



# Helmet use and associated factors among motorcyclists in the Association of Southeast Asian Nations: Prevalence and effect of interventions

*Karl Peltzer*<sup>1</sup>

HIV/AIDS/STIs/TB (HAST), Human Sciences Research Council, Pretoria, South Africa; Department of Psychology, University of Limpopo, Sovenga, South Africa; ASEAN Institute for Health Development, Mahidol University, Salaya, Thailand

*Supa Pengpid*

ASEAN Institute for Health Development, Mahidol University, Salaya, Thailand; Department of Research Innovation and Development, University of Limpopo, Sovenga, South Africa

## ABSTRACT

*The Association of Southeast Asian Nations (ASEAN) is a collaborative group of 10 countries (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam) located in South-East Asia. In most ASEAN countries, the majority of road users are motorcyclists. Globally, among the 20 countries with the greatest rate of motorcycle deaths per 100,000 population, six ASEAN countries are included. A review found that across ASEAN countries, a significant proportion of motorcycle drivers did not wear a helmet; this ranged from 11–20% in Indonesia, 35–66% in Cambodia, 25–97% in Laos, 24.2–67.2% in Malaysia, 44.2%–56.3% in Thailand, and 10–70.1% in Vietnam, while rates of non-use of helmets were higher in motorcycle passengers, ranging from 25% in Vietnam, 38.1% in Malaysia, 48–80% in Indonesia, 72–81% in Thailand, and 91% in Cambodia. The effect of the introduction of helmet-use legislation for drivers and passengers was evaluated in Thailand and Vietnam, and in both evaluations, significant increases in helmet use were found compared to prior the legislation in both countries. Multisectoral or community intervention programmes in localised areas and schools in Laos and Thailand also lead to significant increases in motorcycle helmet use. The effectiveness of the enforcement of helmet laws in ASEAN countries was rated an average of 7.2 (on a scale of 0 to 10, where 0 is not effective at all and 10 is highly effective), with the lowest (5) in Malaysia and the highest (10) in Brunei Duressalam. Stricter enforcement of mandatory helmet laws for two-wheeler riders (both drivers and pillion-riders) are needed.*

<sup>1</sup> Please direct all correspondence to: Prof Karl Peltzer, HIV/AIDS/STIs/and TB (HAST), Human Sciences Research Council, Private Bag X41, Pretoria, 0001, South African; Email: kpetlzer@hsrc.ac.za.

**Keywords:** *helmet use, motorcycle, prevalence, interventions, Southeast Asia.*

## INTRODUCTION

The Association of Southeast Asian Nations (ASEAN) is a collaborative group of 10 countries (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam) located in South-East Asia (Association of Southeast Asian Nations, 2013). It is a populous region with a population of over 604 million and wide variability in socioeconomic and development indicators (ASEAN Community in Figures, 2013). The ASEAN Declaration aims “to accelerate the economic growth, social progress and cultural development in the region through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian Nations.” (Association of Southeast Asian Nations, 2013, p.1). In most ASEAN countries, the majority of road users are motorcyclists. Four ASEAN countries (Vietnam = 358/1000, Malaysia = 332/1000, Indonesia = 251/1000, and Thailand=251/1000) have more than one motorcycle for every four people (World Health Organization, WHO, 2013a). Globally, among the 20 countries with the greatest rate of motorcycle deaths per 100,000 population, six ASEAN countries are included, with the highest in Thailand (28 per 100,000 population), Lao R. (15), Vietnam (15), Malaysia (15), Cambodia (12), Indonesia (6 per 100,000 population) (WHO, 2013a). The six countries in ASEAN where the majority of all vehicles are motorcycles (two- or three-wheeled) are Vietnam (96%), followed by Cambodia (83%), Indonesia (83%), Myanmar (82%), Laos (81%) and Thailand (61%) (WHO, 2013a). Motorcyclists (two- or three-wheeled) comprise a large proportion of all road traffic deaths in ASEAN, 74% in both the Lao People’s Democratic Republic and Thailand, followed by 67% in Cambodia, 59% in Malaysia and 46% in Singapore (see Table 1).

Motorcycle users sustain the most serious injuries leading to disability and death around the head and neck (WHO, 2013a). Wearing a standard, good quality motorcycle helmet can reduce the risk of death by 40% and the risk of serious injury by over 70% (Abbas, Hefny & Abu-Zidan, 2012; WHO, 2013b). