is a short-term strategy that deals with current licensed drivers, and

the other is a long-term strategy that would address the behavior of the upcoming young drivers. Changing the behavior of current drivers is difficult but is doable. In the US, the rigorous non-smoking campaign was able, in a short period of time, to reduce the number of smokers and practically eliminate the smoking habits of the young people. A parallel program could be emulated in Lebanon for changing the driving behavior of the current and upcoming drivers.

Engaging the public and particularly the youth to raise their awareness about the importance of obeying the driving laws and their beneficial impacts on society in terms of saving lives, easing congestion, improving health effects, reducing noise, and increasing the peace of mind of driving is of paramount importance. This engagement and this awareness campaign should enlist all media outlets including radio and TV stations, newspapers, billboards, public exhibits, community rallies, and public Internet sites. The overall message should focus on the positive aspects gained by the public and the individual driver in obeying the laws and in driving safely and properly. The message to the growing youth could be achieved through driver education classes at schools and through driver training programs. Books, videos and exhibits are part of the information delivery program. In addition, the youth programs could also provide a positive incentive for current drivers to change their driving conducts.

Currently, issuing a driver's license in Lebanon is not properly controlled and evaluated due to the lack of proper institutional control. Very simple tests are usually administered before a driver is granted the license. That is, drivers usually get the license first and anticipate learning the driving techniques while driving in traffic. So, they end up learning the "ways of the sheets" and not the correct driving manners and behaviors. A well-qualified public agency is needed to conduct supervised computer and driving tests before granting licenses to drivers. The agency would be also responsible for the periodic renewal of these licenses.

The positive campaigns that take place between now and then to change the behavior of the Lebanese driver should be supported by a parallel program that strongly penalizes the driving violators and particularly the repeated offenders. This program is referred to in many countries as the stick and the carrot program. If you are a repeated violator, your privileges of driving would be suspended and your insurance coverage will be denied or its costs would become astronomical. However, if you are a good driver, your insurance costs will go down. This is based on the premise that individual driver records are kept by a public agency and are used to evaluate the driving performance of each licensed driver; this is not the case in Lebanon. The traffic ticket in Lebanon is listed under the vehicle's license plate and not under the driver's name. The driving record of each person is not kept in Lebanon. This has to change in order for the stick part of the program to become effective. In the US, the Division of Motor vehicles (DMV) in each state, and the states' computers are all linked together in this operation, keeping track of each

person's driving history. This information is also used for other law enforcement programs. In short, the driving laws should have strong teeth to be taken seriously and to discourage the violators. In addition, the accompanying law enforcement agencies and laws should be effective in stopping and arresting the offenders.

## **7.2 Road Traffic Management**

As stated earlier, the focus in Lebanon has been on building the roads and not on how best to manage and operate them. This shortcoming has also been augmented by the fact that the road system responsibilities are divided amongst various agencies, municipalities, and ministries with very little coordination between them and with vague delineation of their duties. The lack of unified and coordinated transportation institutions resulted in deficient and poorly enforced traffic laws, poor land use planning, bad congestion, and weak public transport system. A Traffic Management Organization (Traffic Directorate) is needed to manage arterial and freeway flows, parking, public transit circulation, signing on the roads, intersection control and phasing, as well as incident detection and clearance.

To support the police driving law enforcement efforts, a proper road signage system should be provided. The driver should be properly informed about the traffic conditions he or she should abide with in a particular section of the road. How could the police issue a speeding traffic ticket if a speed sign does not exist and the speed limit is not made clear to the driving public? Drivers cannot be expected to obey the traffic laws if these laws are not clearly displayed through signs on the sides of the road. Proper road signage not only helps controlling and advising driver's behavior, but also provides a safer driving environment for the public user, particularly pedestrians.

