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ACCIDENT FACTORS AND ITS PREVENTATIVE MEASURES IN JOHOR

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DECLARATION

I, the undersigned, hereby declare that this report is my own independent work except where due references are made. I have not committed plagiarism in the accomplishment of this work, nor have I falsified and/or invented the data in my work. I am aware of the university regulations on plagiarism. I accept the academic penalties that may be imposed for any violation.



Romy Tandean

08 - 05 - 2015

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ACCIDENT FACTORS AND ITS PREVENTATIVE MEASURES IN JOHOR

ABSTRACT

The research was conducted to study three main causes of road traffic accidents in Johor, namely the time of occurrence, type of road and type of vehicle. Analysis was made to determine during which hours and what types of roads and vehicles contribute the most and the least to the numbers of fatalities, seriously injured drivers and road users suffering minor injuries from the year 2008 to 2013. With regards to time of occurrence, it was found that accidents occur the most during 4-10 pm and the least during 2-6 am. With regards to type of road, vehicles are most likely to be involved in road accidents on straight roads and least likely on roundabout, elevated and staggered junctions. With regards to type of vehicle, cars have the highest possibilities of being involved in accidents on roads, followed by motorcycles. Other types of vehicle only account for insignificant reported cases of accidents within those six years. Comparison among the three factors was also made and the time of occurrence and type of vehicle are found to be contributing to the most and the least numbers of fatalities and motorists suffering both serious and minor injuries respectively. The HoltWinters time series function in the R software was used to forecast total numbers of road users killed, seriously injured and suffering minor injuries until the year 2020 based on the existing statistics. With the aim to reduce the predicted values, countermeasures as discussed in chapter 2 regarding the literature review were proposed with regards to respective causes of accident.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

A road is a route or a way with a surface pavement which design is intended for vehicles. Built with the purpose of land transportation, it links one place to another and leads vehicles from a starting point to a destination. The development of a region or a country depends highly on the existing infrastructures, which will contribute to its economic growth. The rapid development in other sectors of a region's or a country's infrastructure together with the economic growth are in line with the population growth and the increasing purchasing power of its people, which means the increase in the number of vehicle ownership is inevitable. In the end, there will be a need to add to the existing roads the capacity to accommodate the increasing traffic volume.

Given the increase of activities on roads, there is a high possibility for a road traffic accident to occur. The unfortunate, unexpected and unintentional incident is mostly in form of a crash or collision that involves vehicles, pedestrians or road obstructions, often leads to a casualty or sometimes casualties. With deadly road accidents happen almost everywhere and that they can occur anytime all over the world due to various factors, there is a need to carry out a study regarding these fatal incidents. This research focuses on analyzing major factors causing traffic accidents in Malaysia, specifically in Johor and proposing the preventative measures.

1.2 PROBLEM STATEMENT

Located in the most southern part of West Malaysia, Johor ranks second and fifth in term of population and land area respectively among the states in the country. Thanks to its geographical position, Johor develops rapidly as one of the nation's industrial and transportation hub, especially because it shares a border with Singapore and a maritime border with the Riau Mainland, Indonesia, two of the country's neighbouring countries. With the presences of an international theme park like Legoland Malaysia and the University of Technology, Malaysia (UTM) as one of the most prestigious higher institutions in the nation, not to mention the airport, which is one of the regional hubs for Malaysian popular low-cost airliner, AirAsia, Johor further lives up its reputation as one of the nation's most developed states. The existence of railway stations and the availability of buses as public transport in the rapidly growing state will not stop the government or private institutions and the society to own vehicles. In line with the population growth, more vehicles are expected to travel on the road each day.

Road traffic accidents are common issues all over the world and Malaysia is no exception. Road users are indeed vulnerable to these unwanted incidents. However, those of certain age groups are more susceptible to road accidents compared to the others due to various factors, such as certain negative lifestyles that tend to have great influence on their driving behaviours. There are some other major causes of traffic accidents and the unforeseeable factor like the weather condition, is likely one of them. The consequences of traffic accidents can be very costly. These accidents can result in injury, disability or even lead to death. In economic perspective, the financial costs from vehicle or property damage or both are very much undesirable. The intention of reducing accident cases on the road in Malaysia starting with a state like Johor is a challenge behind the conduct of research. The study will first analyze the root of problems that possibly leads to road traffic crashes before proposing countermeasures that will also be discussed in detail for respective accident factors.

1.3 OBJECTIVES

In the end the study is required to meet the following objectives, namely:

1. To analyze main causes contributing to road traffic accidents by determining the relationship and comparison among them.
2. To predict future number of accident with regards to respective cause of accident using the R software.
3. To propose ways or measures in order to prevent or at least to keep accident cases on roads due to the aforementioned factors to a minimum.

1.4 SCOPE OF STUDY

The scope of study is limited only to the following extent, namely:

- The data collected are within the context of Malaysia only with Johor as the area of interest.
- The data were obtained from the Johor police headquarter.
- The data obtained were in form of numbers of reported death, serious and minor injuries with respect to only three major factors that possibly lead to road traffic accidents, namely the time of occurrence, type of road and type of vehicle.
- The results were then analyzed with the help of the R software only.

