

Vietnam Traffic Safety through Data of Health Sector: Further Study

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Abstract: Traffic accident data of police, though official, but have many shortcomings. The sole other data source, is from the health sector. For various causes, the databases of health sector do not cover the whole country and have other problems in usages. This study is the next step following a previous publication in 2010 to solve these difficulties by proposing or refreshing various methods to calculate main indexes of traffic accidents nationwide. The results confirm that about a half of million or more of people are traffic accident sufferers annually and that's a very high number. This shows the very high seriousness of traffic accident situation. Next, by considering the averaged values of data from top-hospitals as typical for the traffic safety in the whole country, the paper compares various aspects of traffic accidents (e.g. related to helmet, alcohol-driving, sex- and age-groups etc.) of 2009 and 2011 and shows various special features.

Keywords: Traffic accident sufferer, Health sector, Accident indexes, Sex- and age groups, Data underreporting

1. INTRODUCTION

As known, traffic accident data play a very essential role in evaluation of traffic safety situation. In Vietnam, such data collected and issued by traffic police to the National Traffic Safety Committee (NTSC) for publication. These data are legally admitted as official. But unfortunately, the data source has five great shortcomings: lack of systematization; underreporting, incompleteness, incorrectness and inaccessibility (Duc N.H. *et al*, 2011a). So, these data reflect the traffic safety situation incorrectly.

In that case, the data from other sources, if any, would be very useful. As indicated in Duc N.H., *et al* (2011b), there are in Vietnam data from health sector. These data are published by Ministry of Health (MOH) officially, but are not admitted as background for evaluation of the traffic safety situation. It is remarkable that the data of health sector always reflect the overall seriousness of traffic accident at a higher level than those of traffic police.

Though the data of health sector in Vietnam have great value, and due to the fact that these data are considered unofficial materials by the traffic safety authorities, the efforts and necessary resources to collect the data are not enough. Therefore, all studies based on MOH's data would confront a lot of difficulties.

In the paper Duc N.H., *et al* (2011b), for the first time, there are some results in overcoming difficulties of evaluation of traffic safety which is based on data of health sector for the year of 2009.

Further, in 2012, Ministry of Health published their traffic accident data of 2011 (and some of 2010).

In this study, the results from the above-said paper will be refreshed and other outcomes of further efforts to overcome different difficulties in using data of health sector for evaluation of traffic safety will be presented.

In next section, main special features of data of health sector that could lead to useful conclusions and/or difficulties and main conclusions of the previous paper will be resumed. Then, the data of whole country with 63 provinces will be presented based on available data of a fewer number of provinces. Next, discovered special features of traffic accidents in relation to medical treatment in 2009 and 2011 will be compared and explained.

2. OUTLINES OF DATA OF THE HEALTH SECTOR

Although the databases of health sector and traffic police both are related to traffic accident, but these databases have difference that has been systematically summarized in Duc N.H., *et al* (2011b) (see Appendices). These differences are very essential for the usage of related data. Each record in database of health sector mainly deals with each accident sufferer under medical treatment while the police's one mentions to each accident in which there could be none, one or more injuries/fatalities.

As indicating in the reference documents, both databases have shortcomings that make difficulty for any attempt to use the data. Regarding health sector, these difficulties come from the collecting method as indicated below.

2.1 Outlines of Data Collecting Methods of the Vietnam Health Sector

The Health sector collects the traffic accident data by three methods; each of them has some problems.

- (a) Collecting from all 63 provinces: the original information on patient of traffic accidents is included in a special form of MOH and inputted in the computer at the medical care units. For these computers works separately, not under a network, the medical care units will prepare a report to the Provincial Department of Health (PDOH) and PDOH synthesizes these reports into a Provincial Report to send to MOH in hardcopies. But unfortunately, there are always some provinces who do not submit their reports. So, the data are not for the whole 63 provinces of the country. More seriously, while data of some provinces are absent this year, data of some other provinces could be absent next year. That is why it is very difficult to compare the data year by year.
- (b) Collecting from 100 top-hospitals: Similarly, in principle, the 100 top-hospitals should send their synthesized report on traffic accident data to MOH, but always some hospitals do not do that, while data of some hospitals are absent this year, data of some other hospitals could be absent next year.
- (c) Surveys: As usual, MOH uses this method to have some information such as death rate etc. from the surveyed area and applying the results as valid to a larger area, even nationwide. This method has advantages and disadvantages as known, especially, when using the survey results for outside of surveyed area.

