

University of Southern Queensland
Faculty of Engineering & Surveying

Motorcycle Safety in Malaysia

A dissertation submitted by

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Abstract

Motorcycle safety is a major issue in Malaysia because nearly 60 % of road accident fatalities are due to motorcycle crashes. Motorcycles are the main mode of transport in Malaysia, constituting about half of the total registered motor vehicles from 1998 to 2003. Vehicle ownership increased by about 40 % over the six-year period, while road accident fatalities dropped from 6.28 per 10,000 vehicles in 1998 to 4.90 per 10,000 vehicles in 2003. Over that period, the death toll of motorcycle riders per 10,000 motor vehicles decreased from 3.73 to 2.77. Among the states of Malaysia, Perlis and Terengganu had the most number of motorcycle accident fatalities per 10,000 motor vehicles. In contrast, Wilayah Persekutuan had less than 1 death per 10,000 motor vehicles, the lowest recorded by any state in Malaysia.

A survey was conducted to investigate helmet wearing among the suburban residents of Kuala Lumpur. The study shows that 71.4 % of female motorcyclists and 70 % of male motorcyclists wore helmets. It also reveals that 89 % of old motorcyclists (25 years old and above) complied with the helmet wearing law, whereas only 48 % of young motorcyclists (below 25 years old) did so. This indicates that young riders are more likely to break the law of helmet wearing compared to older riders. Hence, young riders should be the prime target of any motorcycle safety programme in Malaysia.

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Certification

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I further certify that the work is original and has not been previously submitted for assessment in any other course, except where specifically stated.

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Chapter 1

Introduction

From the beginning of mankind to the present day, the improvement in the mode of transport can be divided into different stages (Ayers 2004, p.g 1.1). These different stages can be classified into human, animal and machine. In ancient times, human's first vehicle was himself or herself. Later, we used domesticated animals as a means of transport to travel from place to place. With the arrival of Industrial Revolution in the 1700s and 1800s, animals were replaced by machines as our means of transport.

Nowadays, transportation plays an importance role in our modern society (Ayers 2004, p.g 1.1). People use various means of transport to go to work, to carry goods, and to travel from one place to another. Our dependency on transportation is underscored by the rapid increase in motor vehicle ownership throughout the world from year to year.

With a buoyant economy, Malaysia is also experiencing a boom in motor vehicle ownership. It is unfortunate that when the number of motor vehicle increases, the occurrence of road accidents also increases. Road accidents are now one of the major causes of death and injuries in Malaysia. The use of motorcycles in Malaysia as a cheap and convenient form of transport is growing rapidly and with it motorcycle related accidents and fatalities. It is important to focus on motorcycle safety since motorcycle fatalities constitute about 60% of all road accident fatalities in Malaysia.

Malaysia is a developing country which is located in South East Asia, bordering Indonesia, Thailand and Singapore. It consists of thirteen states and one federal territory (Fig. 1.1). Eleven of the thirteen states are situated in Peninsula Malaysia and they are Perlis, Pulau Pinang, Kedah, Perak, Selangor, Negeri Sembilan, Melaka, Johor, Pahang, Kelantan and Terengganu. The federal territory called Wilayah Persekutuan, which plays host to the capital of the nation - Kuala Lumpur, is also found on this part of the nation within the state of Selangor. The remaining two



Fig. 1.1: Map of Malaysia

Adapted from a map displayed on the website of the Malaysia Tourism Promotion Board (Ministry Of Tourism) at <http://tourism.gov.my/TRC/mapmsia.htm>

states, Sarawak and Sabah, are located on the island of Borneo, separated from the rest of the nation by the South China Sea. Malaysia has a population of 25.72 million, 33.2% of which are under the age of 15. The population is made up of Malays, Chinese, Indians and other ethnic groups.

The objectives of this study are: firstly, to investigate the background information relating to road crashes, in particular the analyses of crash data, the incidence of motorcycle crashes, the characteristics of crashes and injury types sustained in motorcycle accidents, and the motor vehicle ownership and usage; secondly, to identify possible causes of motorcycle accidents; and finally, to provide recommendations on improving road safety for motorcyclists and pillion riders.

Chapter 2

Literature Review

Motor vehicle ownership is surging all over the world because of the increasing population year by year. Since we live in the 21st century, the standard of lifestyle has increased compared to old times. Humans are wealthier nowadays and motor vehicles are becoming a necessity in a modern day society. Moreover, we can afford to buy motor vehicles because they are becoming cheaper.

In China, the number of vehicles quadrupled between 1990 and 2002 to more than 55 million, while in Thailand the number of vehicles rose from 4.9 million to 17.7 million from 1987 to 1997. In the 30 member countries of the Organisation for Economic Cooperation and Development (OECD), the number of vehicles is projected to increase by 62% between 2003 and 2012 to reach 705 million (Ingham, 2004). Motorcycles make up 95% of vehicles on the road in Viet Nam, 80% in the Lao People's Democratic Republic, 75% in Cambodia, 73% in Indonesia and 51% in Malaysia (Ingham, 2004).

According to the World Report on Road Traffic Injury Prevention (WHO, 2004a), by the World Health Organisation and the World Bank for World Health, around 1.2 million people are killed in road accidents each year which is equivalent to more than 3,000 every day. Between 20 and 50 million are injured annually and more than half of the fatalities are young adults aged between 15 and 44, who are often the breadwinners in a family (Ingham, 2004). Without any urgent action, these figures will rise by nearly two thirds over the next 20 years (Ingham, 2004). Road accidents will then be the third biggest contributor to premature death and injury, after heart disease and depression (Ingham, 2004). The cost of road accidents is equivalent to one percent of gross national product (GNP) in low income countries, which account for 85% of fatalities (Ingham, 2004). In middle and high income countries, the percentage is 1.5% and 2% respectively (Ingham, 2004).

Countries with the safest roads (Ingham, 2004) are Western Europe, Australia, New Zealand, Japan and South Korea where there are 11 to 12 road deaths per 100,000 people. North and South America come in second with 12.1-16.2 deaths per 100,000 people. This is followed by Eastern Europe, East and Southeast Asia, and India with a rate of 16.3-19 per 100,000 people. On the other hand, countries having the most dangerous roads (Ingham, 2004) are Africa, the Middle East, Afghanistan and Pakistan, where the death rate is 19.1 to 28.3 per 100,000 people. Malaysia is within this range with a fatality rate of about 25.1 per 100,000 people in 2003 (Ingham, 2004).

Injuries from road accidents are a major public health problem in the Asia-Pacific region, with some 10 million people severely injured or killed annually on the region's roads, according to the World Health organization (WHO). The Asia-Pacific region accounts for about 60% of global road deaths, despite having only 16% of the world's vehicles. Road deaths jumped by nearly 40% in Asia between 1987 and 1995, compared to developed nations where road fatalities fell by about 10% because of better safety measures (WHO, 2004b). Furthermore, most of the casualties are motorcycle riders – nearly 90% in Cambodia, 70% in Vietnam and 60% in Malaysia (Ingham, 2004).

The WHO estimates that if the current trends continue, road accidents will be the third major cause of disease or injury by 2020, after heart disease and depression, with the numbers of those killed and disabled expected to increase by 60%. Given the magnitude and urgency of this problem, road safety is the theme for WHO's World Health Day on 7 April 2004. The slogan is "Road safety is no accident" (WHO, 2004b). Key preventive measures include the use of seat belts, restrictions on speed and alcohol intake, and enhanced vehicle standards and road design and conditions. In many Asian countries, these essential measures are lacking, although a number of programmes to promote seat belts or traffic regulations are ongoing. Road accidents are a huge economic drain. Research indicates that the direct costs of road crashes in Thailand are as high as 3% of annual GDP. This does not even include costs from the loss of productivity (WHO, 2004b).

Malaysia has been experiencing a rapid growth in population and wealth since the 1970s. As a result, vehicle ownership has been growing at a fast pace. The rapid growth in vehicle population has resulted in a considerably high increase in road traffic accidents in Malaysia. In 1998, a total number of 5,740 road accident fatalities were reported and this figure increased to 6,286 deaths in 2003. This phenomenon was estimated to consume about six billion Malaysian Ringgit (RM) due to the loss of productivity, medical costs, management costs, property damage and others (Radin Umar et al., 1998). To help address this problem, the Malaysian government in 2001 set a new national road safety target of 4 deaths per 10,000 vehicles by the year 2010. This new goal means that there must be a total of 28% reduction in fatality from the 5.6 fatalities per 10,000 vehicles in 2000 to 4 fatalities per 10,000 vehicles in 2010. Of the 28% reduction envisaged over the 10-year period, 22% of the reduction is expected to come from motorcycle safety programs.

The Malaysian government has been undertaking various measures to make public roads safer for motorists. Some of the main actions (Singh, 2000) are: (i) promotion of road safety campaigns via the multi-media to improve public awareness about the importance of road safety; (ii) imposition of deterrent sentences on drivers involved in reckless and dangerous driving; (iii) overhaul of the Drivers Demerit Points System to make it more efficient; (iv) requirement of all new drivers to learn defensive driving skills and to undergo a two-year probationary period before the issuance of a driver's license.

Recent data suggest that deaths and injuries due to motorcycle crashes are becoming a larger element in the public health problem of road safety. Coordinated effort needs to take place at all levels involving federal and state governments, and community in order to reduce the number of motorcycle crashes, fatalities and injuries. Realizing the severity of motorcycle-related road accidents, the Road Safety Research Centre (RSRC) of the Faculty of Engineering of Universiti Putra Malaysia (UPM) was appointed by the Ministry of Transport Malaysia as the consultant to carry out research on motorcycle safety programmes in Malaysia. Motorcycle safety is one of the many fields of research conducted by RSRC, which include road safety modelling and management, motor vehicle safety and pedestrian safety. Over the

years, the core discipline of road safety branches out into pavement engineering research. The centre fulfils its research and consultancy functions through the collaboration of key researches from the Unit of Highway and Traffic Engineering at the Civil Engineering Department and other researchers from disciplines such as mechanical engineering, economics, social science, communication, epidemiology, medicine and agencies concerned with road safety.

The dissemination of motorcycle safety information to the general public is best achieved through aggressive publicity via the mass media. Following up from the initiatives proposed by RSRC, a national motorcycle safety campaign was launched by the Malaysian Prime Minister on September 18, 1997 with the theme 'Ride Safe, Think of Your Loved Ones' before an assembly of 5,000 riders and carried live on television (Singh, 2000). The programmes included a demonstration of safe riding skills, an emphasis on the use of bright-coloured clothing and luminous materials for improved visibility and the proper usage of safety helmets.

Most injuries among motorcycle riders are to the head, so helmets could significantly reduce the severity of head injuries. Studies have revealed that the death of almost half (49.2 %) of the motorcyclists in Malaysia is due to head injuries (Kulanthayan et al., 2000). Therefore, the proper use of safety helmets is one of the best ways to reduce the likelihood of death resulting from head injuries. This is supported by a study undertaken in California, USA, which showed that following the introduction of the helmet use law in 1992, the incidence of motorcycle crash fatalities reduced by 37.5 % compared to the previous year, and the number of injured motorcyclists sustaining head injuries also decreased significantly (Kraus et al., 1994). To study the attitudes of Malaysian motorcyclists towards the proper usage of safety helmets, the RSRC conducted a questionnaire survey and interviews in Kajang, Selangor, and then analyzed the data using the logistic regression method (Kulanthayan et al., 2000). Of the 500 respondents, 54.4 % were found wearing properly secured helmets, 13.6 % wore loosely fastened helmets, 7.8% were found with untied helmets and the remaining 24.2% did not wear a safety helmet. Interestingly, the survey also reveals that older citizens and females are more likely to comply with the safety helmet rule, and the same is also true for those with a higher education level.

The involvement of young riders in most motorcycle accidents is a major cause for concern in Malaysia. This has prompted the RSRC to recommend exposure control counter measures to reduce motorcycle accidents among youths (Norghani et al., 1998). Some of the measures are: (i) lifting the lower age limit for obtaining a legal driver's license from the current sixteen to eighteen; (ii) imposing a riding curfew on 16 and 17 year-olds during certain time of the day; (iii) discouraging 16 and 17 year-olds from riding by making it financially impracticable to do so.

One of the strategies currently being adopted by the Malaysian government to minimize death toll among motorcyclists and pillion riders is the construction of dedicated motorcycle lanes on all new highways (Sittamparam, 2003). Malaysia is the first country in the world to build a dedicated motorcycle lane. Funded by the World Bank in the early seventies, a motorcycle lane was built parallel to the Federal Highway Route 2. It was later extended by the Projek Lebuhraya Utara Selatan (PLUS) in 1992 and reopened in November 1993. The implications of the separate track on motorcycle safety were revealed by a study (Radin et al., 1995), which showed that incidence of motorcycle accidents had been significantly reduced by 39 % nine months after it was reopen to traffic. Among the reasons given for the decrease in motorcycle accidents were the elimination of motorcycle to vehicle conflicts and the reduction of speed differentials with faster vehicles. The study also highlighted the need for a standard guideline for motorcycle track design, which is lacking at the moment. At present, the design parameters for a motorcycle lane (Radin et al., 1995) are based on the design requirements of a bicycle track (Public Works Department, 1986) and those of a standard highway.