1.5 SIGNIFICANCE OF STUDY

This research takes aims to improve the Malaysian road accident statistics. By concentrating on reducing the cases of traffic accident in Johor, it is hoped that the outcomes of the study in form of preventative ways suggested, having the main factors causing the accidents first analyzed, will be able to at least minimize the unwanted incidents.

It is expected that the study can result in good values that can be passed on to be studied, improved or even adopted by the others to solve similar or related issues in the future. The implementation of those measures in other cities or states in Malaysia may

eventually help to solve one of the serious issues in the country. If it is working well, it can even be adopted in other countries to solve their own aforementioned issues.

1.6 THESIS ORGANIZATION

This report is divided into five chapters. Chapter one is the introductory section comprising background of the study, problem statement, objectives of the study, scope of the project, significance of the study and thesis organization. Chapter two contains the literature review. Chapter three is about the methodology used to analyze main traffic accident factors and their preventative measures in Johor. Chapter four is allocated to the results and analysis of the study. Last but not least, chapter five consists of conclusions and recommendations for future work.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

According to Redhwan and Karim (2010:29), road traffic accidents are resulted from road traffic crashes in the form of physical involvement of a single vehicle on the move or more on the road that possibly leads to injury, either major or minor injury, disability or even death in the worst case. The World Health Organization (WHO) (2013) claimed that around 1.24 million was the number of reported deaths due to the unfortunate incident all around the world in 2010. In a different occasion, the United Nations (UN) agency described road traffic accidents as one of the world's issues that would notably slow the economic growth and hinder social development, in which immense prices were to be paid in return in form of the loss of people's lives, destruction of possessions, reduction of work force and loss of productivity, not to mention the expensive medical fees (WHO, 2002). It was said that eighty-five and nearly ninety percents of the fatalities and cases of disability respectively from the road traffic crashes throughout the world were contributed by the Third World Nations (Jacob et al., 2000 in Redhwan and Karim, 2010). According to Radin Umar (1994), there were more people who lost their lives on account of traffic accidents on the roads in those countries compared to other factors leading to deaths, such as war and disease annually and Malaysia is no exception. In addition, road traffic accidents were considered as one of Malaysian main social issues.

The Kelantan health department (2001) claimed that the unfortunate incidents were included in the top ten factors contributing in the loss of people's lives in Malaysia. The World Health Organization (WHO) (2002) reported that with regard to lives lost due to traffic accidents for each ten thousand populations and those for each ten thousand vehicles, Malaysia was placed at fourth and ninth for respective categories. According to the Royal Malaysia Police (RMP) (2002), Selangor and Johor had the most reported cases of road traffic accidents. On the other hand, Perlis contributed the least to those

cases nationally. The ascending amount of road users corresponds to the reported cases of road traffic accidents. It also applies to Malaysia, which joined the motorcar manufacturing industry in 1985. Malaysian national cars, such as Proton, see the increase in production reaching up to two hundred and forty thousand units annually that leads to the increasing amount of road user registrations (Anonymous, 2010).

Table 2.1 Statistics on car registrations, 2005-2013

Source: Road Transport Department Malaysia (RTD)

Year	Units
2005	537,900
2006	458,294
2007	468,512
2008	537,092
2009	513,954
2010	585,304
2011	594,610
2012	628,239
2013	583,060

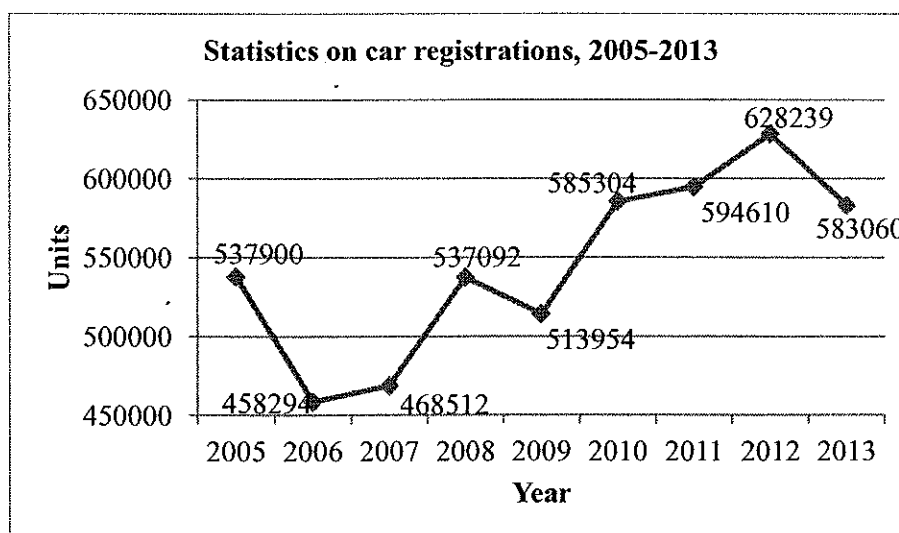


Figure 2.1 Graph of statistics on car registrations, 2005-2013

Table 2.2 Statistics on motorcycle registrations, 2005-2013

Source: Road Transport Department Malaysia (RTD)

