

How to Cite:

Mesloub, M. (2024). Economic analysis of Algerian road traffic accidents for the year 2020: Comparative study between the provinces. *International Journal of Economic Perspectives*, 18(12), 2423–2436. Retrieved from <https://ijeponline.org/index.php/journal/article/view/785>

Economic analysis of Algerian road traffic accidents for the year 2020: Comparative study between the provinces

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Abstract--This paper aims to shed light on the amount of economic losses of road traffic accidents, which is considered one of the social security issues that most countries, such as Algeria, suffer from, until the term road terrorism emerged, especially after the increase in the number of vehicles and the disruption of the traffic system. We used the analytical descriptive method to present the official statistics of traffic accidents, then interpret the results of the indicators, by fixing the time factor (2020), and comparing between the provinces in terms of the outcome.


Keywords--Traffic accidents, Economic indicators of traffic accidents, Driver, Prevention, Algeria.

Introduction

Traffic accidents are classified among the social security issues that most countries, such as Algeria, suffer from, until the term road terrorism emerged, especially after the multiplication of the number of vehicles and the disruption of the traffic system, instead of the vehicle being a means of benefit, it became a major cause of the largest number of deaths at the level of hospitals, Therefore, Algeria has devoted resources to reduce this phenomenon by identifying black spots on the roads and researching the causes of traffic accidents and ways to prevent them, which must precede an accurate descriptive diagnostic process, these accidents leave social losses that cannot be evaluated because in no case can the value of traffic accidents be calculated.

1 The research question:

On the basis of the above, we crystallize the problem of the study in the following fundamental question:

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Submitted: 27 October 2024, Revised: 18 November 2024, Accepted: 09 December 2024

How can we analyze the economic indicators of road accidents in Algeria for the year 2020, and the extent of the contribution of each province to this result.

2. Hypotheses of the study

The hypotheses of the study are as follows:

- Hypothesis one: The severity of accidents is relatively lower in the desert governorates compared to the northern governorates.
- Hypothesis two: The east-west highway has the highest economic losses compared to national, province and local roads.

3. Previous research

- Study (Al-Ghamdi, 1997): Which revolved around the topic of traffic issues in the Kingdom of Saudi Arabia, the study found that 81% of deaths in hospitals are caused by traffic accidents, which is explained by the increase in the severity of accidents, which is considered one of the most important global indicators to measure the size of the tragedy, and this led us to adopt it in this study.
- Study (Dredsch, 2016): "Causes of traffic accidents in Algeria and ways to prevent them". Causes of traffic accidents in Algeria and ways to prevent them", which reached several results, the most important of which is that traffic accidents in Algeria are mainly due to the human factor, through excessive speed and dangerous excesses, and the number of deaths due to these accidents doubled from 197 to 2010 significantly, the researchers observed the human losses during this period, while in our study we fix the years to one year (2020) and we look at the outcome of accidents according to provinces.
- Study (Bougadoum, 2017): Titled "Causes of traffic accidents according to the opinion of road users in the province of Oum El Bouaghi", where she found that human losses in terms of the number of injuries and deaths are significantly increasing due to the lack of awareness among Algerian drivers.

4. Objectives of the study:

This research aims to shed light on the provinces with the highest number of fatalities according to global standards and indicators, especially economic ones, and the most used at the local level, in addition to answering the study's hypotheses.

5. Methodology:

In this study, we relied on the descriptive and analytical methods, the descriptive method was more appropriate to diagnose and describe the various figures related to road accidents, while the analytical aspect was the most appropriate to interpret the results of the applicable indicators, in addition to a comparative study between provinces in terms of the toll recorded in each province.

6. Study plan:

First, we address the conceptual framework of the study, which includes the main definitions that the researcher must be aware of to familiarize himself with the

subject, then we move to a descriptive diagnosis of traffic accidents in Algeria by provinces, then analyze the economic indicators of traffic accidents

I. The conceptual framework of the study:

Through this framework, we address the most important definitions that we consider to be the cornerstone of our study, in order to familiarize ourselves with the theoretical aspect, and also grasp the applied aspect.

1. The concept of traffic accident:

A traffic accident can be defined as an incident that occurs without expectation and without prior management, due to the availability of certain conditions that are likely to occur, and results in bad and undesirable results, and traffic accidents mean all accidents that result in material or physical damage due to the use of the vehicle, and result in death, injury or loss of property without prior intention, and because of vehicles or their cargo during their movement, and this includes combustion accidents during the movement of the vehicle on the public road. (Al-Baily, 1986, p. 7)

According to the definition of the World Health Organization: "It is any accident that occurs on a road open to traffic with at least one vehicle in motion and causes material or physical damage." (World Health Organization, 2021)

From the above two definitions, we can conclude that an accident is what happens due to a vehicle on the road without the driver's anticipation or prior agreement by the parties involved, and results in human loss, whether injury or death, and material loss related to the vehicle or inanimate objects struck.

