Title: Overview of Lifelong Impairment Due to Road Crashes in Cambodia (Analysis of an existing database)

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Course Title	Applying Traffic Psychology
Type of Document	Assignment
Year	2013

Queensland University of Technology
Faculty of Health
School of Psychology & Counseling

PYP404: Applying Traffic Psychology

Assignment 2

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Abstract

Road crashes become a growing issue and a major contributor to disabilities worldwide, especially in low and middle income countries, such as Cambodia. So far, there have been a limited number of studies conducted in these countries; therefore there is a little comprehensive information on the issue. This study aims to provide the overview of road crashes and lifelong impairment in Cambodia. Descriptive statistical analysis was performed from a dataset, which was obtained from the Road Crash and Victim Information System (RCVIS) database. The data indicates that road crashes tend to effect more on poorer communities, those who were pedestrians or travelled by motorbikes and bicycles, and living in rural areas. Additionally, although there are statistically significant differences in fatalities and lifelong injuries by characteristics of crashes, both groups have common contexts that lead to common priorities and interventions, which will contribute to reduce the number of fatalities as well as lifelong injuries.

1. Introduction

Road crashes and injuries have become a growing issue worldwide, as evidenced by the publication of the World Health Organization's (WHO) reports in 2004, 2009 and 2013, and the launch of the UN Decade of Action for Road Safety in 2011 (Guillen, Ishida, & Okamoto, 2012; WHO, 2004, 2009, 2013). Every year, around the world, 1.24 million people die due to road traffic injuries in addition to 20-50 million non-fatal injuries occurring (WHO, 2013). Road traffic injury is recognized as a major contributor to disability (WHO & WorldBank, 2011), ranging from brief short-term impairments to serious lifelong conditions. In 2010, road traffic injuries ranked as the 10th highest cause of the loss of Disability Adjusted Life Years (DALYs) worldwide (Murray et al., 2012). Importantly, it was the 5th ranked cause in Southeast Asia (Murray et al., 2012). This constitutes a marked increase in rank from 12th in 1990, and a 34% increase in numerical value (Murray et al., 2012). The figures alerted decision-makers at national and global levels to emphasize the need for more research in this area to inform policies and action (WHO & WorldBank, 2011).

Although road traffic injury has been recognized as a contributor to disability, very few studies have been conducted to explore the patterns of long-term injury crashes that result in disability, and the impact this has on the persons and their families. This gap in the literature is especially large for low income countries such as Cambodia. To fill up the gap, this study aims to illustrate the road crash context of those injured persons who have lifelong impairments due to road crashes in Cambodia.

2. Data Sources and Measurements

The de-identified data from a database was gathered in Cambodia from the Road Crash and Victim Information System (RCVIS). According to Chapter 5 of the National Ethics Statement (p. 79), this study can be exempted from the QUT ethical review, because it relates to a request to access an existing collection of data that is provided in a non-identifiable form to the researcher. Official approvals have been granted from responsible organizations, who have owned the database, in July 2013.

The system was initiated by Handicap International in 2004. It had been progressively transferred to the government counterparts (the National Road Safety Committee) since 2007, with a full completion of the handover in 2010. The system has been developed to 'provide government and civil society with accurate, continuous and comprehensive information for planning, legal norms, policy development, and evaluating impact of past, current and future initiatives' (National Road Safety Committee, 2012, p. 1).

The system combines information from the traffic police and health facilities through data collection forms, which were filled by traffic police officers in 197 districts and health staff in 45 hospitals and 25 health centres (National Road Safety Committee, 2012). It has been considered as nationwide, covering all provinces in Cambodia through the national and provincial police network. However, only around 60% of hospitals and 3% of health centres participated in the data collection in 2011 (Ministry of Health, 2008; National Road Safety Committee, 2012). The system consists of comprehensive data on casualty information (such as name, gender, type of road users, injuries, etc.) and crash information (location of crash, causes, collision type, etc.). The data accessibility was approved by the General Secretariat of the National Road Safety Committee in July 2013. Data from 2006 to 2012 (seven data files) is abstracted from the system. Each variable was compared among those seven data files to identify the similarity and differences of values. Most of the values were recoded, because more information was added into the data files, as the data collection forms were updated from year to year. The final cleaned files were merged into a single file in SPSS by the researcher.

In total, 64 common variables were analysed in SPSS. Table 1 shows information collected by both sources and is used for the analysis in this study (Sann, Sem, Ear, & Phan, 2012, p. 10).

Table 1: Information collected by health facilities and traffic police

Type of information	Data collected by Health facilities	Data collected by Police
Casualty information	Name, gender, age, occupation, address Type of road user, type of vehicles, helmet/seatbelt use Transportation to hospital, severity of injury	
	Date and time of arrival at hospital, substance use, nature of injury, hospital discharge, disability	Driving license, drug/alcohol use, type of first aids
Crash Information	Date, time and place of crashes	
		Type of crash, cause of crash, road type, collision type, vehicle movement and characteristics, severity of crash

Although traffic police units and health facilities have involved in the data collection, the data that were recorded by both sources were very low, compared to overall data. As shown in the figure below, only 3% of fatalities and 4% of injuries were recorded by both sources (National Road Safety Committee, 2012, p. 2). Majority (94%) of fatalities was reported by traffic police only. Health facilities contributed more among injury records. Both sources are apparently discrete in reporting traffic deaths and injuries. On one side, it is better to capture more deaths and injuries by both sources, rather than depending on only one data source. On the other hand, this kind of distinct data results in limited information of the records that were reported by one source. For example, those records from traffic police units have not included information regarding the result of hospital discharge, especially the lifelong impairment information.

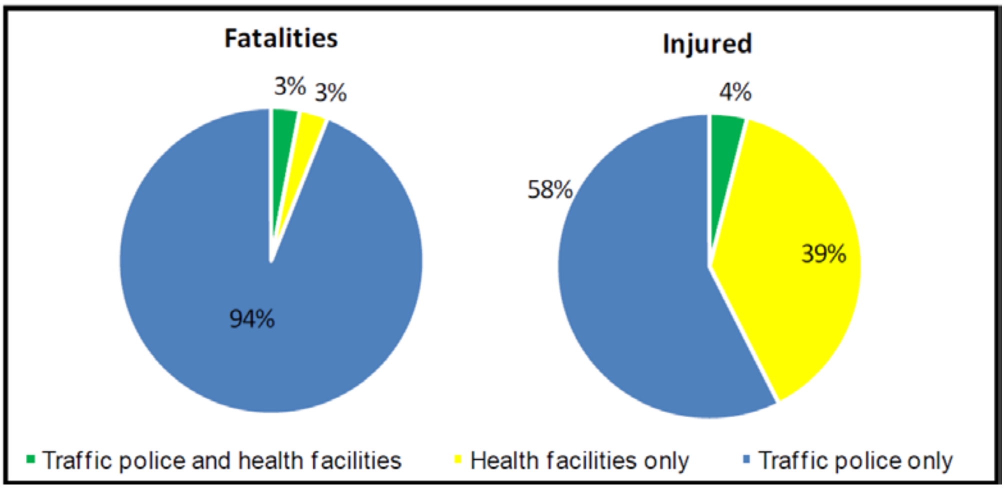

Figure 1: Fatalities and injuries recorded by traffic police and health facilities in 2011

Based on the data, the system does not include follow up information on those casualties discharged from hospitals, as the data collection forms were filled and completed in the emergency rooms only. This gap in information has led to limited understanding of the contexts of the lifelong impairment after the hospital discharge. Additionally, the justification on the lifelong impairment of patients (sent home but disabled for life) was based on individuals (hospital staff) who filled up the forms during the first week of the hospitalization. Therefore, consistency and accuracy of the information on the lifelong impairment might be suspected. Another limitation of the system is the lack of information on the emergency services. This might become a confounding factor when lifelong impairment is analysed and concluded based on only pre and during crash data.

3. Analysis and Findings

Descriptive statistical analysis (frequencies and cross tabulation) was performed on the RCVIS dataset, using SPSS software (Version 17). Most of data are presented in cross tabulation tables. New variables were created and values were recoded, where they were appropriate for statistical and descriptive analysis. Pearson Chi-square (χ^2) test was used for statistically significant differences at the .05 level.

3.1 Overview of the RCVIS database

The RCVIS database recorded 151,420 casualties from 2006 to 2012 from all provinces. The data indicated 11,879 fatalities, 45,305 severe injuries, 87,672 slight injuries and other 6,564 records as unknown injuries (Table 2). Overall, there was statistically significant difference in injury severities from 2006 to 2012 [χ^2 (18) = 5048.78, $p < .001$]. The number of fatalities keeps increasing since 2006, while the numbers of severe and slight injuries decrease. The declines raise an issue of overall data collection quality among both data sources (traffic police and health facilities), rather than a real reduction of the accidents.

Table 2: Numbers of casualties (by injury severities) from 2006 to 2012

Year	Injury severities								Total
	Fatalities		Severe injuries		Slight injuries		Unknown		
2006	1,292	5%	6,033	23%	17,836	68%	985	4%	26,146
2007	1,545	6%	7,150	26%	17,655	64%	1,053	4%	27,403
2008	1,638	6%	7,226	28%	15,985	62%	947	4%	25,796
2009	1,717	8%	7,022	33%	12,117	56%	663	3%	21,519
2010	1,816	10%	6,718	37%	9,170	50%	583	3%	18,287
2011	1,905	11%	5,807	35%	7,661	46%	1,281	8%	16,654
2012	1,966	13%	5,349	34%	7,248	46%	1,052	7%	15,615
Total	11,879	8%	45,305	30%	87,672	58%	6,564	4%	151,420

Note: Based on the definition in the data collection form, slight injury referred to having hospitalization less than seven days, and severe injury was defined as staying in hospital at least seven days or acquired intensive care or surgery.

Only 50% (75,245 out of 151,420) of the records provide information on the severities on injuries and results after hospital discharge. The available information indicates that more than 80% were fully treated and sent home (Table 3). Almost 7% of casualties died, either at hospitals, at accident scene or while transport. It is also important to note that 0.6% (N=422) were sent home, but suspected as having lifelong impairment, which was judged roughly by hospital staff during the first few days of the hospitalization. The table below shows that almost one quarter (24%) of the reported casualties were severe, while other 65% had slight injuries. The data was not tested for significant difference, as it included 5 cells with the value less than or equal 5.

Table 3: Severities of injuries and results after hospital discharge from 2006 to 2012

Results after hospital discharge	Severities of injuries				Total	
	Fatal	Severe	Slight	Unknown		
Fully treated and sent home	43	13,029	46,103	2,112	61,287	81.4%
Died (at hospital, home, at accident scene, while transport)	5,088	5	-	-	5,093	6.8%
Sent home but disabled for life	-	236	162	24	422	0.6%
Admitted or referred to other hospital/communities	28	4,935	2,748	638	8,349	11.1%
Other	4	37	47	6	94	0.1%
Total	5,163	18,242	49,060	2,780	75,245	100%
	6.9%	24.2%	65.2%	3.7%		

Majority (85%) of casualties are in working/driving age group (16-60 years old). Children less than 16 years old comprise of 11%, while other 3% are elderly (Table 4). The statistical differences are significant in injury severities by 3 age groups as shown in Table 4 [χ^2 (4) = 710.59, $p < .001$]. The elderly group is more likely to be killed than other age groups, as it represents 6% of fatalities, compared to only 4% and 3% among severe and slight injuries respectively. On the other hand, 0-15 years old group appears to have higher proportion among slight injuries (12%) than severe injuries (10%) and fatalities (9%).

Table 4: Severities of injuries by age groups from 2006 to 2012

Age of Casualties	Severities of injuries						Total	
	Fatalities		Severe injuries		Slight injuries			
0-15 years old	1,050	9%	4,431	10%	10,843	12%	16,324	11%
16-60 years old	9,941	85%	38,730	86%	73,810	85%	122,481	85%
Older than 60 years old	729	6%	1,738	4%	2,290	3%	4,757	3%
Total	11,720	100%	44,899	100%	86,943	100%	143,562	100%

Majority of casualties are male (73%). Table 5 shows that higher proportion of female was observed among younger age group (less than 15 years old), compared to age distribution among male. The differences are statically significant [χ^2 (2) = 2261.44, $p < .001$].

Table 5: Numbers of casualties (by gender and age groups) from 2006 to 2012

Age of Casualties	Gender				Total
	Male		Female		
0-15 years old	10,159	9%	6,708	17%	16,867
16-60 years old	96,536	88%	30,996	78%	127,532
Older than 60 years old	3,031	3%	1,967	5%	4,998
Total	109,726	100%	39,671	100%	149,397

As shown in Table 6, vehicle controllers comprise of 56% of overall casualties, followed by passengers (36%). There were statically significant differences in age groups by type of road users [χ^2 (4) = 23,300.41, $p < .001$]. Children (0-15 years old) account for much higher proportion (48%) among pedestrians than vehicle controllers (3%) and passengers (16%). Majority of vehicle controller (94%) and passenger (81%) casualties are working age group (16-60 years old).

Table 6: Numbers of casualties (by road user types and age groups) from 2006 to 2012

Age of Casualties	Type of road users						Total
	Pedestrian		Vehicle controller		Passenger		
0-15 years old	5,550	48%	2,834	3%	8,088	16%	16,472
16-60 years old	5,007	43%	76,801	94%	41,894	81%	123,702
Older than 60 years old	966	8%	2,064	3%	1,836	4%	4,866
Total	11,523	100%	81,699	100%	51,818	100%	145,040
		8%		56%		36%	100%

Note: vehicle controllers include car, truck and bus drivers, motorcycle riders by not passengers, and bicycle riders but not passengers.

There were statistically significant differences in types of road users by gender [χ^2 (2) = 13137.81, $p < .001$]. Female casualties are less likely among vehicle controllers (15%), than pedestrians (42%) and passengers (41%), as shown in Table 7.

Table 7: Numbers of casualties (by road user types and gender) from 2006 to 2012

Gender	Type of road users						Total
	Pedestrian		Vehicle controller		Passenger		
Male	6,658	58%	69,869	85%	30,534	59%	10,7061
Female	4,915	42%	12,237	15%	21,613	41%	38,765
Total	11,573	100%	82,106	100%	52,147	100%	145,826

Additionally, table below shows that male casualties have higher injury severities than female casualties. They comprise higher proportion than female among fatalities and severe injuries. The differences were statistically significant [χ^2 (3) = 369.91, $p < .001$].

Table 8: Numbers of casualties (by injury severities and gender) from 2006 to 2012

Gender	Severities of injuries								Total
	Fatal		Severe		Slight		Unknown		
Male	9,436	79.8%	33,629	74.5%	62,864	72.0%	4,740	74.4%	110,669
Female	2,391	20.2%	11,492	25.5%	24,471	28.0%	1,633	25.6%	39,987
Total	11,827	100%	45,121	100%	87,335	100%	6,373	100.0%	150,656

The injury severities by road user types are presented in Table 9. It is found that the injury severities comprise different proportions in different types of road users. The differences are statically significant [χ^2 (6) = 1016.49, $p < .001$]. Fatalities have higher proportion among pedestrians (13%) than vehicle controllers (8%) and passengers (7%). Passengers are likely to have less severity, compared to other road user types. More than 60% of them have slight injuries, compared to 56% among vehicle controllers and 52% among pedestrians.

Table 9: Numbers of casualties (by injury severities and road user types) from 2006 to 2012

Severities of injuries	Type of road users						Total	
	Pedestrian		Vehicle controller		Passenger			
Fatalities	1,502	13%	6,711	8%	3,553	7%	11,766	8%
Severe injuries	3,717	32%	26,162	32%	14,449	28%	44,328	30%
Slight injuries	5,989	52%	46,294	56%	32,705	62%	84,988	58%
Unknown	419	4%	3,312	4%	1,659	3%	5,390	4%
Total	11,627	100%	82,479	100%	52,366	100%	146,472	100%

Human errors involved in at least 75% of causes of injuries. As illustrated in Table 10, speeding causes more than half (51%) of the injuries, followed by drink driving (16%), dangerous overtaking (11%) and not respect the rights of way (10%). There were statically significant differences in severities of injuries by human error factors [χ^2 (12) = 320.29, p < .001]. Speeding is more likely to be responsible for fatal cases (53%) and sever injuries (53%) than in slight injuries (49%).

Table 10: Numbers of casualties (by injury severities and human error factors) from 2006 to 2012

Human errors	Severities of injuries								Total	
	Fatal		Severe		Slight		Unknown			
Speed-related	5,734	53%	18,959	53%	32,226	49%	1,333	51%	58,252	51%
Not respect rights of way	804	7%	3,651	10%	6,210	10%	233	9%	10,898	10%
Dangerous overtaking	1,166	11%	3,649	10%	7,586	12%	279	11%	12,680	11%
Drink driving	1,856	17%	5,040	14%	10,592	16%	416	16%	17,904	16%
Other	1,211	11%	4,217	12%	8,598	13%	342	13%	14,368	13%
Total	10,771	100%	35,516	100%	65,212	100%	2,603	100%	114,102	100%

In an analysis of injury severities by transport modes, proportions are shown in the table below. They are statistically significant differences [$\chi 2$ (18) = 878.38, p < .001]. Majority of casualties (74%) travels by motorbikes at the time of crashes. It is also found that motorbike riders (controllers and passengers) are less likely to be killed than other travellers, as they comprise lower proportion among fatalities (66%), compared to severe and slight injuries (74% and 76% respectively). On the other hands, high injury severities are observed among others, especially pedestrians, who account for 13% of fatalities, and only 8% and 7% in severe and slight injuries.

Table 11: Numbers of casualties (by injury severities and transport modes) from 2006 to 2012

Transport modes	Severities of injuries								Total	
	Fatal		Severe		Slight		Unknown			
Motorbike	7,856	66%	33,298	74%	65,578	76%	4,547	72%	111,279	74%
Bicycle	476	4%	1,785	4%	3,634	4%	267	4%	6,162	4%
Passenger vehicle	962	8%	2,964	7%	5,191	6%	547	9%	9,664	6%
Goods vehicle	616	5%	1,661	4%	3,158	4%	300	5%	5,735	4%
Agriculture vehicle	275	2%	802	2%	1,583	2%	101	2%	2,761	2%
Pedestrian	1,504	13%	3,720	8%	5,957	7%	423	7%	11,604	8%
Other	148	1%	634	1%	1,519	2%	111	2%	2,412	2%
Total	11,837	100%	44,864	100%	86,620	100%	6,296	100%	149,617	100%

Night-time (6pm to 6am) comprises of 37% of all casualties. Table below shows numbers of casualties, classified by time of day and road types. More than a quarter of casualties (29%) were injured at evening and night between 17.00 and 20.59. National roads account for more than half (57%) of casualties, followed by rural roads. It is also found that casualties along city roads are more likely to be injured at 21.00 to midnight, compared to other types of roads at the same time. All roads are responsible for more casualties at 17.00-20.59 than other time of the day. The differences were statically significant [χ^2 (15) = 3561.12, $p < .001$].

Table 12: Numbers of casualties (by time of day and road types) from 2006 to 2012

Time of day	Types of roads								Total	
	National Road		Provincial Road		City Road		Rural Road			
Midnight to 5.59	4,091	6%	378	4%	1,944	11%	816	4%	7,229	6%
6.00 to 10.59	14,487	22%	1,932	20%	3,285	18%	5,003	24%	24,707	22%
11.00 - 13.59	9,707	15%	1,388	14%	2,447	13%	3,374	16%	16,916	15%
14.00 - 16.59	12,211	19%	1,970	20%	2,537	14%	4,263	21%	20,981	18%
17.00 - 20.59	19,137	30%	3,279	34%	4,888	26%	6,115	30%	33,419	29%
21.00 to midnight	5,100	8%	775	8%	3,350	18%	1,129	5%	10,354	9%
Total	64,733	100%	9,722	100%	18,451	100%	20,700	100%	113,606	100%
	57%		9%		16%		18%		100%	

Note:

National roads:	Major country roads link major population centres and provinces in different parts of the county, permitting speeds of 90km/h.
Provincial roads:	Major roads link population centres within a province or they are developed and maintained by provincial public work and transport departments.
City roads:	Roads are located in the cities with/without double central lines, but which are not national or provincial roads.
Rural roads:	Roads connect national/provincial road to village/commune at countryside or road outside urban areas.

3.2 Lifelong impairment due to road crashes in RCVIS

From 2006 to 2012, RCVIS reported 422 casualties, who were suspected of having lifelong impairments. As mentioned earlier, the justification on this kind of impairment was based on individuals (hospital staff) who filled up the forms during the first week of the hospitalization. Information and tables below were analysed and produced among those 422 persons with the suspected lifelong impairments.

Figure below shows the number of persons with lifelong impairment by occupation. It is important to note that almost 70% of them are students (N=72), workers (N=78) and farmers (N=115).

Figure 2: Number of persons with lifelong impairment by occupation

Majority (91%) of the persons with lifelong impairment are in working and driving age group (16-60 years old), as shown in the table below. Around 30% of those lifelong impaired persons are female (120 out of 412). There were statically significant differences in gender by age groups [χ^2 (2) = 7.096, p = .029]. Higher percentage of female than male is observed among children less than 16 years old (11 out of 20 children are female).

Table 13: Numbers of persons with lifelong impairment (by gender and age group) from 2006 to 2012

Age	Gender				Total	
	Male		Female			
0-15 years old	9	3%	11	9%	20	5%
16-60 years old	271	93%	103	86%	374	91%
Older than 60 years old	12	4%	6	5%	18	4%
Total	292	100%	120	100%	412	100%

The data was also analysed to identify differences or similarity of crash characteristics between fatalities and persons with lifelong impairments. It is found that there are statistically significant differences in age groups by both categories [χ^2 (2) = 11.80, p = .003]. The table below shows that casualties between 16 and 60 years old comprise much more proportions among fatalities and lifelong injuries than other age groups. Additionally, they are more likely to sustain lifelong impairment than other age groups, as they accounts for higher proportion among persons with lifelong impairment than fatalities (91% compared to 85%).

Table 14: Numbers of persons with lifelong impairment and fatalities by age groups, from 2006 to 2012

Age	Fatalities		Lifelong impairment	
0-15 years old	1,050	9%	20	5%
16-60 years old	9,941	85%	377	91%
Older than 60 years old	729	6%	18	4%
Total	11,720	100%	415	100%

Although male comprise of majority among fatalities and persons with lifelong impairment, there are statistically significant differences in gender by both categories [χ^2 (1) = 18.87, $p < .001$]. Female are more likely to have lifelong impairment (29% among lifelong impairment casualties, compared on 20% among fatalities), while male are more likely to be killed during the crashes than sustain the lifelong impairment (Table 15).

Table 15: Numbers of persons with lifelong impairment and fatalities by gender, from 2006 to 2012

Gender	Fatalities		Lifelong impairment	
Male	9,436	80%	297	71%
Female	2,391	20%	121	29%
Total	11,827	100%	418	100%

The data indicates that 62% of persons with lifelong impairment are vehicle controllers, other 30% are passengers and 9% are pedestrians (Table 16). Compared to fatalities, there are statistically significant differences in road user types [χ^2 (2) = 6.86, p = .032]. Vehicle controllers are more likely to have lifelong impairment (62% among lifelong impairment persons, and 57% among fatalities), while pedestrians are more likely to be killed (13% among fatalities).

Table 16: Numbers of persons with lifelong impairment and fatalities by road user types, from 2006 to 2012

Type of road users	Fatalities		Lifelong impairment	
Pedestrian	1,502	13%	34	9%
Vehicle controller	6,711	57%	245	62%

Passenger	3,553	30%	118	30%
Total	11,766	100%	397	100%

Proportions of transport modes among fatalities and persons with lifelong impairment are shown in Table 17. They are statistically significant differences [χ^2 (6) = 24.66, p < .001]. Majority of fatalities and persons with lifelong impairment were travelling by motorbikes at the time of crashes. However, motorbike riders are more likely to sustain lifelong impairment than other road users. They account for 77% among lifelong impairment casualties, while less proportion (66%) is observed among fatalities. Only 14% of those motorbike riders, who sustained lifelong impairment, were wearing a helmet at the time of crashes.

Table 17: Numbers of persons with lifelong impairment and fatalities by modes of transport, from 2006 to 2012

Modes of transport	Fatalities		Lifelong impairment	
Motorbike	7,856	66%	315	77%
Bicycle	476	4%	14	3%
Passenger vehicle	962	8%	16	4%
Goods vehicle	616	5%	13	3%
Agriculture vehicle	275	2%	9	2%
Pedestrian	1,504	13%	35	9%
Other	148	1%	6	1%
Total	11,837	100%	408	100%

The table below indicates the proportions of fatalities and persons with lifelong impairments by counterpart transports, which collided with them. More than half of fatalities (51%) were hit by passenger and good vehicles (such as cars, buses, trucks, vans), while other 24% collided with motorbikes. On the other hand, almost half of persons with lifelong impairment collided with motorbikes. The differences are statistically significant [χ^2 (4) = 105.44, p < .001]. Casualties who were injured by motorbikes are more likely to have lifelong impairment, while those who were hit by passenger and goods vehicles are more likely to die.

Table 18: Numbers of persons with lifelong impairment and fatalities by counterpart transport, from 2006 to 2012

Counterpart transports	Fatalities		Lifelong impairment	
Motorbike	2,847	24%	156	43%
Passenger vehicle	3,274	28%	64	18%
Goods vehicle	2,730	23%	31	9%
Fell alone	1,483	13%	66	18%
Other	1,348	12%	43	12%
Total	11,682	100%	360	100%

There are statistically significant differences in urban/rural areas by the fatality and lifelong impairment categories [χ^2 (1) = 24.31, p < .001]. As shown in the table below, 58% of persons with lifelong impairment have accidents in rural areas, compared to 73% among fatalities. Casualties in rural areas are more likely to die in accidents, while those who are injured in urban areas are more likely to sustain lifelong impairment than to lose their life.

Table 19: Numbers of persons with lifelong impairment and fatalities by urban/rural areas from 2006 to 2012

Urban/Rural	Fatalities		Lifelong impairment	
Urban areas	2,668	27%	97	42%
Rural areas	7,147	73%	135	58%
Total	9,815	100%	232	100%

Speed related is the major human error factor that is responsible for more than half of fatalities (53%) and lifelong injuries (56%), followed by drink driving. The proportions of human error factors for fatalities and lifelong injuries are not statistically significant differences [χ^2 (4) = 6.026, p = .197]. Therefore, interventions to prevent road crashes due to speeding and drink driving contribute to reduce fatalities as well as lifelong impairments.

