EFFECT OF MOBILE PHONE USE ON ROADS SAFETY IN AMMAN

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DEDICATION

I dedicate this letter to my parents, wife, and siblings, who have continuously helped and encouraged me to complete my graduate studies and achieve my dream.

I promised them to be more helpful to them, God willing.

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List of Abbreviations

• JTI	Jordan Traffic Institute
• ME's	Missing Exits
• FOTS's	Failing to Observe Traffic Signals
• FASL's	Forgetting to Adjust the Speed to the Limit
• NCOV's	Near Collisions with Other Vehicles or Objects
• DOR's	Driving Off the Road
• SWOL's	Swerving into the Wrong or Opposing Lane
• LCC's	Losing Control of the Car
• $\chi 2$	Chi- Square Test
• DF	Degree of Freedom
• O	Observed Frequency
• E	Expected Frequency
• Ho	Null Hypothesis
• Ha	Alternative Hypothesis
• α	Significant Coefficient

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ABSTRACT

In this research, the purpose was to give a picture of drivers' use of mobile phones while driving and more specifically their attitudes to the use of mobile phones while driving, and the types of routines and behavior practiced when using the mobile phones. In addition, the purpose was to get some idea of the type of mistakes caused by drivers using their mobile phones. The study summarizes results using questionnaires. The research shows that 75% of mobile phone users were hand-held without any extra add-on equipment. Drivers rarely sent and received text messages while driving. Generally, this was often a driver from the younger age group. The use of mobile phones affected driving in different ways. Drivers missed exits, failed to observe traffic signs, and forgot to adjust the speed according to the limit. It was not unusual to have incidents or near collisions with other vehicles or objects, or driving of the road, when mobile phones were used while driving.

The results of the questionnaire are mostly obvious; however, they reveal surprising patterns that one may not notice if the results were not studied. For example,

young male drivers when using a mobile phone (eg. between 25-44 years old) commit most mistakes. On the other hand, one may not have known the different types of mistakes made by drivers when using a mobile phone if this study had not been conducted.

While results indicate that drivers do not believe that the use of phones in a vehicle may cause accidents, 9 out of 10 believe it causes driver confusion. Accordingly, one may not tend to fully believe all of the answers provided because they are in conflict with each other.

The bottom line is to ensure road-safety when drivers are entranced in mobile phone conversations. This can be done through hands-free devices, public awareness of the dangers of placing calls while driving, and placing large fines on violations.

1. INTRODUCTION

In the modern age of technology, one cannot do without the use of mobile phones, whether in or outside a vehicle. The goal is to intermingle road-safety with the can't-do without device. In an effort to see the effect of road safety while using a mobile phone, a questionnaire was passed out and the results thereof formed a study.

Traffic accidents create serious problems in many countries, especially in the developing world. A major accident cause is the use of mobile phones.

A statistical analysis of Traffic accidents in Jordan that was prepared by The Jordan Traffic Institute (JTI) shows that the accident rate (number of accidents/10.000vehicle) increased from 1115.4 (at the year 2000) to 1223.0 (at the year 2005). Every 6 minutes, a traffic accident occurs and every 48 hours, a child is killed in a traffic accident. Additionally, every 11 hours, a person is killed because of a traffic accident.

The mobile phone has become an unavoidable part of our everyday life and it would be unrealistic to expect people to completely stop using mobile phones in vehicles (or to obey a total ban of mobile phones). Therefore, the Jordanian Security Force has introduced various kinds of legislation directed at preventing the use of mobile phones while driving. As in article, 49/A/16/3B in Jordanian law, which beholds a fine of (15-30jd) if caught driving while using mobile phone. Drivers traffic violations by using mobile phone while driving were 35687 at the end of 2005.

The use of mobile phone in Amman has increased substantially this Century. FASTLINK company records show that, at the end of the year 2000, the number of mobile phone subscribers was 1,080,000, at the end of 2005, the number of subscriptions increased to 2,000,000. This means an increase of 85% over a 5-years period of mobile phone use. There are many reasons to believe that there has been a substantial increased usage of mobile phones while driving. However, there is limited information of its effects on traffic safety especially in Amman. Moreover, there is a lack of information from JTI about the accidents caused by the use of mobile phones while driving. There is no accurate data on the accident risk associated with this practice.

The presence or use of a mobile phone in a vehicle during an accident is normally not recorded. Consequently, this contributes to the problem of estimating the number of mobile phone users involved in accidents while driving.

The purpose of this study is to examine drivers' use of mobile phones while driving and investigate the types of behaviors practiced. In addition, the drivers' involvement in accidents and mistakes done by drivers associated with mobile phone usage will be examined.

The main objectives of this study include:

- Identifying actual behaviors of drivers using mobile phones while driving especially those involved in traffic accidents or accidents risks.
- Analyzing mistakes done by drivers while using mobile phone such as: missing exits, failing to observe traffic signals, forgetting to adjust speed according to limits, approaching near collisions with other vehicles or objects, driving off the road, swerving into the wrong or opposing lane, and losing control of the car.

The study of the use of mobile phone while driving in Amman is important because we believe that using the mobile phone while driving may cause accidents or increase accident risks.

This study is different from other studies in the factors considered in the analysis, which include: the drivers age, gender (male or female), average daily use of car, daily activities (students, civil servant, private sector employees, unemployed, owner of a business) average daily use of phone while driving, placing calls while driving, type or form of precaution when using mobile phone while driving, vehicle category, number of received or sent messages, type of mobile phone used (hands-free vs. hand-held), locations and time of mobile phone use, type of driver mistakes done while using mobile phone, number of calls made or received.

2. LITERATURE REVIEW

Previous research were reviewed and categorized into the following groups

- General Previous Reviews.
- Epidemiological studies
- Drivers performance studies.
- Case analyses.
- Studies using driving simulators

2.1 General Previous Reviews

In their review of past research, Cain and Burris (1999) concluded that cell phone use adversely affects driving performance by causing driver inattention. The effects are influenced by the type of cell phone (hand-held vs. hands-free), the complexity of the conversation, and driver age. The studies reviewed by the authors indicated that cell phone use while driving increases crash risk by 34 to 300 percent. The authors suggest that most cell-phone-related crashes occur because drivers are not paying attention to driving and move from their lane or strike a stopped vehicle in their lane.

Another review Lissy, Cohen, Park and Graham, (2000) concluded that using a cell phone while driving creates safety risks. The exact level of these risks is uncertain, but the authors estimated that "a person is less likely to be killed in a crash caused by a cellular phone user than to be killed as a pedestrian, to be killed by a drunk driver, or to be killed in a crash involving a heavy truck." The authors state that it is not clear whether hands-free phones are safer than hand-held phones.

2.2 Epidemiological Studies

John M. Violanti and James R. Marshal, (1999), cellular by using phones and traffic accidents, U.S.A, by using epidemiological approach, conducted a study, they study the correlation between mobile phone use while driving and accident risks, time spent in using the mobile per month, and in attention, factors were examined. They found that using mobile phone while driving more than 50 minutes per month will cause increase in traffic accidents.

The method of the epidemiological research involved a case – control design. Individuals with accidents were considered "cases" and those without accidents were considered the study's "controls." To obtain information on driving behavior not available through department of motor vehicle records, it was necessary to conduct a mail survey with each case and control subject.The"case" group consisted of a random sample of 100 New York State resident drivers who had a record of an accident in 1992- 1993 . A random sample of 100 New York resident drivers, accident- free within the previous ten years before the study, composed the "control" group. From a review of the monthly cell phone billings, cell phone use was measured by the number of minutes that each driver actually talked on the phone in the vehicle. Descriptive analysis results suggested that a higher percentage of the group (case) subjects averaged more minutes per month talking on the cell phone and had a higher average of personal, business and intense business cell phone calls than group (control). As the amount of time spent talking on a cell phone increased, the chances of a vehicle accident also increased, was used as the hypothesis for the multivariate analysis. The statistically non-significant variables were eliminated and only variables that might potentially confound the association between cellular phone use time and vehicles accidents were retained in the final logistic regression model.

The descriptive analysis suggested that drivers who had accidents group (case) spent approximately double the time per month talking on their cell phones as drivers without accidents group (control). Additionally, the case subjects were involved more in business and intense business calls. The multivariate analysis indicated modest evidence that involvement in cell phone conversations by the driver was associated with increased odds of having a vehicle accident. Moreover, males who used a cell phone more than 50 minutes per month had a significant increase in odds of a vehicle accident. Subjects with 26-40 years of driving experience had the greatest chance of having an accident due to cellular phone use time. Examples of limitation of this type of study include:

- Lack of direct evidence that persons were using a cellular phone at the time of the accident;
- Potential sources of bias (i.e., no response to questionnaire);
- No admittance to cell phone use at time of accident.

The researchers for the study state that their findings suggest a statistical association between cell phone use while driving and accidents. They also state that the amount of time spent in cell phone conversations while driving appears to be associated with increased odds of vehicular accidents.

Violanti (1997) performed two rate-ratio analyses, both using data from Oklahoma: (1) 492 crashes in which the driver was reported as using a cell phone at the time of the crash; and (2) 5,292 crashes in which a cell phone was reported as being present in the vehicle. Drivers with cell phones in their vehicles had significantly higher rates for crashes caused by inattention, unsafe speed, and driving on the wrong side of the road. They also had a significantly higher risk of being killed in a crash.

In another study of Oklahoma crashes, Violanti (1998) employed an epidemiological case-control design. The cases were drivers who killed in crashes and the controls were drivers who survived crashes. Both the use and the presence of a cell phone were associated with an increased risk of a fatality, given a crash. The increased risk was nine times for the use of a phone and twice for the presence of a phone. Cell phone use was associated with driving left of center and inattention to further increase the risk of a crash. Study limitations include the lack of exposure data, the lack of information about other potential driver distractions, and the lack of information about whether a hand-held or hands-free phone was used.

A study conducted by Redelmeier, M.D., and Tibshirani, ph.D. Was designed to determine whether using a mobile phone while driving increases the risk of a motor vehicle collision. It used an epidemiological approach to determine potential association between the use of a cell phone and vehicle collision risk in real-world environments.

The case-crossover design was used in this study. This study involved 699 drivers that had cell phones and were in motor vehicle accidents that resulted in substantial property damage without personal injury. Study participants cell phone calls were analyzed using detailed billing records. Each participant's cell phone calls on the day of the collision and during the previous week were analyzed.

Each person functioned as their own control, such that confounding of data due to age, sex, visual acuity, training, personality, driving record, and other fixed characteristics was eliminated. The pair-matched analytic approach was used to contrast a time period on the day of the accident with a comparable period on a day preceding the accident. This contrast allowed the case-crossover analysis to identify an increase in risk if there were more cell phone calls by the driver immediately before the vehicle accident than would be expected solely because of chance.

The sample size was calculated to provide an 80% chance of detecting a doubling or halving of collision rates. Relative risks were estimated with methods of matched-pairs studies based on exact binomial tests and conditional logistic-regression analyses. Modifications of the relative risks were assessed by comparing different subgroups, with particular attention to the pre-specified contrast between hand-held cellular telephones and models that leave the hands free. All P values were two-tailed, and all relative risks were computed with 95% confidence intervals.

Results indicated that there was a four-fold increase in risk associated with the use of a cell phone while driving as compared to not using a cell phone. The authors indicate that the relative risk of vehicle collisions is similar to the hazard associated with driving with a blood alcohol level at the legal limit. Additionally, the study suggested that the use of hands-free design was no safer than the use of hand-held design cell phones.

Min and Redelmeier (1993) used ecologic analysis to look at cell phone use and crash rates in Toronto, Canada. There were 75 study locations, with 1,265 crashes in 1984 and 1,969 crashes in 1993. The density of cell phone towers estimated cell phone use. It is not known if this is an accurate measure of cell phone use while driving. Regression analysis showed that the locations with the greatest increases in crash rates tended to have the smallest increases in estimated use. However, the authors acknowledge, "the risk or benefit associated with using a cellular telephone while driving cannot be determined by ecologic analysis because of multiple sources of bias".

2.3 Drivers Performance Studies

A study conducted by A. James ,Mc knight and A. Scott McKnight , 18 July 2002.The effect of cellular phone use upon driver attention, including study five situations of drivers distraction, including drivers mobile phone calls casual, conversations intense conversation , tuning a radio, and no distraction, these situations studies with respect to age, and gender, the conclusion of the study was older drivers might reduce accident risks by avoiding use of mobile phone, other drivers might do so by stopping calls involving intense conversation.

A fact sheet done by institute for road safety research (SWOV), March 2005, use of mobile phone while driving, analyzed the negative effects of using mobile phone while driving on drivers behavior and accident rate, mobile phones distract drivers in two ways (physical distraction and cognitive distraction) .results of studying of what makes mobile use so dangerous and why,(slower reaction ,more misses, slower braking reaction time, general awareness of other traffic, riskier decision making, large variations in speed) . they studied if hands free mobile phones use safer than hand held ones, the result was that the impact of conversation on driving performance is the same for both, there is no accurate data of how many accidents are caused by the use of mobile phones, because of lack of data collection about mobile use as a cause of traffic accidents and because of the drivers fear of liability. Another fact is that mobile phone use differs from drinking alcohol, the mobile phone impairment is associated with the diversion of attention and it is transitory while impairment from alcohol persists for longer periods. While mobile phone drivers can have some kind of control, drivers who are intoxicated cannot do much to control their performance.

They conclude that the use of mobile phones while driving has negative effect on driving performance (physical and cognitive distraction), also they found that the use of hands- free phones do not have significant safety advantages over hand-held phones, the type of conversations influence the effect on driving performance.

Strayer, Drews, Albert, and Johnston at the University of Utah conducted a study with two objectives. The first objective was to determine the effects of driving and conversing on a cell phone on a multilane freeway while following a pace car that would brake at random intervals. The second objective involved an assessment of the hypothesis that cell phone conversations impair driving performance by removing a driver's attention from visual scene.

Experiments were conducted in a driving simulator that functioned to "immerse" the driver in a driving environment. The simulator environment replicated the partial interior of an American sedan with, for instance, dashboard instrumentation, pedals, and steering wheel. Additionally, the driving simulator incorporated vehicle dynamics, traffic scenarios, road surfaces, realistic scenes, and traffic conditions. Four experiments were performed in this study:

- Experiment one involved forty participants and two different driving conditions. The real-time responses of these participants were monitored under low-density driving conditions. A pace car and the subject's car were the only vehicles on the roadway. The second driving condition involved "distracter" vehicles on a highway scenario. These vehicles gave the impression of a steady flow of traffic in the left-hand lane. In both scenarios, the pace car, equipped with brake lights, would brake in fashion and would continue to brake until the study participant depressed their brake pedal.

- Experiment two tested twenty participants. It analyzed incidental recognition memory as an estimate of the degree to which attention to visual information in the driving environment is distracted by cell phone conversations. Study participants were required to perform a simulated driving task without the previous knowledge that their memory for objects in the driving environment would be tested afterward.
- Experiment three included twenty subjects. The simulated driving tasks of experiment two were repeated while the eye fixations of the participants were measured. Experiment three studied if cell phone conversations while driving reduced attention and the recognition memory for fixated objects.
- Experiment four involved thirty participants and measured the perceptual memory for words that where presented during fixation on objects. This study element estimated the perceptual memory for items by the time taken by a subject to correctly report the identity of the item. The perceptual memory task provided an index of the initial data-driven processing of the visual scene. The application to a driving scenario, for instance, may be the observation of an emergency in the driving environment and appropriate response(s).

  This experiment differed from simulator experiments one, two and three using a joystick in a pursuit-tracking task. This tracking task was done while the study participant was engaged in a cell-phone conversation. Immediately following the tracking task, the subjects performed a perceptual memory task to identify words to which they were previously exposed.

Data analysis for experiment one used a Multivariate Analysis of Variance to provide a general measure of driver performance as a function of experimental conditions. A Multivariate analysis of each dependent measure in the experiments (traffic density and cell phone conversation and no cell phone conversation) was applied to each dependent measure during the simulation.

Experiment two tests the participant's ability to correctly recall billboards that were present during the simulated driving. Recognition memory performance was also calculated in experiment three. Additionally, the total fixation time was measured to ensure that the observed differences in recognition memory were not due to longer fixation times. The conditional probability of recognizing a billboard, given that a subject is fixated on this billboard while driving, was also calculated. Finally, a time-varying analysis of covariance was conducted. The recognition probabilities for the billboard items that were fixated were statistically corrected for variations in fixation duration on a billboard-by-billboard basis. In experiment four, the rate at which a study participant identified words during no cell phone and cell phone tasks were measured. Moreover, the rate at which a subject could identify new words was measured. All words masked randomly and revealed gradually every 33 milliseconds.

Experiment One:

The Multivariate Analysis of variance showed a significant main effect for the tasks of engaging in a cell phone conversation while driving. This effect indicated that during this time, the study subject's reactions were slower when compared to only driving the vehicle. The participants tended to compensate for this sluggish behavior by increasing the distance between their vehicle and the pace vehicle.

Additionally, a Multivariate analysis indicated that the time interval between the brake light illumination on the pace car and the subject's brake pedal depression was greater when driving while engaged in a cell phone conversation. This difference was statistically significant on highway driving conditions with the presence of other vehicles functioning as distractions.

Experiment Two:

Results of experiment indicate a breakdown of a person's visual attention. The data showed that cell phone conversation diverts a driver's attention from the driving environment to the cell phone conversation. The engagement in a cell phone conversation impairs the recognition memory of objects in the driving environment.

Experiment Three:

Similar to experiment two, the experiment indicated that cell phone conversations disrupt the attention of a driver to their visual environment. This disruption still occurred when experiment subjects fixated their vision on objects in the driving environment. These were less likely to form explicit memory of objects when they were engaged in a cell phone conversation.

Experiment Four:

Words were identified slower for trials involving the use of a cell phone while the subject tracked the target with the joystick. This reduction in time requirements applied to words presented in previous experiments during the dual tasks of driving and engaging in a cell phone conversation. Data from this experiment indicated that cell phone conversations diminished perceptual memory of items on which the participants fixated during the completion of tracking tasks

Studies were conducted by (ROSPA) The Royal society for the prevention of accidents (2005), about driving for work Mobile phones, a substantial body of research shows that using a hand- held or hands – free mobile phone while driving is a significant distraction, and substantially increase the risk of the driver crashing. High mileage and company car drivers are more likely than most to use a mobile phone while driving. Research indicates that they are also four times more likely to crash, injuring or killing themselves and / or other people. Recommendations are made for employers to understand the dangerous of using a hand- held or hands– free mobile phone while driving to switch the phone off while driving, to stop in a safe place to check messages.

Study was conducted by Leena Poysti, Sirpa Rajalin and Heikki Summala(july 2004), addressed the strategic decisions on not using a mobile phone at all while driving, and phone related driving hazards among those drivers who do use one, reflecting tactical and operational level processes. A representative sample of 834 licensed drivers who own a mobile phone were interviewed on their phone use and hazards, background factors, and self- image as a driver. Logistic regression models indicated that older age, female gender, smaller amount of driving, and occupation promoted not using a phone at all while driving. Additionally, low skill level and high safety motivation contributed to this decision. Among those used a phone while driving. Exposure to risk in terms of higher mileage and more extensive phone use increased phone related hazards, as also did young age, leading occupational position, and low safety motivation. Neither gender nor driving skill level had any effect on such self –reported hazards. This study clearly indicates that potential risks of mobile phones are being controlled at many levels, by strategic as well as tactics decisions and, consequently, phone related accidents have not increased in line with the use of the mobile phones.

2.4 Studies using driving simulators

Driving simulators are intended to replicate real-life driving conditions but without exposing drivers to the real-life risks. Thus, studies of driver performance are usually simpler to conduct using simulators than actual on-road driving. In fact, Haigney and Westerman (2001) tout the use of simulators as being the most effective and the most ethical method compared with on-road studies. However, it is possible that drivers will be less cautious while in a simulator because they know that they are in no danger of a real-life crash or injury.

Study by alm and Nilsson (1995) investigated the issue of car-following distance, Referred to as headway, as it relates to cell phone use while driving the vehicle. A goal of this study was to analyze the effects on reaction time, mental workload and lateral position when participants in the study must interact with other road users. Another objective of this study was to investigate if engagement in cell phone conversations impacted the participants' choice of following distance (headway).'Forty subjects participated in this study. A complex driving task was used in this study. Similar to other simulator studies, the simulated interior was of a passenger car. The difference to other simulators was the use of a manual gearbox. The cell phone used for this study was a hands-free version. The driving simulator used a moving base system and a wide-angle visual system. Other Simulation effects included vibration generating, sound and temperature – regulating systems. All these operated simultaneously to give the study subjects the impression of a driving experience.

The simulator was equipped to gather real-time values for objective performance Measures. Performance measures analyzed in this study included choice reaction time to braking of lead vehicle, headway, lateral lane position, communication of correct judgments and subjective workload indices. Objective data was analyzed using a two – way ANOVA; the ANOVA results demonstrated a significant difference in choice reaction time in braking. The subjects demonstrated a longer reaction time when involved in cell phone conversations. Compensation by the subjects for increased reaction time would be an increase in the following distance between the subject's vehicle and the lead vehicle. An analysis of the data did not indicate an increase in the following distance. A reason given in this study for the absence of an increase relates to a subject's situational memory. Their reasoning was that a driver must be able to remember and compare reaction time in different situations based on previous experience. The researchers concluded that the headway during cell phone use was not large enough to include the increased risk caused by the slowed reaction time. Lateral position in this study referred to participant's ability to maintain position of the vehicle in their lane. The analysis of the data from this study did not indicate an increased variability in lateral position. Reasoning given for finding includes the frequent stream of oncoming vehicles, which required the subjects to careful about lane position.

In another study, 150 subjects “drove” a simulator while watching a videotape of an actual driving scene (McKnight and McKnight, 1993). The subjects used simulated vehicle controls to respond to 45 traffic situations (such as vehicles stopping or turning) on the video. When no distractions were present, the subjects failed to respond to 34 percent of the situations.

This increased to 41 percent when they were placing a call on a cell phone or carrying on a casual cell phone conversation, and to 44 percent when engaged in an intense conversation. Older subjects (ages 46 to 80) had higher no response rates than younger subjects (ages 17 to 25). The authors also conclude that the effects of cell phones on driving performance are not limited to dialing and do not disappear with hands-free phones.

Parkes and Hooijmeijer (2001) investigated the driving performance of 15 subjects on a simulated rural road. They were able to maintain their speed and lateral position on the roadway while engaged in a cell phone conversation. However, situational awareness was degraded, as many subjects had no idea of what was going on around them while they were on the phone. Reaction time was also slower, especially when near the beginning of a cell phone conversation.

Parkes and hooijmijer directed a driving simulator study that also investigated the impact of cell phone use and driving performance. Driving performance and situational awareness were the parameters measured in this study. Situational awareness is defined as "person perception of the elements of the environment within a volume of time and space, comprehension of their meaning and the projection of their status in the near future."

Static driving simulator tests were conducted on fifteen subjects. This simulation presented various elements of feedback to the driver, such as dashboard lights, engine, road, and wind noise. A route was used in the driving simulation to keep the driver's attention on the road. To increase the realism of the driving experience, oncoming traffic and cars in the rear view mirror were simulated.

A hands-free type of phone was used for cell phone conversations in the experiment. Subjects of the experiment were to keep the vehicle in the middle of the lane and maintain the speed limit. Additionally, they were informed that other traffic would be present during the simulation, as would environmental changes.

Lateral position of the vehicle and its variability were measured during the experiment. Maintenance of vehicle speed, braking distance and response time to unexpected events were also measured. The situational awareness was also used as an indicator of the driver's performance. Three levels of situational awareness were measured:

- Perception of elements in the environment;
- Comprehension of the current situation;
- Projection of future status;

Results from t-test, used to analyze lateral position and braking distance, did not indicate a significant difference between driving during a cell phone conversation and without the conversation. In relation to the mean reaction time to the change in speed limit, the change on the part of the drivers while using the cell phone appeared to be slower for deceleration than when not using a cell phone.

The data from the situational awareness measures utilized x2 analysis. Results of this analysis indicated that there were significantly more correct answers to situational awareness questions in driving without the use of a cell phone than there were with the use of one.

Limitations of this particular simulator experiment included:

- Drivers perceived and adjusted their response patterns to the safety of a simulated environment;
- Road chosen had no directed conflicts with other cars;
- Road did not have sharp curves or large junctions;

The tests of situational awareness indicated a significant difference between cell phone and no cell phone use. A notable decrease in situational awareness, due to the level of concentration demanded by the cell phone conversation, was evident in the data.

3. DATA COLLECTION

In order to study the effect of mobile phone use while driving, data collected using a survey based on questionnaires randomly distributed to drivers in the city of Amman (the capital of Jordan). By choosing different zones, commercial places, busses parking, intersections, west area, east area, university of Jordan, Amman municipality.

The questionnaire focused on traffic safety issues, which will be discussed later in this chapter.

3.1 Questionnaire Survey

A sample Group was utilized in the design of the questionnaire. They identified mistake behavioral patterns while drivers used their mobile phones.

The sample Group, which is comprised of 1000 randomly chosen drivers in regards to gender and age, are the source of information for this questionnaire used to gather statistics on the mistakes occurred when drivers used mobile phones. The questionnaire presents the following questions:

Q1: Gender?

A- Male B- Female

Q2: Age?

A- (18-24) B-(25-34) C-(35-44) D-(45-54)

E-(55-64) F-(65-74) G-(more than 75)

Q3: Average daily use of your private car?

A- 1/2 Hour per day B- One hour per day C- Two hours per day

D- Three hours per day E- More than three hours per day

Q4: Your sector of daily activity?

A- Students B- Civil servant C- Private sector employees

D- Unemployed E- Owner of a business

Q5: Daily use of your phone while driving.

A- Rarely (less than three calls per day) B- Little (4-5 calls per day)

C- Medium (5-10 calls per day) D- Often (more than ten call per day)

Q6: Did you try to make call while driving?

A- Never B- Seldom C- Sometimes D- Always

Q7: If you receive a call while you are driving what would you do, (you can choose more than one answer).

A- Never answer B- Verifies identity of caller before answer or not

C- Reply to most calls D- Answers all incoming calls

E- Parking on the side of the road E- Reduced speed and answer

Q8: Have you or one of your relatives or acquaintance exposed to accident caused because of phone use?

A- Yes B- No

Q9: Do you believe that use of mobile phone while driving (you or other drivers) causes traffic confusion?

A-yes B-no C- Sometimes

Q10: Vehicle category?

A- Private cars B- Public cars C- Government cars

D- Rental cars E- Trucks F- Busses

Q11: Average number of receiving text messages, SMS, or sent while driving?

A- Rarely (less than three text messages per day) B- Little(4-5text messages per day)

C-Medium (5-10 text messages) per day D-Often (more than 10 text messages) per day

Q12: Type of mistake done by drivers while using mobile phone?(you can choose more than one answer)

A- Missing exits

B- Failing to observe traffic signals

C- Forgetting to adjust the speed according To the limit

D-Near collisions with other vehicles or objects

E-Driving off the road

F-Swerving into the wrong or opposing lanes

G-Losing control of the car

Q13: Where do you often use your mobile phone?

A- Highway B- Secondary road C- Freeway D-Inner- city roads

Q14: The type of mobile phone was being used.

A- Hand - held B- Hands- free

The number of questionnaire distributed was 1000, which took about one month to distribute and collect.

See Appendix A, the questionnaire in Arabic language

3.2 Results

- Table 1 and Figure 1 show that 78.6 percent of male drivers in the sample utilized mobile telephones in a vehicle versus a much lower percentage, 21.4, for females.

Table 1. Gender Frequency

	Frequency	Percent	Cumulative Percent	Registered Drivers
Male	786	78.6	78.6	9802960
Female	214	21.4	100	227565
Total	1000	100		1207861

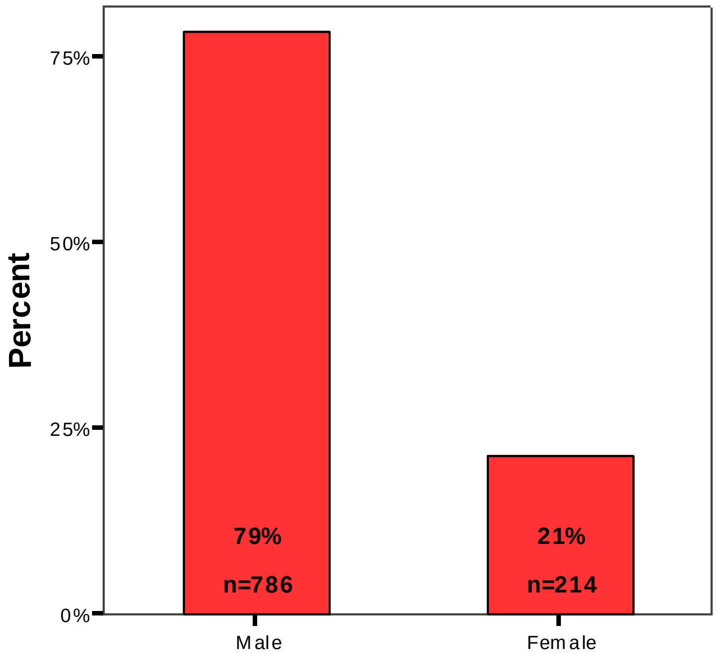

Figure 1. Gender Frequency

- Table 2 and Figure 2 illustrate the frequency and percentage of drivers at various ages in the selected sample study. The majority of persons using mobile phones while driving fall between the ages of 35-44. The study also showed that no drivers above the age of 75 years use mobile telephones.

Table 2. Age Frequency

	Frequency	Percent	Cumulative Percent	Registered Drivers
18-24	131	13.1	13.1	94609
25-34	336	33.6	46.7	480989
35-44	387	38.7	85.4	324639
45-54	118	11.8	97.2	195209
55-64	20	2	99.2	187600
65-74	8	0.8	100	
Total	1000	100		1283046

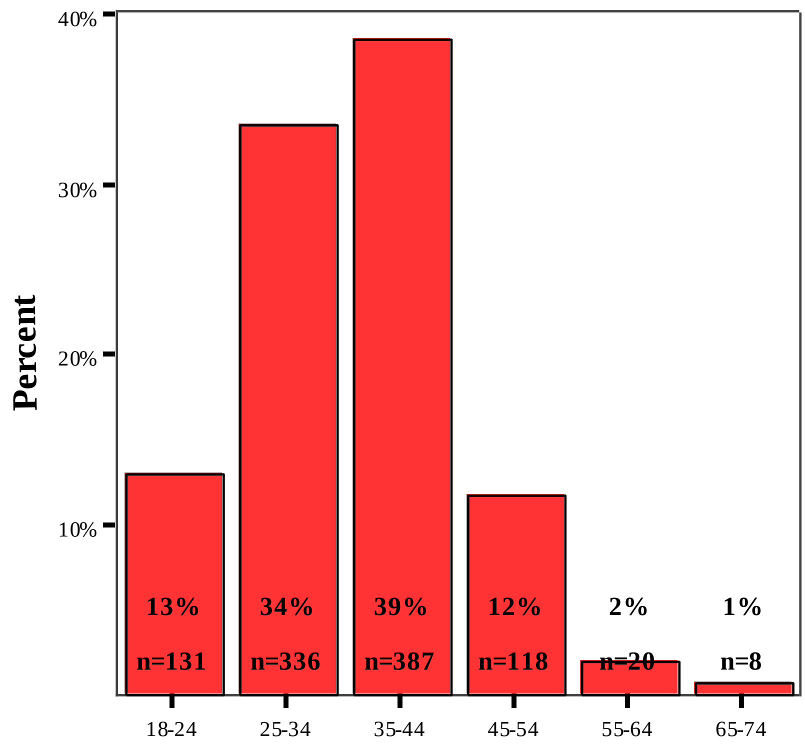

Figure 2. Age Frequency

- Table3 and Figure3 illustrate the highest percentage of the sample study that is 51.6% of all drivers used their vehicles more than three hours per day. On the contrary, a small percentage, 7.2%, of the drivers spent less than 1/2 hour per day driving a vehicle.

Table 3. Average Daily Use of Private Car Frequency

	Frequency	Percent	Cumulative Percent	
1/2 Hour per Day	72	7.2	7.2	
One Hour per Day	133	13.3	20.5	
Two Hours per Day	142	14.2	34.7	
Three Hours per Day	137	13.7	48.4	
More Than Three Hours per Day	516	51.6	100	
Total	1000	100		

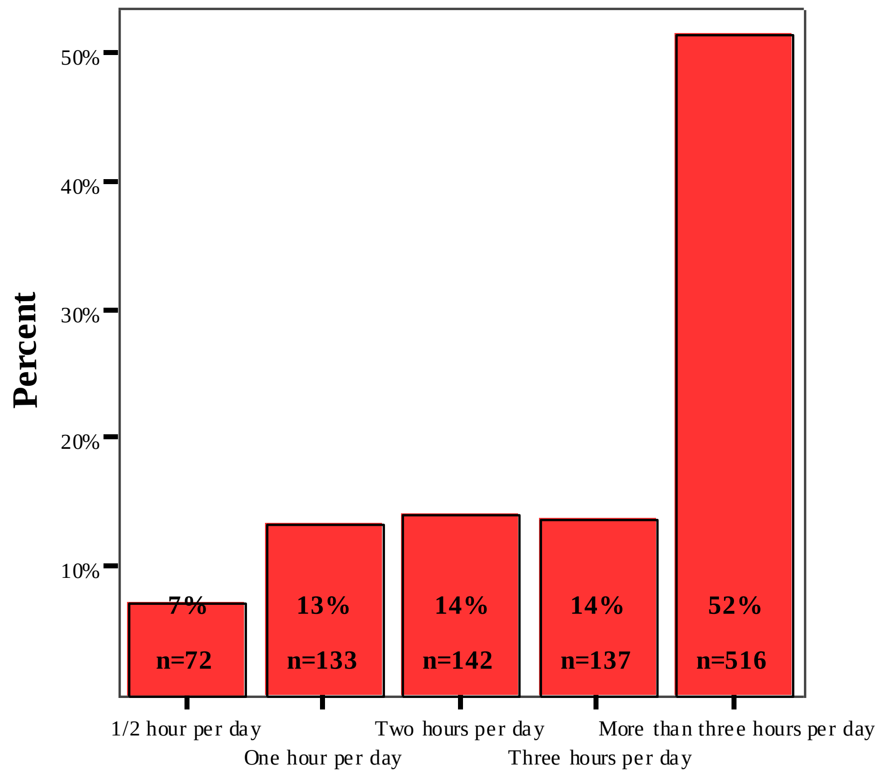

Figure 3. Average Daily Use of Your Private Car Frequency

- Table 4 and Figure 4, which jointly explain that the majority of drivers in the sample were private sector employees, whereas the lowest percentage of drivers in the sample was students.

Table 4. Driver's Daily Activity Frequency.

	Frequency	Percent	Cumulative Percent	
Students	79	7.9	7.9	
Civil Servant	225	22.5	30.4	
Private Sector Employees	321	32.1	62.5	
Unemployed	83	8.3	70.8	
Owner of a business	292	29.2	100	
Total	1000	100		

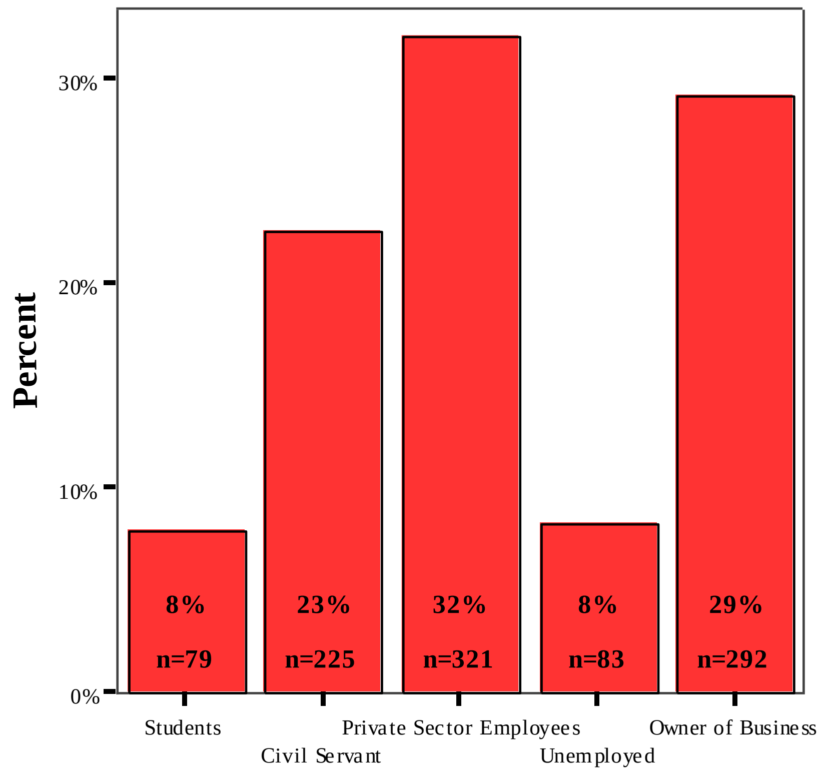

Figure 4. Driver's Daily Activity Frequency

- Table 5 and Figure 5 show that the majority (42.9%) of drivers rarely use their mobile phones. Only 12.5% of drivers often (more than 10 calls per day) use their phones while driving.

Table 5. Average Daily Use of Phone Frequency.