There was a strong debate in Lebanon a long time ago, and it is still going on now, whether the nation, through its political and administrative institutions, can truly support an access-controlled true freeway system similar to the ones in most developed countries. This argument goes back to the days when autostrade Jounieh, a coastal down to the north of Beirut, was built as a limited access facility in the 60's. The fact is that the Jounieh's autostade is no longer a limited access facility and the stores and the land uses that abut the autostade limit its capacity and its travel speed. Serious efforts have been given to the thought of partially converting it back to a limited access facility at huge investment costs. This phenomenon is repeating itself in the 2000's on the newly built autostrade to Saida, a coastal town to the south of Beirut. People are breaking the side barriers, building restaurants next to the road, creating exits and entrances to the autostrade's abutting properties, and placing vending kiosks on the safety shoulders of the road. In addition, public transport buses stop on the freeway to pick up and drop off passengers endangering the safety of the passengers and the driving public and diminishing the capacity of the road. This is truly incomprehensible because the government has spent a lot of money to build the road as an access-controlled facility (i.e. as a high speed facility)

only to see it turn around and be used as a regular access road facility that diminishes its capacity over time and its travel speed. This shows the complete lack of an authority that manages the traffic once the road facility is built. Another shortcoming that is manifested by the behavior of people is that the planners of the high-speed road did not consider building a parallel access road to the autostrade that would ensure access to the properties of the abutting owners similar to what happens in most developed countries. The price of land went up once the autostrade was built, and the owners decided to build on their properties. As they did not have access to the road, they decided to break the barriers and built exits and entrances to their properties from the autostrade. The dovetailing of good planning plus traffic management and operations is of paramount importance if proper utilization of the roads is to be controlled. The irony behind these examples is that there is no land to put another high-speed access controlled facility in these corridors due to land restrictions and availability. It is important to quickly preserve the newly developed autostrades by establishing a strong Traffic Directorate with broad mandates.

Another example of how proper planning and operations could reduce congestion and provide a safe environment for the traveling public is through highway maintenance. A routine highway maintenance program is an important facet of road management and upkeep. However, the road maintenance program should not create traffic congestion and traffic accidents as it does in Lebanon now. On the contrary, these programs should be carved out when feasible during low traffic periods and predominantly at night. In addition, proper signage should be installed at the work sights to avoid accidents and to instruct the driving public of the right traffic maneuvers it needs to take to avoid the working area. Currently, these procedures are not properly administered in Lebanon.

In conclusion, the driver, the vehicle, and the road form the three legs of the stool that supports the transportation system. They should be well managed and coordinated together in order to reach an effective and productive system. Most developing countries have struggled to achieve the proper coordination among these three main elements because they fall under different jurisdictions and they are administered by different agencies of the government. Even in developed countries, it takes a while to achieve seamless coordination among the different entities responsible for managing and administering these three basic elements. In Lebanon, the government agencies that are responsible for the three elements are mainly the police departments, the mechanic inspection department, the judicial department, and the road traffic management department at the Ministry of Public Works and Transport. It is hard to believe that these departments are going to work together in a short period of time to create the proper traffic laws, the driver education programs, the driver safety awareness programs, the proper road controls and signing information, and the adequate law enforcement programs, and coordinate them with the proper road management planning and operation guidelines. A new approach and a new model need to be developed in order to facilitate such coordination and to

provide quick results in an overwhelmingly bureaucratic nation. In this case, a strong Traffic Czar Office must be created that would be responsible for this coordination and has overriding say over the other departments in this domain. It would have a sunset time of say ten years, when the coordination and the main laws and guidelines are put in place and are working. This Office, with a small and a qualified cadre of personnel would report directly to the Minister of Interior and Municipalities and would have the consent as well as the support of the Minister of Public Works and Transport. The Heads of the responsible departments would form an executive committee to be headed and directed by the Traffic Czar. They would continuously report their achievements in a timely fashion to the Minister of Interior and Municipalities who would monitor their progress over time. This Czar mechanism has been widely used in developed countries to achieve difficult coordination procedures among agencies with the purpose of achieving quick and credible results vis-à-vis traffic management in general and road safety in particular.