Poor visibility on the road could undoubtedly increase the risk of an accident. Motorcycle riders are particularly vulnerable since the vehicle's headlight is the only source of illumination. A study conducted in Auckland, New Zealand, has shown that injuries or death from motorcycle accidents could be reduced by up to one third with the use of reflective or fluorescent clothing, light-coloured helmets and running headlights (Wells et al., 2004). Likewise, the mandatory use of running headlights during daytime in Malaysia, which came into effect in 1992, has been shown to result in a 29 % reduction of conspicuity-related motorcycle accidents in Shah Alam and Seremban (Radin Umar et al., 1996). To increase awareness among motorcycle

riders about the importance of improving their conspicuity, measures such as wearing a reflective vest, donning a helmet with fluorescent strips, and switching on the headlights have been included in a road safety guideline produced by the Road Transport Department of Malaysia (2004).

Chapter 3

How Present Study was Performed

3.1 Decision on Area

When I first started my project, I decided to focus my study on Petaling Jaya, a municipality located in Selangor, one of the states of Malaysia. After spending a few months trying to collect data for motorcycle related accidents specific for that area, I found that it was more difficult to obtain information for a city or municipality than for a state or the whole nation. This prompted my thinking about looking at a bigger area such as the state of Selangor. Then, I came to realize that simply studying a state would not be representative of the motorcycle safety problem in Malaysia because the nation is made up of thirteen states and a federal territory, which are all vastly different in terms of population, land size, and socio-economic development. Furthermore, motorcycle safety problem is not confined to one state but the whole country, and perhaps, even the world. I should not just focus on one state while leaving out the others. After consulting my supervisor, Professor Ron Ayers, I finally changed my project title to ‘Motorcycle Safety in Malaysia’.

3.2 Collection of Statistics

Although we hear or read about motorcycle related issues from the mass media almost daily, it is not an easy task when it comes to obtaining the actual statistics from the relevant departments. At first, I went to numerous places since I had no idea where to begin with. I spent about one month visiting some private engineering firms, hospitals, a local university, and some government departments such as the Road Transport Department and the Public Works Department. Later, when I had a better grasp of the functions of the different agencies or organizations, I narrowed the list of places I would visit down to three: the Bukit Aman Police Headquarters located in the heart of Kuala Lumpur, the Road Transport Department of Malaysia at

Putrajaya, a new federal administrative township located within the state of Selangor, and the Road Safety Research Centre (RSRC) at the Universiti Putra Malaysia, Selangor.

The various figures and tables as well as the information of motorcycle safety issues discussed in this report were obtained from the following sources:

- (i) The map of Malaysia (Fig. 1.1) was obtained from the website of the Malaysia Tourism Promotion Board, Ministry of Tourism at <http://tourism.gov.my/TRC/mapmsia.htm>;
- (ii) The statistics for road accidents and the related casualties in Malaysia from 1998 to 2003, presented as Table 4.2, Table 4.3, Table 4.4, Table 4.5, Table 4.6, Table 4.7, Fig. 4.2, Fig. 4.3 and Fig. 4.4 in Chapter 4 were obtained from the Bukit Aman Police Headquarters;
- (iii) The statistics of registered motor vehicles in Malaysia from 1998 to 31st May 2004, presented as Table 4.1, Fig. 4.1a and Fig. 4.1b in Chapter 4 were provided by the Road Transport Department of Malaysia;
- (iv) The research outcome regarding motorcycle safety in Malaysia mentioned in Chapter 2 was obtained from the RSRC.

A survey was conducted to find out the compliance of safety helmet wearing rule among motorcyclists and pillion riders at Taman Sri Sentosa, Wilayah Persekutuan on 13th October 2004 from 8.30am to 9.30am. The number of motorcyclists and pillion riders with or without helmet according to their age (young – below 25 years old, or old – 25 years old and above) and gender was recorded. Within that time frame, a total of 107 motorcycles were observed.

3.3 Lack of Statistics

During my visit to the Bukit Aman Police Headquarters, I faced some problems in getting the necessary information. The various statistics for road accidents and casualties as well as motorcycle crashes and casualties were available from 1998 to 2003. But the data on the motorcycle accident casualties according to different age groups were only available for two years – 2001 and 2002. The officer-in-charge

told me that this was due to the fact that some of the files have gone missing when they upgraded their computer system. Moreover, when I checked the data closely, there was some inconsistency and probably some errors in the numbers provided. As a result, the numerical data in Table 4.7 (Chapter 4) should be treated with caution.

Chapter 4

Motorcycles and Motorcycle Safety in Malaysia

4.1 Malaysia – Population

The population of Malaysia currently stands at 25.72 million (Department of Statistics Malaysia, 2004). According to the Population and Housing Census 2000 (Department of Statistics Malaysia, 2001), the population had been growing steadily at 2.6 % per annum from 1980 to 2000. In the year 2000, 33.3 % of the population were below the age of 15, whereas only 3.9 % were of the age of 65 and above (Department of Statistics Malaysia, 2001). The distribution of the population was uneven, with about 40 % concentrated in the states of Selangor, Johor and Sabah (Department of Statistics Malaysia, 2001). Urbanization has been progressing at a rapid rate in Malaysia. The states with a high density of urban population were Wilayah Persekutuan, Selangor and Pulau Pinang (Department of Statistics Malaysia, 2001).

4.2 Motorcycles – Registered Number of Motor Vehicles

Vehicle population in Malaysia has been undergoing a rapid growth due to the growing affluence of its citizens. Vehicular traffic in the period 1998-2003 (Table 4.1) registered an increase of 40.2% from 9,141,357 to 12,819,248. Up to 31 May 2004, Malaysia had a total vehicle population of 13,193,454. Out of this figure, 6,336,376 were motorcycles, which pose the greatest challenge to road safety efforts in Malaysia.

From 1998 to 2003 (Fig. 4.1a), motorcycles were the most popular mode of transport in Malaysia, making up about 48-51 % of the total number of registered vehicles. Private registered cars came in second with about 37-43 %, while self-driving rented vehicles were the smallest group sharing about 0.07-0.1 %. During that period, W. Persekutuan, Johor and Selangor had the highest number of registered motor vehicles

Table 4.1: Total number of registered motor vehicles in Malaysia from 1998 to 2004*

State	1998							Total
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	
Perlis	23008	6958	141	154	0	1499	854	32614
Kedah	278659	108514	2202	2420	226	23177	10547	425745
P.Pinang	602017	322598	3582	2358	299	34151	11080	976085
Perak	617381	275219	3605	3820	55	43848	25300	969228
Selangor	537677	505911	4108	4172	237	78464	28292	1158861
Wilayah Persekutuan	652069	938369	10286	18503	7160	132680	97988	1857055
Negeri Sembilan	237783	117992	1906	1378	21	23872	5317	388269
Melaka	190138	97619	1403	1138	36	14309	4142	308785
Johor	717870	442442	6687	9989	211	77064	30697	1284960
Pahang	222333	124680	1670	2393	20	27857	9531	388484
Terengganu	122894	59321	821	967	27	14305	4851	203186
Kelantan	199636	89810	1502	2004	16	19519	6590	319077
Sabah	53797	162432	5488	3702	1387	68344	23979	319129
Sarawak	236921	200987	2242	1592	347	40060	27730	509879
Total	4692183	3452852	45643	54590	10042	599149	286898	9141357

State	1999							Total
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	
Perlis	28155	7732	156	162	0	1551	1077	38833
Kedah	338189	118215	2533	2633	258	26265	13337	501430
P.Pinang	639554	354374	3744	2401	317	35281	11405	1047076
Perak	650864	295010	3675	3830	44	45704	25995	1025122
Selangor	574080	537658	4222	4072	196	80185	28369	1228782
Wilayah Persekutuan	682750	1044657	10523	18496	7171	139551	98258	2001406
Negeri Sembilan	265489	133250	2161	1656	21	27943	6330	436850
Melaka	214483	109931	1663	1373	59	16951	4060	348520
Johor	772211	483522	6753	10111	179	80350	30213	1383339
Pahang	230956	135541	1688	2383	18	28828	9522	408936
Terengganu	135769	66031	863	986	22	15448	5443	224562
Kelantan	205285	96579	1536	1985	12	19835	6596	331828
Sabah	68983	184523	5785	3942	1369	80655	30919	376176
Sarawak	275705	220024	2372	1596	354	44429	32611	577091
Total	5082473	3787047	47674	55626	10020	642976	304135	9929951

State	2000							Total
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	
Perlis	30489	8282	159	159	0	1576	1111	41776
Kedah	371342	128808	2621	2756	276	27285	14204	547292
P.Pinang	673559	392990	3889	2449	352	36844	11981	1122064
Perak	679802	317260	3731	3854	47	46824	26641	1078159
Selangor	613320	574496	4318	3954	178	84172	29838	1310276
Wilayah Persekutuan	710081	1165133	10772	18883	7518	145009	100781	2158177
Negeri Sembilan	275214	144320	2187	1690	18	28488	6354	458271
Melaka	223287	120004	1686	1406	58	17449	4135	368025
Johor	812798	530159	6837	10027	167	82976	31632	1474596
Pahang	243448	146886	1701	2425	14	29806	9833	434113
Terengganu	141034	72446	883	970	17	15652	5482	236484
Kelantan	210775	105104	1574	1966	12	20108	6630	346169
Sabah	75556	199962	5852	4015	1386	82414	32773	401958
Sarawak	295899	240132	2452	1598	390	46681	34292	621444
Total	5356604	4145982	48662	56152	10433	665284	315687	10598804

continue....

State	2001							
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	Total
Perlis	32389	8907	154	163	0	1584	1150	44347
Kedah	402205	143719	2789	2962	268	28900	15169	596012
P.Pinang	707851	435744	3949	2518	380	38588	12757	1201787
Perak	708847	342718	3794	3879	64	47983	27363	1134648
Selangor	642683	613666	4430	3819	190	89498	32122	1386408
Wilayah Persekutuan	744679	1317888	11298	19087	7124	152593	105302	2357971
Negeri Sembilan	285475	156607	2261	1722	9	29249	6456	481779
Melaka	232885	131907	1709	1435	58	17909	4215	390118
Johor	849621	583637	6950	10122	167	85799	33093	1569389
Pahang	252812	160701	1760	2445	10	30387	10038	458153
Terengganu	146652	79571	902	959	16	15917	5532	249549
Kelantan	216496	115021	1604	1962	12	20459	6705	362259
Sabah	75688	202965	5648	3907	1328	82643	33944	406123
Sarawak	311068	264941	2523	1599	360	48159	35352	664002
Total	5609351	4557992	49771	56579	9986	689668	329198	11302545