2.2 On Available Data of Health Sector

For various reasons, the available data for this study are the officially published ones of MOH. The data are mainly related to the year 2009 and 2011 (including some data of 2010) which have been collected by two first above-mentioned methods. The data are not fully collected as indicated in the below Table.

Table 1: The availability of data

Year	From all 63 provinces		From 100 top-hospitals	
	Number of provinces issuing data	Number of injury cases	Number of hospitals issuing data	Number of injury cases
2009	59	1,121,113	84	419,621
2010	44	1,064,386	NA	NA
2011	55	1,247,209	49	330,247

Source: MOH (2010) and MOH (2012)

From this table, it could understand following problems in using the available data:

- (1) To compare the traffic accident injury cases nationwide, it should calculate the number of injuries and number of fatalities for the whole country with 63 provinces, based on the available data of 59 (2009) and 44 (2010 and 2011) ones. The method has been proposed in Duc N.H., *et al* (2011b) and it will be refreshed in this study. The extrapolation process and results will be presented in the section 3.
- (2) To discover conclusions on various aspects of traffic accidents, it should use data from top-hospitals. However, the number of hospitals who issue data are different in each year while there is no background for extrapolation, it can not use the absolute value of data for comparison. Instead of that, the average rate of these values will be used for comparison as described in the section 4.
- (3) Regarding the last method, the health sector published in various documents with some results of various surveys on traffic accident patients treated by medical establishments. The related information is very unsystematically and distributed in different documents. In this study, they have been selected and put systematically as original data for further calculation in the section 3.

3. GENERAL INDEXES OF TRAFFIC ACCIDENTS FROM HEALTH SECTOR

As known, among various indexes of traffic accidents, three followings are essential: number of accidents, number of fatalities and number of injuries. As indicated in Duc N.H., *et al* (2011b), the data of Vietnamese health sector do not allow calculating the number of accidents but could provide the two others.

In this section, two methods will be used to overcome the fact that the available data of health sector do not cover the whole country as follows:

Firstly, the below table is about the data on traffic accident fatalities.

- The column (c) is the published data of traffic police with 7-day-standard and in the column (d), these data are converted into 30-day-standard so that they could be compared with correspondent ones of health sector.
- The column (f) is about the data provided by health sector from various surveys. Each survey are implemented in some local areas and published in different documents (see list of MOH and VHEMA documents in the reference). They are systematically collected in the table of this study. Based on conspicuous

assumption that the rates could be used for nationwide, the number of fatalities could be found as indicated in the column (g). Outstandingly that all results on number of accident fatalities by health sectors are always higher remarkable than that of police (at 25-30%).

Table 2. Number of fatalities calculated based on data of health sector

Year	Population	Fatalities by Police		Per 100000 population		Number of fatalities by health sector		
		7 day-standard	30 day-standard	Police	Health sector	Amount	Higher than that of police	%
(a)	(b)	(c)	(d)= 1.08*(c)	(e)= 100000(d)/(b)	(f)	(g)= (f).(b)/100000	(h)=(g)-(d)	(i)=(h)/(d)
2005	82,392,100	11,184	12,079	14.66	19.90	16,396	4,317	35.74%
2006	83,311,200	12,719	13,737	16.49	21.20	17,662	3,925	28.58%
2007	84,218,500	12,982	14,021	16.65	21.70	18,275	4,255	30.35%
2008	85,118,700	11,594	12,522	14.71	18.51	15,755	3,234	25.83%
2009	86,025,000	11,516	12,437	14.46	18.93	16,285	3,847	30.93%
2010	86,932,500	11,449	12,365	14.22	17.91	15,570	3,205	25.92%
2011	87,840,000	11,395	12,307	14.01	18.22	16,004	3,698	30.05%

In the figure 1 are graphs with data on fatalities by police and by health sector. There are two remarks here:

- The data of health sector always higher than those of police, with reflexes a more serious situation of traffic accident.
- The behavior of two graphs in 2005-2008 are similar, but after that they are quite different: while data of police decreases continuously, though a few only, the health sector data shows that the traffic accidents are not under firm control: increase and decrease subsequently.

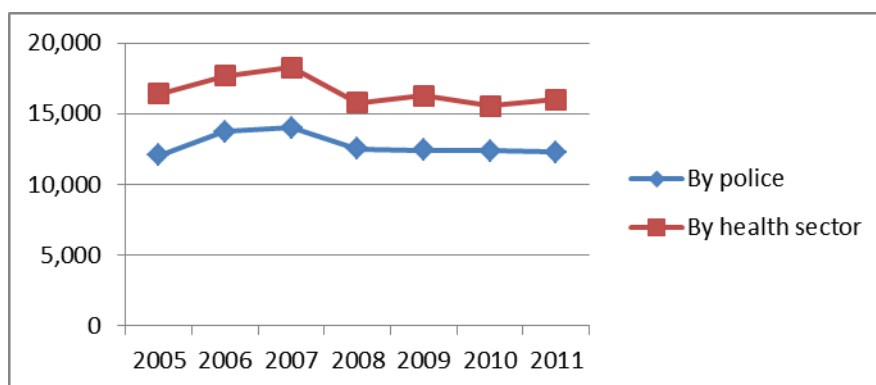


Figure 1 Graphs with data on fatalities by police and by health sector

Secondly, in the below table, the calculated number of accident injuries (or “sufferer” as used in sector health) are presented based on the method proposed in Duc N.H., *et al* (2011b).

As waited, the calculated data of health sector is higher remarkable than that of police, which reflects the high known underreporting level. As indicated, about a half of million or more of people are traffic accident sufferers annually, a very high number. This shows the very seriousness of traffic accident situation.

Table 2. Number of injuries calculated based on data of health sector

Year	Data provided by Police	Original data of MOH		Correlation factors (in %)					Number of sufferers nationwide
		Number of provinces	Number of sufferers	C1	C2	C3	C4	$C=C1*C2*C3*C4$	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(k)=(d).(j)
2009	7,914	59	441,890	95.80	103.10	117.40	99.00	114.80	507,273
2010	51,087	44	409,913	95.75	102.87	131.70	99.00	128.42	526,430
2011	48,734	44	463,212	95.70	103.30	132.30	99.00	129.48	599,745

Note: C1 is the average rate of patients who move to other hospital for further treatment in comparison with the total number of patient. C2 is the average rate of medical service capacities (calculated in terms of patients' beds as health sector used) of small private medical examination rooms with that of hospitals. C3 is the rate of medicine service capacities of provinces (who provide data) in comparison with the whole health system (excluding that of sanatorium). C4 is the rate of sufferer of other injury kind but declared as traffic accident's patient (Source: Duc N.H., et al (2011b)).

The figure 2 shows a large difference in number of accident sufferers, and especially, there is a difference in behavior of graphs with data from two sectors. The number sufferers under health sector increases steadily in 2009-2011 while that of police decreases from 2010 to 2011.

Another remark is worthy to explain the fact that the suddenly increased value in column (b) in 2009 to 2010. This is the results of efforts of Ministry of Public Security to collect better data: before 2010, police collected data of very serious accidents only (mainly, accidents with fatalities and/or with very serious injuries). Since 2010, many provinces have collected other kind of accidents, too.

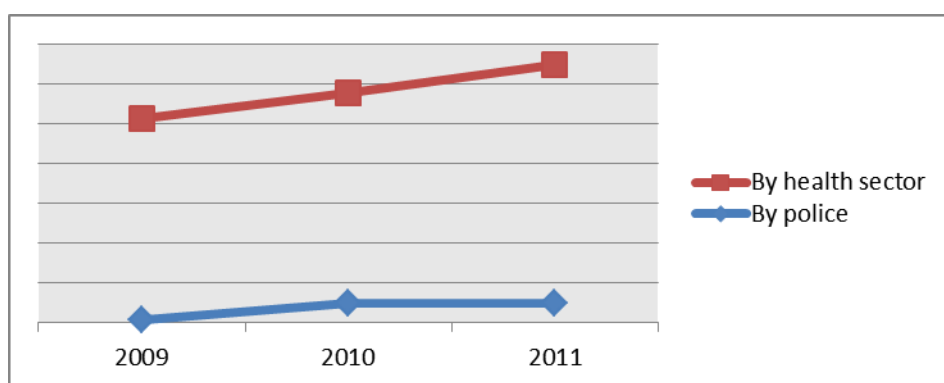


Figure 2. Different behavior of graphs on number of accident sufferers by police and by health sector

4. COMPARATIVE STUDY ON VARIOUS ASPECTS OF TRAFFIC ACCIDENT IN 2009 AND 2011 THROUGH DATA OF HEALTH SECTOR

In this section, comparison will be made between 2009 and 2011 on different aspects of traffic accident through data of health sector. As said in the section 2, the incompleteness of data will be overcome by comparison the average rate instead of absolute value.

Table 3. On various aspects of traffic accident in 2009 and 2010 through the total number of cases

No	Items	No. in 2009	No. in 2011
0	Number of hospitals issuing data	84/100	49/100
1	Number of all patients under medical treatment	419,621	330,247
2	Number of accident patients under medical treatment	143,940	135,224
	<i>Rate of traffic accident sufferers among all cases</i>	34.30%	40.95%
-	Traumatic Brain Injuries (TBI)	36,412	23,426
	<i>Percentage of TBI in all TA</i>	25.30%	17.32%
-	Rate of TBI without helmet	6,110	2,808
	<i>Rate of TBI without helmet in comparison with all TBI</i>	16.78%	11.99%
-	Spinal Cord Injuries (SCI) (Cervical spine injuries)	1,200	669
	<i>Percentage of SCI in all TA</i>	0.83%	0.49%
-	Number of emergencies operation	12,534	7,800
	<i>Rate of emergencies operation among all TA</i>	8.71%	5.77%
3	Number of accident patients related to helmet	27,656	35,271
	<i>Percentage of accidents related to helmet</i>	19.21%	26.08%
-	Number of cases with broken helmet	1,857	1,518
	<i>Percentage of broken helmet cases (in all helmet-related-TA)</i>	6.71%	4.30%
-	Number of patient who did not fasten	2,610	4,152
	<i>Percentage of un-fastened cases (in all helmet-related TA)</i>	9.44%	11.77%
-	Number of patient who used fake helmet	23,189	29,601
	<i>Percentage of fake helmets (in all helmet-related-TA)</i>	83.85%	83.92%
4	Number of drinking driving patients	15,774	20,160
	<i>Rate of drink-driving among all TA</i>	10.96%	14.91%
5	Number of patient with high alcohol concentration in blood	7,138	6,873
	<i>Rate of patient with high alcohol concentration in blood among drinking-driving ones</i>	45.25%	34.09%
6	Number of identified vehicles leading to accident	144,668	133,880
-	Car	9,044	8,812
-	Motorcycle, motorbike	103,147	104,088
	<i>Percentage of TA caused by motorcycle/motorbike</i>	71.30%	77.75%
-	Train	534	16
-	Self-made vehicle	1,298	1,059
-	Self-inflicted accident	19,942	13,136
	<i>Percentage of Self-inflicted accident</i>	13.9	9.7
-	Other	10,703	6,769
	<i>Percentage of other kind of vehicle causing accident</i>	7.4	5.0
7	Fatalities or can not treated further	3,740	2,444
	<i>Percentage of patients with fatalities or can not treated further</i>	2.60%	1.81%
-	Number of Pre-hospital deaths	585	686
	<i>Rate of Pre-hospital deaths</i>	15.64%	28.07%
-	In-hospital death	2,156	1,416
	<i>Rate of In-hospital death</i>	57.65%	57.94%
-	Number of patient with so serious injury that can not be treated further	999	342
	<i>Rate of patient with so serious injury that can not be treated further</i>	26.71%	13.99%

In the above table 3, these aspects will be considered through the total amounts of cases. The data of 2009 are from 84 among 100 top-hospitals while those of 2011 are from 49 only. There are followings remarks:

- The rate of accident sufferer among all patients under medical treatment increases (34.30% to 40.95%), but the rate of Traumatic Brain Injuries (TBI) and the rate of Spinal Cord Injuries (SCI) (Cervical spine injuries) decreases that means efforts to ensure traffic order and safety have at least good impact in decreasing the seriousness.
- The rate of accident patient with helmet increases remarkably, especially, the increasing percentage of patient who did not fasten and the high value of fake helmet show that though helmet regulations are valid from 2008, but after some years, the authorities seem do not pay enough attention, so that people step by step pay less attention in helmet quality.
- The rate of drinking-driving patients and rate of patient with high alcohol concentration in blood among drinking-driving ones are still high or reduced little. That means further efforts for solving the drinking-driving problems are necessary.
- The rate of motorcycle (and motorbike) in the accident causing vehicles is still very high (a little higher than that of police at about 70%).
- The number of death decreases but the increasing rate of pre-hospital deaths shows that the capacity of first-aid still remains as one of serious problem now (see JICA, 2009).

In the below table 4, these aspects will be considered through the sex group of patients. There are following remarks:

- In most cases, the rate of male accident sufferers is higher, even remarkably higher in some features, than that of female.
- But in some aspects, especially, in helmet related cases, the rate of female patient is higher unfortunately such as: rate of Traumatic Brain Injuries (TBI) without helmet in comparison with all TBI cases; percentage of accidents related to helmet; percentage of broken helmet cases; percentage of un-fastened cases (in all helmet-related) etc. This fact reflects a very dangerous current trend: more and more female vehicle operators use the so-called “fashion-helmet” which are fashion but low quality.
- Percentage of female patient of traffic accident caused by motorcycle/motorbike is always higher than that of male. There are opinions that the female motorcycle operators may pay less attention on driving because they are attracted by many other things.
- The rate of female in-hospital death is unfortunately higher than that of male. This fact could be explained by the higher rate of male pre-hospital death.

Table 4. On various aspects of traffic accident in 2009 and 2010 by sex groups

TT	Items	2009		2011	
		Male	Female	Male	Female
1	Number of all patients under medical treatment	257,624	161,997	205,592	124,655
2	Number of accident patient under medical treatment	100,338	43,602	99,149	36,075
	<i>Rate of traffic accident sufferers among all cases</i>	38.95%	26.92%	48.23%	28.94%
-	Traumatic Brain Injuries (TBI)	27,010	9,402	18,595	4,828
	<i>Percentage of TBI in all TA</i>	26.92%	21.56%	18.75%	13.38%
-	Rate of TBI without helmet	4,486	1,624	2,215	593
	<i>Rate of TBI without helmet in comparison with all TBI</i>	16.61%	17.27%	11.91%	12.28%
-	Spinal Cord Injuries (SCI) (Cervical spine injuries)	976	224	491	178
	<i>Percentage of SCI in all TA</i>	0.97%	0.51%	0.50%	0.49%
-	Number of emergencies operation	9,764	2,770	6,022	1,778
	<i>Rate of emergencies operation among all TA</i>	9.73%	6.35%	6.07%	4.93%
3	Number of accident patients related to helmet	19,960	7,696	25,836	9,435
	<i>Percentage of accidents related to helmet</i>	19.89%	17.65%	26.06%	26.15%
-	Number of cases with broken helmet	1,358	499	995	523
	<i>Percentage of broken helmet cases (in all helmet-related-TA)</i>	6.80%	6.48%	3.85%	5.54%
-	Number of patient who did not fasten	1,664	946	2,620	1,532
	<i>Percentage of un-fastened cases (in all helmet-related TA)</i>	8.34%	12.29%	10.14%	16.24%
-	Number of patient who used fake helmet	16,938	6,251	22,221	7,380
	<i>Percentage of fake helmets (in all helmet-related-TA)</i>	84.86%	81.22%	86.01%	78.22%
4	Number of drinking driving patients	15,121	653	19,139	1,021
	<i>Rate of drink-driving among all TA</i>	15.07%	1.50%	19.30%	2.83%
5	Number of patient with high alcohol concentration in blood	6,756	382	6,599	274
	<i>Rate of patient with high alcohol concentration in blood among drinking-driving ones</i>	44.68%	58.50%	34.48%	26.84%
6	Number of identified vehicles leading to accident	102,252	42,416	98,270	35,610
-	Car	6,416	2,628	6,559	2,253
-	Motorcycle, motorbike	72,107	31,040	75,832	28,256
	<i>Percentage of TA caused by motorcycle/motorbike</i>	70.52%	73.18%	77.17%	79.35%
-	Train	367	167	15	1
-	Self-made vehicle	1,017	281	825	234
-	Self-inflicted accident	14,809	5,133	10,308	2,828
	<i>Percentage of Self-inflicted accident</i>	14.8	11.8	10.4	7.8
-	Other	7,536	3,167	4,731	2,038
	<i>Percentage of other kind of vehicle causing accident</i>	7.5	7.3	4.8	5.6

TT	Items	2009		2011	
		Male	Female	Male	Female
7	Fatalities or can not treated further	2,931	809	2,026	418
	<i>Percentage of patients with fatalities or can not treated further</i>	2.92%	1.86%	2.04%	1.16%
-	Number of Pre-hospital deaths	475	110	590	96
	<i>Rate of Pre-hospital deaths</i>	16.21%	13.60%	29.12%	22.97%
-	In-hospital death	1,660	496	1,157	259
	<i>Rate of In-hospital death</i>	56.64%	61.31%	57.11%	61.96%
-	Number of patient with so serious injury that can not be treated further	796	203	279	63
	<i>Rate of patient with so serious injury that can not be treated further</i>	27.16%	25.09%	13.77%	15.07%

In the table 5 below, these aspects will be considered through the age groups of patients. There are following remarks:

- Rate of traffic accident sufferers among all medical treatment cases in 2011 is remarkably higher than that of 2009 for all age groups.
- The highest rate of accident patients is that of the teen-age group (15-19 year old) in both 2009 and 2011. The working age group (20-59 year old), though bigger on the number of members, but has lower rate. That mean, there is a necessity of emphasize of special counter measures for teen-age people.
- Related to helmet, the teen- and working age groups keep high rate, but it is abnormally that the percentage of related accidents of the pupils (0-4) and old people group (60+) in 2011 are higher strongly than that of 2009. This dangerous situation could be explained by the increasing percentage of un-fastened cases (in all helmet-related TA). It is possible that the helmet producers/suppliers pay more attention to other age groups for their majority of customers. The helmets are produced mainly for these people, so they are not quite appropriate for pupils and the old people and these vulnerable inhabitants have to still use same helmets.
- Regarding vehicles causing to accident, as known, motorcycle and motorbike always keep highest rates in comparison with other kinds of vehicles. It is strange that, in 2009, the teen- and working age groups have higher percentages of traffic accident caused by motorcycle/motorbike but in 2011, these percentages become lower than other age groups. This fact could be explained that more and more young people use private car instead of motorcycle.
- On the number of patients with fatalities or can not be treated further, it is not surprising that the old age group (60+) keeps highest rate as they are the most vulnerable. But it is unexpected that the pupils have high rate of pre-hospitals deaths. This fact should be considered as warning for the parents.