2. Types of traffic accidents:

The following types of accidents can be distinguished:

- Collision: An accident involving two or more vehicles, animals or other objects in traffic.
- Rollover: It is the overturning of a vehicle due to the use of speed or a defect in the vehicle's mechanics, due to the lack of periodic inspection or a defect in the road, such as the presence of bumps, or due to weather conditions such as rain, fog in winter and strong winds loaded with dust.

Road accidents can also be categorized according to their consequences: (Hawalef, 2012, p. 103)

- **Minor accidents:** These are accidents that cause human injuries and result in moderate or severe damage, but they often lead to wasted time, pain, and disruption of procedures.
- **Moderate accidents:** These are accidents that have an economic impact, as they cause material losses of public and private funds due to damage to vehicles and what they collide with.
- **Serious accidents:** This type of accidents cause serious injuries represented in the exposure of thousands of people every year to death, and may cause some individuals with permanent disabilities that prevent them from performing their

natural role, and this type is the most dangerous type of accidents because it has effects in the economic, social and psychological aspect.

3. The human factor:

There is no doubt that it is the main axis around which most of the factors that cause road crashes are concentrated. It includes both the driver and the pedestrians (Sawalhi, 1999; p. 8)

- The driver: Any person driving an automobile, motorbike, bicycle or motorcar.
- Pedestrian: This means any person who was injured in an accident and was neither a driver nor a passenger, and pedestrians include people who pull the cart of a child or disabled person, people who drive with their hands while walking an ordinary bicycle, as well as the disabled and sick people who move with motorized chairs, or move it themselves or move it with the normal movement of footsteps. (Mansour, 1996; p. 13)

Type of vehicle:

It is the quality of the vehicle in terms of class and size. While the vehicle "is all that is prepared for travel on the public road, including the machinery and tools of transportation and traction". (Mansour, 1996, p. 2)

The use of the term "vehicle" instead of the term "car" is considered to be more comprehensive, and there is no doubt that the new wording is more accurate because the term is more general and broad. Others have defined it as a vehicle that moves by mechanical or animal power on the road, excluding railway trains. We note that the term nature of the vehicle includes the vehicle in terms of type, size, maintenance and control, while vehicles are divided into two types:

- Fast transport vehicles, that is cars, trucks, buses, trailers and semitrailers.
- Slow transport vehicles, which are tractors, bicycles of all kinds, and human or animal-powered vehicles.

These are tractors, bicycles of all kinds, and vehicles that move by human or animal power. In this way, the concept of vehicle is clarified to include all equipment used for the transportation of persons or things, as well as machines that perform work and mixed work, as long as they move or travel on public roads, such as snow plows, excavators, and agricultural machines.

II. Road traffic accident diagnosis:

A descriptive diagnosis of road accidents in Algeria for the year 2020 can be given as follows:

1. Number of accidents and interventions according to province:

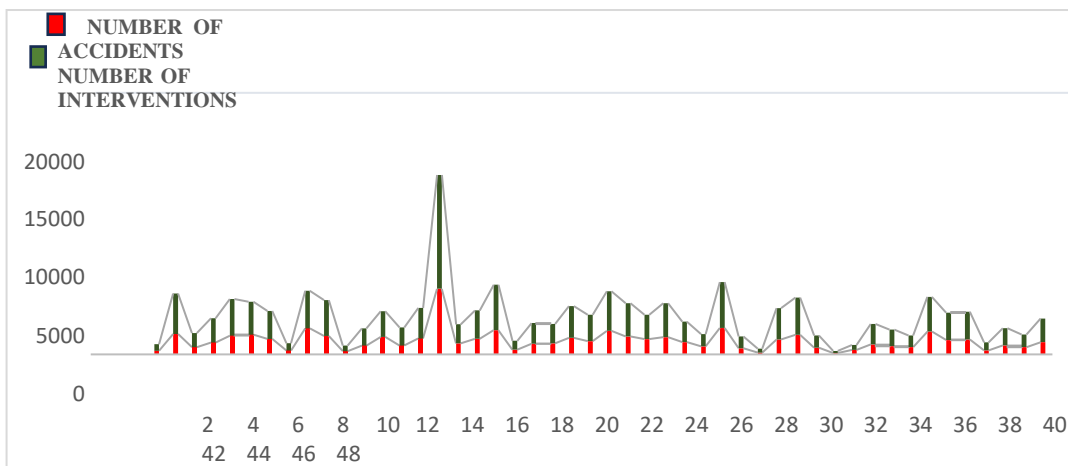


Figure 1: Number of road traffic accidents and interventions by province
 Source: (Department of Information and Communication of the General Direction of Civil Protection, 2021)

Through Figure 1, we can observe that Algiers is in the lead with 5470 incidents and 9542 interventions, followed by a group of provinces such as Oran, Setif, Chlef, Blida, Boumerdes, Tipaza, Batna and Tipaza, which are characterized by a significant increase compared to the rest of the provinces, especially in terms of the number of interventions.