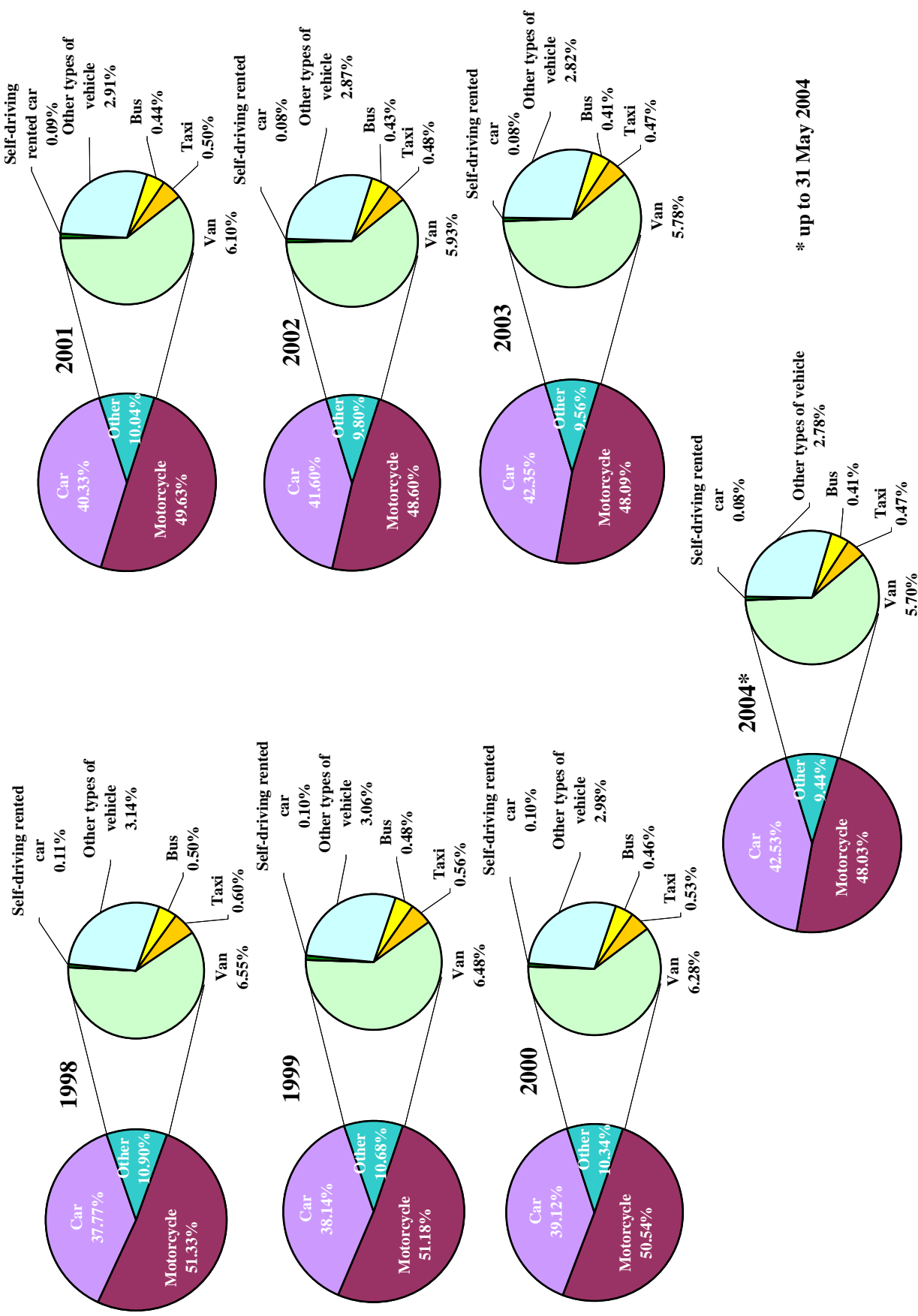
State	2002							
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	Total
Perlis	34218	9565	160	164	1	1602	1196	46906
Kedah	422023	155535	2850	3080	273	29515	15925	629201
P.Pinang	737334	481951	4033	2601	394	40439	13482	1280234
Perak	735381	369306	3923	3908	63	49338	28497	1190416
Selangor	670588	656201	4638	3852	177	95050	34897	1465403
Wilayah Persekutuan	777374	1466161	11628	19940	7230	157747	111472	2551552
Negeri Sembilan	295766	169563	2323	1748	9	30553	6624	506586
Melaka	242693	144215	1748	1439	46	18483	4330	412954
Johor	884595	644816	7176	10308	182	88511	34772	1670360
Pahang	262574	175149	1786	2484	7	30991	10331	483322
Terengganu	153017	86324	915	968	18	16268	5558	263068
Kelantan	222885	126108	1653	1977	12	20887	6762	380284
Sabah	79052	223531	5713	3946	1329	83951	35350	432872
Sarawak	325117	292848	2612	1651	332	49813	36408	708781
Total	5842617	5001273	51158	58066	10073	713148	345604	12021939

State	2003							
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	Total
Perlis	36679	10230	167	173	1	1634	1222	50106
Kedah	444995	165600	2901	3135	256	30101	16376	663364
P.Pinang	776283	525785	4159	2667	383	42738	14144	1366159
Perak	770221	393163	4044	3928	71	51009	29691	1252127
Selangor	705727	698041	4843	4437	153	100864	38304	1552369
Wilayah Persekutuan	821722	1588198	11807	21207	7391	161923	115685	2727933
Negeri Sembilan	310305	181496	2376	1754	16	31882	6807	534636
Melaka	255856	156920	1784	1511	39	19142	4472	439724
Johor	933288	703735	7489	10345	148	91894	36203	1783102
Pahang	276992	187490	1822	2512	14	31821	10680	511331
Terengganu	161989	92093	952	992	14	16634	5648	278322
Kelantan	233656	135635	1698	2004	12	21498	6871	401374
Sabah	90112	266251	6129	4202	1375	87121	37353	492543
Sarawak	347133	324137	2675	1856	337	52201	37819	766158
Total	6164958	5428774	52846	60723	10210	740462	361275	12819248

continue....

State	2004*							
	Motorcycle	Car	Bus	Taxis	Self-driving rented vehicle	Van	Other	Total
Perlis	37935	10511	172	177	1	1636	1262	51694
Kedah	457591	169942	2919	3141	227	30356	16556	680732
P.Pinang	798916	545068	4263	2749	391	44038	14355	1409780
Perak	788135	403713	4084	3951	80	51655	29971	1281589
Selangor	724374	715264	4913	4529	139	103539	39622	1592380
Wilayah Persekutuan	847904	1651110	11998	22134	7575	163740	117387	2821848
Negeri Sembilan	318488	186190	2393	1758	22	32530	6912	548293
Melaka	262209	162478	1797	1542	39	19397	4561	452023
Johor	958712	726588	7645	10383	127	93291	36709	1833455
Pahang	285278	193050	1833	2522	13	32171	10833	525700
Terengganu	166942	94555	961	1012	13	16789	5663	285935
Kelantan	239857	139868	1741	2011	10	21754	6869	412110
Sabah	93023	275530	6192	4232	1383	87993	37993	506346
Sarawak	357012	337854	2717	1891	338	53234	38523	791569
Total	6336376	5611721	53628	62032	10358	752123	367216	13193454

* Up to 31 May 2004



* up to 31 May 2004

Fig. 4.1a: Types of registered motor vehicles in Malaysia from 1998 to 2004*

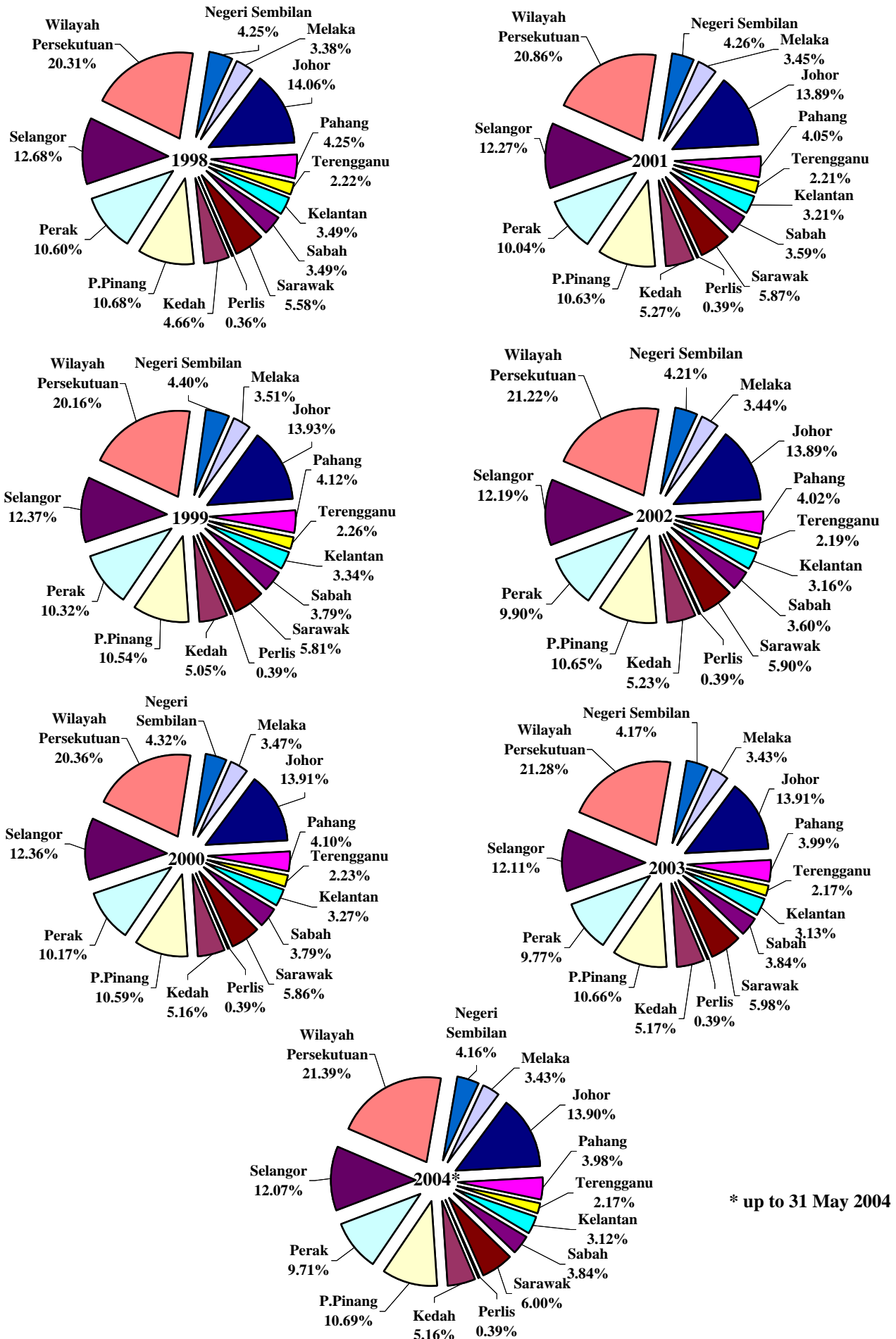
compared to other states in Malaysia (Fig. 4.1b). Together they contributed about 47 % of the total number of registered motor vehicles in Malaysia. In contrast, Perlis had the lowest number of registered motor vehicles, with a share of only 0.4 % of the total registered motor vehicles in Malaysia.

4.3 Motorcycle Safety – Crash Statistics

4.3.1 Incidence of Road Accidents and the Related Casualties

As shown in Table 4.2, the total number of road accidents in Malaysia increased slightly from 1998 to 2003. In 1998, Malaysia had a total of 211,034 accident cases but in 2003 that number jumped to 298,653 signifying an increase of 41.52 % over the six-year period. Out of the 13 states and one federal territory, Selangor had the highest occurrence of road accidents, with 52,063 reported in 1998, and 80,074 in 2003. In contrast, the lowest number of road accidents was recorded in Perlis, which had 828 cases in 1998 and then increased to 1,101 in 2003. In terms of road accident numbers per 10,000 registered motor vehicles over the past six years (Table 4.3; Fig. 4.2), there seemed to be little change for the whole of Malaysia but significant differences between the states. Among the states of Malaysia, Selangor was again the most outstanding with 440.85 to 515.82 accidents per 10,000 motor vehicles for that period. In contrast, Sarawak had the lowest accidents per 10,000 motor vehicles from 1998 to 2001. In 2002 and 2003, Wilayah Persekutuan replaced Sarawak by having the lowest accidents per 10,000 motor vehicles. Between 1998 and 2003, Kelantan experienced the biggest reduction, which was about 29 %, in accident numbers per 10,000 vehicles, whereas Terengganu had the largest increase, registering an almost 50 % increase in accidents per 10,000 vehicles.

Most of the road accidents in Malaysia resulted in vehicle damage without causing physical injury to drivers or passengers, and only a small percentage of accidents were fatal (Table 4.4; Fig. 4.3). The death toll per 10,000 motor vehicles in Malaysia decreased from 6.28 in 1998 to 4.90 in 2003. The numbers for both seriously injured and lightly injured per 10,000 motor vehicles also followed the same trend over the six-year period. The number of seriously injured per 10,000 motor vehicles



* up to 31 May 2004

Fig. 4.1b: Motor vehicle ownership in thirteen states and one federal territory of Malaysia from 1998 to 2004*

Table 4.2: Road accidents and casualties in thirteen states and one federal territory of Malaysia from 1998 to 2003

State	1998											1999											2000										
	Road accidents					Casualties			Road accidents					Casualties			Road accidents					Casualties											
	Total	Fatal	Serious	Minor	Vehicle damage only	Dead	Seriously injured	Lightly injured	Total	Fatal	Serious	Minor	Vehicle damage only	Dead	Seriously injured	Lightly injured	Total	Fatal	Serious	Minor	Vehicle damage only	Dead	Seriously injured	Lightly injured									
Perlis	828	43	162	282	341	49	189	393	900	46	175	333	346	48	202	468	921	38	166	278	439	43	187	331									
Kedah	10386	377	953	3923	5133	411	1104	4711	10837	413	867	4113	5444	453	1017	4916	11504	477	778	3957	6292	509	946	4756									
Pulau Pinang	18233	374	383	4250	13226	395	446	4608	17914	339	365	3714	13496	363	435	4871	22326	349	459	4217	17301	367	510	5213									
Perak	19281	613	1672	4705	12291	694	2105	5373	21055	646	1402	4971	14036	709	1790	5621	23351	655	1408	4447	16841	714	1715	5028									
Selangor	52063	875	963	5460	44765	959	1035	5763	54171	905	810	4441	48015	977	914	4759	62386	905	692	3497	57292	970	778	3809									
Wilayah Persekutuan	33585	260	878	2750	29697	277	902	2797	34804	269	394	1523	32618	284	418	1526	37281	265	134	1155	35727	274	146	1158									
Negeri Sembilan	10068	254	584	1996	7234	275	732	2280	11141	296	493	2022	8330	325	640	2243	12087	305	561	1635	9586	340	696	1895									
Melaka	6984	197	561	1867	4359	206	678	2223	7111	166	294	1996	4655	181	343	2333	8195	175	256	1845	5919	188	292	2294									
Johor	26899	886	1581	3491	20941	996	1896	4100	28606	881	1139	2787	23799	1006	1378	3278	32459	927	1171	2576	27785	1037	1396	3272									
Pahang	6870	339	544	857	5130	385	707	1128	7608	330	520	1037	5721	391	682	1285	8788	345	510	959	6974	427	693	1170									
Kelantan	4896	224	745	751	3176	246	858	1055	5326	204	808	813	3501	228	923	1089	5984	247	753	885	4099	278	904	1226									
Terengganu	5081	270	560	1027	3224	310	682	1250	5962	245	668	1637	3412	291	819	1932	5865	242	578	1517	3528	291	727	1796									
Sabah	8246	266	188	612	7180	300	279	836	9143	267	178	706	7992	302	264	922	9615	280	238	563	8534	325	347	835									
Sarawak	7614	212	355	1100	5947	237	455	1379	8588	212	423	1148	6805	236	541	1534	9667	230	363	1247	7827	272	453	1592									
Total	211034	5190	10129	33071	162644	5740	12068	37896	223166	5219	8536	31241	178170	5794	10366	36777	250429	5440	8067	28778	208144	6035	9790	34375									

