Road Safety Status of AEC Countries

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Abstract

Based on a Global Status Report on Road Safety by WHO in 2009[1] and 2013[2] Road Traffic Fatalities (RTFs) data for ASEAN Economic Community (AEC) countries were analyzed and compared. It was found that RTFs per 100,000 population illustrated low correlation with Gross National Incomes (GNIs) per capita. In contrast, the RTFs per 1,000 vehicles showed reasonably high correlation with both GNIs per capita and number of vehicles per 1,000 population. The greater the GNIs per capita and/or number of vehicles per 1,000 population, the lower the RTFs per 1,000 vehicles were. As GNI per capita increased, the proportion of 4-wheeled motor vehicles clearly rised and the proportion of 2- and 3- wheeled motor vehicles declined. In WHO 2009[1], as the proportion of 2/3 wheeled vehicles increased, the proportion of RTFs caused by 2- and 3- wheeled vehicles also rised among the AEC countries. However, this trend was not realized in WHO 2013[2]. The improvement of the adoption and enforcement of national road safety legislation could be generally realized. However, only high income countries clearly showed the high performances.

Keywords: Road Traffic Fatalities, Fatalities per Vehicles, Fatalities per Population, Vehicle Ownership, Vehicles per population, Gross National Incomes (GNIs) per capita.

1. Introduction

The macroscopic relationships among road traffic fatalities, population, vehicles, traveled distance, vehicles – distance of travel, and income levels were determined for several countries. The general conclusion was that low income countries have been facing greater adverse road safety problems than those high income countries [3]. It has been widely believed that RTFs risk (RTFs per 100,000 populations) will decline as income values (GNIs per capita) increases [4]. Koren and Borsos [5] also noted that as vehicle ownership rises, RTFs per vehicle will decline. While vehicle ownership increases, RTFs per population as well as the total number of RTFs will also enhance. Based on [1], Mohan [6] found that low and medium incomes countries had high RTFs per 100,000 populations than the high incomes countries. Jacop et al [7] pointed out that the reported RTFs were generally underestimated. Mohan [6] also noted that analyzed RTFs data have been generally under reporting and therefore WHO ([1] and [2]) has tried to improve this problem by readjust RTFs data for the 30-day period RTFs after an accident.

2. Objectives and Scope of the Research

In 2009 [1] and 2013 [2], scientifically developed a series of negative binomial regression models to estimate 30-day period RTFs for each country. Such estimations systematically allow us to directly compare RTFs information across the AEC countries. This research is mainly based on these two WHO reports ([1] and [2]). The key objectives of this paper are as follows: (i) to determine the relationship RTFs rates (RTFs per population and RTFs per vehicles), motorization or vehicle ownership (registered vehicles per population) and income levels (GNIs per capita) among the AEC countries; (ii) to examine the relationship between vehicle composition and proportion of RTFs by road user types among the AEC countries and (iii) to consider the nature of the adoption and enforcement of national road safety legislation among the AEC countries.

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Based on the Global Status Report on Road safety: Time for Action [1] and the Global Status Report on Road Safety 2013: Supporting a Decade of Action [2] reported by World Health Organization (WHO), the 2007 and 2010 Road Traffic Fatalities (RTFs) and other related information of each AEC country were analyzed and compared. Some of the key findings are discussed below.

3. Road Traffic Fatalities per Population

As shown in Figure 1, among AEC countries, both reported and estimated RTFs per 100,000 population in 2007 and 2010 showed relatively low correlation with GNIs per capita. Similar findings was also found in Mohan [6]. For Brunei Darussalam, Malaysia, Singapore and Thailand in 2007, the reported RTFs and the estimated RTFs were equal, while the reported and estimated RTFs showed the greatest discrepancy for Myanmar and Philippines. Base on the estimated RTFs per 100,000 population in 2007, Myanmar was the first rank among the AEC countries. In 2010, Thailand showed the greatest discrepancy between the reported RTF per 100,000 population and the estimated one. In 2010 [2], the reported and estimated RTFs per 100,000 population of Malaysia, Philippines and Singapore were generally close. It should also be noted that based on the WHO (2013) estimated RTFs per 100,000 population [2], Thailand became as the first rank among the AEC countries and the third rank in the world. Based on WHO report published in 2014 [9] using 2008 data, University of Michigan Transportation Research Institute [9] found that with respect to the estimated RTFs per 100,000 population, Thailand becomes the second rank (with 44 fatalities per 100,000 population) in the world. Except Brunei Darussalam, for others remaining AEC countries in 2007 and 2010, all reported RTFs per 100,000 population were lower than those WHO estimated values.