2. Number of injured and deaths in road traffic accidents in Algeria by province for the year 2020

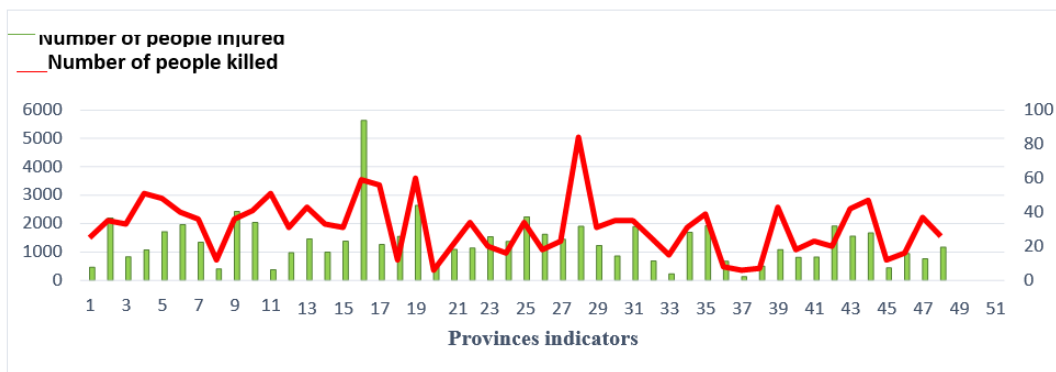


Figure 2: Number of injured and deaths in road traffic accidents by province
 Source: (Department of Information and Communication of the General Direction of Civil Protection, 2021)

Figure (2) shows that the highest number of deaths from road accidents was recorded in the province of Oran with 84 deaths. However, the number of injuries recorded doesn't exceed the average number of injuries for other provinces.. In terms of the number of injured, the capital is in first place with 5618 injured. The

average number of deaths is between 50 and 60 deaths, and the average number of injured is 2000 injured.

From the previous figures (1) and (2), we can see that despite the record number of accidents and the number of interventions in the capital, the number of deaths remains within the average of most provinces, on the other hand, the province of Oran records the highest number of deaths despite the low number of accidents and interventions compared to the capital, and this is due to the seriousness of the traffic accident.

3 Human casualties in terms of the number of wounded by province

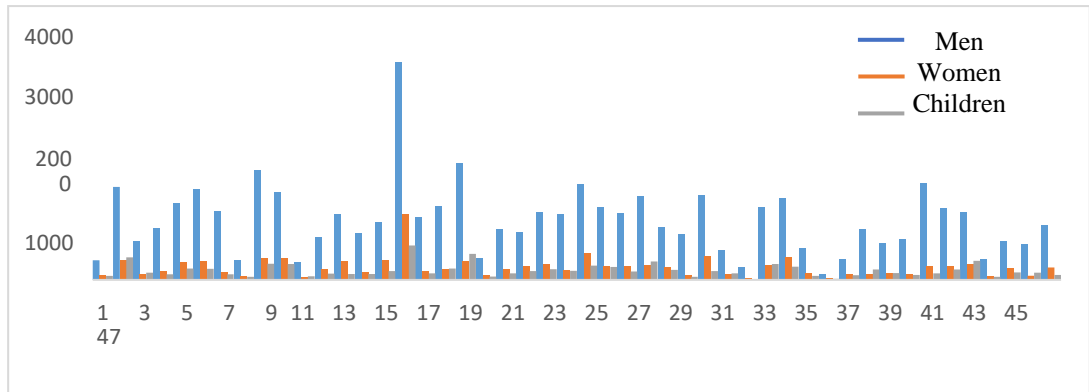


Figure 3. Human casualties in terms of the number of wounded by province
 Source: (Department of Information and Communication of the General Direction of Civil Protection, 2021)

Figure 03 shows that at national level the number of injured was 644,497. By province, the capital ranks first, regardless of gender, with 5618: 3567 men, 1073 women and 561 children, while the rest of the provinces are close to the rate of 1000wounded and 30 dead.

4. Human losses in terms of number of deaths by province

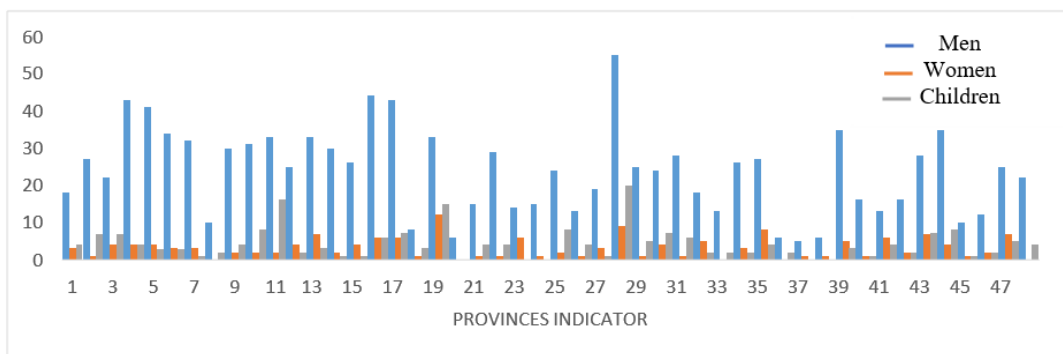


Figure (04): Human losses in terms of number of deaths by province
 Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