State	2001											2002											2003										
	Road accidents					Casualties			Road accidents					Casualties			Road accidents					Casualties											
	Total	Fatal	Serious	Minor	Vehicle damage only	Dead	Seriously injured	Lightly injured	Total	Fatal	Serious	Minor	Vehicle damage only	Dead	Seriously injured	Lightly injured	Total	Fatal	Serious	Minor	Vehicle damage only	Dead	Seriously injured	Lightly injured									
Perlis	997	44	166	300	487	47	168	304	992	46	178	258	510	53	178	258	1101	52	206	286	557	54	206	286									
Kedah	12022	431	677	3938	6976	473	832	4708	12423	456	883	3658	7426	495	1042	4434	12456	493	688	3568	7707	534	902	4385									
Pulau Pinang	25862	326	246	5103	20187	346	312	5578	26419	351	112	4878	21078	363	157	5160	27817	361	190	4642	22624	389	251	4989									
Perak	23698	628	1129	4900	17041	725	1445	5796	25245	642	1024	4838	18741	711	1300	5706	25948	674	1079	4520	19675	739	1402	5295									
Selangor	67009	900	644	4371	61094	967	752	4790	73604	886	768	4397	67553	955	917	4817	80074	995	1005	4473	73601	1083	1200	4997									
Wilayah Persekutuan	38087	223	80	853	36931	234	84	853	39397	245	125	441	38586	248	125	459	41492	260	92	409	40731	273	94	409									
Negeri Sembilan	12737	262	465	1686	10324	284	596	1993	13410	303	394	1670	11043	326	533	1976	13870	306	453	1880	11231	340	571	2313									
Melaka	8899	206	222	1935	6536	223	286	2368	9462	202	161	2150	6949	222	207	2378	10122	216	173	2180	7553	228	225	2483									
Johor	33398	860	1038	2666	28834	960	1255	3182	34275	894	824	3151	29406	988	1013	3581	36445	899	894	3346	31306	983	1045	3710									
Pahang	10053	340	465	906	8342	414	632	1148	10722	380	393	1077	8872	457	618	1464	12303	343	379	1473	10108	438	554	1895									
Kelantan	5814	246	722	1053	3793	271	872	1406	6166	279	830	1082	3975	302	983	1397	6882	275	830	1451	4326	314	997	2405									
Terengganu	5812	254	488	1354	3716	287	652	1568	5851	230	497	1254	3870	256	650	1505	6589	261	649	1391	4288	311	855	1804									
Sabah	10073	261	336	619	8857	328	462	913	10244	225	241	513	9265	252	340	811	11071	261	288	619	9903	310	426	1021									
Sarawak	10714	249	264	1000	9201	295	336	1366	11501	239	266	892	10104	263	362	1290	12483	238	237	1119	10889	290	312	1423									
Total	265175	5230	6942	30684	222319	5854	8684	35973	279711	5378	6696	30259	237378	5891	8425	35236	298653	5634	7163	31357	254499	6286	9040	37415									

Table 4.3: Number of road accidents per 10,000 registered motor vehicles in Malaysia from 1998 to 2003

State	1998			1999			2000		
	Number of registered motor vehicles	Number of road accidents	Accident frequency per 10,000 motor vehicles	Number of registered motor vehicles	Number of road accidents	Accident frequency per 10,000 motor vehicles	Number of registered motor vehicles	Number of road accidents	Accident frequency per 10,000 motor vehicles
Perlis	32614	828	253.88	38833	900	231.76	41776	921	220.46
Kedah	425745	10386	243.95	501430	10837	216.12	547292	11504	210.20
Pulau Pinang	976085	18233	186.80	1047076	17914	171.09	1122064	22326	198.97
Perak	969228	19281	198.93	1025122	21055	205.39	1078159	23351	216.58
Selangor	1158861	52063	449.26	1228782	54171	440.85	1310276	62386	476.13
Wilayah Persekutuan	1857055	33585	180.85	2001406	34804	173.90	2158177	37281	172.74
Negeri Sembilan	388269	10068	259.30	436850	11141	255.03	458271	12087	263.75
Melaka	308785	6984	226.18	348520	7111	204.03	368025	8195	222.68
Johor	1284960	26899	209.34	1383339	28606	206.79	1474596	32459	220.12
Pahang	388484	6870	176.84	408936	7608	186.04	434113	8788	202.44
Kelantan	203186	4896	240.96	331828	5326	160.50	346169	5984	172.86
Terengganu	319077	5081	159.24	224562	5962	265.49	236484	5865	248.01
Sabah	319129	8246	258.39	376176	9143	243.05	401958	9615	239.20
Sarawak	509879	7614	149.33	577091	8588	148.82	621444	9667	155.56
Total	9141357	211034	230.86	9929951	223166	224.74	10598804	250429	236.28

State	2001			2002			2003		
	Number of registered motor vehicles	Number of road accidents	Accident frequency per 10,000 motor vehicles	Number of registered motor vehicles	Number of road accidents	Accident frequency per 10,000 motor vehicles	Number of registered motor vehicles	Number of road accidents	Accident frequency per 10,000 motor vehicles
Perlis	44347	997	224.82	46906	992	211.49	50106	1101	219.73
Kedah	596012	12022	201.71	629201	12423	197.44	663364	12456	187.77
Pulau Pinang	1201787	25862	215.20	1280234	26419	206.36	1366159	27817	203.61
Perak	1134648	23698	208.86	1190416	25245	212.07	1252127	25948	207.23
Selangor	1386408	67009	483.33	1465403	73604	502.28	1552369	80074	515.82
Wilayah Persekutuan	2357971	38087	161.52	2551552	39397	154.40	2727933	41492	152.10
Negeri Sembilan	481779	12737	264.37	506586	13410	264.71	534636	13870	259.43
Melaka	390118	8899	228.11	412954	9462	229.13	439724	10122	230.19
Johor	1569389	33398	212.81	1670360	34275	205.20	1783102	36445	204.39
Pahang	458153	10053	219.42	483322	10722	221.84	511331	12303	240.61
Kelantan	362259	5814	160.49	380284	6166	162.14	401374	6882	171.46
Terengganu	249549	5812	232.90	263068	5851	222.41	278322	6589	236.74
Sabah	406123	10073	248.03	432872	10244	236.65	492543	11071	224.77
Sarawak	664002	10714	161.35	708781	11501	162.26	766158	12483	162.93
Total	11302545	265175	234.62	12021939	279711	232.67	12819248	298653	232.97

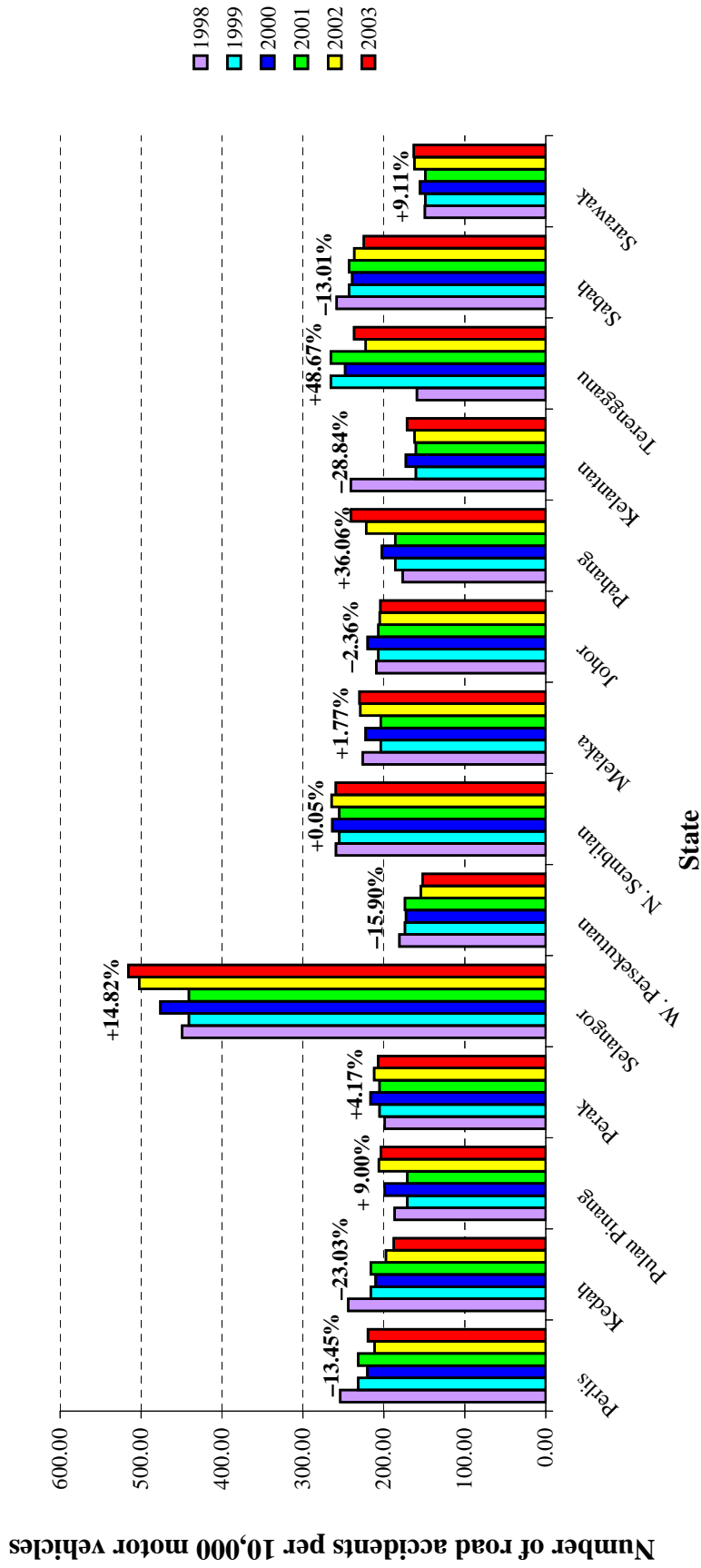


Fig. 4.2: Number of road accidents per 10,000 registered motor vehicles in Malaysia from 1998 to 2003
 The percentage above each stack of bars represents the change in accident rates between 1998 and 2003 for that particular state. W. Persekutuan = Wilayah Persekutuan (Federal Territory); N. Sembilan = Negeri Sembilan.