## REFERENCES

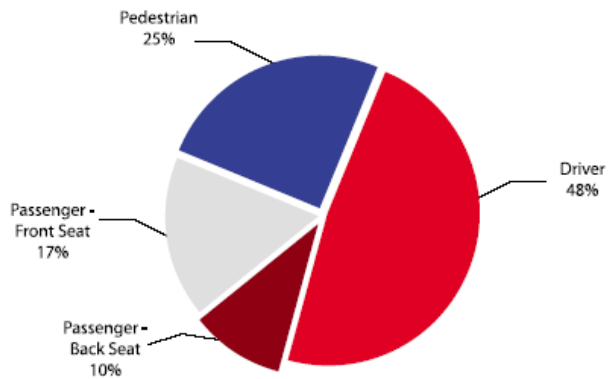
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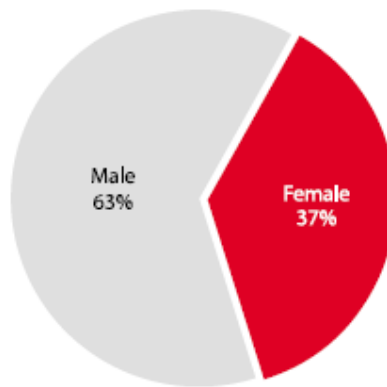
<b>Low</b>		
	Yemen	8
<b>Lower middle</b>		
	Egypt	13
	Iraq	8
	Jordan	15
	<b>Lebanon</b>	<b>15</b>
	Syria	10
<b>Upper middle</b>		
	Oman	25
<b>High</b>		
	Bahrain	12
	Israel	8
	Kuwait	18
	Qatar	19
	Saudi Arabia	21
	United Arab Emirates	29

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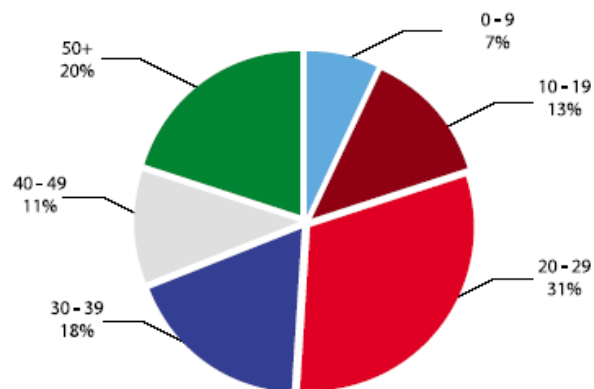
**Table 1:** Traffic Deaths per 100,000 people in the Middle East