Figure 04 shows that the number of deaths nationally is 1504. In terms of provinces, Masila is in first place with 84 deaths of different sexes: 55 men, 9 women and 20 children, which means that one man dies every week, one woman every 10 days and one child every 20 days as a result of road accidents in this province, while the rest of the provinces come close to the rate of 1,000 wounded and 30 deaths.

5. Human losses according to the age criterion

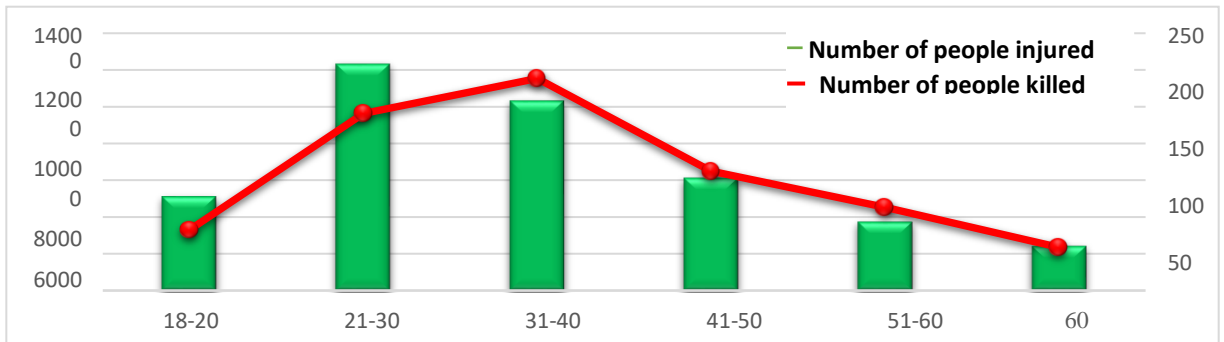


Figure 5: Human losses by age

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

From Figure 5 it can be seen that the age group '21-30 years' had the highest number of casualties with 12317 casualties. The age group '31-40 years' had the highest number of fatalities with 206 fatalities.

6. Number of accidents by chronological time:

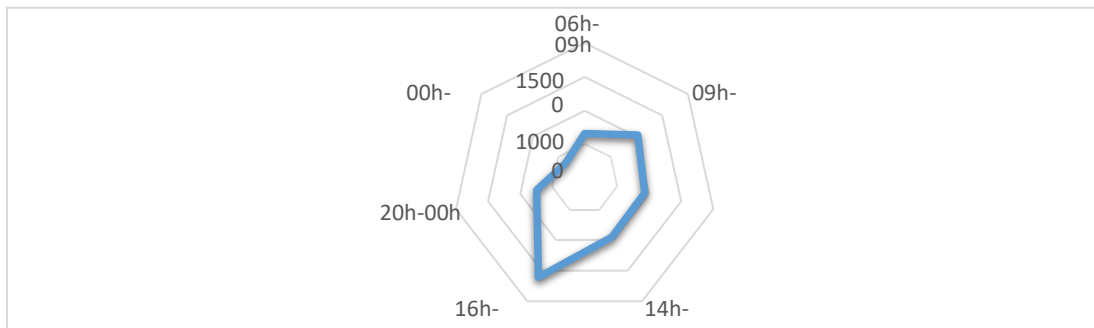


Figure 6: Number of accidents by chronological time

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

Figure 6 shows that the peak of traffic crashes occurred between 4 p.m. and 8 p.m., when there were 16076 crashes, as this is when traffic jams occur due to workers leaving work and going home or elsewhere.

7. Number of road traffic accidents per weekday:

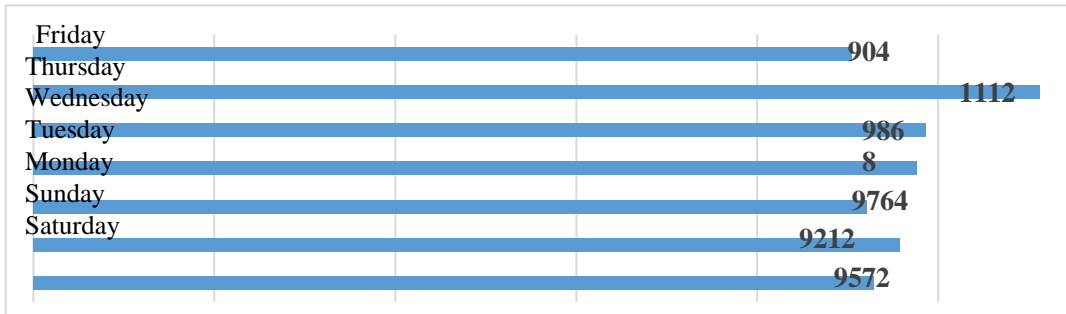


Figure (7) Number of road traffic accidents per weekday

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

Figure 7 shows that, in terms of days of the week, Thursday has the highest number of crashes (11122) and Friday the lowest (9044), while the other days of the week are close to the average (9500).