Table 4.4: Road accident casualties per 10,000 motor vehicles in Malaysia from 1998 to 2003

State	1998			1999			2000					
	Number of registered motor vehicles	Casualties per 10,000 vehicles			Number of registered motor vehicles	Casualties per 10,000 vehicles			Number of registered motor vehicles	Casualties per 10,000 vehicles		
		Dead	Seriously injured	Lightly injured		Dead	Seriously injured	Lightly injured		Dead	Seriously injured	Lightly injured
Perlis	32614	15.02	57.95	120.5	38833	12.36	52.02	120.52	41776	10.29	44.76	79.23
Kedah	425745	9.65	25.93	110.65	501430	9.03	20.28	98.04	547292	9.3	17.29	86.9
Pulau Pinang	976085	4.05	4.57	47.21	1047076	3.47	4.15	46.52	1122064	3.27	4.55	46.46
Perak	969228	7.16	21.72	55.44	1025122	6.92	17.46	54.83	1078159	6.62	15.91	46.64
Selangor	1158861	8.28	8.93	49.73	1228782	7.95	7.44	38.73	1310276	7.4	5.94	29.07
Wilayah Persekutuan	1857055	1.49	4.86	15.06	2001406	1.42	2.09	7.62	2158177	1.27	0.68	5.37
Negeri Sembilan	388269	7.08	18.85	58.72	436850	7.44	14.65	51.34	458271	7.42	15.19	41.35
Melaka	308785	6.67	21.96	71.99	348520	5.19	9.84	66.94	368025	5.11	7.93	62.33
Johor	1284960	7.75	14.76	31.91	1383339	7.27	9.96	23.7	1474596	7.03	9.47	22.19
Pahang	388484	9.91	18.2	29.04	408936	9.56	16.68	31.42	434113	9.84	15.96	26.95
Kelantan	203186	12.11	42.23	51.92	331828	6.87	27.82	32.82	346169	8.03	26.11	35.42
Terengganu	319077	9.72	21.37	39.18	224562	12.96	36.47	86.03	236484	12.31	30.74	75.95
Sabah	319129	9.4	8.74	26.2	376176	8.03	7.02	24.51	401958	8.09	8.63	20.77
Sarawak	509879	4.65	8.92	27.05	577091	4.09	9.37	26.58	621444	4.38	7.29	25.62
Total	9141357	6.28	13.2	41.46	9929951	5.83	10.44	37.04	10598804	5.69	9.24	32.43

State	2001			2002			2003					
	Number of registered motor vehicles	Casualties per 10,000 vehicles			Number of registered motor vehicles	Casualties per 10,000 vehicles			Number of registered motor vehicles	Casualties per 10,000 vehicles		
		Dead	Seriously injured	Lightly injured		Dead	Seriously injured	Lightly injured		Dead	Seriously injured	Lightly injured
Perlis	44347	10.6	37.88	68.55	46906	11.3	37.95	55	50106	10.78	41.11	57.08
Kedah	596012	7.94	13.96	78.99	629201	7.87	16.56	70.47	663364	8.05	13.6	66.1
Pulau Pinang	1201787	2.88	2.6	46.41	1280234	2.84	1.23	40.31	1366159	2.85	1.84	36.52
Perak	1134648	6.39	12.74	51.08	1190416	5.97	10.92	47.93	1252127	5.9	11.2	42.29
Selangor	1386408	6.97	5.42	34.55	1465403	6.52	6.26	32.87	1552369	6.98	7.73	32.19
Wilayah Persekutuan	2357971	0.99	0.36	3.62	2551552	0.97	0.49	1.8	2727933	1	0.34	1.5
Negeri Sembilan	481779	5.89	12.37	41.37	506586	6.44	10.52	39.01	534636	6.36	10.68	43.26
Melaka	390118	5.72	7.33	60.7	412954	5.38	5.01	57.59	439724	5.19	5.12	56.47
Johor	1569389	6.12	8	20.28	1670360	5.91	6.06	21.44	1783102	5.51	5.86	20.81
Pahang	458153	9.04	13.79	25.06	483322	9.46	12.79	30.29	511331	8.57	10.83	37.06
Kelantan	362259	7.48	24.07	38.81	380284	7.94	25.85	36.74	401374	7.82	24.84	59.92
Terengganu	249549	11.5	26.13	62.83	263068	9.73	24.71	57.21	278322	11.17	30.72	64.82
Sabah	406123	8.08	11.38	22.48	432872	5.82	7.85	18.74	492543	6.29	8.65	20.73
Sarawak	664002	4.44	5.06	20.57	708781	3.71	5.11	18.2	766158	3.79	4.07	18.57
Total	11302545	5.18	7.68	31.83	12021939	4.9	7.01	29.31	12819248	4.9	7.05	29.19

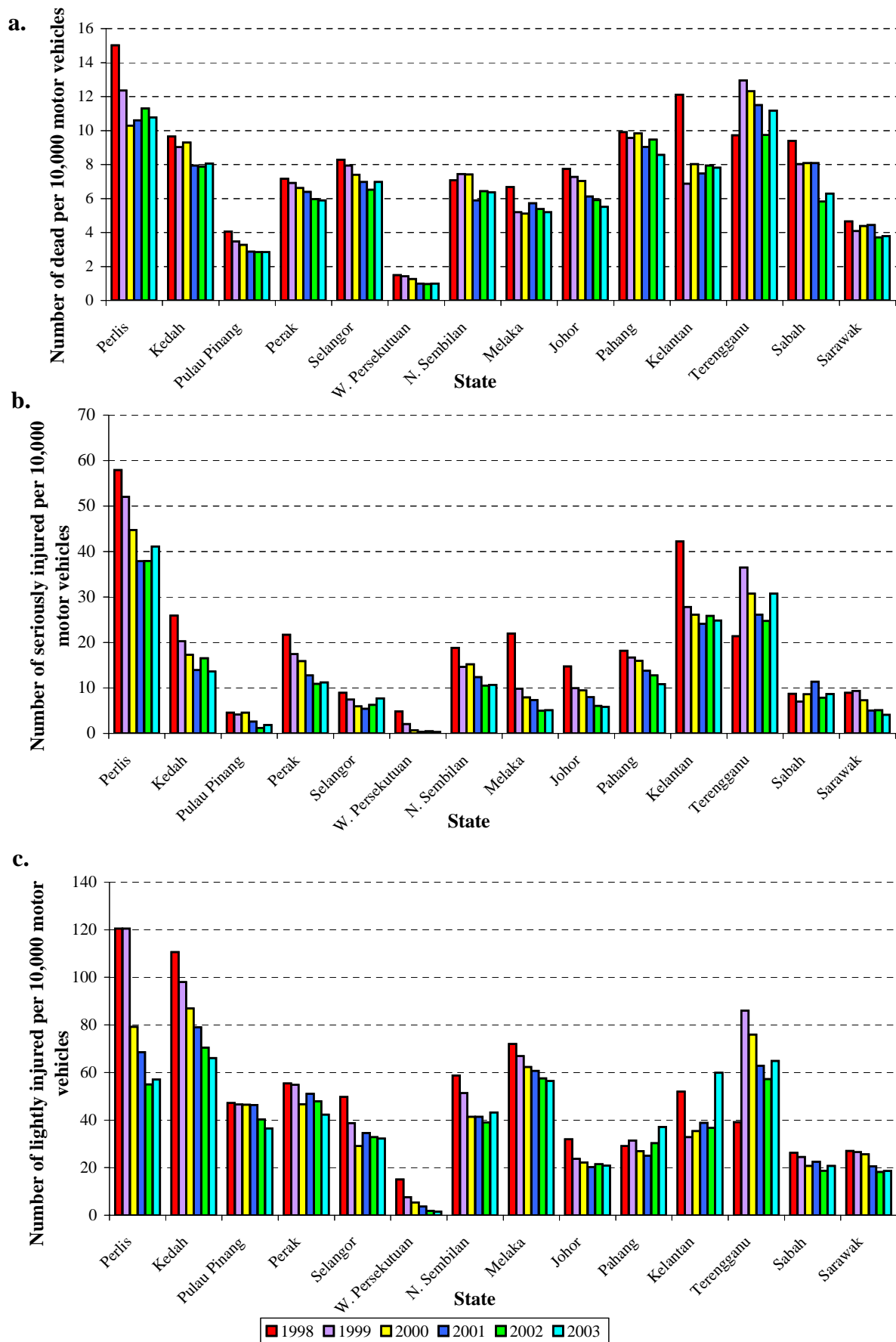


Fig. 4.3: Number of road accident casualties per 10,000 motor vehicles in Malaysia from 1998 to 2003

Number of casualties per 10,000 motor vehicles in the 13 states and one federal territory of Malaysia according to the type of injuries sustained in road accidents: dead (a), seriously injured (b) and lightly injured (c). W. Persekutuan = Wilayah Persekutuan; N. Sembilan = Negeri Sembilan

decreased from 13.20 in 1998 to 7.05 in 2003, while that of lightly injured dropped from 41.46 in 1998 to 29.19 in 2003.

The casualty rates among the states of Malaysia were vastly different during the past six years (Table 4.4; Fig. 4.3). In 1998, Perlis and Kelantan had the highest number of fatalities per 10,000 motor vehicles with 15.02 and 12.11 respectively. However, starting from 1999 to 2003, Terengganu replaced Kelantan to join Perlis as the states having the highest death toll per 10,000 motor vehicles. In the past six years, Terengganu had between 9.72 and 12.96 dead per 10,000 motor vehicles, while Perlis consistently had more than 10 dead per 10,000 motor vehicles. In contrast, Wilayah Persekutuan had the lowest number of dead per 10,000 motor vehicles, recording between 0.97 and 1.49.

From 1998 to 2003 (Table 4.4; Fig. 4.3), Perlis topped the list of seriously injured with between 37.88 and 57.95 cases per 10,000 motor vehicles. In contrast, Wilayah Persekutuan had the lowest rate, registering between 0.34 and 4.86. In the lightly injured category, Perlis again came out top with between 79.23 and 120.52 cases per 10,000 motor vehicles from 1998 to 2000. However, in the following three years, Kedah replaced Perlis to become the state having the highest number of casualties with light injuries per 10,000 motor vehicles, recording between 66.1 and 78.99. With the number of lightly injured per 10,000 motor vehicles ranging from 1.5 to 15.06, Wilayah Persekutuan once again had the distinction of having the lowest occurrence of light injuries compared to other states.

4.3.2 Casualties among Motorcyclists and Pillion Riders

As presented in Table 4.5, the total number of casualties for motorcyclists and pillion riders in Malaysia decreased from 38,448 in 1998 to 34,248 in 2003. During that time, the death toll of motorcyclists increased slightly from 2,981 to 3,166. On the other hand, the number of deaths among pillion riders decreased from 428 in 1998 to 382 in 2003. It could be concluded the likelihood of death among motorcyclists was about 6.57 to 8.28 times that of the pillion riders.

Table 4.5: Casualties of motorcycle crashes in Malaysia from 1998 to 2003

State	1998						1999						2000								
	Motorcyclist			Pillion rider			Motorcyclist			Pillion rider			Motorcyclist			Pillion rider					
	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Total	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Total	Dead	Seriously injured	Lightly injured	Total			
Perlis	28	121	261	4	25	35	474	32	139	318	3	18	34	544	22	137	226	5	17	14	421
Kedah	248	716	3198	31	117	361	4671	260	668	3409	45	113	424	4919	324	604	3235	42	101	407	4713
Pulau Pinang	250	269	3560	33	58	362	4532	233	292	3828	23	43	242	4661	230	338	4324	28	42	200	5162
Perak	364	1272	3601	57	199	326	5819	369	1056	3777	50	202	340	5794	402	1013	3249	41	190	323	5218
Selangor	531	625	3858	76	59	295	5444	565	538	3015	61	69	205	4453	547	426	2287	59	66	179	3564
Wilayah Persekutuan	150	604	2116	10	57	64	3001	147	214	1180	24	20	23	1608	150	77	957	11	7	8	1210
Negeri Sembilan	161	431	1420	16	60	112	2200	172	370	1368	28	65	165	2168	186	384	1084	19	82	137	1892
Melaka	132	424	1507	12	75	153	2303	100	209	1522	18	41	211	2101	113	152	1428	16	37	190	1936
Johor	502	1108	2463	81	168	259	4581	527	798	1903	95	128	195	3646	543	773	1792	76	124	187	3495
Pahang	183	343	488	34	81	114	1243	168	320	575	20	68	123	1274	167	296	515	27	79	119	1203
Kelantan	117	435	491	17	90	107	1257	85	444	455	22	104	107	1217	109	492	610	20	73	128	1432
Terengganu	154	347	743	28	67	74	1413	147	444	1146	31	109	167	2044	148	368	1001	28	72	155	1772
Sabah	52	54	185	7	14	20	332	56	46	221	7	13	42	385	54	77	172	8	19	28	358
Sarawak	109	229	686	22	58	74	1178	99	266	757	23	50	91	1286	123	232	742	21	44	113	1275
Total	2981	6978	24577	428	1128	2356	38448	2960	5804	23474	450	1043	2369	36100	3118	5369	21622	401	953	2188	33651
2001																					
State	Motorcyclist			Pillion rider			Total	Motorcyclist			Pillion rider			Total	Motorcyclist			Pillion rider			Total
	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured		Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured		Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	
	30	119	211	5	10	14		389	32	132	186	5	10		8	373	32	165	210	2	
Kedah	296	486	3179	38	117	400	4516	300	671	2995	46	128	324	4464	311	556	2832	47	122	368	4236
Pulau Pinang	223	217	4861	24	35	155	5515	236	89	4219	25	12	131	4712	247	139	3918	20	21	166	4511
Perak	388	799	3628	45	162	343	5365	378	745	3553	45	131	388	5240	359	769	3256	50	135	348	4917
Selangor	539	429	2878	64	50	238	4198	524	464	2881	50	84	394	4397	598	691	3060	49	110	270	4778
Wilayah Persekutuan	115	46	682	16	2	2	863	137	62	322	12	9	5	547	140	64	341	12	3	3	563
Negeri Sembilan	171	323	1136	17	55	143	1845	181	295	1115	16	54	132	1793	178	309	1202	18	38	180	1925
Melaka	126	135	1602	20	38	169	2090	120	86	1525	17	27	258	2033	141	107	1731	11	22	179	2191
Johor	482	676	1760	54	107	166	3245	529	591	2055	59	70	149	3453	494	567	2116	59	90	153	3479
Pahang	159	291	472	25	71	100	1118	176	222	626	31	44	121	1220	189	244	855	33	51	162	1534
Kelantan	124	498	730	31	77	108	1568	135	554	742	30	116	112	1689	140	552	1641	24	101	117	2575
Terengganu	137	321	893	30	51	111	1543	129	367	830	25	55	109	1515	166	449	934	25	65	138	1777
Sabah	61	85	162	8	16	24	356	49	70	155	11	16	36	337	55	68	159	9	16	26	333
Sarawak	121	153	600	22	27	93	1016	108	144	471	23	52	80	878	116	156	575	23	36	98	1004
Total	2972	4578	22794	399	818	2066	33627	3034	4492	21675	395	808	2247	32651	3166	4836	22830	382	820	2214	34248

Between 1998 and 2003, the combined death toll of motorcyclists and pillion riders per 10,000 motor vehicles in Malaysia decreased from 3.73 to 2.77 (Table 4.6; Fig. 4.4). Among the states of Malaysia, Perlis recorded the highest number of fatalities per 10,000 motor vehicles with between 7.89 and 9.81 in four of the past six years. In 2000 and 2003, Terengganu overtook Perlis as the state having the highest number of fatalities per 10,000 motor vehicles. In contrast, the lowest number of dead occurred in Wilayah Persekutuan with less than 1 death per 10,000 motor vehicles for the past six years.