**Figure 1:** Identity of the Victim



**Figure 2:** Gender of the Victim



**Figure 3:** Age of the Victim

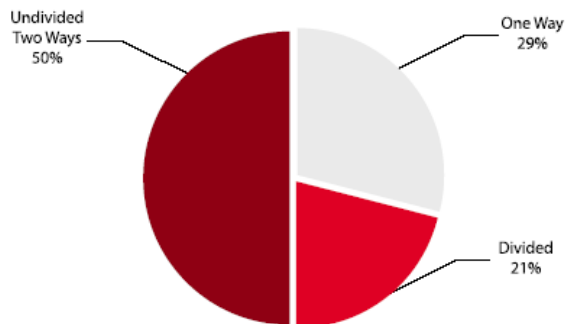


Figure 4: Roadway Type

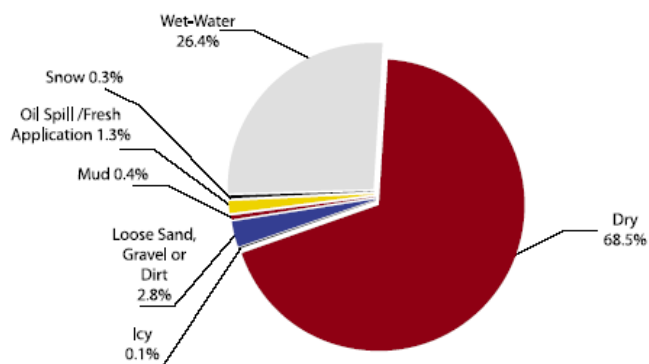


Figure 5: Roadway Condition

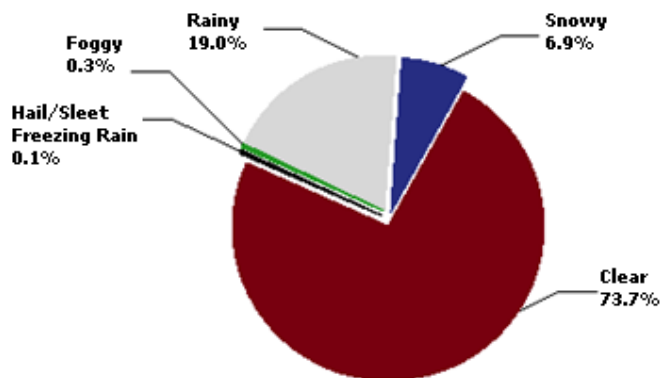


Figure 6: Weather Condition

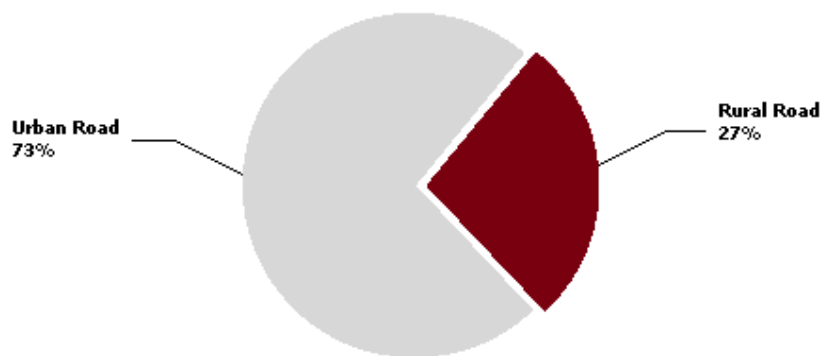


Figure 7: Accident Location