8. Human losses in road accidents by gender

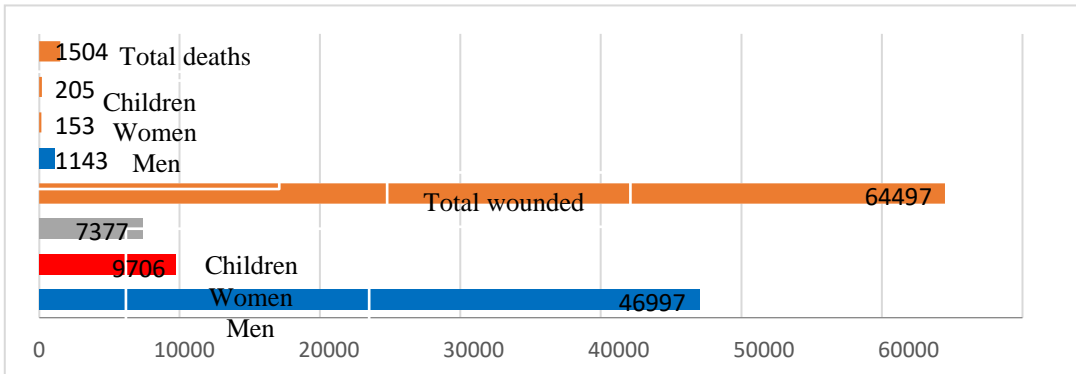


Figure (8): Human losses by gender

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

As shown in Figure 8, the number of injured men was 46,997, compared to 9,706 injured women and 7,377 injured children. As for the number of deaths, the figures are as follows: 1143 men, 153 women and 205 children, i.e. 03 men die every day as a result of road traffic accidents and one woman and one child die every two days.

9. Accident types for different vehicles

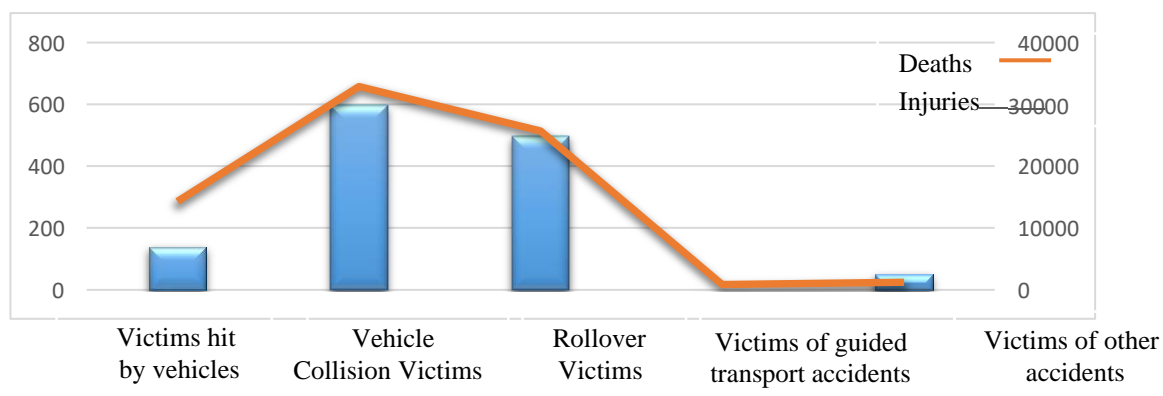


Figure 9: Accident types for different vehicles

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

According to Figure 9 on the types of accidents by type of vehicle, the highest number of deaths and injuries were caused by vehicle collisions with 29,798 injuries and 657 fatalities, followed by vehicle rollovers with 24,844 injuries and 513 fatalities, and the lowest number of deaths and injuries were caused by guided transport with 32 injuries and 17 fatalities.