	Frequency	Percent	Cumulative Percent	
Rarely(less than three calls per day)	429	42.9	42.9	
Little(4-5 calls per day)	188	18.8	61.7	
Medium(5-10 calls per day)	258	25.8	87.5	
Often(more than ten calls)	125	12.5	100	
Total	1000	100		

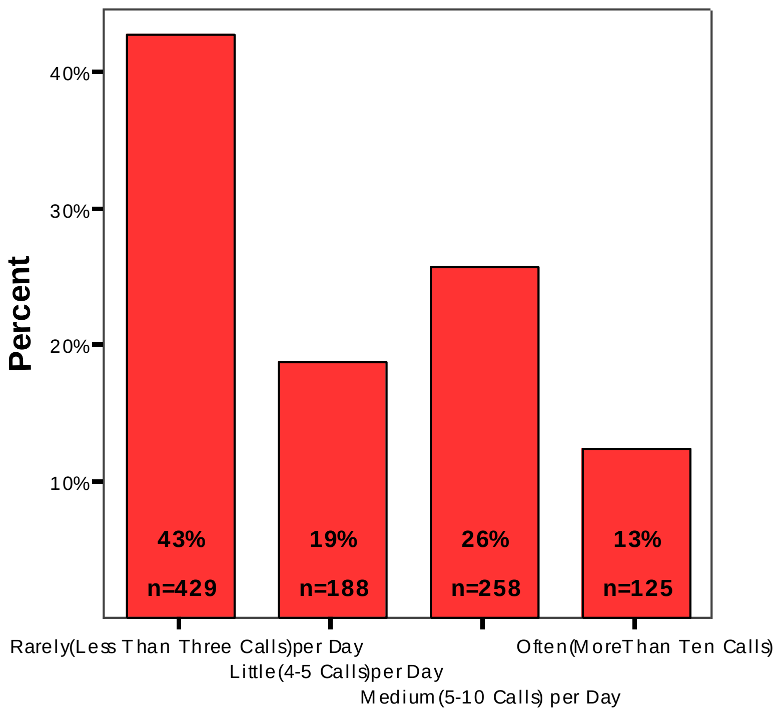

Figure 5. Average Daily Use of Phone Frequency

- Table 6 and Figure 6 demonstrate that the majority of the drivers, 30.2%, place a call sometimes while driving, whereas 27.3% of the drivers seldom place calls while driving.

Table 6. Placing Calls while Driving Frequency

	Frequency	Percent	Cumulative Percent
Never	210	21	21
Seldom	273	27.3	48.3
Sometimes	302	30.2	78.5
Always	215	21.5	100
Total	1000	100	

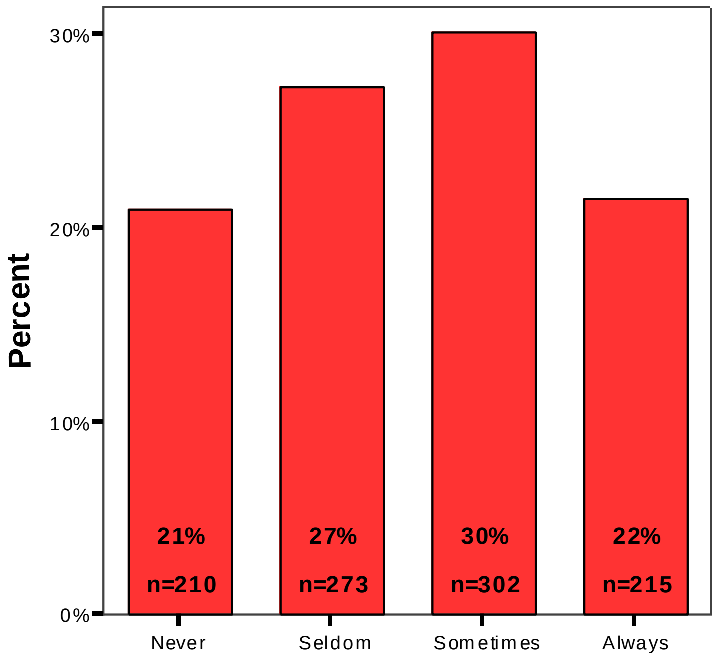

Figure 6. Placing Calls while Driving Frequency

- (Table 7.1 and Figure 7.1) to (Table 7.6 and Figure 7.6) explain that 9.9% of the drivers never answer incoming calls while driving. 34.1% look at caller ID first and may or may not answer. 29.1% of drivers answer most of incoming calls while 16.5% answer everything. 31.8% park on the right curb and 21% of drivers reduced their speed while using their phones.

Table 7.1 Never Answer Frequency

	Frequency	Percent	Cumulative Percent	
Others	901	90.1	90.1	
Never Answer	99	9.9	100	
Total	1000	100		

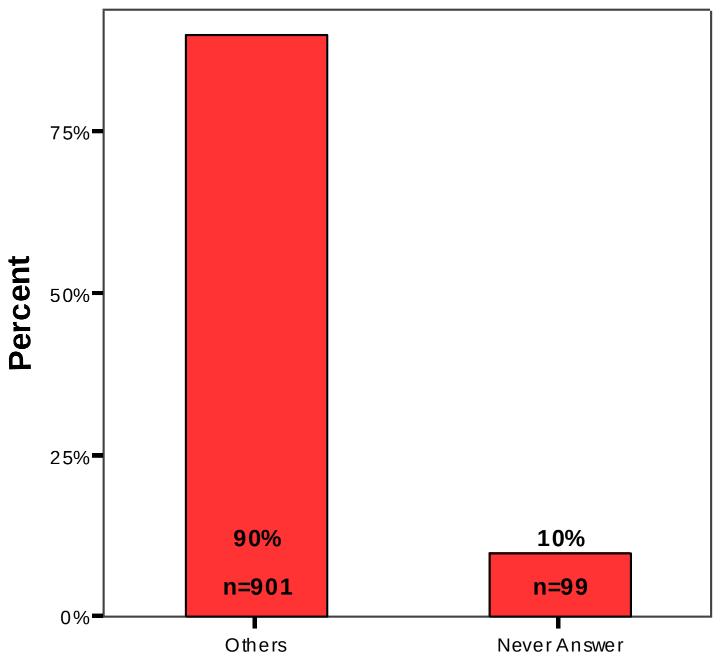

Figure 7.1 Never Answer Frequency

Table 7.2. Verifies Identity of Caller before One Answers or not Frequency

	Frequency	Percent	Cumulative Percent	
Others	659	65.9	65.9	
Verifies Identity of Caller before One Answers or not	341	34.1	100	
Total	1000	100		

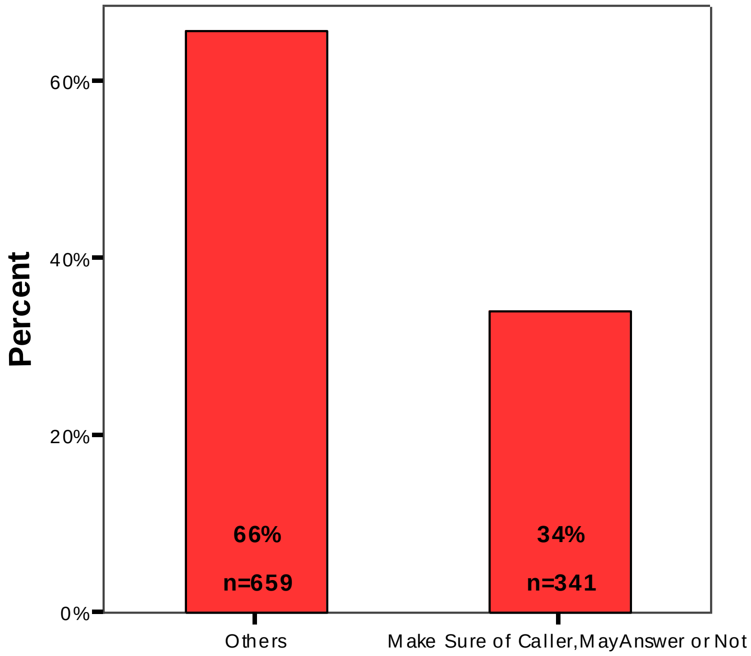

Figure 7.2. Verifies Identity of Caller before One Answers or not Frequency

Table 7.3. Answer All Incoming Calls

	Frequency	Percent	Cumulative Percent	
Others	709	70.9	70.9	
Answer All Incoming Calls	291	29.1	100	
Total	1000	100		

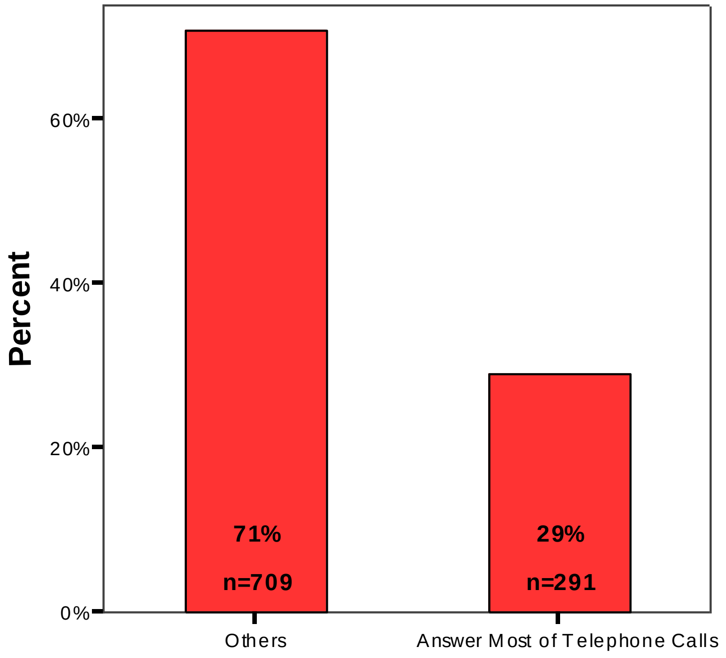

Figure 7.3. Answer All Incoming Calls

Table 7.4. Answer all of Telephone Calls Frequency

	Frequency	Percent	Cumulative Percent
Others	835	83.5	83.5
Answer All of Telephone Calls	165	16.5	100
Total	1000	100	

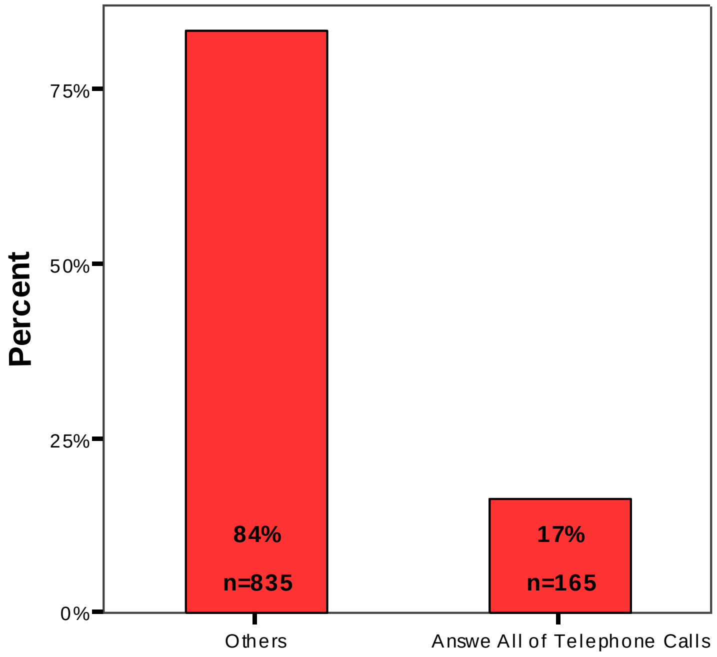

Figure 7.4. Answer all of Telephone Calls Frequency

Table 7.5. Parking on the Side of the Road Frequency

	Frequency	Percent	Cumulative Percent	
Others	682	68.2	68.2	
Parking on the Side of the Road	318	31.8	100	
Total	1000	100		

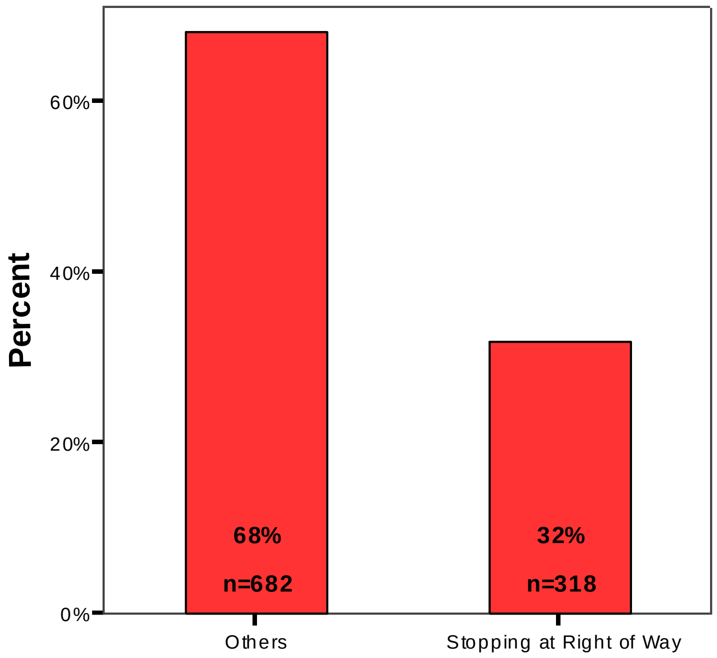

Figure 7.5. Parking on the Side of the Road Frequency

Table 7.6. Reduced Speed Frequency

	Frequency	Percent	Cumulative Percent
Others	790	79	79
Reduced Speed	210	21	100
Total	1000	100	

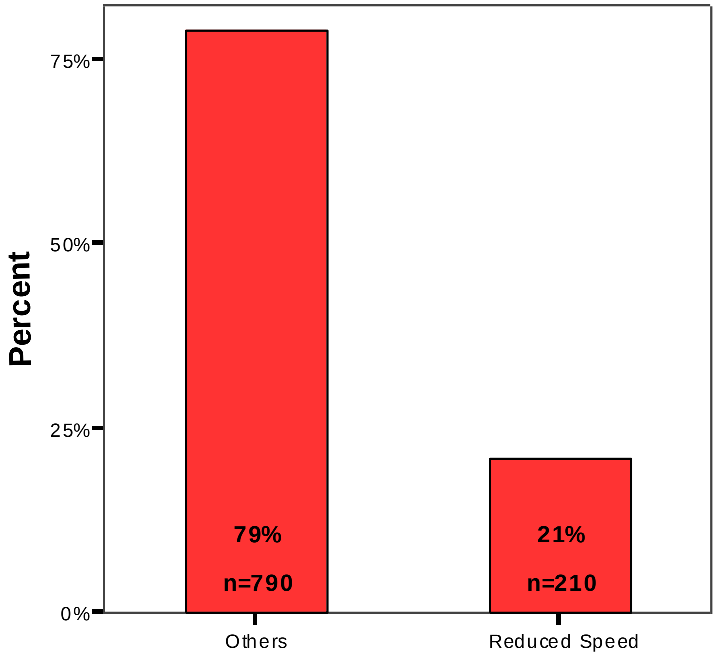

Figure 7.6. Reduced Speed Frequency

- 27.8% of drivers, as shown in Table and Fig 8 & 9, confirm that the use of phones while driving caused accidents. 92.5% of drivers believe that use of mobile telephone while driving at least caused traffic confusion.

Table 8. Exposing to Accident Caused by Phone Use Frequency

	Frequency	Percent	Cumulative Percent
Yes	278	27.8	27.8
No	722	72.2	100
Total	1000	100	

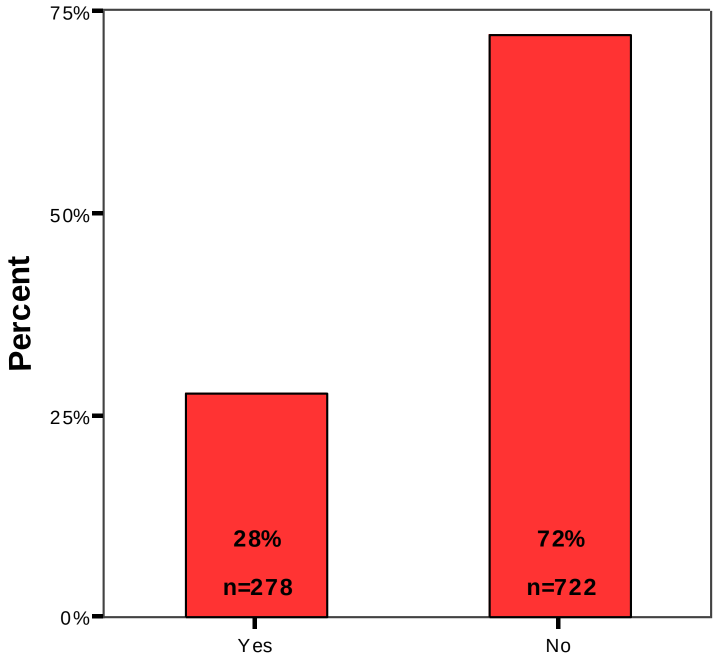

Figure 8. Exposing to Accident Caused by Phone Use Frequency

Table 9. Causing Traffic Confusion Frequency

	Frequency	Percent	Cumulative Percent
Yes	925	92.5	92.5
No	75	7.5	100
Total	1000	100	

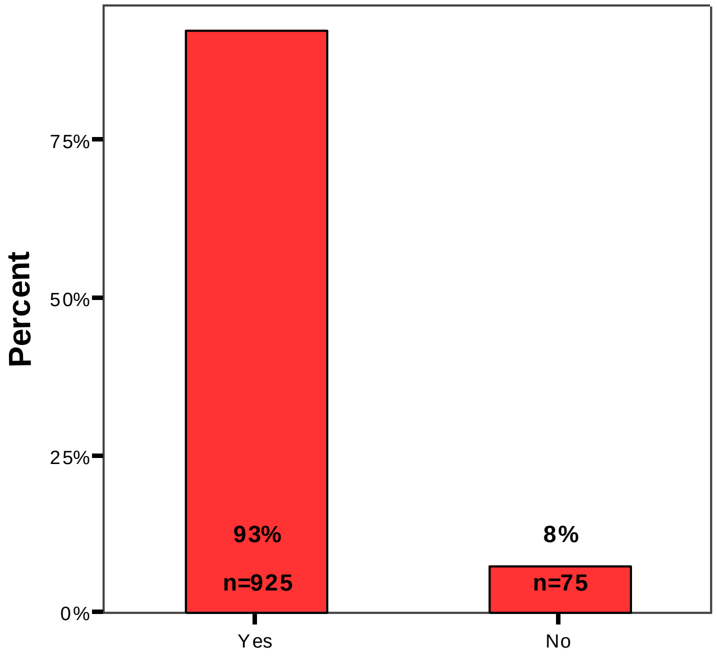

Figure 9. Causing Traffic Confusion Frequency

- Table 10 and Figure 10 focus on vehicle category, and explain that 42.1% of all vehicles were private cars.