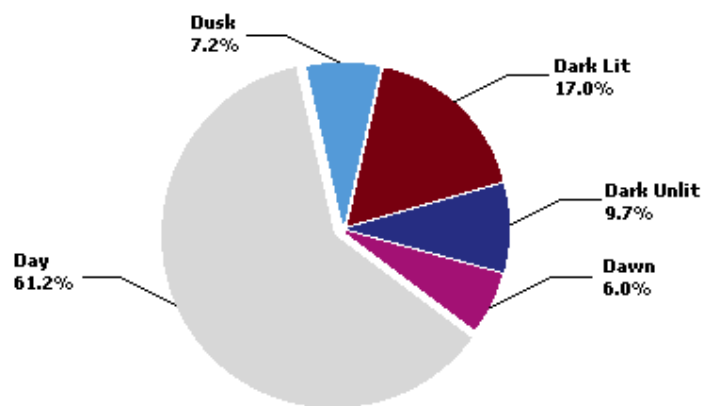


Figure 8: Daylight Condition

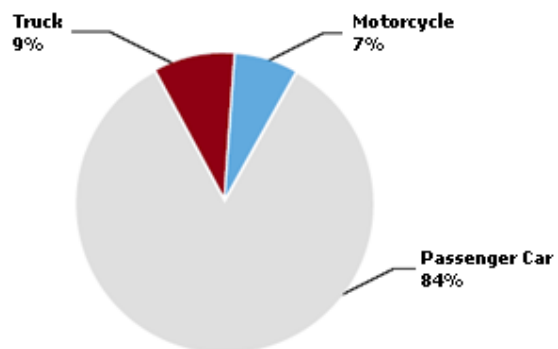


Figure 9: Vehicle Type

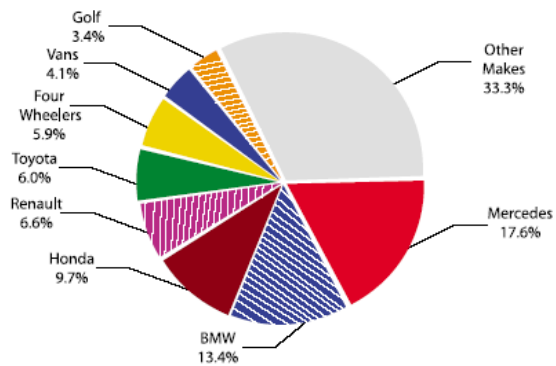


Figure 10: Make of the Vehicle

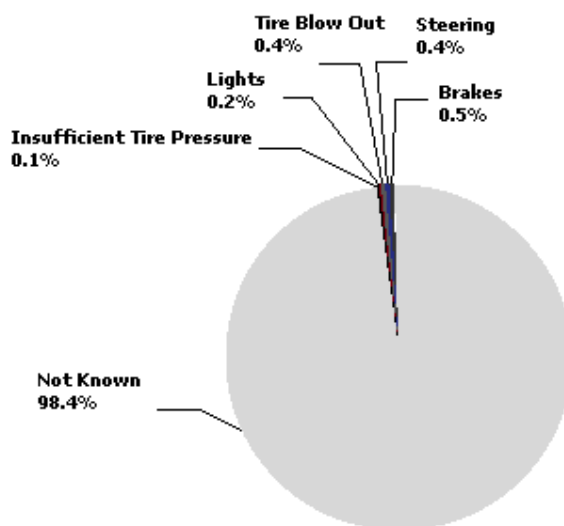


Figure 11: Vehicle Defects

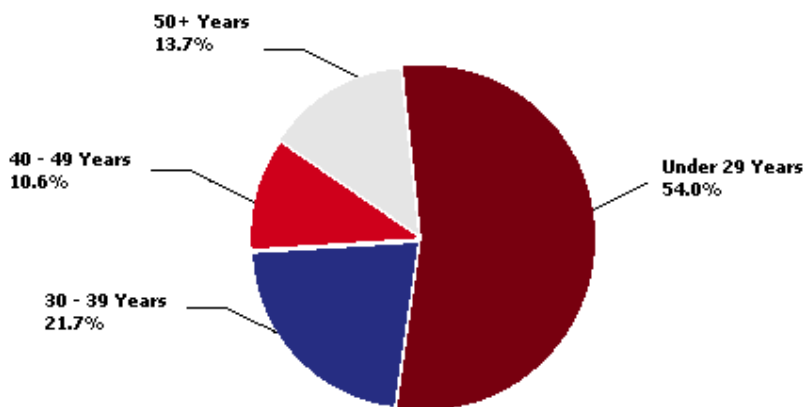


Figure 12: Driver's Age

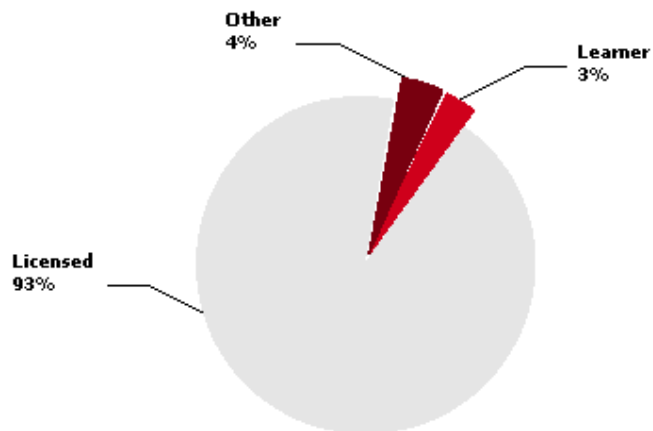


Figure 13: Driver's License Status