10-Traffic Tolls by Road Type

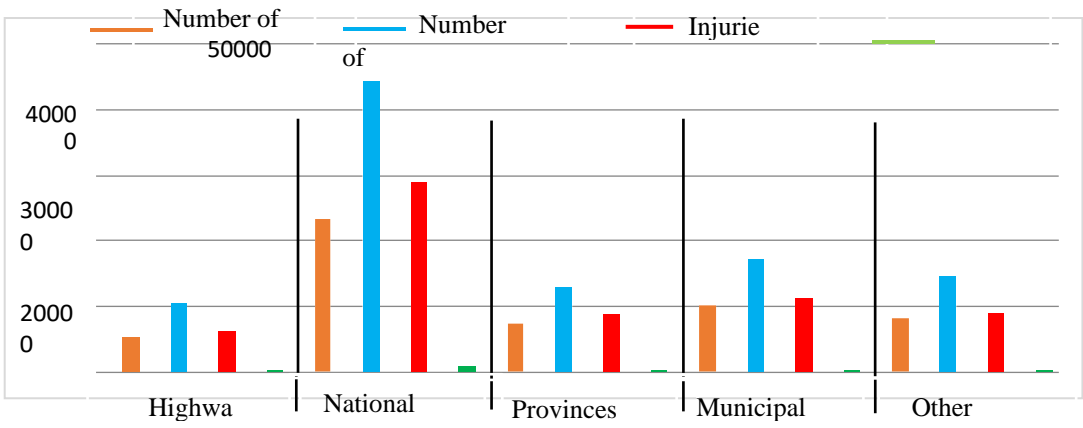


Figure 10: Traffic Tolls by Road Type

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

From Figure 10 it can be concluded that the national roads have the highest number of traffic accidents with 4415 interventions, 23319 accidents, 29000 injured and 818 dead, thus negating the hypothesis of the second study that the east-west motorway has the highest number of traffic accidents.

III. Analysis of the economic indicators of road traffic accidents

Before analysing the economic indicators, it is important to refer to the global indicators used in this field, which are summarised in the following table:

Table 1: The most important indicators in the road traffic accident field

Indicator type	Accident indicators	For population density indicators	For vehiclerelated indicators	Timelines
Its most important contents elements	Accident severity Deaths(per infected indicator	number Deaths/100,000 people Number of wounded/100,000 people	Number of accidents/10,000 vehicles Number of deaths/10,000 vehicles / Number of injured vehicles 10,000	accident/day Death / Day Wounded/day

Source: Prepared by the researcherA. Analysing Time Indicators

The temporal indicators can be represented in the following figure:

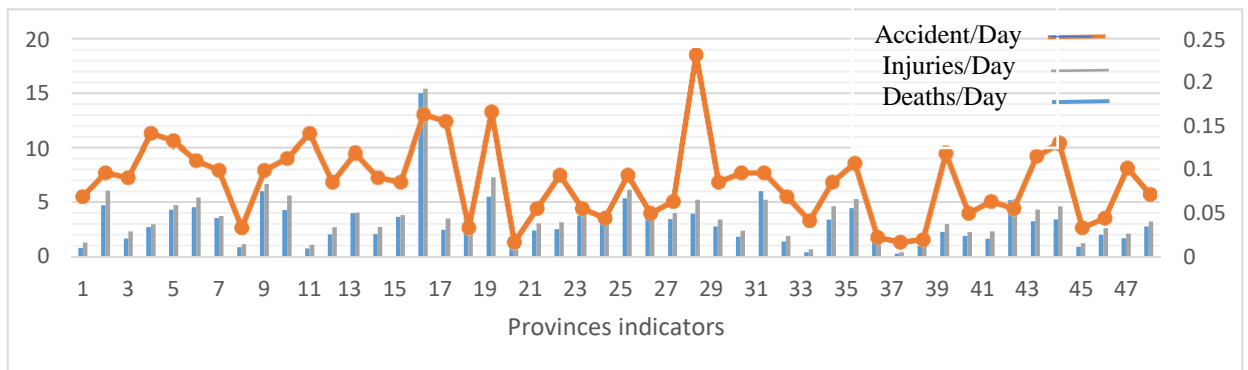


Figure (11) Temporal indicators of road traffic accidents by province
Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021

From Figure 11 we can analyse each time indicator as follows:

Accident/day: Algeria records about 150 accidents per day, which means one accident every 10 minutes. In terms of provinces, Algiers leads with 15 accidents per day, which means one accident every two hours, while the other provinces are close to 06 accidents per day, i.e. one accident every four hours.

Deaths/day: These accidents result in an average of 04 deaths per day, including 03 males, which means one death every 06 hours. As for the provinces, Messila leads with one death every 05 days, while the other provinces are close to the rate of one death every 10 days.

Injured per day: The average number of wounded per day is 177, which means one wounded every 08 minutes, with Algiers leading with 15 wounded per day, which means one wounded every 2 hours, while the rest of the provinces are close to the average of 06 wounded per day, which means one wounded every 04 hours.

B. Analysis of indicators relating to vehicles:

- Number of accidents/10,000 vehicles: 85 accidents per 10,000 vehicles.
- Number of fatalities/10,000 vehicles: Two (02) fatalities per 10,000 vehicles.
- Number of injuries/10 000 vehicles: 101 injured per 10,000 vehicles.