Table 10. Vehicle Category Frequency

	Frequency	Percent	Cumulative Percent	
Private Cars	421	42.1	42.1	
Public Cars	109	10.9	53	
Government Cars	75	7.5	60.5	
Rental cars	68	6.8	67.3	
Trucks	155	15.5	82.8	
Busses	172	17.2	100	
Total	1000	100		

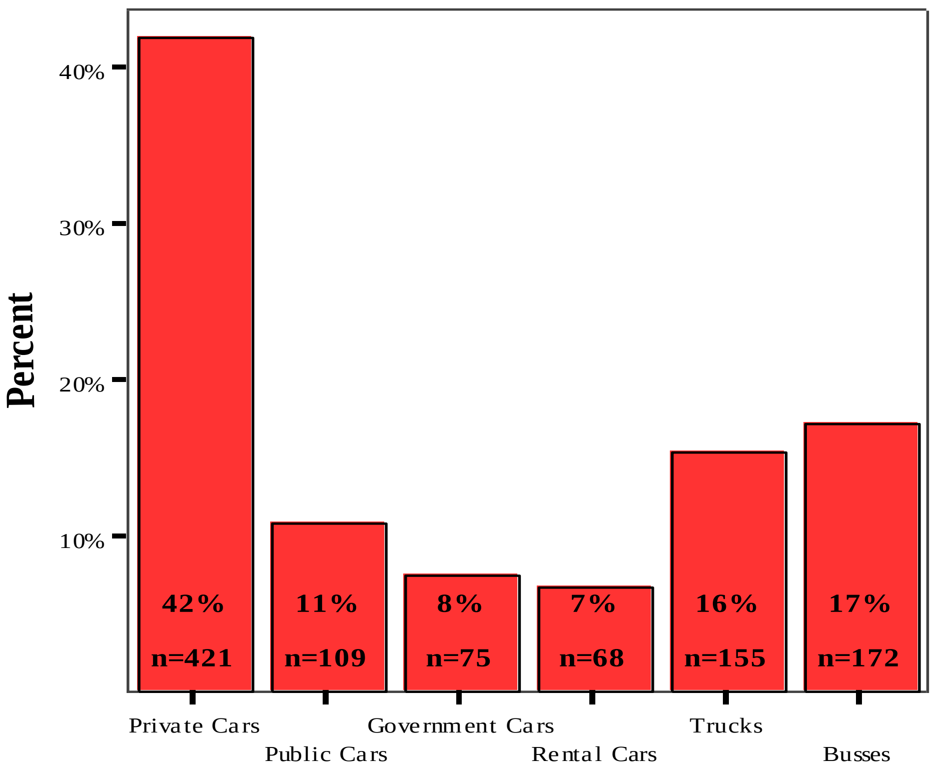

Figure 10. Vehicle Category Frequency

- Table 11 and Figure 11 show that the majority, 66.1%, of drivers rarely receive or send text messages while driving.

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Table 11. Receiving or Sent Text Messages Frequency

	Frequency	Percent	Cumulative Percent	
Rarely (less than three text messages per day)	661	66.1	66.1	
Little(4-5 text messages per day)	231	23.1	89.2	
Medium(5-10 text messages per day)	67	6.7	95.9	
Often(more than 10 text messages per day)	41	4.1	100	
Total	1000	100		

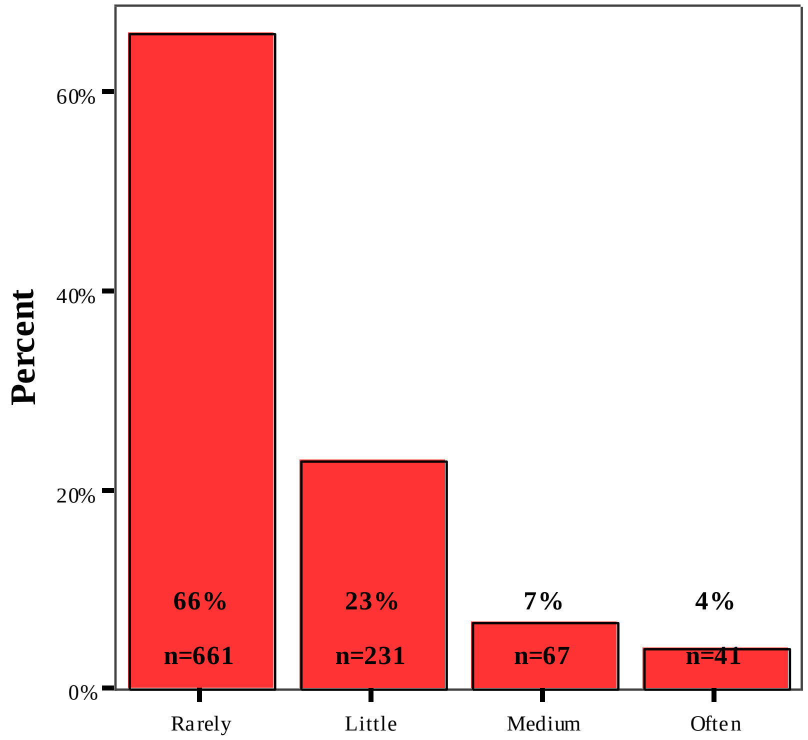

Figure 11. Receiving or Sent Text Messages Frequency

- (Table 12.1 and Figure 12.1) to (Table 12.7 and Figure 12.7) show that 38.5% of drivers in the study experience Missing Exits (ME's) while using a phone. 26.3% failed to observe traffic signals; 35.4% forgot to adjust the speed according to the limit; 33.7% near collision with other vehicles or objects; 18.9% driving off the road,; 14.9% swerving into the wrong or opposing lane; and 21.4% losing control of the car.

Table 12.1. Missing Exits (ME's) Frequency

	Frequency	Percent	Cumulative Percent
Others	615	61.5	61.5
ME's	385	38.5	100
Total	1000	100	

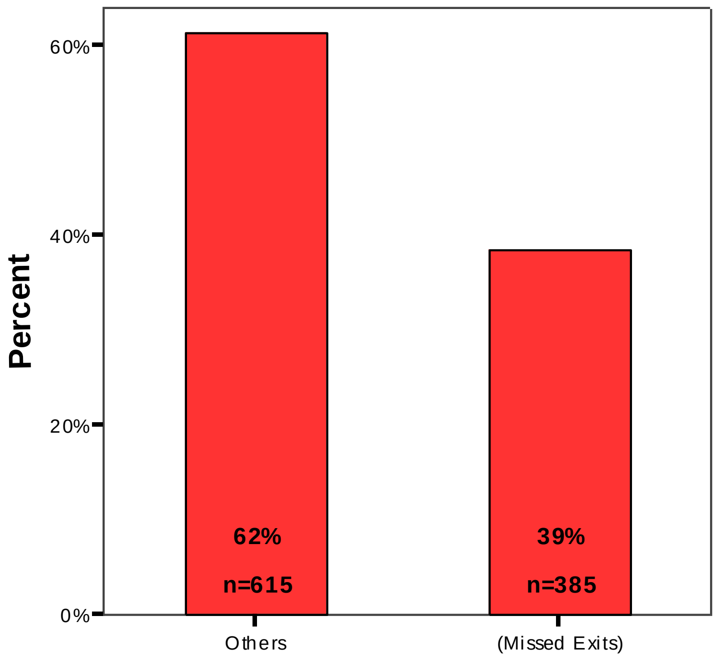

Figure 12.1. ME's Frequency

Table 12.2. Failing to Observe Traffic Signals (FOTS's) Frequency

	Frequency	Percent	Cumulative Percent	
Others	737	73.7	73.7	
Failed to Observe Traffic Signals	263	26.3	100	
Total	1000	100		

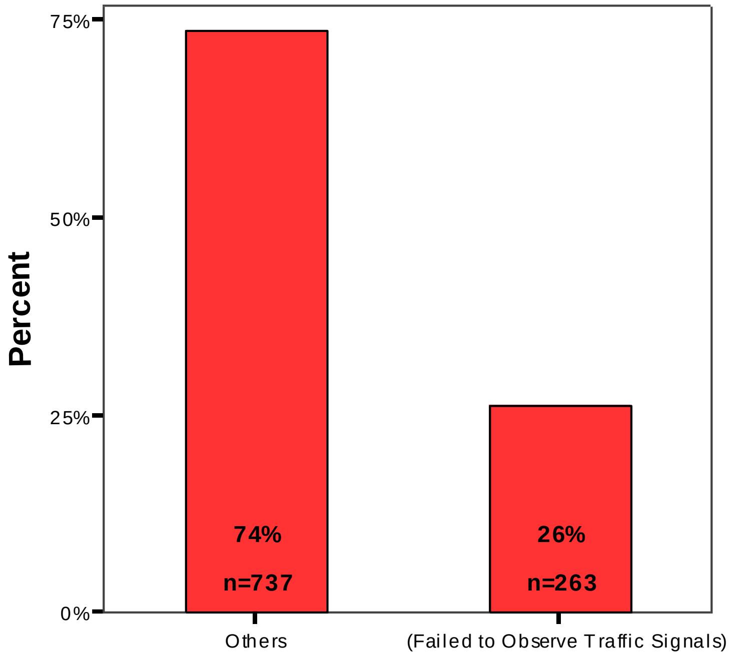

Figure 12.2. Failing to Observe Traffic Signals (FOTS's) Frequency

Table 12.3. Forgetting to Adjust the Speed According to the Limit (FASL's) Frequency

	Frequency	Percent	Cumulative Percent	
Others	646	64.6	64.6	
Forget to Adjust the Speed According to the Limit	354	35.4	100	
Total	1000	100		

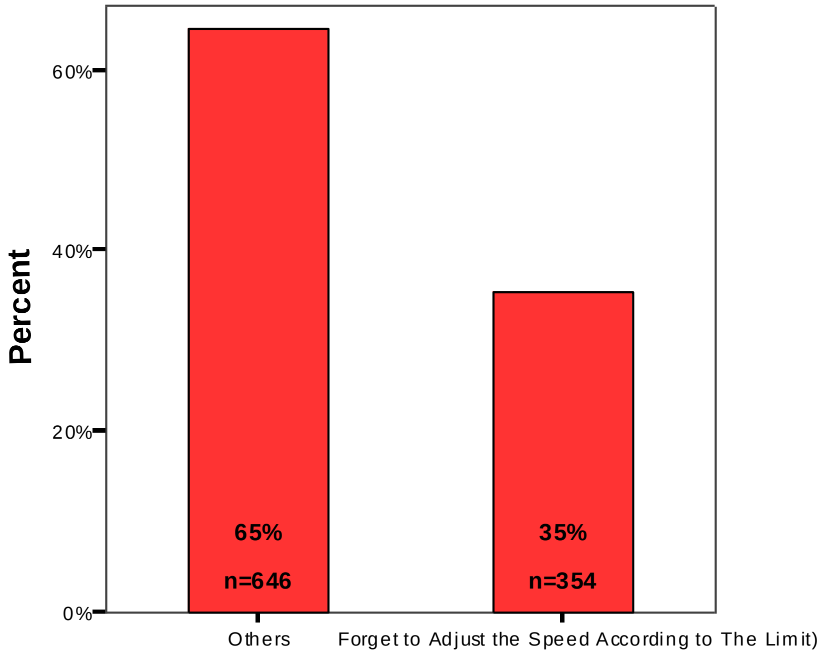

Figure 12.3. Forgetting to Adjust the Speed According to the Limit Frequency

Table 12.4. Near Collisions with Other Vehicles or objects (NCOV's) Frequency

	Frequency	Percent	Cumulative Percent	
Others	663	66.3	66.3	
Near Collisions with Other Vehicles or Objects)	337	33.7	100	
Total	1000	100		

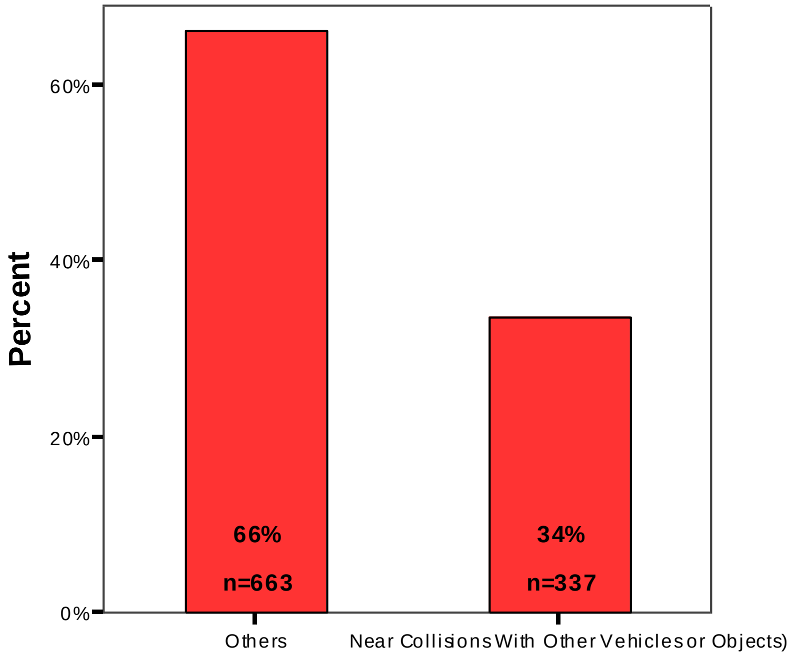

Figure 12.4. Near Collisions with Other Vehicles or objects (NCOV's) Frequency

Table 12.5. Driving Off the Road (DOR's) Frequency

	Frequency	Percent	Cumulative Percent
Others	811	81.1	81.1
Driving off the Road	189	18.9	100
Total	1000	100	

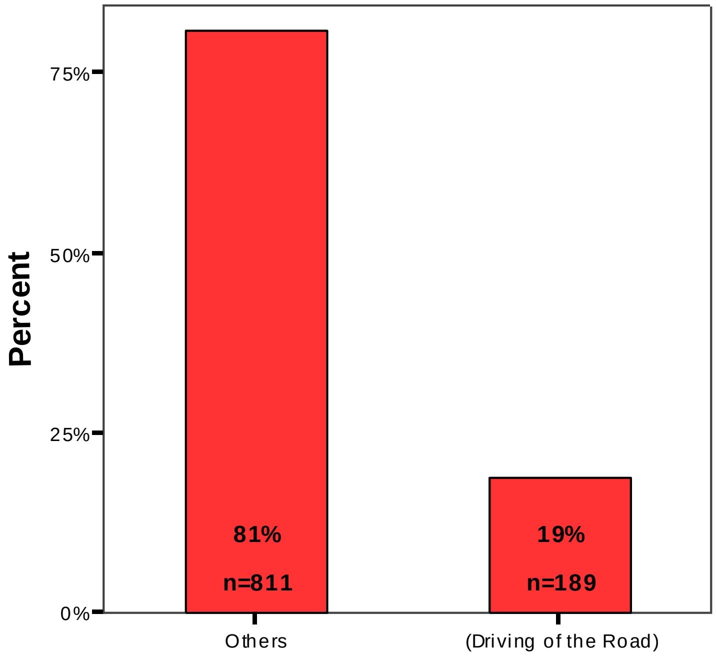

Figure 12.5. Driving Off the Road (DOR's) Frequency

Table 12.6. Swerving into the Wrong or Opposing Lane (SWOL's) Frequency

	Frequency	Percent	Cumulative Percent	
Others	851	85.1	85.1	
Swerving into the Wrong or Opposing Lane	149	14.9	100	
Total	1000	100		

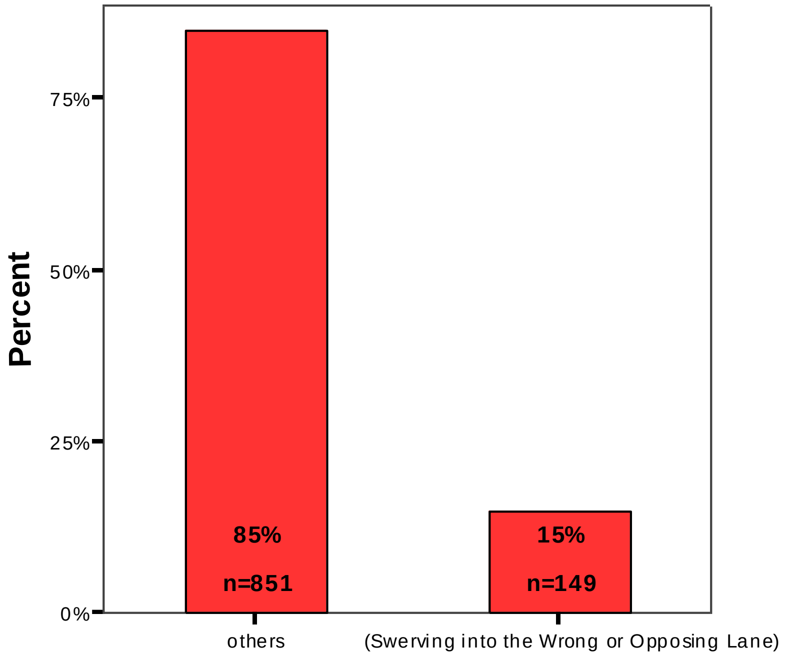

Figure 12.6. Swerving into the Wrong or Opposing Lane (SWOL's) Frequency

Table 12.7. Losing Control of the Car (LCC's) Frequency

	Frequency	Percent	Cumulative Percent
Others	786	78.6	78.6
Losing Control of the Car)	214	21.4	100
Total	1000	100	

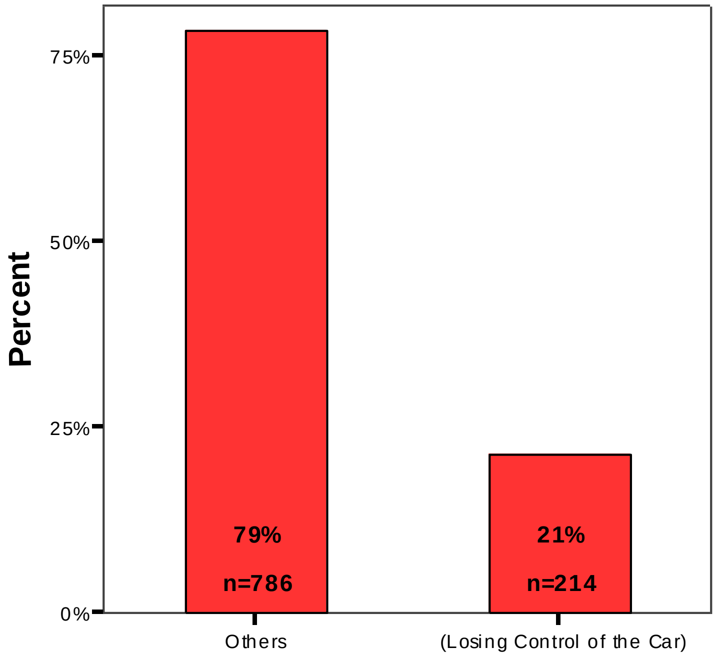

Figure12.7. Losing Control of the Car (LCC's) Frequency

- Table 13 and Figure 13 show that 44.4% of drivers in the study use secondary roads while using phones. Table 14 and Figure 14 verify that 75.9% of the drivers in the sample use Hand- Held devices, in comparison with 24.1% use Hands- Free devices.