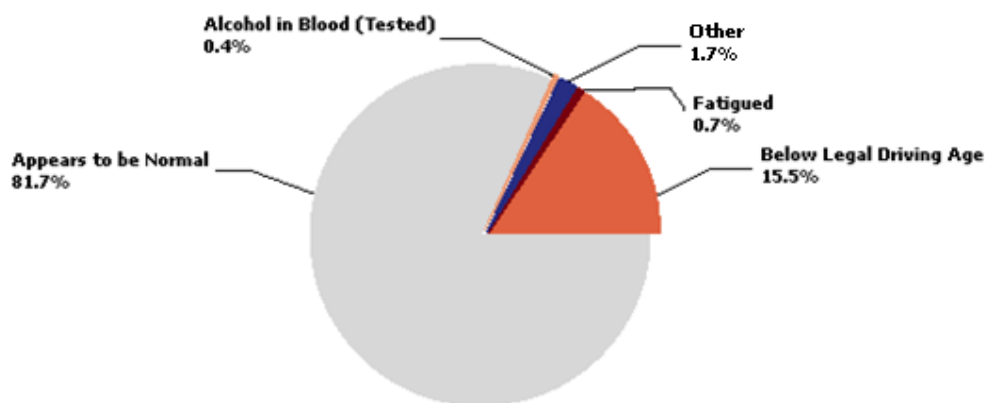


Figure 14: Driver's Condition

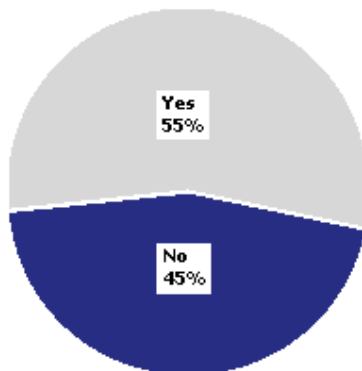
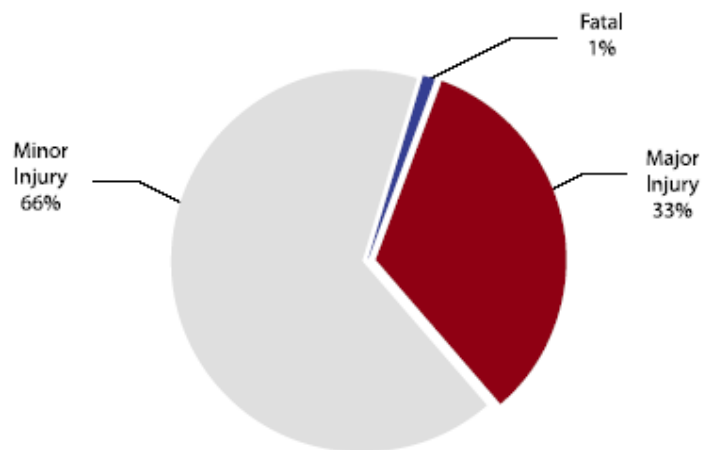
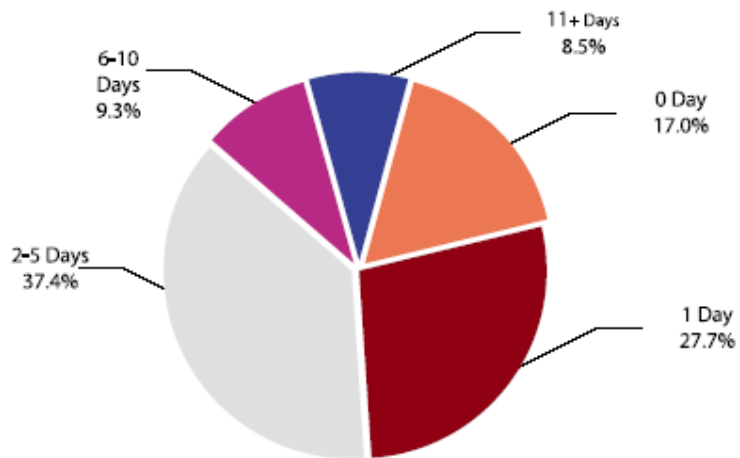


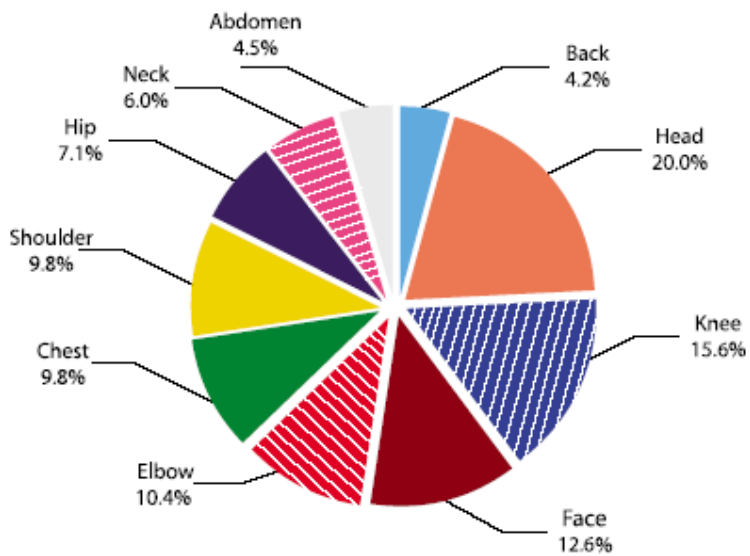
Figure 15: Helmet Use by Motorcyclists



**Figure 16:** Injury Severity



**Figure 17:** In-Hospital Length of Stay



**Figure 18:** Injury Location