4. Road Traffic Fatal ities per Vehicles

Vehicle-kilometers of travels on road network of each country would be ideally suitable for determining the road accident exposure [5]. Although the number of registered vehicles is less appropriate than vehicle-kilometers values, it is capable of being an indicator of motorization and vehicle ownership. Although the most widely accepted indicator representing road safety characteristics of several countries is RTFs per 100,000 population [5], RTFs per 1,000 registered vehicles are considered in this section. As shown in Figure 2 and Figure 3 in 2007 [1] and 2010 [2], the reported and estimated RTFs per 1,000 registered vehicles showed reasonably high correlation with both GNI per capita and number of vehicles per 1,000 populations. The greater the GNI per capita and number of registered vehicles per 1,000 populations, the lower the reported and estimated RTFs per 1,000 vehicles were. This means that as the countries incomes (GNIs per capita) as well as number of vehicles per 1,000 population increase, the social awareness and attitude

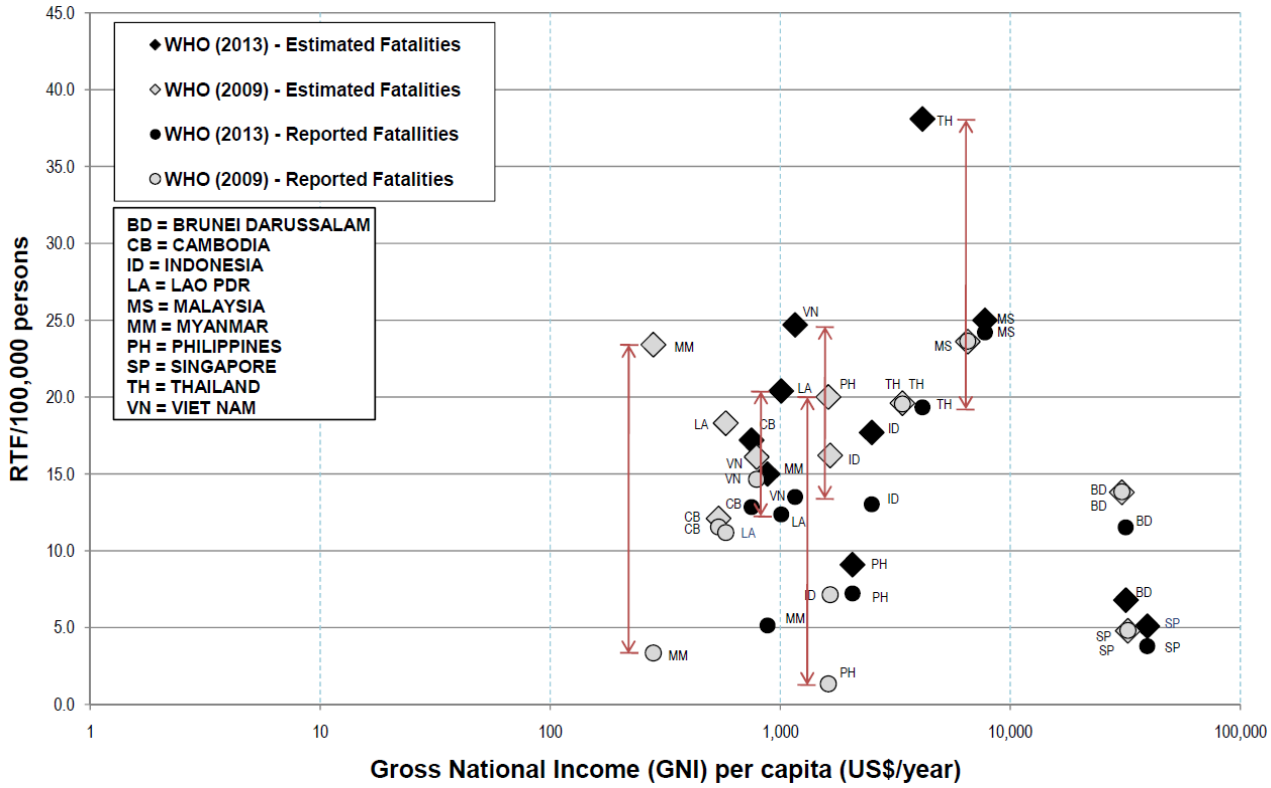

Fig. 1 The relationship between RTFs per 100,000 population and GNI per capita among AEC countries in 2007 and 2010 [1]