C. Analysis of indicators related to population density:

- Deaths/100,000 inhabitants: A total of 03 deaths per 100,000 inhabitants.
- Injured/100,000 inhabitants: 147 injured per 100,000 inhabitants.

D. Analysis of the indicators relating to the accident itself:

Accident severity = number of fatalities/number of accidents = 0.03.

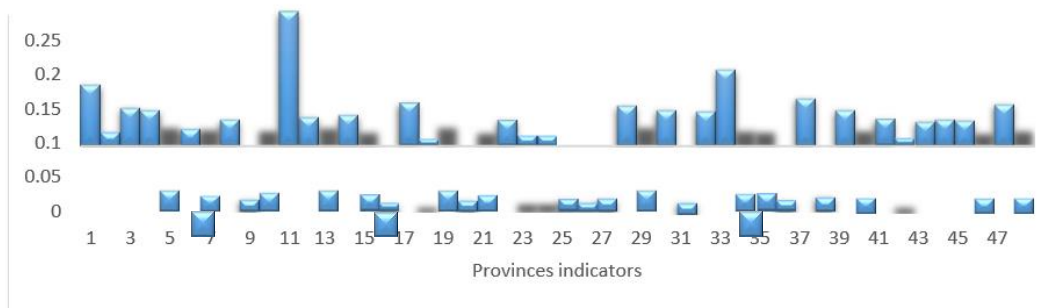


Figure (12) Indicator (fatalities/accidents) by provinces

Source: (Department of Information and Communication of the General Direction of Civil Protection, 2021)

From Figure (12) we can conclude that there is one fatality for every 33 accidents, i.e. there is a 03% chance of finding a fatality for every accident, as for the provinces, the province of 'Tamanrasset' ranks first in the accident severity index with approximately one fatality for every 05 accidents, i.e. there is a 20% chance of finding a fatality for every accident that occurs in this province, followed by the provinces of 'Ilizi and Adrar' with a rate of one fatality for every 10 accidents, while the rest of the provinces have a rate of one fatality for every 50 accidents.

There is a 20% chance of finding a fatality, followed by the provinces of 'Ilizi and Adrar' with a rate of one fatality per 10 accidents, while the rest of the provinces have a rate of one fatality per 50 accidents, which negates the first hypothesis that the severity of accidents is lower in the desert provinces compared to those in the north.

- Index of number of fatalities per injured = number of fatalities / number of injured
= 0.02

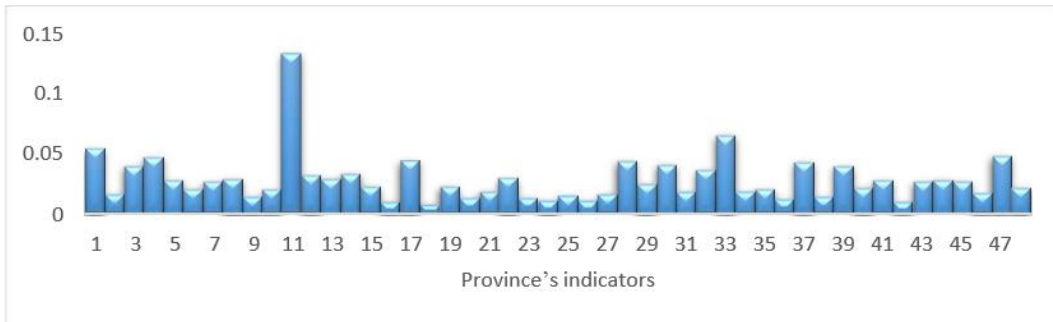


Figure (13): (Fatalities/Injuries) Indicator by Province

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

From Figure 13, this indicator can be interpreted to mean that in Algeria: there is one fatality for every 50 persons injured, which means each injured person has a 02% chance of becoming a fatality. Among the provinces, Tamanrasset ranks first with a rate of one fatality for every 06 injured, which means each person injured in a road accident in this province has a 15% chance of becoming a fatality, followed by the provinces of Illizi and Adrar with a rate of one fatality for every 16 injured.

2. Analysis of economic indicators related to injuries and deaths:

According to a study (A. Marazzaqa et al., 2017), the average cost of an injured person in a road accident was \$210.6, while the average cost of a fatality was estimated at \$101.63. From this, the average cost of injuries is shown in the following figure:

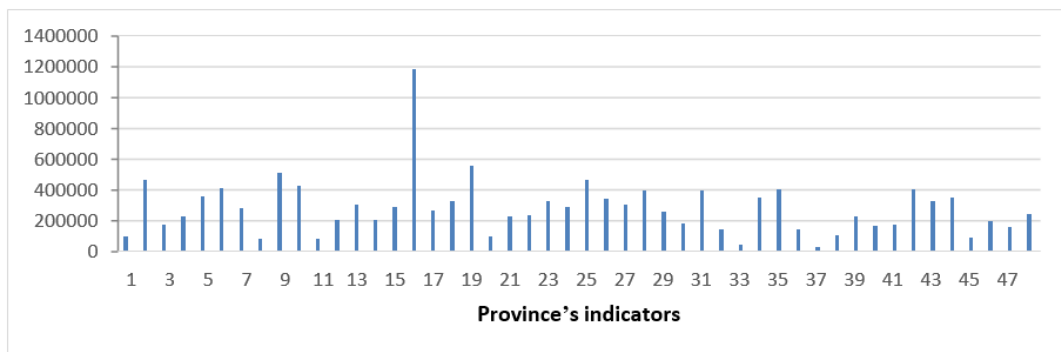


Figure 14: Average cost of injuries in road traffic crashes by province

Source: (Department of Information and Communication of the General Direction of CivilProtection, 2021)

From the above figure, we can observe that the capital has the highest average cost with nearly one million US dollars, while the average cost of traffic fatalities can be represented as follows:

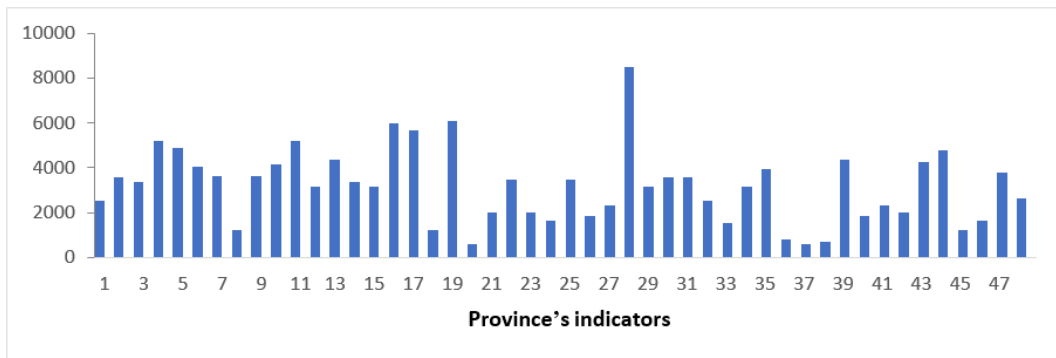


Figure (15): The average cost of road traffic fatalities

Source: (Department of Information and Communication of the General Direction of Civil Protection, 2021)

From the figure above, we can observe that the state of Masila has the highest average cost at approximately 9000 USD.

Conclusion

Through this study, we have analysed the indicators related to road traffic accidents, especially the economic ones, in order to understand the extent of the tragedies caused by road accidents. At the level of Algeria, we have tried to study them and the contribution and share of each province in this result, and we have reached several results, the most important of which are the following:

- The hypothesis that the Saharan provinces are safer in terms of accidents than their northern counterparts has been disproved, as Tamanrasset is at the top of the accident severity index with approximately one fatality for every five accidents, i.e. for every accident that occurs in this province, there is a 20% chance of a fatality.
- The hypothesis that the east-west motorway is the most costly in terms of economic losses compared to national, state and municipal roads was disproved, as the national roads have the highest number of traffic accidents, with 44415 interventions, 23319 accidents, 29000 injured and 818 dead, equivalent to an economic loss of around 83,133.34 USD.
- Despite the record number of accidents and interventions in the capital, the number of fatalities remains within the average of most provinces.
- M'sila is the province with the highest number of deaths, especially children. Every week one man, every 10 days one woman and every 20 days one child, 3 men and 2 women die as a result of road accidents in the prefecture.
- Although the age group '21-30' accounted for the lion's share of human losses in terms of number of injured, the age group '31-40' was in the lead in terms of fatalities.
- Road accidents peak between 16:00 and 20:00, with the highest number of accidents on Thursdays and the lowest on Fridays.
- Algeria records one accident every 10 minutes, one fatality every 06 hours and one injury every 08 minutes, an economic loss of around 800 USD per hour.

- In terms of provinces, Algiers leads with an average of one accident every two hours resulting in at least one casualty, while M'sila leads in terms of fatalities with an average of one fatality every five days, or about 42 USD per day.

We also proposed the following recommendations

- The need to step up awareness and information campaigns on the dangers of road accidents and ways of preventing them, through the competent authorities such as the National Centre for Road Safety and Security, in addition to the involvement of civil society, civil protection and the National Gendarmerie, because this phenomenon is first and foremost a security issue and secondly a social issue.
- Include the concept of road safety in educational curricula to try to build a culture of respect for others and their right to life.

The creation of air-conditioned medical services, equipped with modern ambulances, in order to save as many injured people as possible and minimise fatalities.

- Regularly monitor the work of driving schools in order to increase the efficiency of new drivers.
- Strictly combat the phenomenon of corruption in the recovery of illegally withdrawn driving licences in order to deter offenders.
- Cooperate with universities and colleges to carry out studies on this phenomenon and monitor its evolution.

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