Table 5. On various aspects of traffic accident in 2009 and 2010 by age groups

No.	Items	Age groups 2009					Age groups 2011				
		0-4	5-14	15-19	20-59	60+	0-4	5-14	15-19	20-59	60+
1	Number of all patients under medical treatment	16,311	24,725	49,094	263,192	64,456	7,602	17,575	34,892	236,761	33,432
2	Number of accident patients under medical treatment	3,121	8,152	21,221	103,097	8,409	2,661	7,934	19,795	97,850	6,971
	<i>Rate of traffic accident sufferers among all cases</i>	19.13%	32.97%	43.23%	39.17%	13.05%	35.00%	45.14%	56.73%	41.33%	20.85%
-	Traumatic Brain Injuries (TBI)	765	2,223	5,127	25,709	2,543	352	1,203	3,119	17,534	1,197
	<i>Percentage of TBI in all TA</i>	24.51%	27.27%	24.16%	24.94%	30.24%	13.23%	15.16%	15.76%	17.92%	17.17%
-	Rate of TBI without helmet	410	767	1,125	3,438	361	91	296	426	1,784	211
	<i>Rate of TBI without helmet in comparison with all TBI</i>	53.59%	34.50%	21.94%	13.37%	14.20%	25.85%	24.61%	13.66%	10.17%	17.63%
-	Spinal Cord Injuries (SCI) (Cervical spine injuries)	6	31	129	918	119	3	5	72	527	62
	<i>Percentage of SCI in all TA</i>	0.19%	0.38%	0.61%	0.89%	1.42%	0.11%	0.06%	0.36%	0.54%	0.89%
-	Number of emergency operations	113	417	1,491	9,859	648	73	525	1,337	5,415	439
	<i>Rate of emergency operations among all TA</i>	3.62%	5.12%	7.03%	9.56%	7.71%	2.74%	6.62%	6.75%	5.53%	6.30%
3	Number of accident patients related to helmet	248	909	3,866	21,144	1,484	459	1,300	4,776	26,453	2,283
	<i>Percentage of accidents related to helmet</i>	7.95%	11.15%	18.22%	20.51%	17.65%	17.25%	16.39%	24.13%	27.03%	32.75%
-	Number of cases with broken helmet	16	59	339	1,368	74	33	80	252	1,067	86
	<i>Percentage of broken helmet cases (in all helmet-related-TA)</i>	6.45%	6.49%	8.77%	6.47%	4.99%	7.19%	6.15%	5.28%	4.03%	3.77%
-	Number of patients who did not fasten	46	117	453	1,767	224	120	247	477	2,812	496
	<i>Percentage of un-fastened cases (in all helmet-related TA)</i>	18.55%	12.87%	11.72%	8.36%	15.09%	26.14%	19.00%	9.99%	10.63%	21.73%
-	Number of patients who used fake helmet	186	733	3,074	18,009	1,186	306	973	4,047	22,574	1,701

No.	Items	Age groups 2009					Age groups 2011				
		0-4	5-14	15-19	20-59	60+	0-4	5-14	15-19	20-59	60+
	<i>Percentage of fake helmets (in all helmet-related-TA)</i>	75.00%	80.64%	79.51%	85.17%	79.92%	66.67%	74.85%	84.74%	85.34%	74.51%
4	Number of drinking driving patients		130	1,805	13,421	413		131	2,249	17,321	429
	<i>Rate of drink-driving among all TA</i>		1.59%	8.51%	13.02%	4.91%		1.65%	11.36%	17.70%	6.15%
5	Number of patients with high alcohol concentration in blood		52	786	6,107	173		19	740	6,017	97
	<i>Rate of patient with high alcohol concentration in blood among drinking-driving ones</i>		40.00%	43.55%	45.50%	41.89%		14.50%	32.90%	34.74%	22.61%
6	Number of identified vehicles causing accident	3,326	8,145	21,694	102,523	8,980	2,878	7,985	20,054	95,623	7,325
	- Car	195	514	1,588	6,117	630	167	509	1,213	6,356	565
	- Motorcycle, motorbike	2,174	5,360	14,870	74,795	5,998	2,350	6,597	14,926	74,395	5,820
	<i>Percentage of TA caused by motorcycle/motorbike</i>	65.36%	65.81%	68.54%	72.95%	66.79%	81.65%	82.62%	74.43%	77.80%	79.45%
	- Train	13	24	81	391	23	0	6	0	10	0
	- Self-made vehicle	47	159	154	815	121	12	58	192	731	66
	- Self-inflicted accident	456	1,071	3,244	14,009	1,162	64	267	2,386	10,076	334
	<i>Percentage of Self-inflicted accident</i>	14.6	13.1	15.3	13.6	13.8	2.4	3.4	12.1	10.3	4.8
	- Other	441	1,017	1,757	6,396	1,092	285	548	1,337	4,055	540
	<i>Percentage of other kind of vehicle causing accident</i>	14.1	12.5	8.3	6.2	13.6	10.7	6.9	6.8	4.1	7.7
7	Fatalities or can not treated further	24	98	410	2,727	471	35	40	267	1,896	216
	<i>Percentage of patients with fatalities or can not treated further</i>	0.77%	1.20%	1.93%	2.65%	5.60%	1.32%	0.50%	1.35%	1.94%	3.10%
	- Number of Pre-hospital deaths	1	19	69	441	53	18	7	59	552	50
	<i>Rate of Pre-hospital deaths</i>	4.17%	19.39%	16.83%	16.17%	11.25%	51.43%	17.50%	22.10%	29.11%	23.15%
	- In-hospital death	20	56	238	1,596	244	15	22	173	1,067	142
	<i>Rate of In-hospital death</i>	83.33%	57.14%	58.05%	58.53%	51.80%	42.86%	55.00%	64.79%	56.28%	65.74%
	- Number of patients with so serious injury that can not be treated further	3	23	103	690	174	2	11	35	277	24
	<i>Rate of patient with serious injury that can not be treated further</i>	12.50%	23.47%	25.12%	25.30%	36.94%	5.71%	27.50%	13.11%	14.61%	11.11%