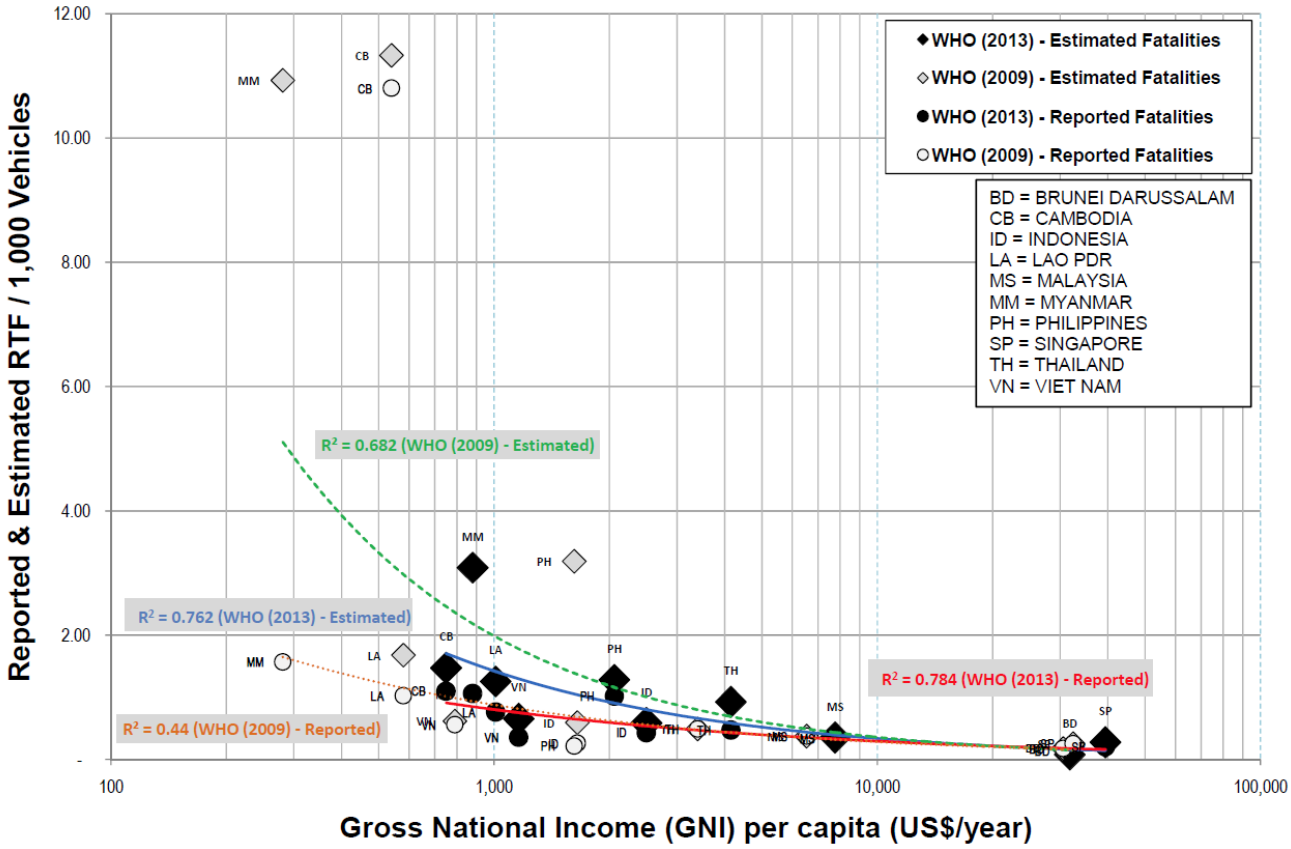

Fig. 2 The relationship between the reported and estimated RTFs per 1,000 vehicles and GNI per capita (US$/year) among AEC countries in 2007 and 2010 [1]