Year	Units
2005	422,255
2006	448,751
2007	484,598
2008	543,122
2009	441,545
2010	498,041
2011	542,308
2012	609,596
2013	528,508

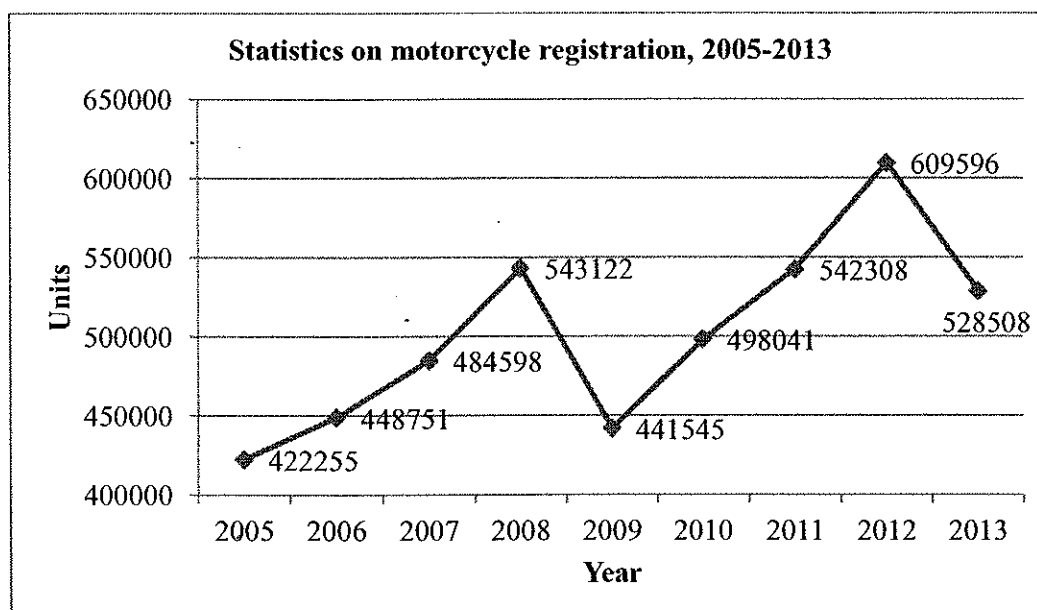


Figure 2.2 Graph of statistics on motorcycle registration, 2005-2013

Table 2.3 Statistics on public vehicle registrations, 2005-2013

Source: Road Transport Department Malaysia (RTD)

Year	Units
2005	9,981
2006	9,090
2007	7,692
2008	9,713
2009	8,209
2010	10,370
2011	10,920
2012	7,754
2013	9,603

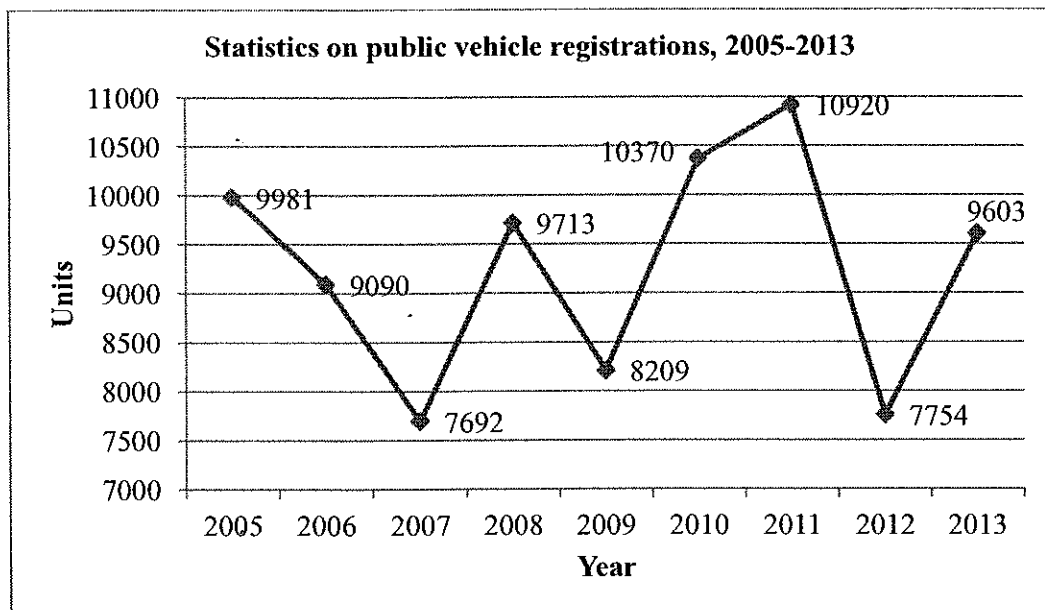


Figure 2.3 Graph of statistics on public vehicle registrations, 2005-2013

Table 2.4 Statistics on commercial vehicle registrations, 2005-2013

Source: Road Transport Department Malaysia (RTD)

Year	Units
2005	33,532
2006	35,677
2007	39,655
2008	43,733
2009	34,731
2010	40,887
2011	39,718
2012	40,742
2013	40,765

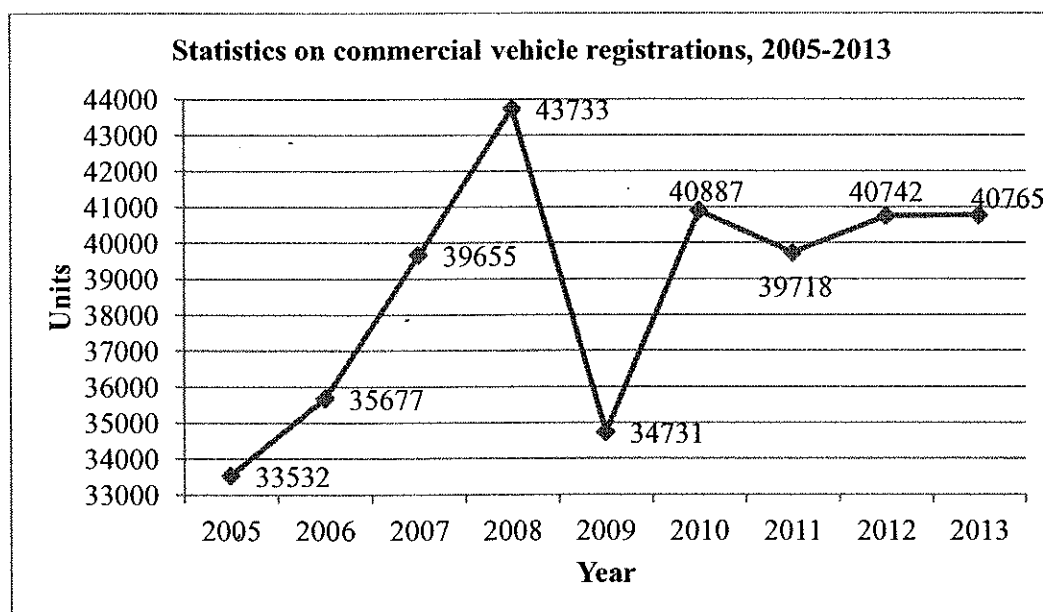


Figure 2.4 Graph of statistics on commercial vehicle registrations, 2005-2013

Table 2.5 Statistics on other vehicle registrations, 2005-2013

Source: Road Transport Department Malaysia (RTD)

Year	Units
2005	16,440
2006	19,701
2007	21,882
2008	22,943
2009	18,922
2010	23,470
2011	24,443
2012	25,418
2013	40,753

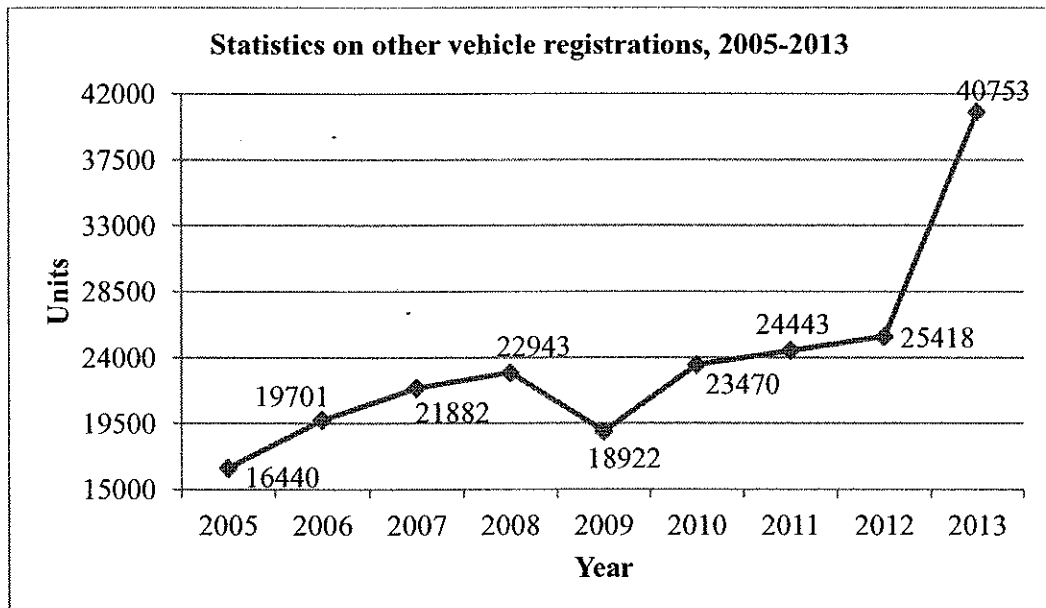


Figure 2.5 Graph of statistics on other vehicle registrations, 2005-2013

Table 2.6 Statistics on total accumulated drivers, 2005-2012

Source: Road Transport Department Malaysia (RTD)

Year	Amount
2005	9,928,238
2006	10,351,332
2007	10,769,531
2008	11,227,144
2009	11,697,306
2010	12,236,254
2011	12,763,452
2012	13,303,843

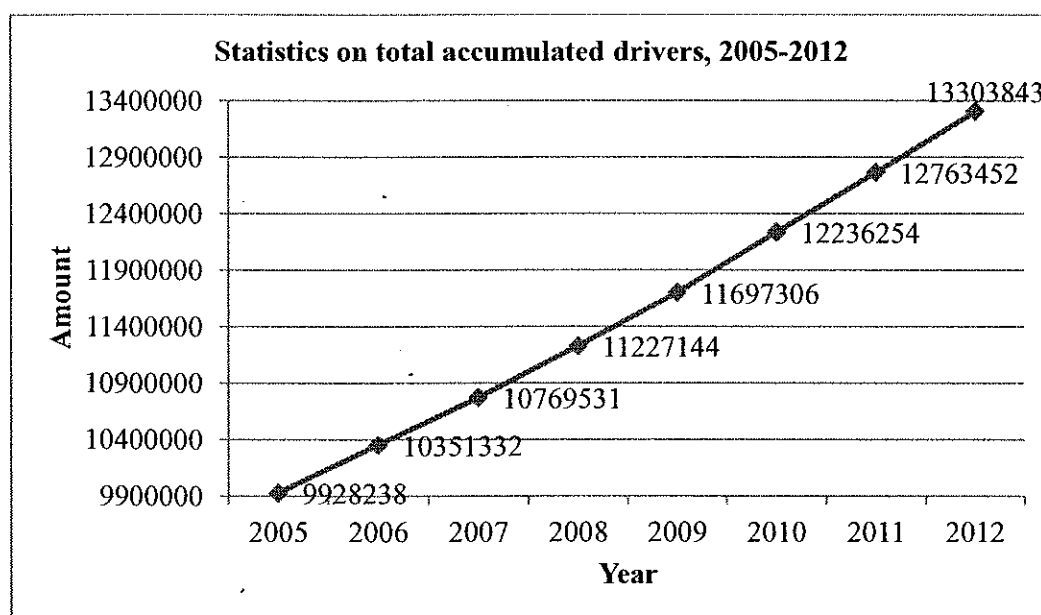


Figure 2.6 Graph of statistics on total accumulated drivers, 2005-2012

Table 2.7 Statistics on general Malaysian road traffic accidents, 1995-2012

Source: Malaysian Institute of Road Safety Research (MIROS)

Year	Population	Vehicles Registered	Vehicle Involved	Road Length	Road Accidents	Road Casualties	Road Deaths	Vehicle Ownership (Person per vehicle)
1995	20,096,700	6,802,375	275,430	62,221	162,491	52,152	5,712	3.0
1996	21,169,000	7,686,684	325,915	64,511	189,109	53,475	6,304	2.8
1997	21,665,600	8,550,469	373,526	66,108	215,632	56,574	6,302	2.5
1998	22,179,500	9,141,357	366,932	66,741	211,037	55,704	5,740	2.4
1999	22,711,900	9,929,951	390,674	67,069	223,166	52,937	5,794	2.3
2000	23,263,600	10,598,804	441,386	68,770	250,429	50,200	6,035	2.2
2001	23,795,300	11,302,545	483,351	74,217	265,175	50,473	5,849	2.1
2002	24,526,500	12,068,144	507,995	74,641	279,711	49,552	5,891	2.0
2003	25,048,300	12,819,248	555,634	79,667	298,653	52,741	6,286	2.0
2004	25,580,000	13,828,889	596,533	71,814	326,815	54,091	6,228	1.8
2005	26,130,000	15,026,660	581,136	71,814	328,264	47,012	6,200	1.7
2006	26,640,000	15,790,732	635,024	72,781	341,252	35,425	6,287	1.7
2007	27,170,000	16,813,943	668,173	73,032	363,319	33,999	6,282	1.6
2008	27,730,000	17,971,901	671,078	73,419	373,071	32,274	6,527	1.5
2009	28,310,000	19,016,782	705,623	100,002	397,330	31,417	6,745	1.5
2010	28,910,000	20,188,565	760,433	111,378	414,421	28,269	6,872	1.4
2011	29,000,000	21,401,269	817,151	127,517	449,040	25,570	6,877	1.4
2012	29,300,000	22,702,221	777,817	127,517	462,423	24,439	6,917	1.3

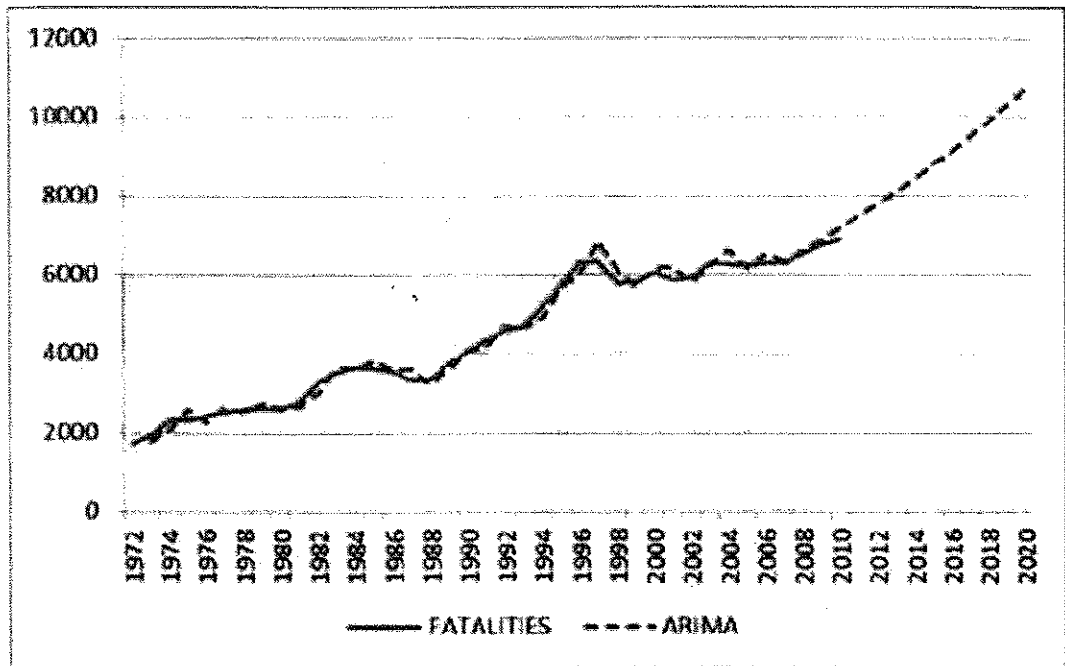


Figure 2.7 Graph of Prediction of Malaysian Road Fatalities for Year 2020

(Source: Malaysian Institute of Road Safety Research (MIROS) – 2012)

2.2 ACCIDENT FACTORS AND ITS PREVENTATIVE MEASURES

2.2.1 AGE FACTOR

2.2.1.1 YOUNG MOTORIST

The World Health Organization (WHO) (2007) claimed that even though attempts to minimize cases of road traffic accidents that could result in unwanted consequences all over the world had been made, those unfortunate incidents were still the main reasons that killed young road users with reportedly a thousand drivers under the age of twenty five lost their lives each day due to them. According to Ferguson et al. (2007), the aforementioned age group had higher risks of being involved in the accidents on roads compared to their older counterparts as the result of lacking experience, knowledge or skill, not being mature enough, making incorrect decisions and having their attentions diverted inside the cars, with the latter was in the form of mobile phone use based on the claims made by Kass et al. (2007).

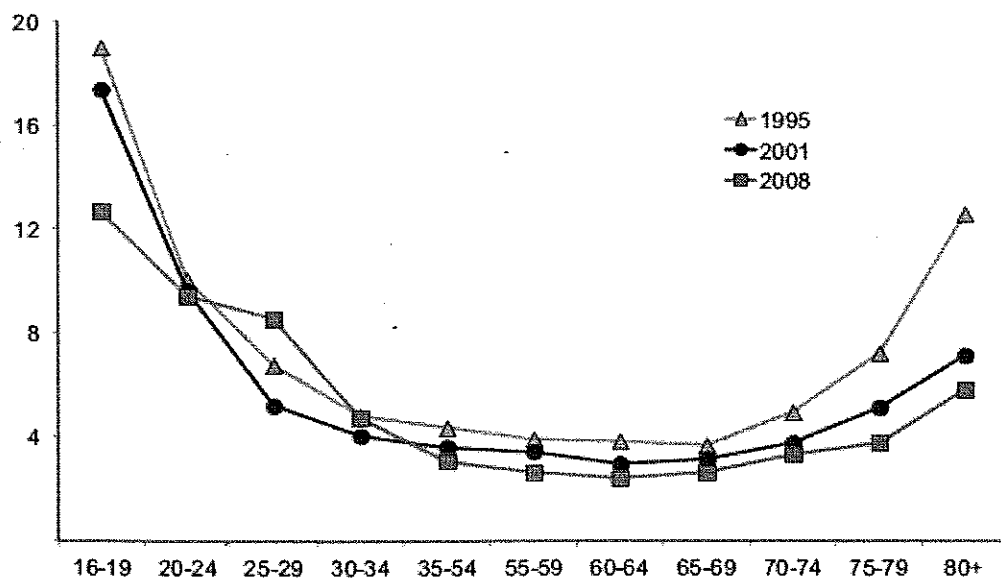


Figure 2.8 The US national police-reported passenger vehicle driver crash involvements per million vehicle miles traveled by age group, 1995, 2001, 2008.

(Source: J.B. Cicchino, A.T. McCartt / Accident Analysis and Prevention 72 (2014) 44-54)

Lee et al. (2008) claimed that even in challenging steering circumstances, young motorists seemed reluctant to put their ongoing texting activities on hold. A research was conducted by Nelson et al. (2009) on college students who drove and the results revealed a shocking fact that seventy two percent of them sent or read text messages while steering. McKnight and McKnight (2003) were concerned with the bitter truth because young road users were projected as the benchmark to gauge the prospective security on roads in the future, by taking into account that what they did would be carried on as their habit, and because it was no longer a secret that the aforementioned age group was seen to have high tendency to be involved in road traffic crashes statistically. Subramanian (2005) added that the habit of sending or reading text messages on the cellular phone would only form a harmful combination for young drivers who could lose their lives due to the main factor that had got road users of that age group killed all this time, namely the road traffic crashes.

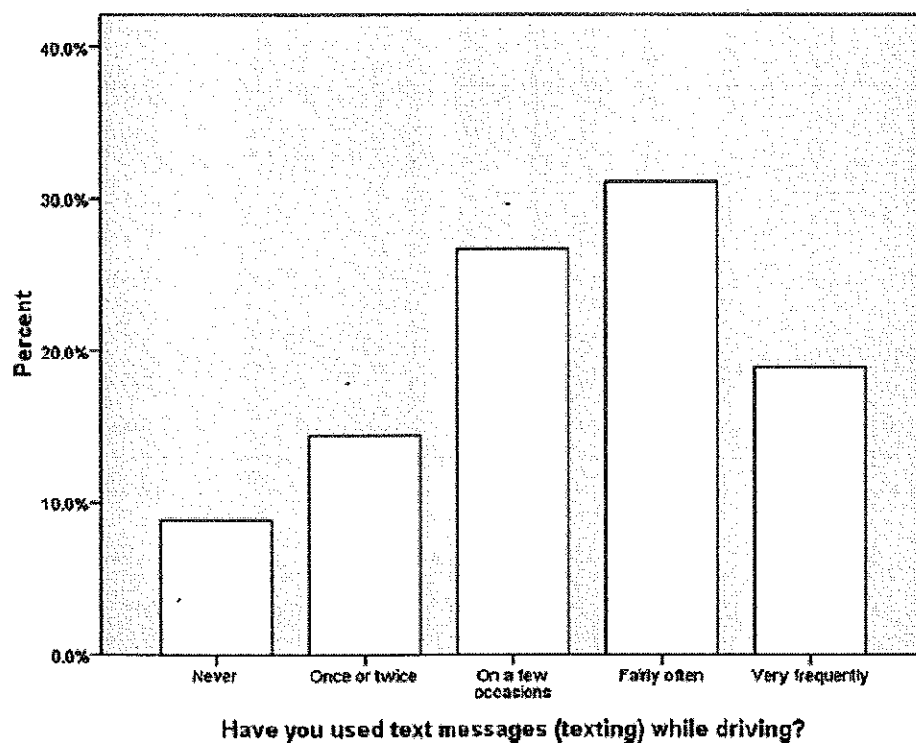


Figure 2.9 Frequency of texting while driving among college students in the USA.

(Source: M.A. Harrison / *Accident Analysis and Prevention* 43 (2011) 1516–1520)

According to Rhodes et al. (2005), the reported cases of road traffic accidents among young motorists were constantly linked to their risky steering conducts in form of speeding, going very close to the vehicle in front of them and steering rapidly under certain circumstances. Harre et al. (2005) added that young road users overestimated their capabilities of steering and acknowledging dangers. Fischer et al. (2008) conducted a research and discovered that under the exposure of pictures or figures encouraging risk taking, particular movie segments and video game genres a person tended to have risky driving conducts. Lucas and Sherry (2004) claimed that video games with racing genre emerged as youngsters' favourite regardless of the gender. Beullens et al. (2008) took a notice at teenagers playing racing games, in which the winner of the races would be the one who cross the finish line ahead of the others. Driving along the virtual circuit, they might encounter obstructions such as vehicles or pedestrians, which they needed to run into in order to gain game points that might decide the winner of the game, especially in "drive'em up" racing games. The act of playing the aforementioned genres of video games was the key indicator to forecast whether they intended to steer in a similar manner in the future.

According to Hoyert et al. (2005), road traffic crashes and steering under the influence of alcohol posed major threats to young motorists' health. Engstrom et al. (2003) made a comparison among young road users and their older counterparts and claimed that the latter age group possessed lower risk of being involved in the unfortunate incidents with equal concentration of alcohol in their blood. Williams (2003) said the reasons were because of young drivers' lack of experiences with alcohol, with steering and with driving under the influence of alcohol.

Williams (2006) concluded that graduated driver licensing (GDL) programs had helped reducing the number of young motorists involved in road traffic accidents. According to Begg et al. (2001), those programs took aims to control the aforementioned age group in form of steering limitation under a variety of circumstances considered highly risky, namely steering under the influence of alcohol, during night time and accompanied by teen companions, which took place until young drivers were experienced enough as the result of steering in less risky circumstances. Brookland and Begg (2011) added that the

aforementioned programs had higher chances to succeed provided that the enforcement was done by parents together with the compliance by their driving children.