From 1998 to 2003 (Table 4.6; Fig. 4.4), Perlis was the state having the highest number of seriously injured per 10,000 motor vehicles among motorcyclists and pillion riders, recording between 29.09 and 44.77. In comparison, Sabah topped the list for having the lowest occurrence of serious injuries per 10,000 motor vehicles in 1998 with 2.13. However, in the following five years, Wilayah Persekutuan took over the top spot by having 0.2 to 1.17 incidents of serious injuries per 10,000 motor vehicles, the lowest recorded by any state in Malaysia.

In the light injuries category (Table 4.6; Fig. 4.4), Perlis again came out top of the list for having the highest recorded number of lightly injured motorcyclists and pillion riders per 10,000 motor vehicles in 1998 and 1999. However, from 2000 to 2003, Kedah substituted Perlis as the state with the most number of lightly injured per 10,000 motor vehicles. In contrast, Wilayah Persekutuan had the lowest incidence of light injuries per 10,000 motor vehicles in five out of the six years. The only year when Wilayah Persekutuan was relegated to second place was 1998 when Sabah took the top spot with 6.42 lightly injured per 10,000 motor vehicles.

4.3.3 Casualties among Different Age Groups

In 2001 and 2002 (Table 4.7), people between 16 and 20 years of age were most susceptible to fatal and serious motorcycle accidents, whereas those who were least likely to be involved in such accidents were aged between 0 and 5. The highest number of deaths among motorcyclists and pillion riders came from the age group of 16-20. Compared to the previous year, the death toll of motorcyclists dropped slightly in 2002, while that of pillion riders remained pretty much the same. The

Table 4.6: Number of casualties among motorcyclists and pillion riders per 10,000 motor vehicles in Malaysia from 1998 to 2003

State	1998						1999						2000							
	Number of registered motor vehicles		Casualties per 10,000 vehicles		Number of registered motor vehicles		Casualties per 10,000 vehicles		Number of registered motor vehicles		Casualties per 10,000 vehicles		Number of registered motor vehicles		Casualties per 10,000 vehicles					
	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured		
Perlis	32614	9.81	44.77	90.76	38833	9.01	40.43	90.64	41776	6.46	36.86	57.45	44347	7.89	29.09	50.74	46906	7.89	30.27	41.36
Kedah	425745	6.55	19.57	83.59	501430	6.08	15.58	76.44	547292	6.69	12.88	66.55	596012	5.60	10.12	60.05	629201	5.50	12.7	52.75
Pulau Pinang	976085	2.90	3.35	40.18	1047076	2.44	3.2	38.87	1122064	2.30	3.39	40.32	1201787	2.06	2.1	41.74	1280234	2.04	0.79	33.98
Perak	969228	4.34	15.18	40.52	1025122	4.09	12.27	40.16	1078159	4.11	11.16	33.13	1134648	3.82	8.47	35	1190416	3.55	7.36	33.11
Selangor	1158861	5.24	5.90	35.84	1228782	5.09	4.94	26.2	1310276	4.62	3.75	18.82	1386408	4.35	3.45	22.48	1465403	3.92	3.74	22.35
Wilayah Persekutuan	1857055	0.86	3.56	11.74	2001406	0.85	1.17	6.01	2158177	0.75	0.39	4.47	2357971	0.56	0.2	2.9	2551552	0.58	0.28	1.28
Negeri Sembilan	388269	4.56	12.65	39.46	436850	4.58	9.96	35.09	458271	4.47	10.17	26.64	481779	3.90	7.85	26.55	506586	3.89	6.89	24.62
Melaka	308785	4.66	16.16	53.76	348520	3.39	7.17	49.72	368025	3.51	5.14	43.96	390118	3.74	4.43	45.4	412954	3.32	2.74	43.18
Johor	1284960	4.54	9.93	21.18	1383339	4.50	6.69	15.17	1474596	4.20	6.08	13.42	1569389	3.42	4.99	12.27	1670360	3.52	3.96	13.19
Pahang	388484	5.59	10.91	15.50	408936	4.60	9.49	17.07	434113	4.47	8.64	14.6	458153	4.02	7.9	12.48	483322	4.28	5.5	15.46
Kelantan	203186	4.20	25.84	29.43	331828	3.22	16.51	16.94	346169	3.73	16.32	21.32	362259	4.28	15.87	23.13	380284	4.34	17.62	22.46
Terengganu	319077	8.96	12.97	25.61	224562	8.33	24.63	58.47	236484	7.44	18.61	48.88	249549	6.69	14.91	40.23	263068	5.85	16.04	35.69
Sabah	319129	1.85	2.13	6.42	376176	1.67	1.57	6.99	401958	1.54	2.39	4.98	406123	1.70	2.49	4.58	432872	1.39	1.99	4.41
Sarawak	509879	2.57	5.63	14.91	577091	2.11	5.48	14.69	621444	2.32	4.44	13.76	664002	2.15	2.71	10.44	708781	1.85	2.77	7.77
Total	9141357	3.73	8.87	29.46	9929951	3.44	6.9	26.03	10598804	3.32	5.96	22.46	11302545	2.98	4.77	22	12021939	2.85	4.41	19.9
2001																				
State	Number of registered motor vehicles		Casualties per 10,000 vehicles		Number of registered motor vehicles		Casualties per 10,000 vehicles		Number of registered motor vehicles		Casualties per 10,000 vehicles		Number of registered motor vehicles		Casualties per 10,000 vehicles					
	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured	Dead	Seriously injured	Lightly injured		
Perlis	44347	7.89	29.09	50.74	46906	7.89	30.27	41.36	50106	6.79	34.93	43.11	44347	7.89	29.09	50.74	46906	7.89	30.27	41.36
Kedah	596012	5.60	10.12	60.05	629201	5.50	12.7	52.75	663364	5.40	10.22	48.24	596012	5.60	10.12	60.05	629201	5.50	12.7	52.75
Pulau Pinang	1201787	2.06	2.1	41.74	1280234	2.04	0.79	33.98	1366159	1.95	1.17	29.89	1201787	2.06	2.1	41.74	1280234	2.04	0.79	33.98
Perak	1134648	3.82	8.47	35	1190416	3.55	7.36	33.11	1252127	3.27	7.22	28.78	1134648	3.82	8.47	35	1190416	3.55	7.36	33.11
Selangor	1386408	4.35	3.45	22.48	1465403	3.92	3.74	22.35	1552369	4.17	5.16	21.45	1386408	4.35	3.45	22.48	1465403	3.92	3.74	22.35
Wilayah Persekutuan	2357971	0.56	0.2	2.9	2551552	0.58	0.28	1.28	2727933	0.56	0.25	1.26	2357971	0.56	0.2	2.9	2551552	0.58	0.28	1.28
Negeri Sembilan	481779	3.90	7.85	26.55	506586	3.89	6.89	24.62	534636	3.67	6.49	25.85	481779	3.90	7.85	26.55	506586	3.89	6.89	24.62
Melaka	390118	3.74	4.43	45.4	412954	3.32	2.74	43.18	439724	3.46	2.93	43.44	390118	3.74	4.43	45.4	412954	3.32	2.74	43.18
Johor	1569389	3.42	4.99	12.27	1670360	3.52	3.96	13.19	1783102	3.10	3.68	12.73	1569389	3.42	4.99	12.27	1670360	3.52	3.96	13.19
Pahang	458153	4.02	7.9	12.48	483322	4.28	5.5	15.46	511331	4.34	5.77	19.89	458153	4.02	7.9	12.48	483322	4.28	5.5	15.46
Kelantan	362259	4.28	15.87	23.13	380284	4.34	17.62	22.46	401374	4.09	16.27	43.8	362259	4.28	15.87	23.13	380284	4.34	17.62	22.46
Terengganu	249549	6.69	14.91	40.23	263068	5.85	16.04	35.69	278322	6.86	18.47	38.52	249549	6.69	14.91	40.23	263068	5.85	16.04	35.69
Sabah	406123	1.70	2.49	4.58	432872	1.39	1.99	4.41	492543	1.30	1.71	3.76	406123	1.70	2.49	4.58	432872	1.39	1.99	4.41
Sarawak	664002	2.15	2.71	10.44	708781	1.85	2.77	7.77	766158	1.81	2.51	8.78	664002	2.15	2.71	10.44	708781	1.85	2.77	7.77
Total	11302545	2.98	4.77	22	12021939	2.85	4.41	19.9	12819248	2.77	4.41	19.54	11302545	2.98	4.77	22	12021939	2.85	4.41	19.9

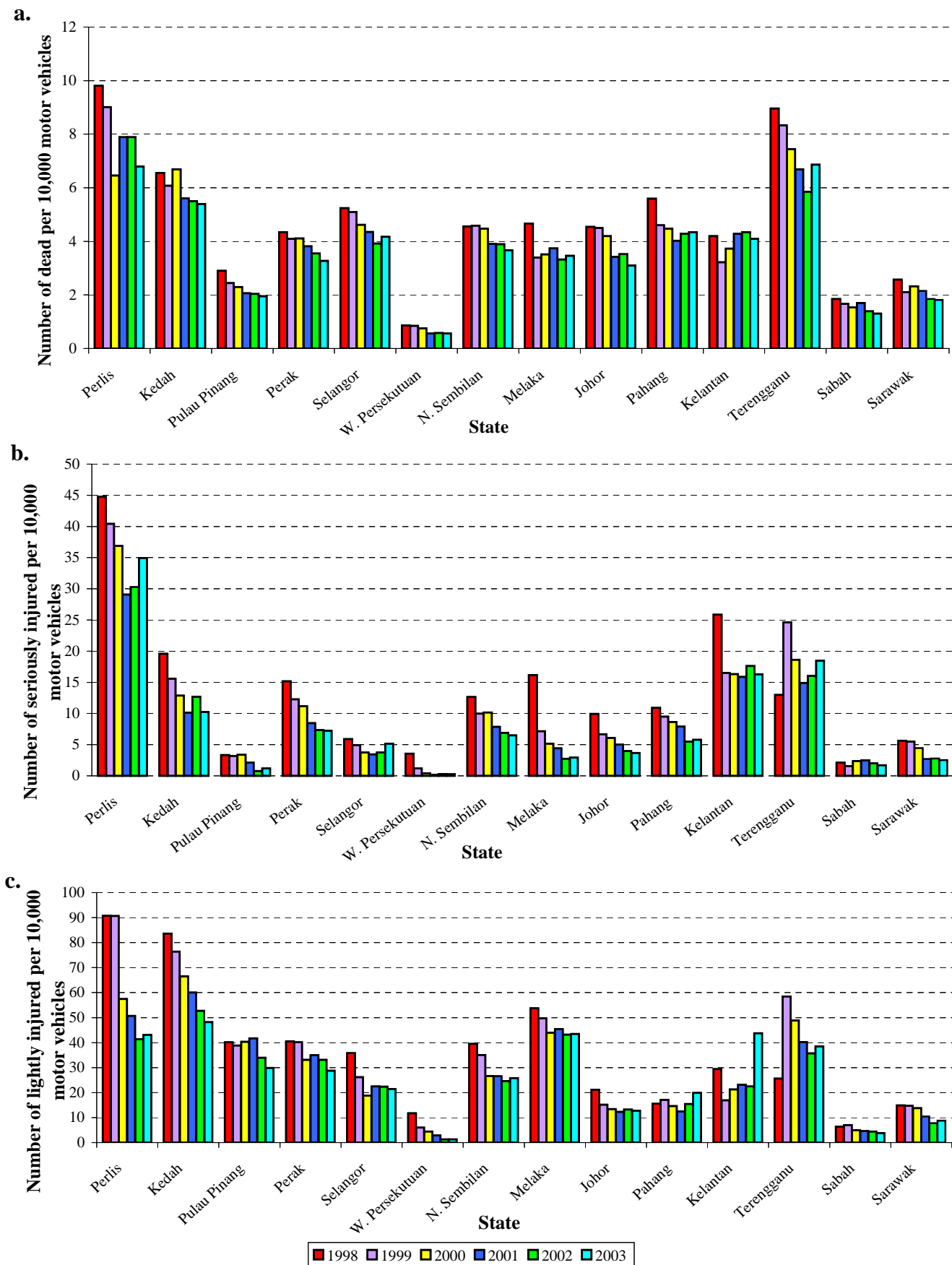


Fig. 4.4: Number of motorcycle accident casualties per 10,000 motor vehicles in Malaysia from 1998 to 2003