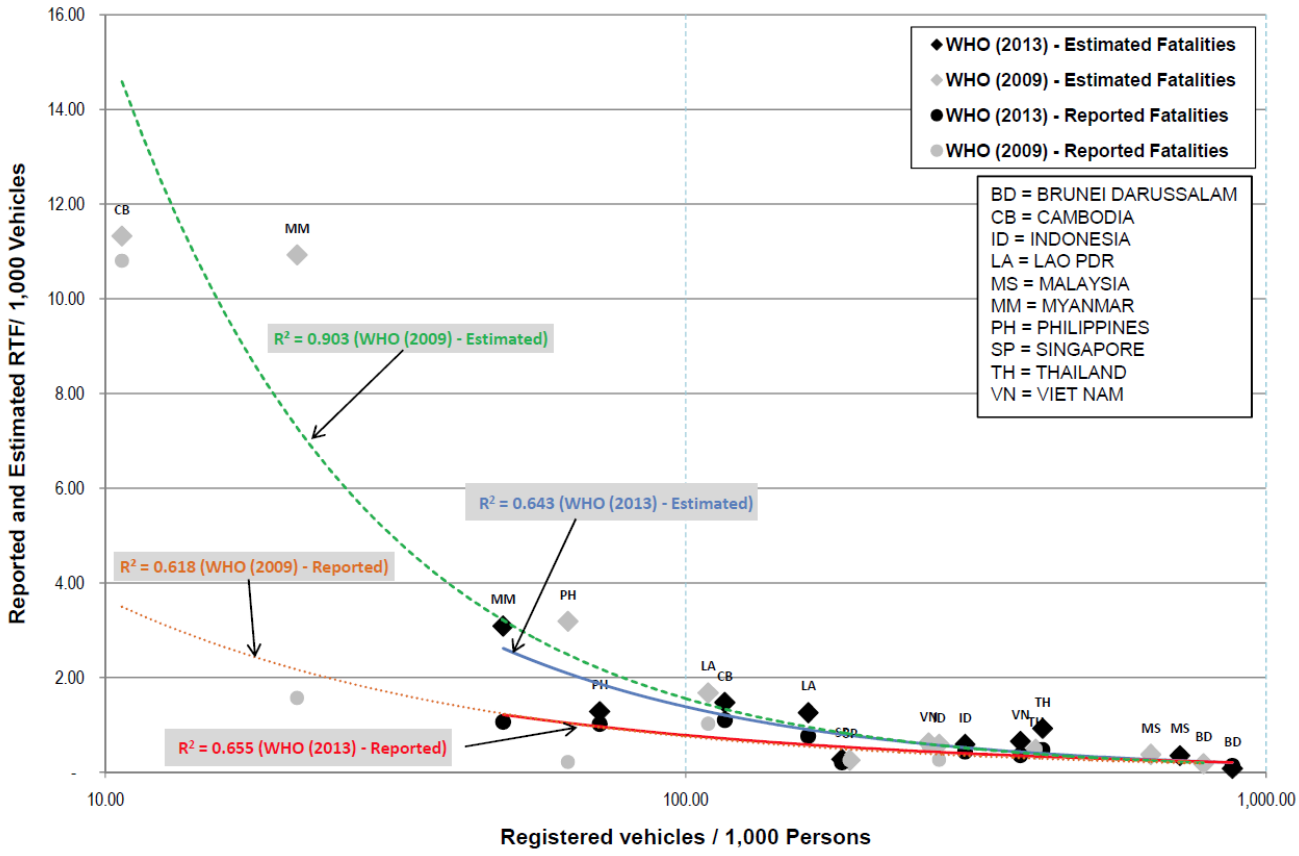

Fig. 3 The relationship between the reported and estimated RTFs per 1,000 vehicles and Registered vehicles per 1,000 population among AEC countries in 2007