Table 20: Numbers of persons with lifelong impairment and fatalities by human errors, from 2006 to 2012

Human errors	Fatalities		Lifelong impairment	
Speed-related	5,734	53%	133	56%
Not respect right of way	804	7%	9	4%
Dangerous overtaking	1,166	11%	31	13%
Drink driving	1,856	17%	37	16%
Other	1,211	11%	27	11%
Total	10,771	100%	237	100%

It was also noticed that 21% of persons with lifelong impairment due to road crashes were suspected (by traffic police officers or health staff) of having alcohol while traveling. The suspicion was only based on basic appearances, such as attitudes of the persons or alcohol symptom.

In term of injury types, 42% of the injured persons have concussion/neck injuries (Figure 3). Around 85% of them are motorbike riders (either passengers or drivers). As shown in the figure below, more than 40% of persons with lifelong impairment had fractural injuries. Importantly, around 35% of them sustained moving difficulty.

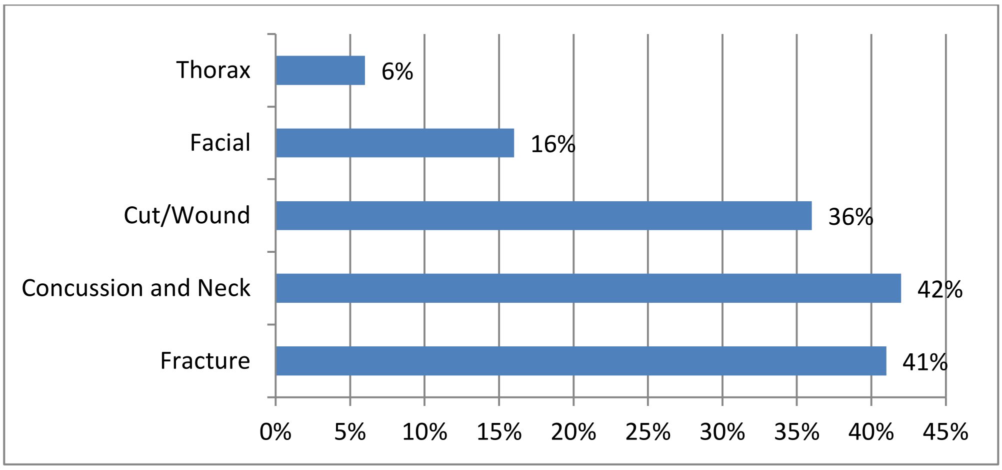

Figure 3: Nature of injuries among persons with lifelong impairment

Only 35% of the records in RCVIS dataset provided information on type of disabilities. As shown in the pie chart below, 68% of them have moving difficulty, followed by learning difficulty.

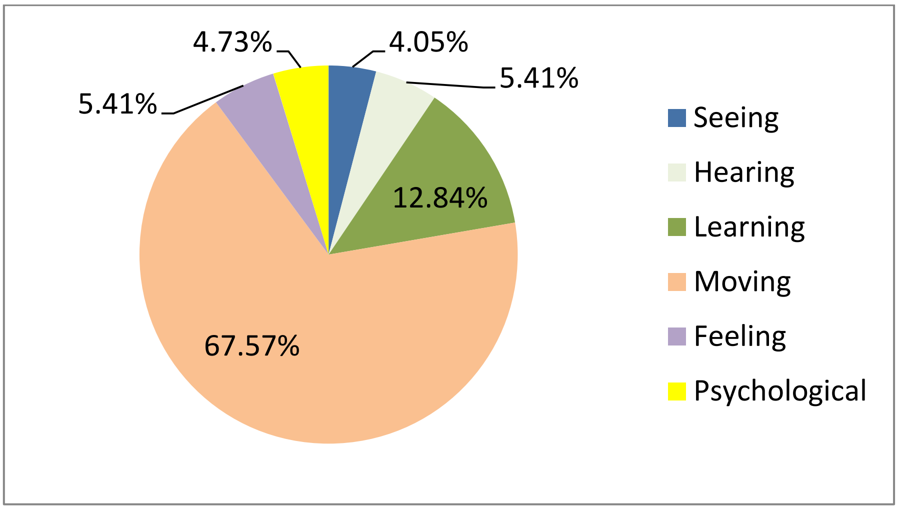

Figure 4: Type of lifelong impairment

Among persons with moving difficulty, 60% had fractural injuries and 28% had concussion/neck injuries. Importantly, all of those injured persons, who sustained learning difficulty, had concussion/neck injury and were not wearing a helmet at the time of crashes.