Casualties among motorcyclists and pillion riders per 10,000 motor vehicles in the 13 states and one federal territory of Malaysia according to the type of injuries sustained: dead (a), seriously injured (b) and lightly injured (c). W. Persekutuan = Wilayah Persekutuan; N. Sembilan = Negeri Sembilan

Table 4.7: Types of motorcycle accidents and the resulting casualties by age groups in Malaysia from 2001 to 2002

Age	2001										
	Type of accidents			Type of casualties							
				Motorcyclist				Pillion rider			
	Fatal	Serious	Total	Death	Serious injuries	Minor injuries	Total	Death	Serious injuries	Minor injuries	Total
0 - 5	17	24	41	5	10	5	20	17	34	11	62
6 - 10	6	48	54	3	9	2	14	15	39	31	85
11 - 15	124	293	417	78	187	61	326	17	124	59	200
16 - 20	1009	1908	2917	637	1323	413	2373	93	245	130	468
21 - 25	874	1345	2219	471	830	220	1521	44	103	58	205
26 - 30	629	941	1570	241	400	90	731	40	61	21	122
31 - 35	490	797	1287	166	238	69	473	18	28	8	54
36 - 40	485	784	1269	129	255	59	443	12	34	15	61
41 - 45	374	692	1066	122	215	54	391	13	24	12	49
46 - 50	319	557	876	118	200	23	341	11	23	9	43
51 - 55	253	416	669	121	158	35	314	20	18	5	43
56 - 60	152	240	392	87	105	21	213	4	12	5	21
61 - 65	127	205	332	83	84	15	182	9	9	1	19
66 - 70	74	127	201	58	57	8	123	4	6	0	10
71 - 75	70	60	130	50	39	6	95	3	2	1	6
> 75	48	45	93	36	26	3	65	4	3	2	9
Total	5051	8482	13533	2405	4136	1084	7625	324	765	368	1457

Age	2002										
	Type of accidents			Type of casualties							
				Motorcyclist				Pillion rider			
	Fatal	Serious	Total	Death	Serious injuries	Minor injuries	Total	Death	Serious injuries	Minor injuries	Total
0 - 5	8	11	19	4	5	0	9	16	38	25	79
6 - 10	2	32	34	0	3	0	3	9	36	24	69
11 - 15	124	331	455	76	247	50	373	26	127	60	213
16 - 20	945	1802	2747	589	1268	317	2174	100	246	141	487
21 - 25	847	1369	2216	437	748	209	1394	52	116	57	225
26 - 30	596	906	1502	207	349	72	628	37	53	22	112
31 - 35	519	796	1315	138	254	54	446	10	30	19	59
36 - 40	478	743	1221	128	230	50	408	17	32	10	59
41 - 45	444	710	1154	115	212	43	370	19	23	9	51
46 - 50	334	598	932	121	205	34	360	10	27	9	46
51 - 55	246	418	664	98	155	25	278	17	17	9	43
56 - 60	187	271	458	92	110	15	217	9	18	8	35
61 - 65	137	223	360	90	97	18	205	11	18	4	33
66 - 70	98	126	224	70	57	12	139	5	8	0	13
71 - 75	70	90	160	52	57	8	117	9	4	0	13
> 75	42	41	83	33	23	1	57	3	2	2	7
Total	5077	8467	13544	2250	4020	908	7178	350	795	399	1544

number of casualties with serious and minor injuries was the highest among the age groups of 16-20 and 21-25 in 2001 and 2002. In contrast, the occurrence of serious or minor injuries among the age groups of 71-75 and above 75 was the lowest in both years.

Chapter 5

Result of Helmet Wearing Investigation

In Malaysia, head injury is the main cause of death among motorcycle riders involved in road accidents. According to the Transport Ministry of Malaysia (New Straits Times, 2004), the death of more than 3,500 motorcyclists on the road every year was mainly due to the failure of many riders to wear a helmet. This shows that helmet wearing is one of the major issues in Malaysia even though helmet wearing law has been in place since the 1970s. It is very common to find motorcycle riders without a helmet in rural areas as well as in suburban areas of Malaysia. To find out the compliance level of helmet wearing among suburban population of Malaysia, an investigation was conducted at a residential estate called Taman Seri Sentosa, which is located in Wilayah Persekutuan, Malaysia. A map of the residential estate is shown in Appendix B. The residential estate is about 25 minutes' drive from the centre of Kuala Lumpur. It consists of residential housing units such as low cost apartments, condominiums and terrace houses, and commercial buildings such as shop lots. It also has a fire station, a school and a police station. The people in this area use cars, motorcycles and van or lorry as their means of transport.

The survey was conducted on 13th October 2004 from 8.30am to 9.30am at a T-junction. This junction (Fig. 5.1) connects one of the arterial roads of the housing estate to the main road, which then connects to a highway leading into Kuala Lumpur city centre. The reason the survey was carried out during the morning rush hour is because around that time, most of the residents would use the main road to go to work, to send their children to school, or to go shopping at the local market. The number of motorcyclists and pillion riders with or without a helmet was recorded based on their gender and age as they passed by. A total of 107 motorcycles on the road carrying 107 motorcyclists and 21 pillion riders were observed.



Fig. 5.1: The T-junction of Taman Sri Sentosa, Wilayah Persekutuan

Given above is a photograph showing the location where a survey on helmet wearing was conducted.

The results of the survey were compiled and presented as Table 5.1a and Table 5.1b.

It shows that:

- i. 70.09 % of motorcyclists (both genders, young and old) wore safety helmets, while 61.9 % of pillion riders (both genders, young and old) did the same;
- ii. 70 % of male motorcyclists wore safety helmets, while 71.4 % of female motorcyclists did so;
- iii. 66.67 % of male pillion riders wore safety helmets compared to 60 % of female pillion riders;
- iv. 89 % of old motorcyclists (25 years old and above) wore safety helmets, whereas only 48 % of young motorcyclists (below 25 years old) did so;
- v. 100 % of old pillion riders (25 years old and above) wore safety helmets, whereas only 50 % of young pillion riders (below 25 years old) did so.

Table 5.1a: Compliance of helmet wearing rule among motorcyclists and pillion riders according to gender in Taman Sri Sentosa, Wilayah Persekutuan, Malaysia

Type of rider	With helmet			Without helmet		
	Male	Female	Total	Male	Female	Total
Motorcyclist	70	5	75	30	2	32
Pillion rider	4	9	13	2	6	8
Total	74	14	88	32	8	40

Table 5.1b: Compliance of helmet wearing rule among motorcyclists and pillion riders according to age in Taman Sri Sentosa, Wilayah Persekutuan, Malaysia

Type of rider	With helmet			Without helmet		
	Young	Old	Total	Young	Old	Total
Motorcyclist	24	51	75	26	6	32
Pillion rider	8	5	13	8	0	8
Total	32	56	88	34	6	40

Chapter 6

Discussion

6.1 Personal Observations

6.1.1 Motorcycle Safety on the Roads of Malaysia

About half of the motor vehicles on the roads of Malaysia consist of motorcycles (Table 4.1). The popularity of motorcycles is mainly because they are cheaper than other types of motor vehicles, and thus making them affordable to low and middle income families, who make up the majority of Malaysia's population. Furthermore, the maintenance cost and fuel consumption of motorcycles are low compared to cars. More importantly, no toll has to be paid when riding a motorcycle on toll roads. In major cities of Malaysia such as Kuala Lumpur, at least one third of the urban community (Table 4.1; Radin Umar et al., 1998) prefer to travel by motorcycles. This is because it is easier to manoeuvre a motorcycle through the often congested streets of the cities, and to find a parking space for the vehicle. In less developed states of Malaysia such as Perlis, motorcycles are the major mode of transport for the mostly impoverished inhabitants, and almost every family owns at least one motorcycle which is used to carry people as well as goods (Radin Umar et al., 1998).

In the past six years, motorcycle accident fatalities accounted for about 58 % of the total road accident deaths in Malaysia. Another country, which has recorded such a high proportion of deaths from motorcycle accidents, is Thailand with about 70 % (WHO, 2004a). This is because motorcycles are a common mode of transport in Thailand and Malaysia. Since the price of a motorcycle is much cheaper than that of other types of vehicles, it is not surprising that it is the best selling motor vehicles in both countries. With the presence of more motorcycles on the road, the likelihood of an accident would undoubtedly increase. In contrast, fatalities from motorcycle crashes in developed countries such as USA, Australia and Japan constitute less than

20 % of the total killed on the road (WHO, 2004a). This could be due to the fact that cars are the dominant mode of transport in these countries. Besides, the cost of owning a car is lower in these countries than developing countries such as Malaysia. Since the public transport system is more advanced in the developed countries, the reliance on private vehicles might be less compared to that of the developing countries.

From the crash statistics presented in Chapter 4, it can be concluded that less developed states such as Perlis, Kedah and Terengganu have a relatively higher incidence of casualties (dead, seriously injured and lightly injured) per 10, 000 motor vehicles among motorcycle riders compared to other states of Malaysia. These states do not have sufficient financial and human resources to build and maintain roads, and to install lights along all roads. Having proper lighting along the roads is necessary to reduce fatal accidents as highlighted by a study (Noordzij, 1976) which showed that motorcyclists travelling on the roads under dark conditions were at a four-fold higher risk of being involved in fatal crashes with other vehicles. Another factor contributing to the grim statistics is the lack of law enforcement in the rural areas. The absence of law enforcement would embolden some motorcycle riders to ride without a helmet or even without a valid driver's license. This problem is further compounded by the fact that motorcycles are the dominant mode of transport in these areas. All this would combine to hinder any effort aimed at reducing motorcycle accidents in the state.

In contrast, Wilayah Persekutuan has the lowest motorcycle accident casualties (dead, seriously injured and lightly injured) per 10, 000 motor vehicles in Malaysia. Being a federally governed territory where the capital of the nation is located, Wilayah Persekutuan is the commercial and social hub of the nation. Hence, roads in this area are routinely maintained and upgraded, and most if not all are decorated with proper lighting. Law enforcement officers are seen patrolling the area most of the time to ensure that road safety regulations are adhered to by all road users. The relatively low rate of motorcycle accident casualties could also be due to the higher level of education among the city dwellers. It should be noted that education level has been identified by Kulanthayan et al. (2000) as one of the factors influencing the compliance behaviour of motorcycle riders towards road safety regulations.

It is disheartening to learn that young citizens between the age of 16 to 20 form the majority of those who die in motorcycle accidents (Table 4.7). This could be due to the fact that the legal age to obtain a motorcycle driver's license is 16 years old. Furthermore, the examination and license fees for a motorcycle driver's license are much cheaper than those for a car. This makes people in the rural areas prefer their children to go for a motorcycle driver's license rather than a car driver's license. Once the young riders get their license, they are raring to go riding on the road. Young riders are normally impatient and thus, have a tendency to speed or overtake in dangerous situations. Moreover, young riders still lack the experience to control the vehicle in the unfortunate event of an accident. This all could contribute to the high fatalities observed among young riders.

The Malaysian government has undertaken numerous strategies to reduce motorcycle accident fatalities and injuries. Among them are the mandatory helmet wearing, the use of daytime running headlights, the use of reflective stripes at the rear portion of safety helmets, the use of reflective number plates, and the wearing of reflective and fluorescent clothing. Apart from these safety regulations, public education through the mass media about good riding practices is also actively promoted.

The daytime running headlights programme has been a success in either urban or rural areas. Nearly all of the motorcyclists in Malaysia use running headlights when they ride on the road during day or night. This is because the headlight of a motorcycle automatically switches on when the engine is started. So, it is not difficult to achieve one hundred percent compliance. Most of the motorcyclists also put on reflective stripes at the rear portion of their helmets. This is because reflective stripes are not expensive and many can afford to buy one. Another factor that encourages them to comply is the fact that they will be fined if they are caught without any reflective stripe on their helmets.

Some of the safety measures introduced by the Malaysian government to tackle motorcycle accidents do not seem to be widely followed by motorcycle riders, as observed at Taman Sri Sentosa, Wilayah Persekutuan. More than half of the motorcycles observed did not have a reflective number plate. This is because when a

motorcycle is purchased, the number plate is usually not reflective, and hence, the owner will have to replace it with one that is reflective. Most of the motorcyclists would tend to forget about it or would even feel that it is very troublesome to change the brand new original number plate. On the issue of reflective clothing, the number of motorcyclists not wearing a reflective safety vest seems much higher than that of motorcyclists riding without a reflective number plate. The reason is that Malaysia is a tropical country with a warm climate. It is conceivable that a motorcyclist will feel uncomfortable and sweat profusely when riding under a hot sun with a reflective safety vest worn on top of their clothes. To some young motorcycle riders, putting on a reflective vest while riding on the road looks funny and would be ridiculed by their peers. This causes the majority of the motorcyclists choosing not to wear the reflective vest.