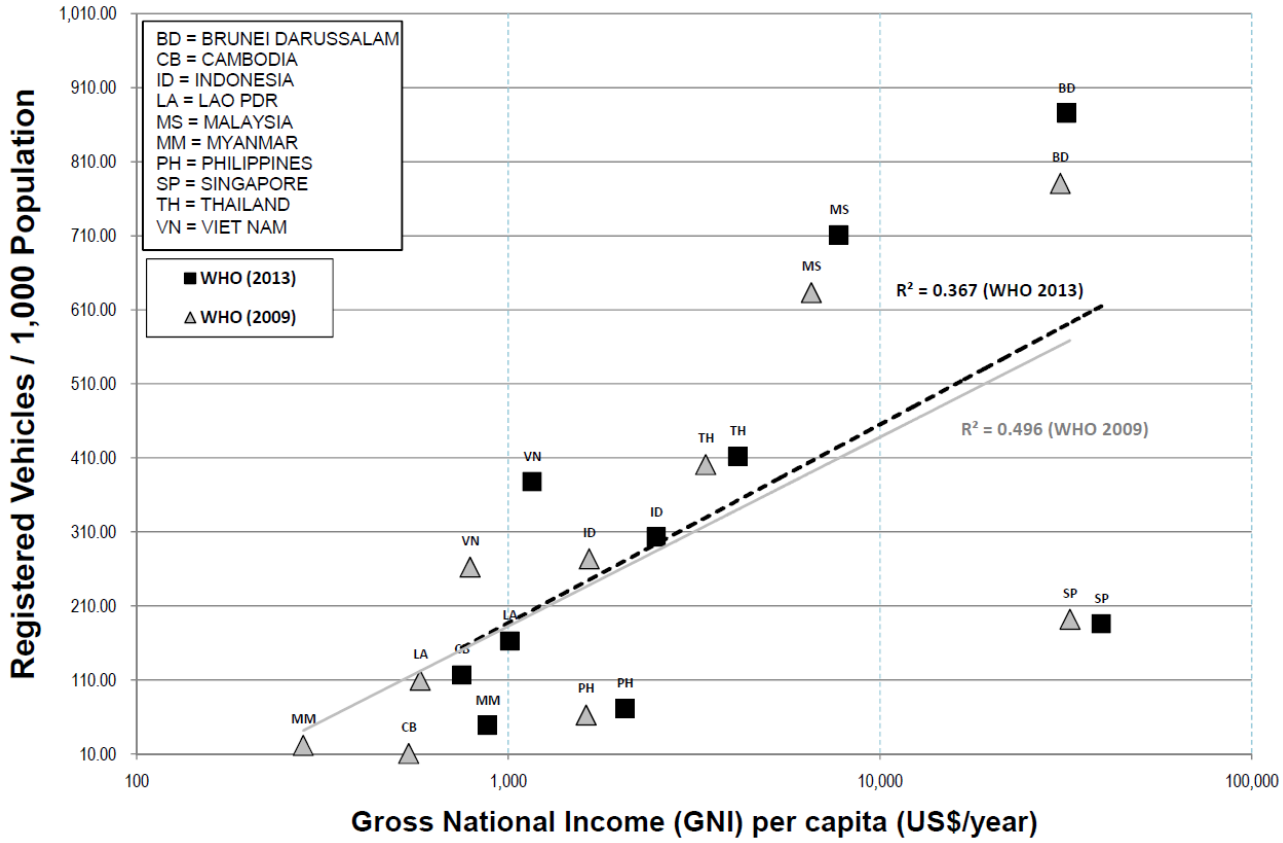

Fig. 4 Registered Vehicles/1,000 Persons vs GNI per capita (US$/year) in WHO 2009 and 2013 [2]

towards road safety were also rised, the adoption and enforcement of national road safety legislation were increased and the safer road infrastructure development was implemented accordingly. In addition, it has been realized that vehicle ownership rate grew much faster than that of RTFs. It should also be pointed out that as both GNI per capita and number of vehicles per 1,000 population increased, the discrepancy between the reported and estimated RTFs per 1,000 vehicles of those AEC countries decreased considerably. Myanmar illustrated the greatest discrepancy between the reported RTFs per 1,000 registered vehicles and the estimated one. Base on the estimated RTFs per 1,000 vehicles in 2007 [1] and in 2010 [2], Cambodia, Myanmar and Philippines were ranked as the top three ranking and Thailand was the seventh and the fifth ranks, respectively. The relationship between reiterated vehicles per 1,000 population and Gross National Incomes (GNI) per capita in 2007 [1] and 2010 [2] was illustrated in Figure 4. The greater the GNI per capita, the higher the vehicles per 1,000 population were. It should be noted that although GNI per capita values of Brunei Darussalam and Singapore were similar, the values of registered vehicles per 1,000 population were very different. Figure 4 shown Registered Vehicles / 1,000 Persons vs GNI per capita (US$/year) in WHO 2009 and 2013

5. Vehicle Compositions and Proportion of RTFs by Road User Types

Figure 5 and 6 shows the vehicle composition of each AEC Countries rearranged from low to high according to their GNI per capita levels in 2007 [1] and 2010 [2]. As the GNI per capita increased, the proportion of 2- and 3- wheeled motor vehicles declined and that of 4-wheeled vehicles will raised. As shown in Figure 7.

In most low and medium incomes AEC countries, 2- and 3- wheeled motor vehicles were the dominant mode of the total road fleet. Based on the distribution of RTFs by road user types among AEC countries, 2- and 3- wheeled motor vehicle were the main contributor of RTF in 2010 [2], as the fleet composition of 2- and 3- wheeled motor vehicles increased, the proportion of RTFs caused by such vehicles generally rised as shown in Figure 8. In contrast in 2009 [1], such trend was not statistically significant. The inclusion of RTFs of pedestrians, cyclists and motorcycle riders and passengers was greater than the RTFs of 4 wheeled motor vehicles and greater than half of total RTFs in most cases. Similar finding was also found in Mohan [6]. Therefore, these unprotected road user types were the most vulnerable to road traffic injuries and fatalities.

It should be noted that while as shown in Figure 6 the road fleet compositions of 2- and 3- wheeled motor vehicles in Myanmar and

Indonesia were 82 and 83 percent, respectively, the percentage of 2- and 3- wheeled motor vehicles fatalities of Myanmar and Indonesia were surprisingly low as 23 and 36, respectively. This finding is quit contrast with the general trend and may suggest that road traffic fatalities databases of the two (low-income) countries may be unreliable and/or may not represent the real RTFs patterns of the two countries. On the other hand, while the Singapore fleet composition of 2- and 3- wheeled motor vehicles and 4 wheeled motor vehicles were 16 and 64percent, respectively, the RTFs proportion of 2- and 3- wheeled motor vehicles and 4 wheeled motor vehicles were 46 and 9 percent, respectively. It should be noted that the proportion of RTFs by road user types for Viet Nam, Philippines and Brunei Darussalam was unfortunately not available.

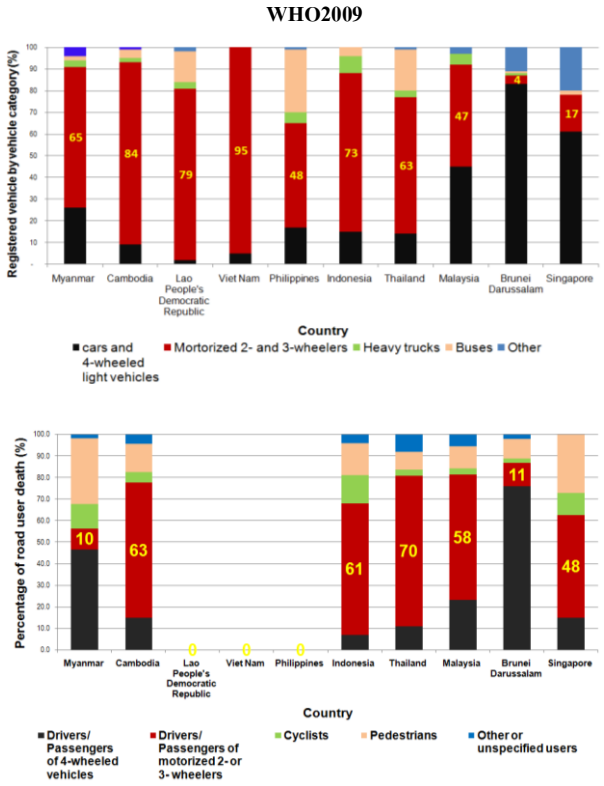

Fig. 5 Vehicles composition and proportion of RTFs by road user types among AEC countries in 2009 [2]

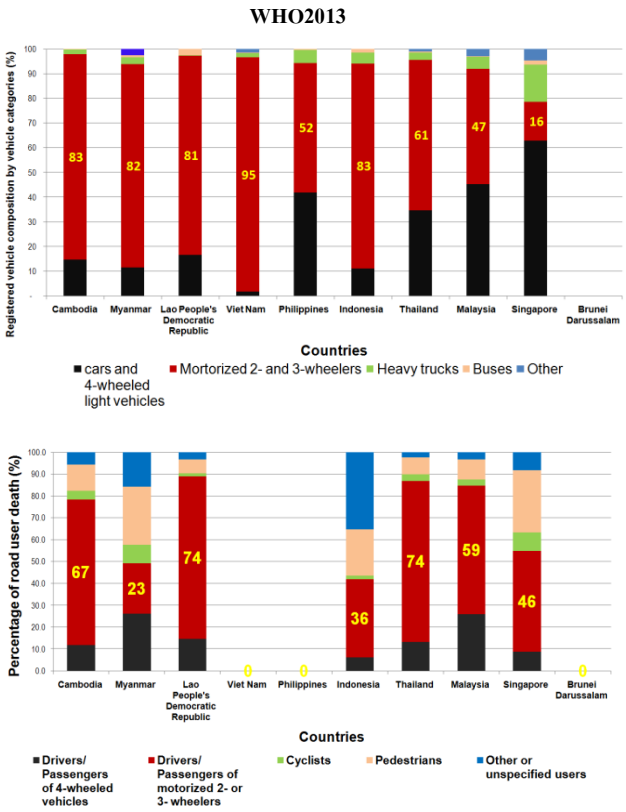

Fig. 6 Vehicles composition and proportion of RTFs by road user types among AEC countries in 2010 [2]

As shown in Figure 7, the proportion of motor cars and 4-wheeled vehicles rises and that of 2- and 3- wheeled motor vehicles (including motorcycles) declines as GNI per capita increases. Most (low and medium incomes) AEC countries consequently need critical consideration regarding the education, campaigning, public relation and the implementation and enforcement of the national road safety legislation on the usage of 2- and 3- wheeled motor vehicles.

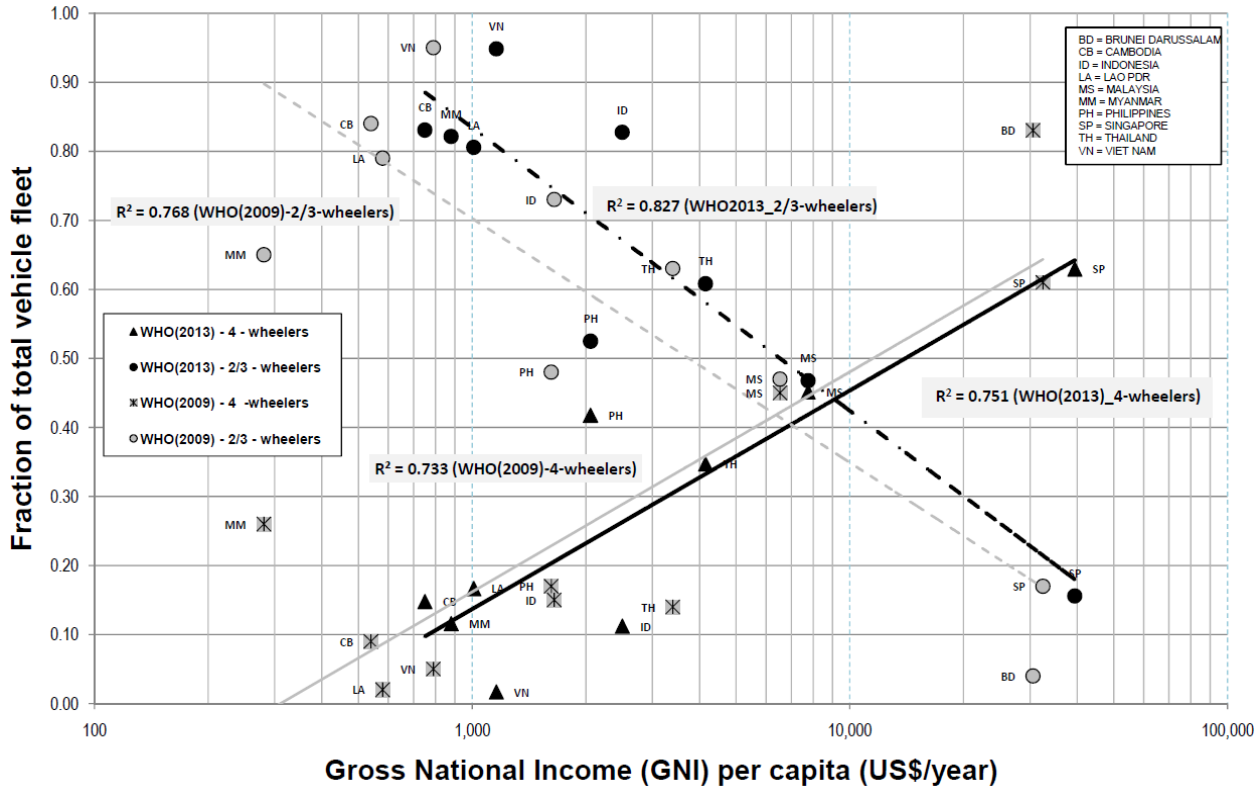

Fig. 7 Proportion of Motorized 2/3-wheeler and 4-Wheeled vehicles in vehicles fleet composition vs. GNI per capita in ASEAN Countries

6. The Adoption and Enforcement of National Road Safety Legislation

Based on some analysis of data containing in the 2009 and 2013 WHO global status reports on road safety ([1] and [2]) as shown in Figure 5, Cambodia, Lao People's Democratic Republic, Viet Nam, Philippines, Indonesia and Thailand generally illustrated certain degree of national legislation improvement (including speed limits, drinking and driving law, motorcycle helmet law, seat belt law and child restraint law). Malaysia showed declining trend and Myanmar was still unchanged. However, high incomes AEC countries (including Singapore and Brunei Darussalam) clearly show the high performances on the adoption and enforcement of national road safety legislation and only these two countries currently implement and enforce the child-restraint law. Most low income AEC countries need critical determination on the adoption and enforcement of the national road safety legislation, particularly on the utilization of 2- and 3- wheeled motor vehicles.

Given considerable discrepancy in terms of economic situations, road fleet composition, geographical, land uses and road network characteristics and others, low income countries have had much less potential capacity regarding the road safety awareness and attitude, education and technological equipment and therefore effective law enforcement practices. The road safety situation can be aggravated by the utilization of unsafe vehicles and road infrastructure and other related facilities.