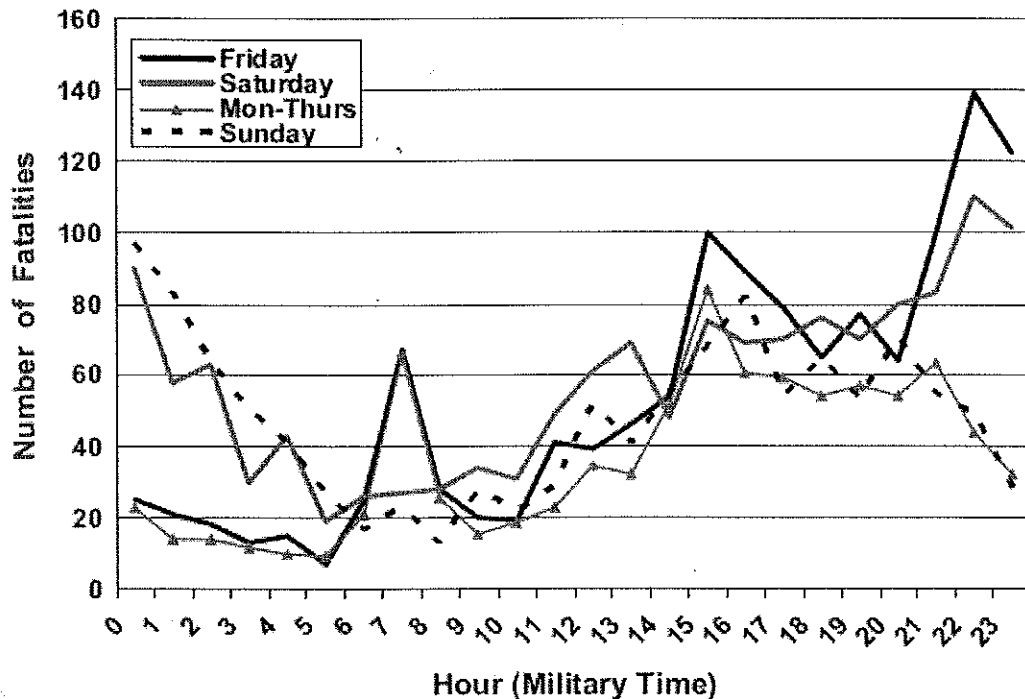


Figure 2.10 The US 15-17-year-old driver fatalities by hour of the day.

(Source: D. Carpenter, J.C. Pressley / *Accident Analysis and Prevention* 56 (2013) 110–117)

2.2.1.2 AGED MOTORIST

Johansson et al. (1996) claimed that there were increasingly more aged motorists. According to Anstey et al. (2005), in comparison with their younger counterparts the aforementioned age group involved in fewer road traffic accidents as they tended to drive shorter accumulative distances each year compared to the others. With regard to driving distance, older road users aged seventy started to involve more in the unfortunate incidents mainly due to natural cognitive weakening, visual impairment and other functions of the bodies as they were older. Kahane (2013) added that their fragile and frail bodies meant that they might be injured badly and might get themselves killed

respectively. Furthermore, Langford et al. (2006) claimed that as people from this age group involved in reduced occasion of steering, their abilities to do so began to deteriorate.

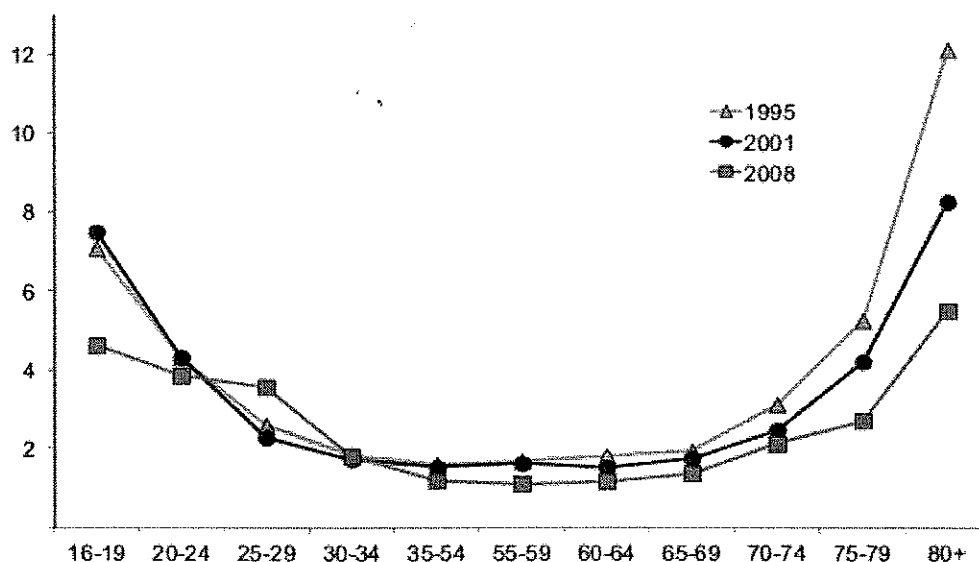


Figure 2.11 The US national fatal passenger vehicle driver crash involvements per 100 million vehicle miles traveled by age group, 1995, 2001, 2008.

(Source: J.B. Cicchino, A.T. McCartt / Accident Analysis and Prevention 72 (2014) 44-54)

According to Mayhew et al. (2006), statistically the involvement of older motorists in road traffic accidents occurred more in intersections, especially those under the control of stop sign rather than those with signal based on the demonstration as stated by Braitman et al. (2007). Oxley et al. (2006) added that traffic accidents on roads among the age group were also due to their wrong gap evaluations among other vehicles and theirs. A study conducted by Stutts et al. (2001) suggested that activities other than steering itself, which diverted young motorists' attentions from steering, were not major factors that led older road users to be involved in road traffic accidents. However, the physical declines related factors were the actual crashing factors involving the aged