Table 13. Location of Using Mobile Phone Frequency

	Frequency	Percent	Cumulative Percent
Highway	305	30.5	30.5
Secondary Road	444	44.4	74.9
Freeway	140	14	88.9
Inner- City Road	111	11.1	100
Total	1000	100	

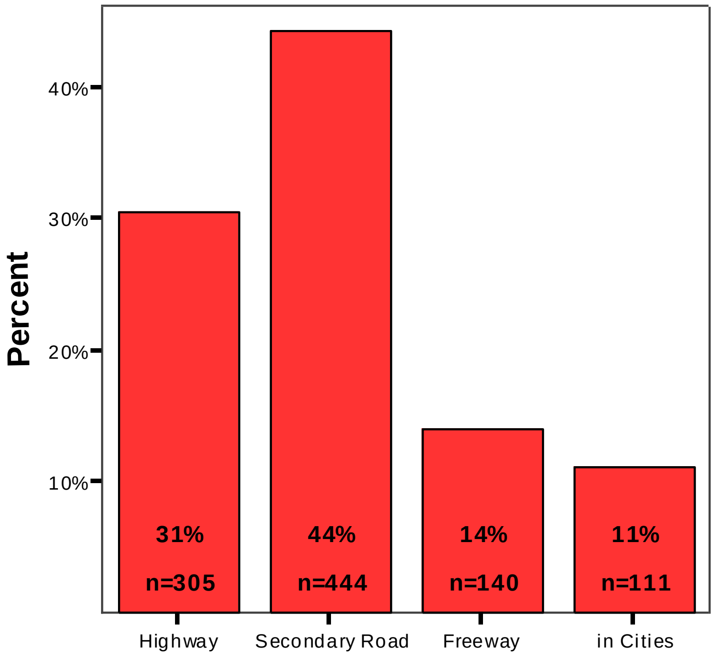

Figure 13. Location of Using Mobile Phone Frequency

Table 14. The Type of Mobile Phone Used Frequency

	Frequency	Percent	Cumulative Percent	
hand-held	759	75.9	75.9	
hands-free	241	24.1	100	
Total	1000	100		

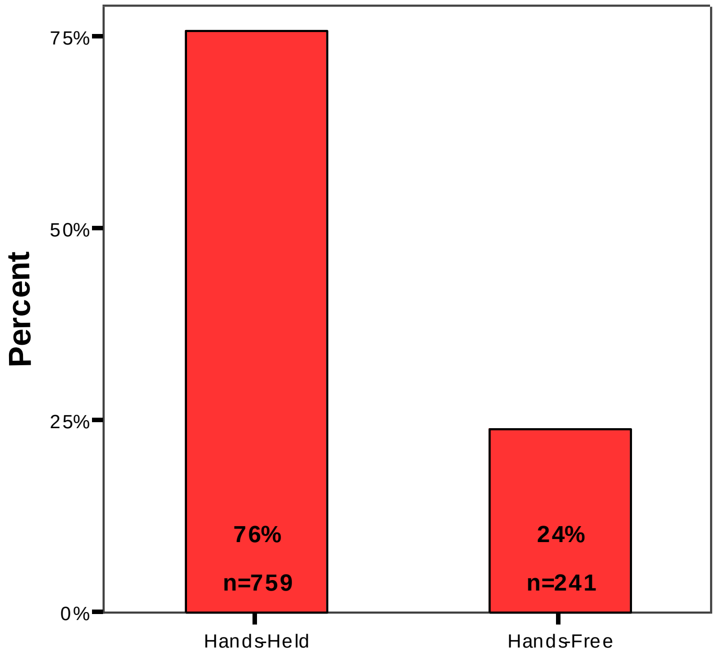

Figure 14. The Type of Mobile Phone Used Frequency

4. DATA ANALYSIS AND RESULTS

Data was analyzed using the (SPSS) software program. The "Chi square test" method was used to analyze the results of the questionnaire survey by looking at the relationship between driver-prone mistakes while using mobile phones (regarded as a Dependent Factor) and Independent factors include:

1- The Driver's Age (18-24, 25-34, 35-44, 45-54, 55-64, 65-74, and more than 75).

2- Gender (Male or Female)

3- Average daily use of car

4- Daily activities

5- Average daily use of phone while driving

6- Placing calls while driving.

7- The type or form of precaution used when using mobile phones while driving (i.e. never answers, verify the identity of a caller before answering or not, replying to most calls, answering all incoming calls, stopping at the side of the road, and reducing one's speed)

8- Vehicle category (private car, public car, governmental car, rental car, trucks, or buses.).

9- Number of received or sent messages.

10- The type of mobile phone used (hands-free or hand-held).

11- Locations and time of mobile phone use (inner- city roads, secondary roads, highways, and on freeways).

4.1 Chi- Square Test ($\chi 2$)

This test enabled one to discover whether there is a relationship or association between two categorical variables and as to whether a set of observed frequencies differ from an expected set of frequencies. Usually the expected frequencies are the ones that one expects to find if the null hypothesis is true. However, one can compare observed frequencies to any set of frequencies (i.e. how good the fit is). The numbers that one finds in the various categories are called the observed frequencies.

. The chi-square probability distribution is characterized by a quantity called the degrees of freedom (DF) associated with the distribution. The degrees of freedom for the chi-square statistic used to test the goodness of fit of a set of cell probabilities will always be one less than the number of cells. If (r) is the number of rows and (c) is the number of columns, then

Degree of freedom: DF= (c-1)*(r-1)

The probability associated with each statistical test is often called the p-value or alpha (α). It ranges from zero to one.

Also for the test statistic to be reliable:

- Not more than 25% of cells should have an expected frequency of less than 5
- No cell should contain less than 1
- Check that participants do not appear in more than one cell.

There are two hypothesizes:

1. Null hypothesis (Ho): the two categorical variables are independent and there is no significant association between them.
2. Alternative hypothesis (Ha): the two categorical variables are dependent and there is a significant association between them.

If the probability of obtaining a difference between two conditions is small then the alternative hypothesis is more acceptable. If, however, this probability were large then the null hypothesis would be more acceptable.

$\chi 2$= (O-E) 2/E

$\chi 2$: chi-square

O: observed frequency

E: expected frequency

For more information, see appendix (A), Critical Values for the $\chi 2$ Statistic.

4.2 Chi – Square Analysis

Chi – square test has been done at all the questions of the questionnaire by considering that the type of mistake done by drivers while using mobile phone is the independent factor.

To achieve the objectives of this study, following is the illustration of the results of this test.

4.2.1 The effect of mobile use on driver-missing exits (ME's) in relation to the different independent variables

- **Gender**: Table 15 shows that the majority of drivers (81.3%) made ME's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 18.7% ME's. the value of Pearson chi- square is (2.711), degree of freedom is (1), and the Significance coefficient (α = 0.1>0.05). The null hypothesis is accepted which means there is no statistically significance association between gender and ME's.

Table 15. Chi-Square Statistics Related to Driver Gender

Variables	Category Group	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	313	302.6	81.3%			
	Female	72	82.4	18.7%	2.711	1	0.1

- **Age group**: Table 16 demonstrates the different ME's percentage rates among 6 different groups. One may notice that the largest ME's rate is found within Group (25-34yr.). The smallest ME's rate is found within Group (65-74yr.). The value of Pearson chi- square is (5.316), degree of freedom is (5), and the Significant coefficient (α = 0.379>0.05), the null hypothesis is accepted which means there is no statistically significant association between age and ME's.

Table 16. Chi-Square Statistics Related to Driver Age

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	55	50.4	14.3%	5.316	5	0.379
	25-34	136	129.4	35.3%			
	35-44	133	149	34.5%			
	45-54	50	45.4	13.0%			
	55-64	7	7.7	1.8%			
	65-74	4	3.1	1.0%			

- **Average daily use:** Table17 is an analysis of the average daily use of private cars and ME's. Group (>3hr.) represents the highest percentage rate (47%) of ME's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 6.8% Group (1/2hr.) because they only drive only 1/2 hour per day. The value of Pearson Chi- Square is (11.81), the degree of freedom is (4), and the significant coefficient (α = .019<.05). The alternative hypothesis is accepted which means there is a statistically significant association between average daily use of private car and ME's.

Table 17. Chi-Square Statistics Related to average daily use of private car

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Private Car	1/2 Hour per Day	26	27.7	6.8%	11.81	4	0.019
	One Hour per Day	65	51.2	16.9%			
	Two Hours per Day	51	54.7	13.2%			
	Three Hours per Day	62	52.7	16.1%			
	More Than Three Hours per Day	181	198.7	47.0%			

- **Driver’s daily activity**: Table 18 demonstrates the different ME's percentage rates among 5 different groups. One may notice that the largest ME's rate is found within Group (private sector). The smallest ME's rate is found within Group (students). The value of Pearson chi- square is (23.281); the degree of freedom is (4); the Significant coefficient is (α =0.00<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and ME’s.

Table 18. Chi-Square Statistics Related to driver’s daily activity

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Sector of Daily Activity	Students	35	30.4	9.1%	23.281	4	0.0
	Civil Servant	98	86.6	25.5%			
	Private Sector Employees	135	123.6	35.1%			
	Unemployed	38	32	9.9%			
	Owner of Business	79	112.4	20.5%			

- **Average Daily use of phone while driving**: Table 19 is an analysis of the average daily use of private cars and ME's. Group (<3 calls/day) represents the highest percentage rate (43.6%) of ME's because they made less than three calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (14.5%) because they often made more than ten calls per day. The value of Pearson Chi-square is (12.156); the degree of freedom is(3); the Significant coefficient (α =0.007<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between the average daily use of mobile phone while driving and ME’s.

Table 19. Chi-Square Statistics Related to Avg. Daily use of phone while driving

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	168	165.2	43.6%	12.156	3	0.007
	Little (4-5 Calls) per Day	83	72.4	21.6%			
	Medium (5-10 Calls) per Day	78	99.3	20.3%			
	Often (More Than Ten Calls) per Day	56	48.1	14.5%			

- **Placing calls while driving**: Table 20 is an analysis based on mistakes done when placing calls while driving and ME's. It also demonstrates that the majority of drivers (37.7%) sometimes try to make call while driving , whereas (14.3%) of drivers always try to make call while driving. The value of Pearson chi- square is (26.793); the degree of freedom is(3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and ME's.

Table 20. Chi-Square Statistics Related to Placing Calls While Driving and ME's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Did You Try to Make Call While Driving	Never	82	80.9	21.3%			
	Seldom	103	105.1	26.8%			
	Sometimes	145	116.3	37.7%			
	Always	55	82.4	14.3%	26.793	3	.00

- **Type or Form of Driver Precautions**: Table 21 illustrates that most drivers (36.9%) park on the side of the road when receiving a call while driving, while a few of them answer all phone calls (18.2%). The percentage rate of the group that never answers any incoming calls while driving is (33.3%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (never answers, verifies identity of caller before one answers or not, answers all incoming calls, reduces speed) and ME's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (replying to most calls, parking on the side of the road) and ME's.

Table 21. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and ME's.

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	33	38.1	33.3%	1.239	1	0.266
	Verify Identity of Caller Before Answer or Not	126	131.3	32.7%	0.525	1	0.469
	Reply to Most Calls	83	112	21.6%	17.257	1	0.0
	Answer All of Telephone Calls	70	63.5	18.2%	1.285	1	0.257
	Park on the Side of the road	142	122.4	36.9%	7.458	1	0.006
	Reduced Speed	89	80.9	23.1%	1.691	1	0.193

- **Vehicle Category**: Table 22 illustrates the Analysis of the two following variables: Vehicle Category and ME's. One may notice that Private Cars have the highest percentage rates (43.1%) that encounter ME's. This is in comparison to Rental Cars that have the lowest percent rate (8.3%) that encounter ME's. The value of Pearson chi- square is (42.213); the degree of freedom is (5); the Significant coefficient ($\alpha = 0.00 < 0.05$). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and ME's.

Table 22. Chi-Square Statistics Related to Vehicle Category and ME's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	166	162.1	43.1%			
	Public Cars	44	42	11.4%			
	Government Cars	43	28.9	11.2%			
	Rental Cars	32	26.2	8.3%			
	Trucks	67	59.7	17.4%			
	Buses	33	66.2	8.6%	42.213	5	0.0

- **Number of received or sent messages**: Table 23 is an analysis of the number of received or sent messages and ME's. Group (<3 messages/ day) has the lowest percent rate (4.7%) of ME's because they rarely send/ receive messages whereas Group (> 10 messages/ day) has the highest percent rate of ME's because of the many distractions. The value of Pearson chi- square is (47.893); the degree of freedom is (3); and the Significant coefficient ($\alpha = 0.00 < 0.05$). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and ME's.

Table 23. Chi-Square Statistics in relation to the number of received/ sent messages & ME's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	18	15.8	4.7%			
	Little (4-5 Messages) per Day	35	25.8	9.1%			
	Medium (5-10 Messages) per Day	45	88.9	11.7%			
	Often (More Than Ten Messages) per Day	28.7	254.7	74.5%	47.893	3	0.0

- **Mobile Phone use depending on type of road**: Table 24 is an analysis of mobile phone use depending on the type of road and ME's. The usage of phones on Secondary Roads has the highest percentage rate (40.0%) while the Inner-City Roads has the lowest rate (10.4%) of ME's. The value of Pearson chi- square is (10.183), degree of freedom is (3); the Significant coefficient (α =0.017<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between Mobile phone use depending on Types of Roads and ME's.

Table 24. Chi-Square Statistics in Relation to Phone use depending on Road-Type & ME's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	122	117.4	31.7%			
	Secondary Road	154	170.9	40.0%			
	Freeway	69	53.9	17.9%			
	Inner- city roads	40	42.7	10.4%	10.183	3	0.017

- **Mobile Phone Use (Hand-held vs. Hands-Free):** Table 25 shows that the highest % rate of phone users which commit ME's are hands-held users ((73.8%) and only (26.2%) who use hands-free commit ME's. The value of Pearson chi- square is (1.558); the degree of freedom is (1); and the Significance coefficient (α = .212>0.05). The null hypothesis is accepted which means there is no statistically significant association between type of mobile phone use and ME's.

Table 25. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) & ME's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	284	292.2	73.8%			
	Hands-Free	101	92.8	26.2%	1.558	1	0.212

4.2.2 The effect of mobile use on driver- Failing to Observe Traffic Signs (FOTS) in relation to the different independent variables

- **Gender**: Table 26 shows that the majority of drivers (89.4%) made FOTS's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 10.6% FOTS's. the value of Pearson chi- square is (29.534), degree of freedom is (1), and the Significance coefficient (α = 0.0<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between gender and FOTS's.

Table 26. Chi-Square Statistics Related to Driver Gender and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	235	206.7	89.4%			
	Female	28	56.3	10.6%	29.534	1	0.0

- **Age group**: Table 27 demonstrates the different FOTS's percentage rates among 6 different groups. One may notice that the largest FOTS's rate is found within Group (35-44yr.). The smallest ME's rate is found within Group (65-74yr.). The value of Pearson chi- square is (36.763), degree of freedom is (5), and the Significant coefficient (α = 0.0<0.05), the alternative hypothesis is accepted which means there is statistically significant association between age and FOTS's.

Table 27. Chi-Square Statistics Related to Driver Age and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	27	34.5	10.3%			
	25-34	66	88.4	25.1%			
	35-44	142	101.8	54.0%			
	45-54	21	31.6	8.0%			
	55-64	6	5.3	2.3%			
	65-74	1	2.1	0.4%	36.763	5	0.0

Average daily use: Table 28 is an analysis of the average daily use of private cars and FOTS's. Group (>3hr.) represents the highest percentage rate (65.4%) of FOTS's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 3.8% Group (1/2hr.) because they only drive 1/2 hour per day. The value of Pearson Chi- Square is (31.133), the degree of freedom is (4), and the significant coefficient (α = 0.0<.05). The alternative hypothesis is accepted which means there is a statistically significant association between average daily use of private car and FOTS's.

Table 28. Chi-Square Statistics Related to average daily use of private car and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Your Private Car	1/2 Hour per Day	10	18.9	3.8%			
	One Hour per Day	33	35.0	12.5%			
	Two Hours per Day	26	37.3	9.9%			
	Three Hours per Day	22	36.0	8.4%			
	More Than Three Hours per Day	172	135.7	65.4%	31.133	4	0.0

Driver's daily activity: Table 29 demonstrates the different FOTS's percentage rates among 5 different groups. One may notice that the largest FOTS's rate is found within Group (owner of business). The smallest FOTS's rate is found within Group (unemployed). The value of Pearson chi- square is (83.988); the degree of freedom is (4); the Significant coefficient is (α =0.00<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and FOTS's.

Table 29. Chi-Square Statistics Related to driver's daily activity and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Your Sector of Daily Activity	Students	31	20.8	11.8%			
	Civil Servant	29	59.2	11.0%			
	Private Sector Employees	70	84.4	26.6%			
	Unemployed	8	21.8	3.0%			
	Owner of Business	125	76.8	47.5%	83.988	4	0.0

- **Average Daily use of phone while driving**: Table 30 is an analysis of the average daily use of private cars and FOTS's. Group (5-10 calls/day) represents the highest percentage rate (47.9%) of FOTS's because they made (medium) five to ten calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (14.4%) because they often made more than ten calls per day. The value of Pearson Chi-square is (109.719); the degree of freedom is(3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between the average daily use of mobile phone while driving and FOTS's.

Table 30. Chi-Square Statistics Related to Avg. Daily use of phone while driving and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	55	112.8	20.9%			
	Little (4-5 Calls) per Day	44	49.4	16.7%			
	Medium (5-10 Calls) per Day	126	67.9	47.9%			
	Often (More Than Ten Calls) per Day	38	32.9	14.4%	109.719	3	0.0

- **Placing calls while driving**: Table 31 is an analysis based on mistakes done when placing calls while driving and FOTS's. It also demonstrates that the majority of drivers (44.1%) always try to make call while driving, whereas (12.2%) of drivers never try to make call while driving. The value of Pearson chi- square is (107.947); the degree of freedom is(3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and FOTS's.

Table 31. Chi-Square Statistics Related to Placing Calls While Driving and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Placing Calls While Driving	Never	32	55.2	12.2%			
	Seldom	53	71.8	20.2%			
	Sometimes	62	79.4	23.6%			
	Always	116	56.5	44.1%	107.947	3	0.0

- **Type or Form of Driver Precautions**: Table 21 illustrates that most drivers (54.0%) reply to most calls when receiving a call while driving, while a few of them never answer phone calls (8.4%). The percentage rate of the group that verify identity of caller before answer or not while driving is (19.732%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (never answers, answers all incoming calls,) and FOTS's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (replying to most calls, reduces speed, verifies identity of caller before one answers or not, parking on the side of the road) and FOTS's.

Table 32. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and FOTS's.

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	22	26.0	8.4%	0.943	1	0.332
	Verify Identity of Caller Before Answer or Not	119	89.7	45.2%	19.732	1	0.0
	Reply to Most Calls	142	76.5	54.0%	107.172	1	0.0
	Answer All of Telephone Calls	46	43.4	17.5%	0.254	1	0.614
	Park on the Side of the road	42	83.6	16.0%	41.235	1	0.0
	Reduced Speed	76	55.2	28.9%	13.415	1	0.0

- **Vehicle Category**: Table 33 illustrates the Analysis of the two following variables: Vehicle Category and FOTS's. One may notice that Busses have the highest percentage rates (39.2%) that encounter FOTS's. This is in comparison to Government Cars that have to lowest % rate (3.0%) that encounter FOTS's. The value of Pearson chi- square is (128.33); the degree of freedom is (5); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and FOTS's.

Table 33. Chi-Square Statistics Related to Vehicle Category and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	74	110.7	28.1%			
	Public Cars	22	28.7	8.4%			
	Government Cars	8	19.7	3.0			
	Rental Cars	17	17.9	6.5%			
	Trucks	39	40.8	14.8%			
	Buses	103	45.2	39.2%	128.33	5	0.0

Number of received or sent messages: Table 34 is an analysis of the number of received or sent messages and FOTS's. Group (<3 messages/ day) has the lowest % rate (3.8%) of FOTS's because they rarely send/ receive messages whereas Group (5-10 messages/ day) has the highest % rate of FOTS's because of the many distractions. The value of Pearson chi- square is (133.112); the degree of freedom is (3); and the Significant coefficient ($\alpha = 0.00 < 0.05$). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and FOTS's.