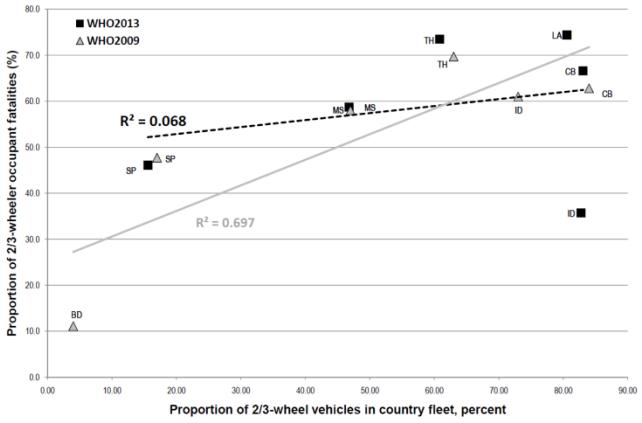

Fig. 8 Proportion of 2/3-wheeler occupant fatalities vs. proportion of 2/3-wheeled vehicles in country fleet

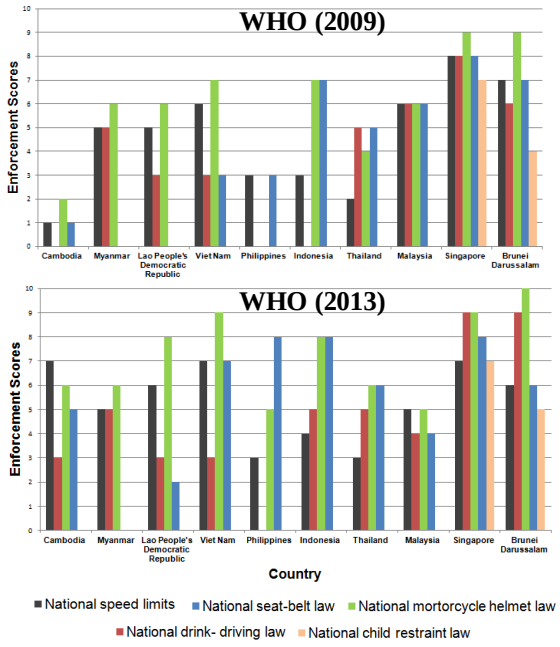

Fig. 9 The enforcement score of different national road safety legislation among ASEAN countries between 2007 and 2010 ([1] and [2])

7. Conclusions

Based on RTFs and other related statistics [2], both the reported and estimated RTFs per 100,000 population showed low correlation with Gross National Incomes (GNIs) per capita among AEC countries. In contrast, the reported and estimated RTFs per 1,000 vehicles showed relatively high correlation with both GNIs per capita and number of vehicles per 1,000 population. The greater the GNIs per capita and/or number of vehicles per 1,000 population, the lower the reported and estimated RTFs per 1,000 vehicles were. As GNI per capita increased, the proportion of 4-wheeled motor vehicles enhanced and the proportion of 2- and 3- wheeled motor vehicles declined. It should be noted that 2- and 3- wheeled motor vehicles were the main contributor to RTFs. The improvement of the adoption and enforcement of national road safety legislation can be generally realized. However, only high income countries (including Singapore and Brunei Darussalam) clearly showed the high performances and only these two countries has adopted and enforced the child-restraint law. Besides number of population, number of vehicles as well as vehicle-kilometers should be investigated as RTF exposure. Most low income AEC countries need critical determination on the adoption and enforcement of the national road safety legislation, particularly on the utilization of 2- and 3- wheeled motor vehicles. Development of consistent and accurate road safety database systems among AEC countries is crucially needed.

References

[1] World Health Organization (WHO), Global Status Report on Road safety: Time for Action, (2009), Geneva, http://www.who.int/violence_injury_prevention/road_safety_status/2009.

[2] World Health Organization (WHO), Global Status Report on Road safety 2013: Supporting a Decade of Action, (2013), Geneva, http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/

[3] C. Koren , A. Borsos, The advantage of late-comers: analysis of road fatality rates in the EU member states, Procedia-Social and Behavioral Science, 48 (2012), 2101-2110.

[4] E. Kopits, M. Cropper, Traffic fatalities and economic growth, Accident Analysis & Prevention, 37 (2005), 169-178.

[5] C. Koren , A. Borsos, Is Smeed's law still valid? A world-wide analysis of the trend in fatality rates, Journal of Society for Transportation and Traffic Studies (JSTS), 1 (2010), 64-76.

[6] D. Mohan, Analysis of road traffic fatalities data for Asia, Journal of the Eastern Asia Society for Transportation Studies, 9 (2011), 1786-1794.

[7] G. Jacobs, A. Aeron-Thomas, A. Astrop, Estimating Global Road Fatality, Transport Research Laboratory (TRL) Report 445, (2000).

[8] M. Sivak and B. Schcettle, Mortality from Road Crashes in 193 Countries: A Comparison with Other Leading Cancer of Death, University of Michigan, Transportation Research Institute (UMTRI), 2014.

[9] World Health Organization (WHO), Disease and injury country estimates,(2014), http://www.who.int/healthinfo/global_burden_disease/estimates_country/en/index.html