5. CONCLUSIONS AND RECOMMENDATIONS

In this paper, by selection of related data from various official sources of health sector and by refreshing/proposing various calculation methods, following conclusions have been presented:

- The Traffic Accident Database of the Health sector, despite of some limitation and problems, especially it does not cover the whole country, they are the sole source, except that of police.
- For the shortcomings of police's data, it is essential to have necessary methods to overcome the problems in database of the health sector. Such methods are available and they are updated (the old ones) and newly proposed for the usage of data of health sector.
- By using the results in different surveys of health sector, it could find out the number of traffic accident fatalities nationwide. These numbers are more essential to those of police. This fact reconfirms the known underestimation of police.
- By using the proposed method in Duc N.H., *et al* (2011b) with newly updated data, about a half of million or more of people are traffic accident sufferers annually, a very high number. This shows the very seriousness of traffic accident situation.
- Further, the paper compares various aspects of traffic accidents (e.g. related to helmet, alcohol-driving, sex- and age-groups etc.) of 2009 and 2011 and shows various special features.

It's recommended that the health sector would keep efforts to improve their database and such database should be officially recognized in the traffic safety situation evaluation together with that of traffic police.

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APPENDIX: CHARACTERISTICS OF THE DATABASE OF HEALTH SECTOR AND THAT OF TRAFFIC POLICE

Table 6. Comparisons between the database of health sector and that of traffic police

Item	Database of health sector	Database of traffic police (*)
Definition of traffic accident	Similar	
Object of record	Each record is related to one patient	Each record is related to one accident
Main inputted information	Related to medical trauma and	Related to causes, situation,

¹ Under discussion with him, the authors in Duc N.H., *et al* (2011b) want to withdraw the conclusion at the end of sub-section 3.1 in their paper.

Item	Database of health sector	Database of traffic police (*)
	health damage of patient	conditions and consequences of accident
Agencies to record primitive information	All medical establishments from local level to central level (about 13, 000 establishments nationwide)	All provincial/district traffic police team (about 1000 units nationwide)
Standard of fatal injury	Any person who was killed outright or who died within 30 days as a result of the accident	Any person who was killed outright or who died within 07 days as a result of the accident
Systematization in collection and storage	Low but better level	Low level
Completeness of data fields (level of filled-in fields)	Good	Low. Many data fields are empty.
Completeness of records	The data collection system is still in establishment process.	Very low. It is the background for underreporting
Correctness of data	Not 100%, but acceptable	At different levels with different fields.
Over-, Underreporting	Both at low levels, but objectively	Underreporting at very high level
Consistency	There are still inconsistency problem	
Accessibility	Difficult	Difficult

Source: Duc N.H., et al (2011b)

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