Although the Malaysian government has set a speed limit for certain areas, it is quite often to find many of the motorcyclists choose to ignore the warning and refuse to slow down. This usually happens on long stretches of straight roads. One of the actions being taken by the government to deter speeding is to place a hump on certain roads and this seems to be quite effective. However, the placement of humps can only be done on certain roads. Hence, the problem of speeding is still a problem on other roads such as highways.

6.1.2 Helmet Wearing among Motorcycle Riders of Taman Sri Sentosa

From the survey carried out at Taman Sri Sentosa, 30% of the motorcyclists and 40% of the pillion riders did not wear safety helmets when travelling on the road. This could be due to the fact that some of them might work in shops which are near to their house within the residential area. They might think it is too troublesome to put on a helmet especially for a short journey. Compared to motorcyclists, pillion riders appear to have a higher tendency of not wearing a helmet. The possible explanation for that is the prevalent use of motorcycle as a means of transporting family members or friends riding pillion to school or work, which happens to be located nearby. This might prompt them not to wear a helmet, which they are going to take off anyway a short while later.

The percentage of female motorcyclists wearing a helmet is a bit higher than that of male motorcyclists. This could be because females are more willing to follow the rule than males. But when it comes to pillion riders, the likelihood of females donning a helmet is less than that of males. One explanation could be that some of the female pillion riders might not feel the need to wear a helmet especially if the travel distance to their destination, which is usually located within the residential area, is less than 2 km. They might think that nothing untoward would happen in that short distance and so it would not be necessary to waste money on buying a helmet. Another possible explanation is that the person giving them a lift on the motorcycle has forgotten to bring an extra helmet for the pillion rider, whom they would drop off a short distance later. This problem is further exacerbated by the fact that not many female residents own a motor vehicle, and hence, have to depend on others, usually males, to take them from one place to another.

The survey also reveals that old riders (motorcyclists and pillion riders) have a much higher tendency of wearing a helmet than young riders (motorcyclists and pillion riders). This could be explained by the fact that young riders are usually immature and do not have much experience of riding a motorcycle. This could lead to their failure to realize how dangerous it is to ride on the road without a safety helmet.

6.2 Future Strategies

6.2.1 Strategies specific to Taman Sri Sentosa

The proportion of motorcyclists and pillion riders wearing a safety helmet at Taman Sri Sentosa, Wilayah Persekutuan is not very satisfactory based on the results of my survey of that area. To solve this problem, the relevant agency can organize a campaign promoting the use of safety helmets at Taman Sri Sentosa for there is no such campaign being held in that area. This would let local residents learn more about the proper use of safety helmets since head is the most fragile part of a body and it usually bears the brunt in most of the motorcycle crashes. Hence, promoting the proper use of a safety helmet could help reduce the incidence of head injury as shown by various studies (Hurt et al., 1981; Waller, 1985).

Educating the young about the importance of safe and good riding practices can play an important role in reducing motorcycle accidents. Since there is a secondary school at Taman Sri Sentosa, motorcycle safety campaigns can be brought in as an extra-curricular activity to the school to let youngsters know more about the rules and regulation of motorcycle riding. Hopefully, this will then be related to their family members and friends.

The stationing of law enforcement units at various locations within the housing estate can also help to encourage motorcyclists and pillion riders to wear a helmet especially when public education fails to work. For those recurrent offenders, stiffer penalty such as temporary suspension of their driver's license should be imposed as a deterrent. Since motorcycles are indispensable to most of the residents for their daily living, this would be a very effective way to make them wear a helmet and follow the rules.

6.2.2 Strategies at the National Level

The Malaysian government has organized innumerable motorcycle safety campaigns in the last few years. However, the response is not yet satisfactory especially from those living in the rural areas. The government still fails to ensure that motorcyclists in the rural areas wear a helmet when they travel on the road. The government should pay more attention to the rural areas and make sure that road condition is good and lamp posts are installed along the road. Most of the roads in the rural areas do not have proper lighting for illumination during night time. Apart from that, the government should ensure that road safety information is effectively disseminated to those living in the more remote areas of the nation.

Another thing that the government should do is to improve the efficiency and accessibility of the public transport system so that more people can be persuaded to travel by train or bus. Most of the people in the urban areas prefer to travel by motorcycles or cars. This is partly because of the unreliability and inaccessibility of the public transport system. Having a properly run public transport system will help to reduce the number of motor vehicles on the road, and thus, reduce the chances of road accidents.

The legal age for obtaining a motorcycle driver's license should be increased to 18 from the existing age of 16. This is because young riders are the major casualties of motorcycle crashes in Malaysia. In addition, heavier penalty should be imposed on those that disobey the law. For those that are involved in dangerous and reckless driving, the government should consider suspending their license for a certain period of time. With the wellbeing of the nation's future generation at stake, it is about time the government gets tough with those that flout the law.

The recording and management of road accident statistics is important to the development of any future policy that tries to address the problem of road safety. Hence, it is imperative that the various departments responsible for data collection and storage have a good management system. As highlighted in Chapter 3, poor management of data still affects some of the government agencies. Besides, road accident data should be updated frequently so that policy-makers and those who are involved in devising road safety programmes are kept up to date.

We can have all the rules and regulation in place as well as a pro-active safety campaign, but at the end of the day it is the attitude of riders that determines the safety of our roads. The rules are there. It is up to them to follow. It is difficult to change the mindset of older riders. But we can do something about the younger generation. Therefore, it is important to start educating future generation from a young age by incorporating road safety into the school curriculum.

Chapter 7

Conclusions

The Malaysian government has been doing everything it can to try to reduce motorcycle-related road accidents through road safety campaigns, and rules and regulations. Despite all the effort to tackle the problem, minimizing the incidence of motorcycle crashes is still a major challenge facing the government. This daunting task is further complicated by the fact that motorcycles are the predominant mode of transport for most Malaysians. Some of the pressing issues remained to be solved by the government include the lack of proper helmet use, inadequate protective attire, reckless driving and speeding, and dangerous overtaking. On top of that, some of the existing regulations need to be improved especially those regarding the legal age of getting a motorcycle driver's license and the penalty for not following the law.

Nearly one third of the total motorcyclists and pillion riders surveyed at Taman Sri Sentosa, Wilayah Persekutuan did not wear a helmet and most of them were young male riders. It should be noted that Taman Sri Sentosa is located near the city centre of Kuala Lumpur and yet there seems to be a blatant flouting of the motorcycle safety regulation by some of the riders, which could be due to a lack of law enforcement in that area. We could imagine what the situation is like in more remote regions of the nation. The lack of law enforcement in out-of-town areas could give motorcycle riders a free rein while riding on the road. Therefore, law enforcement has to be stepped up in suburban and rural areas.

The safety of our public roads is determined to a large extent by the behaviour of motorcycle riders and their awareness of the potential risks of riding on a road. As the saying goes, old habits die hard. It is hard to change the attitudes of existing riders but we may be able to mould our younger generation into responsible road users. Hence, it is important to educate our young from an early age that the various rules and regulations are meant to minimize their chances of getting involved in an accident and to protect them from sustaining life-threatening injuries in the event of

an accident. In a nut shell, young motorcycle riders should be the focus of any future road safety initiatives.

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Appendix A

Project Specification

University of Southern Queensland
FACULTY OF ENGINEERING AND SURVEYING

ENG 4111/4112 Research Project **PROJECT SPECIFICATION**

Issue A: 10 March 2004

STUDENT : **TAN KOK WEI**

TOPIC : **Motorcycle Safety in Malaysia**

SUPERVISOR : USQ - Associate Professor Ron Ayers
Prime College – Mr. Lim Jee Yat
Associate – Mr. Law Teik Hwa

PROJECT AIM : The project aims to investigate the characteristics of motorcycle crashes in Malaysia and to develop motorcycle related strategies to improve road safety in the nation.

PROGRAMME :

1. Research background information relating to road crashes, and in particular:
 - Analysis of crash data
 - The incidence of motorcycle crashes;
 - The characteristics of crash types, and injury types sustained in motorcycle crashes
 - Motor vehicle ownership, usage and crash occurrence in Malaysia (eg: consequences of the rapid grow in motor vehicle use, number of crash deaths and injuries, etc.).
2. Obtain crash data for Malaysia for the last 5 to 10 years.
3. Analyse the crash data and attempt to determine the major factors influencing and contributing towards motorcycle accidents.
4. Evaluate existing road rules and regulations pertaining to motorcycle safety.
5. Recommend appropriate and affordable strategies to reduce the number and severity of motorcycle crashes.

6. Report findings through oral presentation at the Project Conference, and in the required written format.

AGREED :

_____ (Student)

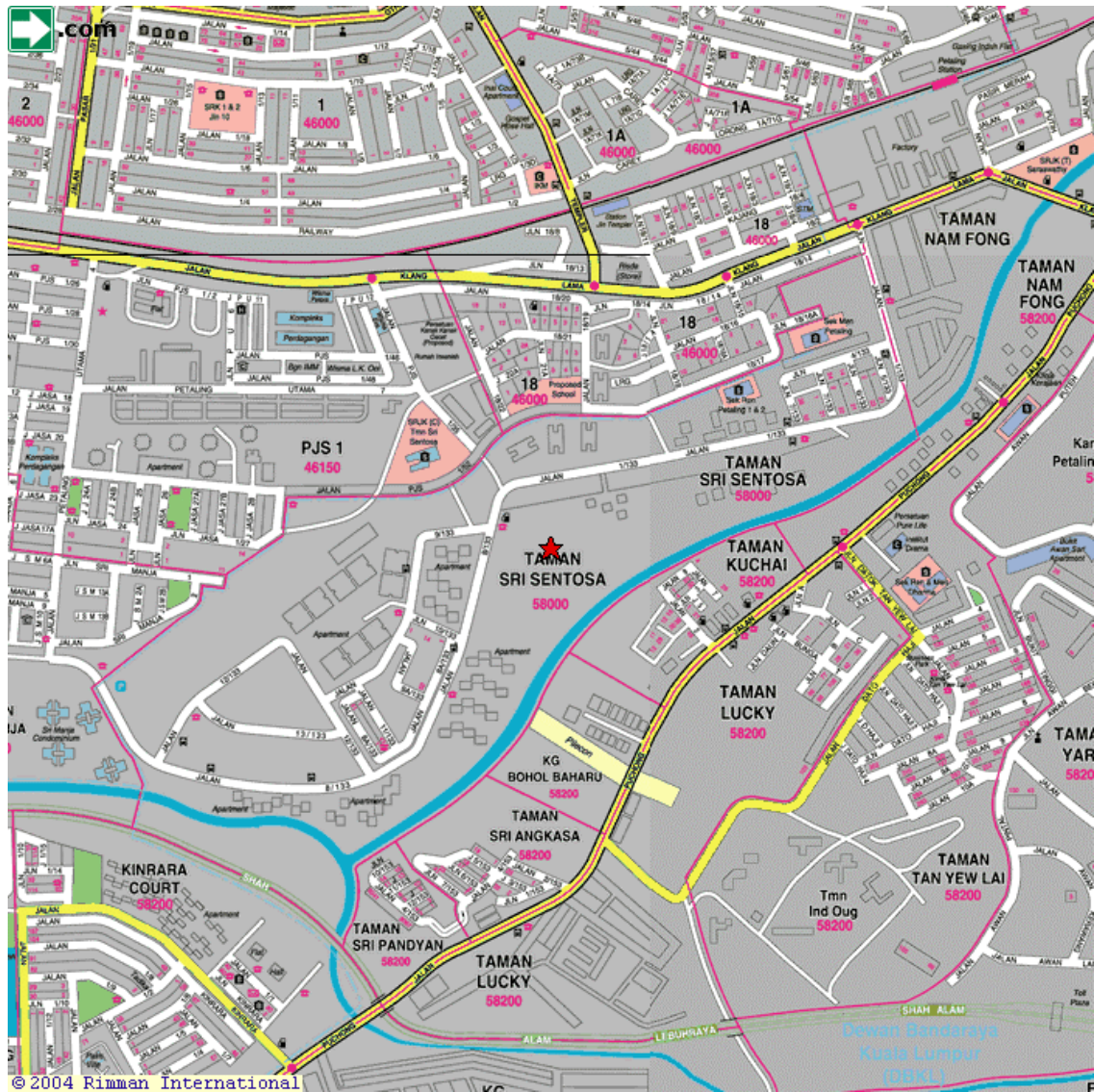
_____ (USQ Supervisor)

_____/_____/_____

_____/_____/_____

Appendix B

Map of Taman Sri Sentosa and the Surrounding Area



Source: Adapted from a map provided by Streetdirectory.com at http://www.streetdirectory.com.sg/kl/kl_map.cgi?print=1&x=406783&y=340340&level=4&circle=&star=1