Table 34. Chi-Square Statistics in relation to the number of received/ sent messages & FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	10	10.8	3.8%			
	Little (4-5 Messages) per Day	19	17.6	7.2%			
	Medium (5-10 Messages) per Day	127	60.8	48.3%			
	Often (More Than Ten Messages) per Day	107	173.8	40.7%	133.112	3	0.0

- **Mobile Phone use depending on type of road**: Table 35 is an analysis of mobile phone use depending on the type of road and FOTS's. The usage of phones on Secondary Roads has the highest % rate (53.6%) while the Inner-City Roads has the lowest rate (9.9%) of FOTS's. The value of Pearson chi- square is (29.455), degree of freedom is (3); the Significant coefficient (α =0.0<0.05). The alternative hypothesis is accepted which means there a statistically significant association between Mobile phone use is depending on Types of Roads and FOTS's.

Table 35. Chi-Square Statistics in Relation to Phone use depending on Road-Type and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	48	80.2	18.3%			
	Secondary Road	141	116.8	53.6%			
	Freeway	48	36.8	18.3%			
	Inner- city roads	26	29.2	9.9%	29.455	3	0.0

- **Mobile Phone Use (Hand-held vs. Hands Free):** Table 36 shows that the highest % rate of phone users which commit FOTS's are hands-held users (84.8%) and only (15.2%) who use hands-free commit FOTS's. The value of Pearson chi- square is (15.421); the degree of freedom is (1); and the Significance coefficient (α = 0.0<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between type of mobile phone use and FOTS's.

Table 36. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) and FOTS's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	223	199.6	84.8%			
	Hands-Free	40	63.4	15.2%	15.421	1	0.0

4.2.3 The effect of mobile use on driver- Forgetting to Adjust the Speed to the Limit(FASL'S) in relation to the different independent variables

- **Gender**: Table 37 shows that the majority of drivers (85.0%) made FASL's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 15.0% FASL's. the value of Pearson chi- square is (13.462), degree of freedom is (1), and the Significance coefficient (α = 0.0<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between gender and FASL's.

Table 37. Chi-Square Statistics Related to Driver Gender and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	301	278.1	85.0%			
	Female	53	75.8	15.0%	13.462	1	0.0

- **Age group**: Table 38 demonstrates the different FASL's percentage rates among 6 different groups. One may notice that the largest ME's rate is found within Group (35-44yr.). The smallest FASL's rate is found within Group (65-74yr.). The value of Pearson chi- square is (24.942), degree of freedom is (5), and the Significant coefficient (α = 0.0<0.05), the alternative hypothesis is accepted which means there is a statistically significant association between age and FASL's.

Table 38. Chi-Square Statistics Related to Driver Age and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	51	46.4	14.4%			
	25-34	111	118.9	31.4%			
	35-44	162	137.0	45.8%			
	45-54	24	41.8	6.8%			
	55-64	6	7.1	1.7%			
	65-74	0	2.8	0%	24.942	5	0.0

Average daily use: Table 39 is an analysis of the average daily use of private cars and FASL's. Group (>3hr.) represents the highest percentage rate (64.4%) of FASL's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 6.2% Group (1/2hr.) because they only drive only 1/2 hour per day. The value of Pearson Chi- Square is (37.04), the degree of freedom is (4), and the significant coefficient (α = 0.0<.05). The alternative hypothesis is accepted which means there is a statistically significant association between average daily use of private car and FASL's.

Table 39. Chi-Square Statistics Related to average daily use of private car and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Your Private Car	1/2 Hour per Day	22	25.5	6.2%			
	One Hour per Day	36	47.1	10.2%			
	Two Hours per Day	35	50.3	9.9%			
	Three Hours per Day	33	48.5	9.3%			
	More Than Three Hours per Day	228	182.7	64.4%	37.040	4	0.0

- **Driver's daily activity**: Table 40 demonstrates the different FASL's percentage rates among 5 different groups. One may notice that the largest FASL's rate is found within Group (owner of business). The smallest FASL's rate is found within Group (unemployed). The value of Pearson chi- square is (81.414); the degree of freedom is (4); the Significant coefficient is (α =0.00<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and FASL's.

Table 40. Chi-Square Statistics Related to driver's daily activity and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Your Sector of Daily Activity	Students	36	28.0	10.2%			
	Civil Servant	48	79.7	13.6%			
	Private Sector Employees	92	113.6	26.0%			
	Unemployed	19	29.4	5.4%			
	Owner of Business	159	103.4	44.9%	81.414	4	0.0

- **Average Daily use of phone while driving**: Table 41 is an analysis of the average daily use of private cars and FASL's. Group (5-10 calls/day) represents the highest percentage rate (40.4%) of FASL's because they made less than three calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (11.3%) because they often made more than ten calls per day. The value of Pearson Chi-square is (67.378); the degree of freedom is (3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between the average daily use of mobile phone while driving and FASL's.

Table 41. Chi-Square Statistics Related to Avg. Daily use of phone while driving and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	106	151.9	29.9%			
	Little (4-5 Calls) per Day	65	66.6	18.4%			
	Medium (5-10 Calls) per Day	143	91.3	40.4%			
	Often (More Than Ten Calls) per Day	40	44.3	11.3%	67.378	3	0.0

- **Placing calls while driving**: Table 42 is an analysis based on mistakes done when placing calls while driving and FASL's. It also demonstrates that the majority of drivers (34.2%) always try to make call while driving, whereas (15.8%) of drivers never try to make call while driving. The value of Pearson chi- square is (53.847); the degree of freedom is (3); the Significant coefficient ($\alpha = 0.00 < 0.05$). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and FASL's.

Table 42. Chi-Square Statistics Related to Placing Calls While Driving and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Did You Try to Make Call While Driving	Never	56	74.3	15.8%			
	Seldom	80	96.6	22.6%			
	Sometimes	97	106.9	27.4%			
	Always	121	76.1	34.2%	53.847	3	0.0

- **Type or Form of Driver Precautions**: Table 43 illustrates that most drivers (59.504%) reply to most calls when receiving a call while driving, while a few of them answer all phone calls (0.992%). The percentage rate of the group that verify identity of caller before answer or not while driving is (21.560%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (answers all incoming calls, reduces speed) and FASL's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (replying to most calls, never answers, verifies identity of caller before one answers or not, parking on the side of the road) and FASL's.

Table 43. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and FASL's.

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	27	35.0	7.6%	3.174	1	0.075
	Verify Identity of Caller Before Answer or Not	154	120.7	43.5%	21.560	1	0.0
	Reply to Most Calls	156	103.0	44.1%	59.504	1	0.0
	Answer All of Telephone Calls	64	58.4	18.1%	0.992	1	0.319
	Parking on the Side of the road	87	112.6	24.6%	13.185	1	0.0
	Reduced Speed	81	74.3	22.9%	1.169	1	0.280

- **Vehicle Category**: Table 44 illustrates the Analysis of the two following variables: Vehicle Category and FASL's. One may notice that Busses have the highest percentage rates (32.2%) that encounter FASL's. This is in comparison to Government Cars that have to lowest % rate (3.1%) that encounter FASL's. The value of Pearson chi- square is (101.161); the degree of freedom is (5); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and FASL's.

Table 44. Chi-Square Statistics Related to Vehicle Category and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	110	149.0	31.1%			
	Public Cars	33	38.6	9.3%			
	Government Cars	11	26.6	3.1%			
	Rental Cars	28	24.1	7.9%			
	Trucks	58	54.9	16.4%			
	Buses	114	60.9	32.2%	101.161	5	0.0

- **Number of received or sent messages**: Table 45 is an analysis of the number of received or sent messages and FASL's. Group (<3 messages/ day) has the lowest % rate (4.2%) of FASL's because they rarely send/ receive messages whereas Group (> 10 messages/ day) has the highest % rate of FASL's because of the many distractions. The value of Pearson chi- square is (64.987); the degree of freedom is (3); and the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and FASL's.

Table 45. Chi-Square Statistics in relation to the number of received/ sent messages & FASL's

Type of Mistakes Done by Drivers While Using Mobile Phone
(Forget to Adjust the Speed According to the Limit)

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	15	14.5	4.2%	64.987	3	0.0
	Little (4-5 Messages) per Day	24	23.7	6.8%			
	Medium (5-10 Messages) per Day	132	81.8	37.8%			
	Often (More Than Ten Messages) per Day	183	234	51.7%			

- **Mobile Phone use depending on type of road**: Table 46 is an analysis of mobile phone use depending on the type of road and FASL's. The usage of phones on Secondary Roads has the highest % rate (49.7%) while the Inner-City Roads has the lowest rate (7.9%) of FASL's. The value of Pearson chi- square is (9.733), degree of freedom is (3); the Significant coefficient (α =.021<0.05). The alternative hypothesis is accepted which means there a statistically significant association between Mobile phone use is depending on Types of Roads and FASL's.

Table 46. Chi-Square Statistics in Relation to Phone use depending on Road-Type and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	99	108.0	28.0%			
	Secondary Road	176	157.2	49.7%			
	Freeway	51	49.6	14.4%			
	Inner- city roads	28	39.3	7.9%	9.733	3	0.021

- **Mobile Phone Use (Hand-held vs. Hands Free):** Table 47 shows that the highest % rate of phone users which commit FASL's are hand-held users (79.9%) and only (20.1%) who use hands-free commit FASL's. The value of Pearson chi- square is (4.898); the degree of freedom is (1); and the Significance coefficient (α = .027<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between type of mobile phone use and FASL's.

Table 47. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) and FASL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	283	268.7	79.9%			
	Hands-Free	71	85.3	20.1%	4.898	1	0.027

4.2.4 The effect of mobile use on driver- Near Collisions with Other Vehicles or Objects (NCOV's) in relation to the different independent variables

- **Gender**: Table 48 shows that the majority of drivers (84.6%) made NCOV's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 15.4% NCOV's. the value of Pearson chi- square is (10.769), degree of freedom is (1), and the Significance coefficient (α = 0.001<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between gender and NCOV's.

Table 48. Chi-Square Statistics Related to Driver Gender and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	285	264.9	84.6%			
	Female	52	72.1	15.4%	10.769	1	0.001

- **Age group**: Table 49 demonstrates the different NCOV's percentage rates among 6 different groups. One may notice that the largest NCOV's rate is found within Group (35-44yr.). The smallest NCOV's rate is found within Group (55-64yr.). The value of Pearson chi- square is (38.934), degree of freedom is (5), and the Significant coefficient (α = 0.0<0.05), the alternative hypothesis is accepted which means there is a statistically significant association between age and NCOV's.

Table 49. Chi-Square Statistics Related to Driver Age and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	36	44.1	10.7%			
	25-34	95	113.2	28.2%			
	35-44	173	130.4	51.3%			
	45-54	26	39.8	7.7%			
	55-64	3	6.7	0.9%			
	65-74	4	2.7	1.2%	38.934	5	0.0

Average daily use: Table 50 is an analysis of the average daily use of private cars and NCOV's. Group (>3hr.) represents the highest percentage rate (64.7%) of NCOV's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 3.0% Group (1/2hr.) because they only drive only 1/2 hour per day. The value of Pearson Chi- Square is (39.369), the degree of freedom is (4), and the significant coefficient (α = 0.0<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between average daily use of private car and NCOV's.

Table 50. Chi-Square Statistics Related to average daily use of private car and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Your Private Car	1/2 Hour per Day	10	24.3	3.0%	39.369	4	0.0
	One Hour per Day	37	44.8	11.0%			
	Two Hours per Day	37	47.9	11.0%			
	Three Hours per Day	35	46.2	10.4%			
	More Than Three Hours per Day	218	173.9	64.7%			

- **Driver's daily activity**: Table 51 demonstrates the different NCOV's percentage rates among 5 different groups. One may notice that the largest NCOV's rate is found within Group (owner of business). The smallest NCOV's rate is found within Group (students). The value of Pearson chi- square is (50.635); the degree of freedom is (4); the Significant coefficient is (α =0.00<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and NCOV's.

Table 51. Chi-Square Statistics Related to driver's daily activity and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Your Sector of Daily Activity	Students	19	26.6	5.6%			
	Civil Servant	82	75.8	24.3%			
	Private Sector Employees	75	108.2	22.3%			
	Unemployed	20	28.0	5.9%			
	Owner of Business	141	98.4	41.8%	50.635	4	0.0

- **Average Daily use of phone while driving**: Table 52 is an analysis of the average daily use of private cars and NCOV's. Group (<3 calls/day) represents the highest percentage rate (35.9%) of NCOV's because they made less than three calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (8.6%) because they often made more than ten calls per day. The value of Pearson Chi-square is (28.0); the degree of freedom is (3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between the average daily use of mobile phone while driving and NCOV's.

Table 52. Chi-Square Statistics Related to Avg. Daily use of phone while driving and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	121	144.6	35.9%			
	Little (4-5 Calls) per Day	71	63.4	21.1%			
	Medium (5-10 Calls) per Day	116	86.9	34.4%			
	Often (More Than Ten Calls) per Day	29	42.1	8.6%	28.0	3	0.0

- **Placing calls while driving**: Table 53 is an analysis based on mistakes done when placing calls while driving and NCOV's. It also demonstrates that the majority of drivers (32.9%) always try to make call while driving , whereas (15.1%) of drivers never try to make call while driving. The value of Pearson chi- square is (45.178); the degree of freedom is(3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and NCOV's.

Table 53. Chi-Square Statistics Related to Placing Calls While Driving and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Did You Try to Make Call While Driving	Never	51	70.8	15.1%			
	Seldom	73	92.0	21.7%			
	Sometimes	102	101.8	30.3%			
	Always	111	72.5	32.9%	45.178	3	0.0

- **Type or Form of Driver Precautions**: Table 54 illustrates that most drivers (52.5%) verifies identity of caller before one answers or not while driving, while a few of them answer all phone calls (13.9%). The percentage rate of the group that never answers any incoming calls while driving is (5.6%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (parking on the side of the road, answers all incoming calls, and reduces speed) and NCOV's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (replying to most calls, never answers, verifies identity of caller before one answers or not,) and NCOV's.

Table 54. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and NCOV's.

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	19	33.4	5.6%	10.351	1	0.001
	Verify Identity of Caller Before Answer or Not	177	114.9	52.5%	76.765	1	0.0
	Reply to Most Calls	145	98.1	43.0%	47.783	1	0.0
	Answer All of Telephone Calls	47	55.6	13.9%	2.405	1	0.121
	Parking on the Side of the road	100	107.2	29.7%	1.060	1	0.303
	Reduced Speed	63	70.8	18.7%	1.629	1	0.202

- **Vehicle Category**: Table 55 illustrates the Analysis of the two following variables: Vehicle Category and NCOV's. One may notice that Private Cars have the highest percentage rates (31.5%) that encounter NCOV's. This is in comparison to Rental Cars that have to lowest % rate (6.8%) that encounter NCOV's. The value of Pearson chi- square is (108.329); the degree of freedom is (5); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and NCOV's.

Table 55. Chi-Square Statistics Related to Vehicle Category and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	106	141.9	31.5%			
	Public Cars	28	36.7	8.3%			
	Government Cars	44	25.3	13.1%			
	Rental Cars	23	22.9	6.8%			
	Trucks	31	52.2	9.2%			
	Buses	105	58.0	31.2%	108.329	5	0.0

- **Number of received or sent messages**: Table 56 is an analysis of the number of received or sent messages and NCOV's. Group (>10 messages/ day) has the highest % rate (52.2%) of NCOV's because they often send/ receive messages, whereas, Group (4-5 messages/ day) has the lowest % rate of NCOV's because of the many distractions. The value of Pearson chi- square is (76.691); the degree of freedom is (3); and the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and NCOV's.

Table 56. Chi-Square Statistics in relation to the number of received/ sent messages & NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	15	13.8	4.5%	76.691	3	0.0
	Little (4-5 Messages) per Day	14	22.6	4.2%			
	Medium (5-10 Messages) per Day	132	77.8	39.2			
	Often (More Than Ten Messages) per Day	176	222.8	52.2			

- **Mobile Phone use depending on type of road**: Table 57 is an analysis of mobile phone use depending on the type of road and NCOV's. The usage of phones on Secondary Roads has the highest % rate (51.9%) while the Inner-City Roads has the lowest rate (9.8%) of NCOV's. The value of Pearson chi- square is (13.715), degree of freedom is (3); the Significant coefficient (α =0.03<0.05). The alternative hypothesis is accepted which means there a statistically significant association between Mobile phone use is depending on Types of Roads and NCOV's.

Table 57. Chi-Square Statistics in Relation to Phone use depending on Road-Type and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	95	102.8	28.2%			
	Secondary Road	175	149.6	51.9%			
	Freeway	34	47.2	10.1%			
	Inner- city roads	33	37.4	9.8%	13.715	3	0.003

- **Mobile Phone Use (Hand-held vs. Hands Free):** Table 58 shows that the highest % rate of phone users which commit NCOV's are hand-held users (77.2%) and only (22.8%) who use hands-free commit NCOV's. The value of Pearson chi- square is (0.435); the degree of freedom is (1); and the Significance coefficient (α = 0.509>0.05). The null hypothesis is accepted which means there is no statistically significant association between type of mobile phone use and NCOV's.

Table 58. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) and NCOV's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	260	255.8	77.2%			
	Hands-Free	77	81.2	22.8%	0.435	1	0.509

4.2.5 The effect of mobile use on driver- Driving Off the Road(DOR's) in relation to the different independent variables

- **Gender**: Table 59 shows that the majority of drivers (82.0%) made DOR's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 18.0% DOR's. the value of Pearson chi- square is (1.612), degree of freedom is (1), and the Significance coefficient (α = .204>0.05). The null hypothesis is accepted which means there is no statistically significant association between gender and DOR's.

Table 59. Chi-Square Statistics Related to Driver Gender and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	155	148.6	82.0%			
	Female	34	40.4	18.0%	1.612	1	0.204

- **Age group**: Table 60 demonstrates the different DOR's percentage rates among 6 different groups. One may notice that the largest DOR's rate is found within Group (25-34yr.). The smallest DOR's rate is found within Group (55-74yr.). The value of Pearson chi- square is (7.70), degree of freedom is (5), and the Significant coefficient (α = 0.174>0.05), the null hypothesis is accepted which means there is no statistically significant association between age and DOR's.

Table 60. Chi-Square Statistics Related to Driver Age and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	29	24.8	15.3%			
	25-34	67	63.5	35.4%			
	35-44	64	73.1	33.9%			
	45-54	21	22.3	11.1%			
	55-64	4	3.8	2.1%			
	65-74	4	1.5	2.1%	7.70	5	0.174

- **Average daily use:** Table 61 is an analysis of the average daily use of private cars and DOR's. Group (>3hr.) represents the highest percentage rate (48.7%) of DOR's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 7.9% Group (1/2hr.) because they only drive only 1/2 hour per day. The value of Pearson Chi- Square is (5.149), the degree of freedom is (4), and the significant coefficient (α = 0.272>05). The null hypothesis is accepted which means there no a statistically significant association between average daily use of private car and DOR's.

Table 61. Chi-Square Statistics Related to average daily use of private car and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Your Private Car	1/2 Hour per Day	15	13.6	7.9%			
	One Hour per Day	22	25.1	11.6%			
	Two Hours per Day	25	26.8	13.2%			
	Three Hours per Day	35	25.9	18.5%			
	More Than Three Hours per Day	92	97.5	48.7%	5.149	4	0.272

- **Driver’s daily activity**: Table 62 demonstrates the different DOR's percentage rates among 5 different groups. One may notice that the largest DOR's rate is found within Group (private sector). The smallest DOR's rate is found within Group (students). The value of Pearson chi- square is (16.59); the degree of freedom is (4); the Significant coefficient is (α =0.002<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and DOR's.

Table 62. Chi-Square Statistics Related to driver's daily activity and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Your Sector of Daily Activity	Students	16	14.9	8.5%			
	Civil Servant	39	42.5	20.6%			
	Private Sector Employees	76	60.7	40.2%			
	Unemployed	22	15.7	11.6%			
	Owner of Business	36	55.2	19.0%	16.59	4	0.002

- **Average Daily use of phone while driving**: Table 63 is an analysis of the average daily use of private cars and DOR's. Group (<3 calls/day) represents the highest percentage rate (43.4%) of DOR's because they made less than three calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (12.2%) because they often made more than ten calls per day. The value of Pearson Chi-square is (0.187); the degree of freedom is (3); the Significant coefficient (α =0.980>0.05). The null hypothesis is accepted which means there no a statistically significant association between the average daily use of mobile phone while driving and DOR's.

Table 63. Chi-Square Statistics Related to Avg. Daily use of phone while driving and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	82	81.1	43.4%			
	Little (4-5 Calls) per Day	37	35.5	19.6%			
	Medium (5-10 Calls) per Day	47	48.8	24.9%			
	Often (More Than Ten Calls) per Day	23	23.6	12.2%	.187	3	0.980

- **Placing calls while driving**: Table 64 is an analysis based on mistakes done when placing calls while driving and DOR's. It also demonstrates that the majority of drivers (32.2%) sometimes try to make call while driving , whereas (18.0%) of drivers always try to make call while driving. The value of Pearson chi- square is (11.244); the degree of freedom is(3); the Significant coefficient (α =0.010<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and DOR's.

Table 64. Chi-Square Statistics Related to Placing Calls While Driving and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Did You Try to Make Call While Driving	Never	54	39.7	28.6%			
	Seldom	40	51.6	21.2%			
	Sometimes	61	57.1	32.3%			
	Always	34	40.6	18.0%	11.244	3	0.010

- **Type or Form of Driver Precautions**: Table 65 illustrates that most drivers (41.8%) park on the side of the road when receiving a call while driving, while a few of them never answer all phone calls (11.1%). The percentage rate of the group that answers all phone calls while driving is (14.3%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (never answers, answers all incoming calls,) and DOR's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (replying to most calls, reduces speed, verifies identity of caller before one answers or not, parking on the side of the road) and DOR's.

Table 65. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and DOR's.

Variables l	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	21	18.7	11.1%	.383	1	.536
	Verify Identity of Caller Before Answer or Not	50	64.4	26.5%	6.061	1	0.014
	Reply to Most Calls	41	55.0	21.7%	6.197	1	0.013
	Answer All of Telephone Calls	27	31.2	14.3%	.829	1	0.362
	Parking on the Side of the road	79	60.1	41.8%	10.743	1	0.001
	Reduced Speed	50	39.7	26.5%	4.180	1	0.041

- **Vehicle Category**: Table 66 illustrates the Analysis of the two following variables: Vehicle Category and DOR's. One may notice that Private Cars have the highest percentage rates (38.6%) that encounter DOR's. This is in comparison to Busses that have to lowest % rate (6.9%) that encounter DOR's. The value of Pearson chi- square is (26.936); the degree of freedom is (5); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and DOR's.

Table 66. Chi-Square Statistics Related to Vehicle Category and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	73	79.6	38.6%			
	Public Cars	26	20.6	13.8%			
	Government Cars	17	14.2	9.0%			
	Rental Cars	19	12.9	10.1%			
	Trucks	41	29.3	21.7%			
	Buses	13	32.5	6.9%	26.936	5	0.0

- **Number of received or sent messages**: Table 67 is an analysis of the number of received or sent messages and DOR's. Group (<3 messages/ day) has the lowest % rate (7.9%) of DOR's because they rarely send/ receive messages whereas Group (>10 messages/ day) has the highest % rate of DOR's because of the many distractions. The value of Pearson chi- square is (19.141); the degree of freedom is (3); and the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and DOR's.
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Table 67. Chi-Square Statistics in relation to the number of received/ sent messages & DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	15	7.7	7.9%	19.141	3	0.0
	Little (4-5 Messages) per Day	18	12.7	9.5%			
	Medium (5-10 Messages) per Day	27	43.7	14.3%			
	Often (More Than Ten Messages) per Day	129	124.9	68.3%			

- **Mobile Phone use depending on type of road**: Table 68 is an analysis of mobile phone use depending on the type of road and DOR's. The usage of phones on Highway has the highest % rate (36.0%) while the Inner-City Roads has the lowest rate (7.4%) of DOR's. The value of Pearson chi- square is (33.221), degree of freedom is (3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there a statistically significant association between Mobile phone use is depending on Types of Roads and DOR's.

Table 68. Chi-Square Statistics in Relation to Phone use depending on Road-Type and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	68	57.6	36.0%			
	Secondary Road	60	83.9	31.7%			
	Freeway	47	26.5	24.9%			
	Inner- city roads	14	21.0	7.4%	33.221	3	0.0

- **Mobile Phone Use (Hand-held vs. Hands Free):** Table 69 shows that the highest % rate of phone users which commit DOR's are hand-held users (72.5%) and only (27.8%) who use hands-free commit DOR's. The value of Pearson chi-square is (1.484); the degree of freedom is (1); and the Significance coefficient (α = 0.223>0.05). The null hypothesis is accepted which means there is no statistically significant association between type of mobile phone use and DOR's.

Table 69. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) and DOR's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	137	143.5	72.5%			
	Hands-Free	52	45.5	27.5%	1.484	1	0.223

4.2.6 The effect of mobile use on driver- Swerving into the Wrong or Opposing Lane (SWOL's) in relation to the different independent variables

- **Gender**: Table 70 shows that the majority of drivers (81.2%) made SWOL's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 18.8% DOR's. The value of Pearson chi- square is (0.708), degree of freedom is (1), and the Significance coefficient (α = 0.400>0.05). The null hypothesis is accepted which means there is no statistically significant association between gender and SWOL's.

Table 70. Chi-Square Statistics Related to Driver Gender and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	121	117.1	81.2%			
	Female	28	31.9	18.8%	0.708	1	0.400

- **Age group**: Table 71 demonstrates the different SWOL's percentage rates among 6 different groups. One may notice that the largest SWOL's rate is found within Group (25-34yr.). The smallest SWOL's rate is found within Group (55-74yr.). The value of Pearson chi- square is (8.359), degree of freedom is (5), and the Significant coefficient (α = 0.138>0.05), the null hypothesis is accepted which means there is no statistically significant association between age and SWOL's.

Table 71. Chi-Square Statistics Related to Driver Age and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	24	19.5	16.1%			
	25-34	61	50.1	40.9%			
	35-44	48	57.7	32.2%			
	45-54	14	17.6	9.4%			
	55-64	1	3.0	0.7%			
	65-74	1	1.2	0.7%	8.359	5	0.138

- **Average daily use:** Table 72 is an analysis of the average daily use of private cars and SWOL's. Group (>3hr.) represents the highest percentage rate (43.0%) of SWOL's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 8.7% Group (1/2hr.) because they only drive only 1/2 hour per day. The value of Pearson Chi- Square is (9.985), the degree of freedom is (4), and the significant coefficient (α = 0.041<05). The alternative hypothesis is accepted which means there is a statistically significant association between average daily use of private car and SWOL's.

Table 72. Chi-Square Statistics Related to average daily use of private car and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Your Private Car	1/2 Hour per Day	13	10.7	8.7%			
	One Hour per Day	24	19.8	16.1%			
	Two Hours per Day	18	21.2	12.1%			
	Three Hours per Day	30	20.4	20.1%			
	More Than Three Hours per Day	64	76.9	43.0%	9.985	4	0.041

- **Driver’s daily activity**: Table 73 demonstrates the different SWOL's percentage rates among 5 different groups. One may notice that the largest SWOL's rate is found within Group (private sector). The smallest SWOL's rate is found within Group (students) and Group (unemployed). The value of Pearson chi- square is (12.758); the degree of freedom is (4); the Significant coefficient is (α =0.013<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and SWOL's.

Table 73. Chi-Square Statistics Related to driver’s daily activity and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Your Sector of Daily Activity	Students	10	11.8	6.7%			
	Civil Servant	31	33.5	20.8%			
	Private Sector Employees	66	47.8	44.3%			
	Unemployed	10	12.4	6.7%			
	Owner of Business	32	43.5	21.5%	12.758	4	0.013

- **Average Daily use of phone while driving**: Table 74 is an analysis of the average daily use of private cars and SWOL's. Group (<3 calls/day) represents the highest percentage rate (39.6%) of SWOL's because they made less than three calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (14.1%) because they often made more than ten calls per day. The value of Pearson Chi-square is (1.532); the degree of freedom is (3); the Significant coefficient (α =0.675>0.05). The null hypothesis is accepted which means there no a statistically significant association between the average daily use of mobile phone while driving and DOR's.

Table 74. Chi-Square Statistics Related to Avg. Daily use of phone while driving and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	59	63.9	39.6%			
	Little (4-5 Calls) per Day	32	28.0	21.5%			
	Medium (5-10 Calls) per Day	37	38.4	24.8%			
	Often (More Than Ten Calls) per Day	21	18.6	14.1%	1.532	3	0.675

- **Placing calls while driving**: Table 75 is an analysis based on mistakes done when placing calls while driving and SWOL's. It also demonstrates that the majority of drivers (35.6%) sometimes try to make call while driving, whereas (26.2%) of drivers seldom try to make call while driving. The value of Pearson chi- square is (9.677); the degree of freedom is (3); the Significant coefficient (α =0.022<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and SWOL's.

Table 75. Chi-Square Statistics Related to Placing Calls While Driving and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Did You Try to Make Call While Driving	Never	38	31.3	25.5%			
	Seldom	39	40.7	26.2%			
	Sometimes	53	45.0	35.6%			
	Always	19	32.0	12.8%	9.677	3	0.022

- **Type or Form of Driver Precautions**: Table 76 illustrates that most drivers (38.9%) park on the side of the road when receiving a call while driving, while a few of them never answer all phone calls (12.1%). The percentage rate of the group that answers all phone calls while driving is (24.2%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (never answers, verifies identity of caller before one answers or not, replying to most calls,) and SWOL's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (reduces speed, answers all incoming calls, parking on the side of the road) and SWOL's.

Table 76. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and SWOL's.

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	18	14.8	12.1%	0.933	1	0.334
	Verify Identity of Caller Before Answer or Not	44	50.8	29.5%	1.627	1	0.202
	Reply to Most Calls	39	43.4	26.2%	0.726	1	0.394
	Answer All of Telephone Calls	36	24.6	24.2%	7.459	1	0.006
	Parking on the Side of the road	58	47.4	38.9%	4.10	1	0.043
	Reduced Speed	41	31.3	27.5%	4.482	1	0.034

- **Vehicle Category**: Table 77 illustrates the Analysis of the two following variables: Vehicle Category and SWOL's. One may notice that Private Cars have the highest percentage rates (38.9%) that encounter SWOL's. This is in comparison to Government Cars that have to lowest % rate (8.7%) that encounter SWOL's. The value of Pearson chi- square is (13.803); the degree of freedom is (5); the Significant coefficient (α =0.0170<0.05). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and SWOL's.

Table 77. Chi-Square Statistics Related to Vehicle Category and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	58	62.7	38.9%			
	Public Cars	20	16.2	13.4%			
	Government Cars	13	11.2	8.7%			
	Rental Cars	19	10.1	12.8%			
	Trucks	21	23.1	14.1%			
	Buses	18	25.6	12.1%	13.803	5	0.017

- **Number of received or sent messages**: Table 78 is an analysis of the number of received or sent messages and SWOL's. Group (<3 messages/ day) has the lowest % rate (8.1%) of SWOL's because they rarely send/ receive messages whereas Group (>10 messages/ day) has the highest % rate of SWOL's because of the many distractions. The value of Pearson chi- square is (10.170); the degree of freedom is (3); and the Significant coefficient (α =0.017<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and SWOL's.

Table 78. Chi-Square Statistics in relation to the number of received/ sent messages & SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	12	6.1	8.1%			
	Little (4-5 Messages) per Day	13	10.0	8.7%			
	Medium (5-10 Messages) per Day	26	34.4	17.4%			
	Often (More Than Ten Messages) per Day	98	98.5	65.8%	10.170	3	0.017

- **Mobile Phone use depending on type of road**: Table 79 is an analysis of mobile phone use depending on the type of road and SWOL's. The usage of phones on Highway has the highest % rate (39.6%) while the Inner-City Roads has the lowest rate (14.1%) of SWOL's. The value of Pearson chi- square is (18.653), degree of freedom is (3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there a statistically significant association between Mobile phone use is depending on Types of Roads and SWOL's.

Table 79. Chi-Square Statistics in Relation to Phone use depending on Road-Type and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	59	45.4	39.6%			
	Secondary Road	42	66.2	28.2%			
	Freeway	27	20.9	18.1%			
	Inner- city roads	21	16.5	14.1%	18.653	3	0.0

- **Mobile Phone Use (Hand-held vs. Hands Free):** Table 80 shows that the highest % rate of phone users which commit SWOL's are hand-held users (74.5%) and only (25.5%) who use hands-free commit SWOL's. The value of Pearson chi- square is (0.189); the degree of freedom is (1); and the Significance coefficient (α = 0.664>0.05). The null hypothesis is accepted which means there is no statistically significant association between type of mobile phone use and SWOL's.

Table 80. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) and SWOL's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	111	113.1	74.5%	0.189	1	0.664
	Hands-Free	38	35.9	25.5%			

4.2.7 The effect of mobile use on driver- Losing Control of the Car(LCC's) in relation to the different independent variables

- **Gender**: Table 81 shows that the majority of drivers (75.2%) made LCC's when using mobile phone while driving are male drivers. on the contrary, a few of female representing 24.8% LCC's. the value of Pearson chi- square is (1.834), degree of freedom is (1), and the Significance coefficient (α = 0.176>0.05). The null hypothesis is accepted which means there is no statistically significant association between gender and LCC's.

Table 81. Chi-Square Statistics Related to Driver Gender and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Gender	Male	161	168.2	75.2%			
	Female	53	45.8	24.8%	1.834	1	0.176

- **Age group**: Table 82 demonstrates the different LCC's percentage rates among 6 different groups. One may notice that the largest LCC's rate is found within Group (35-44yr.). The smallest LCC's rate is found within Group (65-74yr.). The value of Pearson chi- square is (10.462), degree of freedom is (5), and the Significant coefficient (α = 0.063>0.05), the alternative hypothesis is accepted which means there is a statistically significant association between age and LCC's.

Table82. Chi-Square Statistics Related to Driver Age and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Age	18-24	29	28.0	13.6%			
	25-34	70	71.9	32.7%			
	35-44	71	82.8	33.2%			
	45-54	37	25.3	17.3%			
	55-64	6	4.3	2.8%			
	65-74	1	1.7	0.5%	10.462	5	0.063

- **Average daily use:** Table 83 is an analysis of the average daily use of private cars and LCC's. Group (>3hr.) represents the highest percentage rate (40.7f LCC's because they drive more than three hours per day. This can be compared to the smallest percentage rate of 8.9roup (1/2hr.) because they only drive only 1/2 hour per day. The value of Pearson Chi- Square is (13.577); degree of freedom is (4), and the significant coefficient (α =.009<.050). The null hypothesis is accepted which means there no a statistically significant association between average daily use of private car and LCC's.

Table 83. Chi-Square Statistics Related to average daily use of private car and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Daily Use of Your Private Car	1/2 Hour per Day	19	15.4	8.9%			
	One Hour per Day	33	28.5	15.4%			
	Two Hours per Day	40	30.4	18.7%			
	Three Hours per Day	35	29.3	16.4%			
	More Than Three Hours per Day	87	110.4	40.7%	13.577	4	0.009

- **Driver's daily activity**: Table 84 demonstrates the different LCC's percentage rates among 5 different groups. One may notice that the largest LCC's rate is found within Group (civil servant). The smallest LCC's rate is found within Group (students). The value of Pearson chi- square is (21.2); the degree of freedom is (4); the Significant coefficient is (α =0.00<0.05). The alternative hypothesis is accepted which means that there is a statistically significant association between the daily activity of drivers and LCC's.

Table 84. Chi-Square Statistics Related to driver's daily activity and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Your Sector of Daily Activity	Students	12	16.9	5.6%			
	Civil Servant	68	48.2	31.8%			
	Private Sector Employees	67	68.7	31.3%			
	Unemployed	23	17.8	10.7%			
	Owner of Business	44	62.5	20.6%	21.2	4	0.0

- **Average Daily use of phone while driving**: Table 85 is an analysis of the average daily use of private cars and LCC's. Group (<3 calls/day) represents the highest percentage rate (47.7%) of LCC's because they made less than three calls per day. This can be compared to the Group (>10calls/day) with the smallest percentage rate (13.1%) because they often made more than ten calls per day. The value of Pearson Chi-square is (20.178); the degree of freedom is(3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between the average daily use of mobile phone while driving and LCC's.

Table 85. Chi-Square Statistics Related to Avg. Daily use of phone while driving and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Daily Use of Your Phone While Driving	Rarely (Less Than Three Calls) per Day	102	91.8	47.7%			
	Little (4-5 Calls) per Day	53	40.2	24.8%			
	Medium (5-10 Calls) per Day	31	55.2	14.5%			
	Often (More Than Ten Calls) per Day	28	26.8	13.1%	20.178	3	0.0

- **Placing calls while driving**: Table 86 is an analysis based on mistakes done when placing calls while driving and LCC's. It also demonstrates that the majority of drivers (35.0%) sometime try to make call while driving, whereas (10.3%) of drivers always try to make call while driving. The value of Pearson chi- square is (21.202); the degree of freedom is (3); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between trying to make call while driving and LCC's.

Table 86. Chi-Square Statistics Related to Placing Calls While Driving and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Did You Try to Make Call While Driving	Never	55	44.9	25.7%			
	Seldom	62	58.4	29.0%			
	Sometimes	75	64.6	35.0%			
	Always	22	46.0	10.3%	21.202	3	0.0

- **Type or Form of Driver Precautions**: Table 87 illustrates that most drivers (49.100%) parking on the side of the road when receiving a call while driving, while a few of them never answers phone calls (7.500%). The percentage rate of the group that verify identity of caller before answer or not while driving is (32.700%). There is no statistically significant association between the Type and form of precaution taken when using mobile phones while driving (answers all incoming calls, never answers, verifies identity of caller before one answers or not, reduces speed) and LCC's. There is a statistically significant association between the type and form of precaution when using mobile phones while driving (replying to most calls, parking on the side of the road) and LCC's.

Table 87. Chi-Square Statistics Related to Type or Form of Driver Precaution Variables and LCC's.