Phnom Penh, Kandal, Siem Reap and Kampong Cham constituted to the majority of accident places (25%, 14%, 9% and 8% respectively) among persons with lifelong impairment.

Only half (205 out of 422) of the records provide valid information on the transportation to health facilities and areas of accidents. As shown in Table 21 more than half (58%) of them were injured in rural areas. Health facilities offer transport services to 50% of the persons with lifelong impairment due to road crashes. The remaining travelled by other means, such as private transportation. The differences are not statically significant [χ^2 (1) = 1.83, p = .175]. So, the proportion of persons with lifelong impairment transported by health facilities to other transports (such as alone, by family or by private transport) are the same for both urban and rural areas.

Table 21: Numbers of persons with lifelong impairment by areas of accidents and type of transport to health facilities, from 2006 to 2012

Transport to health facilities	Areas of accidents				Total	
	Urban		Rural			
Transported by health facilities	48	56%	55	46%	103	50%
Alone/Family/Private transport	38	44%	64	54%	102	50%
Total	86	100%	119	100%	205	100%

3.5 Discussion

The RCVIS database recorded 151,420 casualties from 2006 to 2012 from all provinces. During these seven years, the data indicated 11,879 fatalities, 45,305 severe injuries, 87,672 slight injuries. The system reported 422 casualties, who were suspected of having lifelong impairments. The number of fatalities keeps increasing since 2006.

Majority of casualties are in working/driving age group (16-60 years old). They are also more likely to sustain lifelong impairment than other age groups. Male account for a majority of casualties, and they are more likely to be killed than female casualties, who are more likely to sustain lifelong impairment.

Vehicle controllers comprise of 56% of overall casualties. They are more likely to have lifelong impairment, while pedestrians are more likely to be killed. Children (0-15 years old) account for almost half (48%) of pedestrians. Majority of casualties (74%) travels by motorbikes at the time of crashes. Besides, motorbike riders are less likely to be killed than other travellers. Casualties who were injured by motorbikes are more likely to have lifelong impairment, while those who were hit by passenger and goods vehicles are more likely to die.

National roads account for more than half (57%) of casualties, followed by rural roads. Casualties in rural areas are more likely to die in accidents, while those who are injured in urban areas are more likely to sustain lifelong impairment than to lose their life.

Human errors involved in at least 75% of causes of injuries. Speed related is the major human error factor that is responsible for more than half of fatalities (53%) and lifelong injuries (56%), followed by drink driving. Speeding is more likely to be responsible for fatal cases (53%) and sever injuries (53%) than in slight injuries

It is important to note that almost 70% of persons with lifelong impairment due to road crashes are students, workers and farmers. Majority of them sustain moving difficulty and 42% have concussion/neck injuries. Importantly, all injured persons with learning difficulty, had concussion/neck injury and were not wearing a helmet at the time of crashes.

The findings from the data analysis also indicate that road crashes tend to effect more on poorer communities, those who were pedestrians or travelled by motorbikes and bicycles, and living in rural areas. This aligned with the fact that 80% of Cambodian live in rural areas (National Institute of Statistics, 2008). Although there are statistically significant differences in fatalities and lifelong injuries by characteristics of crashes, both groups have common contexts that lead to common priorities and interventions. Those general interventions might include targeting male vehicle controllers (16-60 years old) for proper driving training, speeding, drink driving, pedestrian safety, and community along national roads. These kinds of interventions will contribute to reduce the number of fatalities as well as lifelong injuries.

4. Conclusion

The results from this study confirm the findings in the publications of WHO and WorldBank (2011) and Murray et al. (2012). Road crashes become a growing issue and a major contributor to disabilities in Cambodia. This study provides useful information on the overview of road crashes, and lifelong impairment. It helps to prioritize target group, location, time etc.

Besides, it was found that there were numbers of invalid data in most of variables. Improving the mechanism of the data collection system would help to have better and more accurate information, especially on the lifelong impairment. Additionally, limited information also leads to limited analysis in confounding factors that might contribute to the lifelong impairment. At the same time, dataset could not provide comprehensive information on the live experiences of persons with lifelong impairments after the hospital discharge, such as challenges and social barriers which hinder them from full participants into their society. Therefore, there is a need to have further study in order to develop proper intervention towards disability inclusion, improving the rehabilitation services as well as prevention of road crashes.

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