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
If You Receive A Call While You are Driving What will You Do	Never Answer	16	21.2	7.5%	1.793	1	0.181
	Verify Identity of Caller Before Answer or Not	70	73.0	32.7%	0.234	1	0.629
	Reply to Most Calls	45	62.3	21.0%	8.598	1	0.003
	Answer All of Telephone Calls	33	35.3	15.4%	0.230	1	0.631
	Parking on the Side of the road	105	68.1	49.1%	37.423	1	0.0
	Reduced Speed	46	44.9	21.5%	0.040	1	0.841

- **Vehicle Category**: Table 88 illustrates the Analysis of the two following variables: Vehicle Category and LCC's. One may notice that Private Cars have the highest percentage rates (45.8%) that encounter LCC's. This is in comparison to Busses that have to lowest % rate (7.9%) that encounter LCC's. The value of Pearson chi- square is (30.484); the degree of freedom is (5); the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted, which means there is a statistically significant association between vehicle category and LCC's.

Table 88. Chi-Square Statistics Related to Vehicle Category and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Vehicle Category	Private Cars	98	90.1	45.8%			
	Public Cars	25	23.3	11.7%			
	Government Cars	28	16.1	13.1%			
	Rental Cars	20	14.6	9.3%			
	Trucks	26	33.2	12.1%			
	Buses	17	36.8	7.9%	30.484	5	0.0

- **Number of received or sent messages**: Table 89 is an analysis of the number of received or sent messages and LCC's. Group (<3 messages/ day) has the lowest % rate (6.5%) of LCC's because they rarely send/ receive messages whereas Group (> 10 messages/ day) has the highest % rate of LCC's because of the many distractions. The value of Pearson chi- square is (23.853); the degree of freedom is (3); and the Significant coefficient (α =0.00<0.05). The alternative hypothesis is accepted which means there is a statistically significant association between Numbers of received or sent messages and LCC's.

Table 89. Chi-Square Statistics in relation to the number of received/ sent messages & LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Average Number of Receive or Sent Messages	Rarely (Less Than Three Messages per Day	14	8.8	6.5%			
	Little (4-5 Messages) per Day	26	14.3	12.1%			
	Medium (5-10 Messages) per Day	32	49.4	15.0%			
	Often (More Than Ten Messages) per Day	142	141.5	66.4%	23.853	3	0.0

- **Mobile Phone use depending on type of road**: Table 90 is an analysis of mobile phone use depending on the type of road and LCC's. The usage of phones on Secondary Roads has the highest % rate (48.1%) while the Inner-City Roads has the lowest rate (11.7%) of LCC's. The value of Pearson chi- square is (2.0309), degree of freedom is (3); the Significant coefficient (α =.511>.05). The null hypothesis is accepted which means there no statistically significant association between Mobile phone use is depending on Types of Roads and LCC's.

Table 90. Chi-Square Statistics in Relation to Phone use depending on Road-Type and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Where You Often Use Your Mobile Phone	Highway	57	65.3	26.6%			
	Secondary Road	103	95.0	48.1%			
	Freeway	29	30.0	13.6%			
	Inner- city roads	25	23.8	11.7%	2.309	3	0.511

- **Mobile Phone Use (Hand-Held vs. Hands-Free):** Table91 shows that the highest % rate of phone users which commit LCC's are hand-held users (71.5%) and only (28.5%) who use hands-free commit LCC's. The value of Pearson chi-square is (2.888); the degree of freedom is (1); and the Significance coefficient (α = 0.08>.05). The null hypothesis is accepted which means there no statistically significant association between type of mobile phone use and LCC's.

Table 91. Chi-Square Statistics Related to Mobile Phone Use (Hand-held vs. Hands-Free) and LCC's

Variables	Groups	Observed Count	Expected Count	Percent %	Pearson Chi-Square	Degree of Freedom(df)	Sig.
Type of Mobile Phone Used	Hand-Held	153	162.4	71.5%			
	Hands-Free	61	51.6	28.5%	2.888	1	0.08

4.3 Summary of Results

Table 92 shows summary of significant results presented in the previous sections:

Table 92. Results of Chi- Square Tests

	Missed exits	Failed to observe traffic signal	Forget to adjust the speed according to the limit	Near collision with other vehicles or objects	Driving off the road	Swerving into the wrong or opposing lane	Losing control of the car
Gender	Not sig.	Sig.	Sig.	Sig.	Not sig.	Not sig.	Not sig.
Age	Not sig.	Sig.	Sig.	Sig.	Not sig.	Not sig.	Not sig.
Average daily use of your private car	Sig.	Sig.	Sig.	Sig.	Not sig.	Sig.	Sig.
Your sector of daily activity	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
Daily use of your phone while driving	Sig.	Sig.	Sig.	Sig.	Not sig.	Not sig.	Sig.
Did you try to make call while driving	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
Never answer	Not sig.	Not sig.	Not sig.	Sig.	Not sig.	Not sig.	Not sig.
Verifies identity of caller before answer or not	Not sig.	Sig.	Sig.	Sig.	Sig.	Not sig.	Not sig.
Reply to most calls	sig.	Sig.	Sig.	Sig.	Sig.	Not sig.	Sig.
Answer all of telephone calls	Not sig.	Not sig.	Not sig.	Not sig.	Not sig.	Sig.	Not sig.
Park on the right curb	Sig.	Sig.	Sig.	Not sig.	Sig.	Sig.	Sig.
Reduced speed	Not sig.	Sig.	Not sig.	Not sig.	Sig.	Sig.	Not sig.
Vehicle category	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
Average number of receiving or sent text messages	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
Where you often use your mobile phone	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Not sig.
The type of mobile phone was being used	Not sig.	Sig.	Sig.	Not sig.	Not sig.	Not sig.	Not sig.

4.4 Discussion of Results

- There is no statistically significant association between Missing Exits (ME's) and the following variables (gender, age, never answering, verifying Caller ID before answering or not, answering all incoming calls, reducing speed, and the type of mobile phone used).
- There is a statically significant association between ME's and the following variables (average daily use, drivers daily activity, average daily use of phone while driving, placing calls while driving, replying to most calls, parking on the side of the road, vehicle category, average number of Text Messages received or sent; and mobile phone use depending on type of road).
- There is no statistically significant association between Failing to Observe Traffic Signals (FOTS's), and the following variables (never answering; and answering all incoming calls).
- There is a statistically significant association between FOTS's and the following (gender; age; verifying Caller ID before deciding to answer or not; reducing speed; the type of mobile phone used; average daily use; drivers daily activity,; average daily use of phone while driving; placing calls while driving; replying to most calls; parking on the side of the road; vehicle category; average number of receiving or sent text messages; and mobile phone use depending on type of road).
- There is no statistically significant association between Forgetting to Adjust the Speed to the Limit (FASL's), and the following (never answering, answering all incoming calls, and reducing speed,).
- There is however a statistically significant association between FASL's and the following (gender; age; verifying Caller ID before answering or not; the type of

mobile phone used; average daily use; drivers daily activity; average daily use of phone while driving; placing calls while driving; replying to most calls; parking on the side of the road; vehicle category; average number of receiving or sent text messages; and mobile phone use depending on type of road).

- There is no statistically significant association between Near Collisions with Other Vehicles or Objects (NCOV's) and the following (answering all incoming calls, parking on the side of the road, and reducing speed,).
- There is statistically significant associations between NCOV's and the following (gender; age; verifying Caller ID before answering or not; the type of mobile phone used; average daily use; drivers daily activity; average daily use of phone while driving; placing calls while driving; never answering calls; replying to most calls; vehicle category; average number of receiving or sent text messages; and mobile phone use depending on type of road).
- There is no statistically significant association between Driving Off the Road (DOR's) and the following (gender; age; answering all incoming calls; average daily use of car, average daily use of phone while driving; never answering; the type of mobile phone used).
- There is a statistically significant association between DOR's and the following (verifying Caller ID before answering or not; drivers daily activity; placing calls while driving; replying to most calls; parking on the side of the road; reducing speed; vehicle category; average number of receiving or sent text messages; and mobile phone use depending on type of road).
- There is no statistically significant association between Swerving into the Wrong or Opposing Lane (SWOL's) and the following (gender; age; average

daily use of phone while driving; never answering; the type of mobile phone used; verifying Caller ID before answering or not; and replying to most calls).

- There is a statistically significant association between SWOL's and the following (average daily use of car; drivers daily activity; placing calls while driving; answering all incoming calls; parking on the side of the road; reducing speed; vehicle category; average number of Text Messages received or sent; mobile phone use depending on type of road).
- There is no statistically significant association between Losing Control of the Car (LCC's) and the following (gender; age; never answering; the type of mobile phone used; verifying Caller ID before answering or not; reducing speed; answering all incoming calls; mobile phone use depending on type of road).
- There is a statistically significant association between Losing Control of the Car (LCC's) and the following (average daily use of phone while driving, replying to most calls; average daily use of car; drivers daily activity; placing calls while driving; parking on the side of the road; vehicle category; average number of Text Messages received or sent).

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

- The majority of the drivers in the sample were males of various age groups between 25 – 44 years.
- The greatest percentage of drivers use their private vehicles more than three hours per day using secondary roads; work in the private sector; and use the mobile on an average of 5-10 calls per day.
- The majority of the drivers place calls sometimes while driving, looking at the Caller ID in order to determine as whether or not to answer.
- Few of the drivers believe that their relatives and/ or acquaintance had accidents caused by phone use. Most drivers believe that using mobile phone while driving causes traffic confusion.
- The majority of the drivers often receive or send text messages (e.g. more than 10 text messages per day).
- The majority of drivers in the sample study missed exits while using mobile phone.
- The type of calling devices mostly used was hand – held phones.
- The majority of male drivers who ME's fall within the 25-34 age group. This group drives more than 3 hours per day within and is in the private sector using private cars. They made less than 3 call per day, at times placing call when driving. However, the majority parked on the side of the road when there was incoming call and/ or sent/ received messages on secondary roads using a hand-held device.

- The majority of drivers made FOTS's when using mobile phone are males, 35 – 44 years old, and drive more than 3 hours per day. On average, 5 to 10 calls were made on a daily basis and always placed calls while driving. Most of them reply to most calls when receiving a call. One may notice that buses have the highest percentage rates that encounter FOTS's. The drivers in this category often send or receive text messages, using hand-held phones on secondary roads.
- The majority of drivers made FASL's were male between the ages of 35-44 years and drive more than 3 hours per day. On average, 5 to 10 calls were made on a daily basis and always placed calls while driving. Most of them reply to most calls when receiving a call. One may notice that buses have the highest percentage rates that encounter FASL's. The drivers in this category often send or receive text messages, using hand-held phones on secondary roads.
- The majority of drivers made NCOV's were male between the ages of 35-44 years and drive more than 3 hours per day. On average, 5 to 10 calls were made on a daily basis and always placed calls while driving. Most of them reply to most calls when receiving a call. One may notice that buses have the highest percentage rates that encounter NCOV's. The drivers in this category often send or receive text messages, using hand-held phones on secondary roads
- The majority of drivers that made DOR's were males between 25-34 years of age. They normally drive more than 3 hours per day and have an average daily phone use (< 3 calls /day). They sometimes place calls while driving, however, most of them park on the side of the road in order to answer incoming calls. One may notice that private cars have the highest percentage rates that make DOR's .

Drivers in this category often send or receive text messages and use phones on highway roads using hand – held devices.

- The majority of drivers made LCC's were male between 35-44 years. They drive more than 3 hours per day within group (civil servant). They used the phone less than 3 times a day, placing some calls while driving, but mostly parking at the side of the road to take incoming calls. One may notice that private cars have the highest percentage rates that experience LCC's . The drivers in this category often send or receive text messages and use hand-held phones on secondary roads.

5.2 Recommendations:

In light of the results of the study, the following safety guidelines is recommended in order to best safeguard drivers:

1. To introduce clear traffic signs warning against the use of mobile phones while driving, specifically on secondary roads.
2. More awareness of the effect of mobile phone use while driving at schools, institutes, and universities. By receiving proper educational courses in the field of proper driving habits.
3. To pass firm laws and systems, those that which will oblige the driver not to use mobile phones while driving. Unless these news laws are enforced, they will not take hold on drivers.
4. To make it obligatory for drivers to use only Hands-free devices while driving. This can be done by either placing fixed phone accessories in a vehicle suitable for hands-free capability or using mobile hands-free sets while driving.

5. To produce educational programs and advertisements on radios and TV's.
6. To note on traffic accident citations that the use of a mobile phone was a major contributor

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APPENDIX A

THE QUESSTIONNAIRE IN ARABIC LANGUAGE

أنا طالب في كلية الهندسة والتكنولوجيا من الجامعه الاردنية, أقوم بدراسة ميدانية لمشروع رسالة ماجستير بعنوان "أثر استعمال الهاتف النقال على سلامة الطرق في عمان", أرجو منك التكرم بتعبئة الاستبانة المرفقة بدقة لاغراض الدراسة مع جزيل الشكر .

السؤال الاول: الجنس ؟
أ- ذكر ب- أنثى

السؤال الثاني: العمر ؟
أ- (18-24) ب- (25-34) ج- (35-44) د- (45-54)
هـ-(55-64) و- (65-74) ز- (اكثر من 75)

السؤال الثالث : معدل إستعمال اليومي لسيارتك الخاصة ؟
أ- نصف ساعة يوميا ب- ساعة يوميا ج- ساعتين يوميا
د- ثلاث ساعات يوميا هـ- أكثر من ثلاث ساعات يوميا

السؤال الرابع :مجال نشاطك اليومي ؟
أ- طالب / طالبة ب- موظف / موظفة/حكومي ج- موظف قطاع خاص
د- لا اعمل ولست طالباً هـ- صاحب مصلحة

السؤال الخامس : معدل إستعمالك لهاتفك النقال / أثناءالقيادة ؟
أ- قليل جداً (اقل من ثلاث مكالمات) يومياً ب- قليل (5-4 مكالمات)يوميا
ج- متوسط (10-5 مكالمات) يومياً د- كثير (أكثر من عشر مكالمات) يومياً

السؤال السادس : هل تحاول الاتصال بشخص آخر من هاتفك النقال أثناء قيادتك سيارتك ؟
أ- لا أقوم بذلك بتاتاً ب- نادراً
ج- أحياناً د- دائماً

السؤال السابع : في حال تلقيت مكالمة عبر هاتفك النقال أثناء قيادتك لسيارتك ماذا تفعل ؟(يمكن اختيار اكثر من اجابة):
أ- لا أجيب نهائياً ب- أتأكد من هوية المتصل وقد أجيب أو لا أجيب
ج- أجيب على معظم المكالمات د- أجيب على جميع المكالمات
هـ- أتوقف على يمين الطريق و- أقلل من السرعة

السؤال الثامن : هل سبق أن تعرضت أو أحد أقاربك أو معارفك لحادث مروري كان سببه الهاتف النقال ؟
أ – نعم ب- لا

السؤال التاسع : هل تعتقد أن إستعمال الهاتف النقال أثناء القيادة (من قبلك أو من قبل الآخرين) يسبب ارباكاً لحركة المرور ؟
أ- نعم ب- لا

السؤال العاشر : ما هي فئة المركبة التي تقودها ؟
أ- خصوصي ب- عمومي ج- حكومي د- سياحي
هـ- شحن و- باص ز- أخرى اذكرها------------------------------

السؤال الحادي عشر: معدل عدد الرسائل التي تتلقاها أو ترسلها خلال قيادة مركبتك ؟
أ- قليل جداً (اقل من ثلاث رسائل) يومياً   ب- قليل (5-4 رسائل)يوميا
ج- متوسط (10-5 رسائل) يومياً   د- كثير (أكثر من عشر رسائل) يومياً

السؤال الثاني عشر : الاخطاء التي تعرضت لها عند استخدامك الهاتف النقال اثناء القيادة,(يمكن اختيار اكثر من جواب):
أ- السهو عن الاتجاه المطلوب   ب- عدم الانتباه لاشارة المرور
ج- عدم الانتباه للسرعة المقررة   د- الاقتراب من الاصطدام بمركبة اواجسام اخرى
هـ- الخروج عن مسار الطريق   و- اتخاذ المسرب او الاتجاه الخاطيء
ز- عدم السيطرة على المركبة   ح- اخرى اذكرها------------------------------

السؤال الثالث عشر : أكثر الاماكن التي استخدم فيها الهاتف النقال اثناء القيادة:
أ- طريق رئيسي   ب- طريق فرعي
ج- طريق سريع   د- وسط المدينة

السؤال الرابع عشر: استخدم الهاتف النقال اثناء القيادة :
أ- بحمل الهاتف النقال باليد   ب- باستخدام سماعة اذن خارجية
ج- اخرى اذكرها---

APPENDIX B

REGISTERED DRIVERS UNTIL THE END OF 2005

Registered Drivers until the end of 2005 **عدد السائقين المسجلين لنهاية 2005**

مجموع السائقين المسجلين ***Total Registered Drivers***	**Age Group الفئة العمرية**
21983	**18-20**
72626	**21-23**
113173	**24-26**
118695	**27-29**
128652	**30-32**
120469	**33-35**
115678	**36-38**
115513	**39-41**
93448	**42-44**
70776	**45-47**
74715	**48-50**
49718	**51-53**
39135	**54-56**
33079	**57-59**
115386	**60+**
1283046	**Total المجموع**

APPENDIX C

THE ABSTRACT IN ARABIC LANGUAG

أثر استخدام الهاتف النقال على سلامة الطرق في عمان

اعداد

زياد محمد حسن الفراج

المشرف

الأستاذ الدكتور عدلي البلبيسي

الملخص

في عالمنا المعاصر لا يستطيع الانسان العمل دون استخدام الهاتف النقال سواء داخل المركبة او خارجها، والهدف الاساسي هو ربط سلامة الطرق واستخدام الهاتف النقال.

ولدراسة تأثير الهاتف النقال على سلامة الطرق في عمان تم عمل استبانة وكانت النتائج هي محور الدراسة، من الممكن أن تكون النتائج واضحة ومتوقعة ومعروفة لدى الكثير من الناس ولكن ما يميز دراستنا هو تحديد الاخطاء التي يرتكبها السائق اثناء القيادة وأثناء استخدام الهاتف النقال معاً.

من النتائج التي حصلنا عليها، هو أن معظم الحوادث كانت بين الذكور من اعمار (25 - 44) سنة، وقد تبين من دراسة الاستبانة وجود العديد من الاخطاء التي ترتكب عند استخدام الهاتف النقال اثناء القيادة والتي هي محور دراستنا.

بعض النتائج أوضحت أن معظم السائقين لا يعتقدون أن استخدام الهاتف النقال يؤدي الى حوادث، بينما البعض الآخر وبنسبة (كل 9 من 10 أشخاص) يعتقدون أن الهاتف النقال يؤدي الى الارتباك أثناء القيادة، مما يدل على أن التوقعات مخالفة للواقع، ولكن لانستطيع اعتماد هذا القرار لاننا لانثق بصحة او دقة الاجابة على نسبة الحوادث.

ان الهدف من الدراسة هو الوصول الى سلامة الطرق عندما يكون السائق مرتبطاً بمحادثة مع شخص آخر، ويمكن الحد من الخطر على سلامة الطريق باستخدام اجهزة توضع في السيارات دون الحاجة الى حمل الهاتف باليد.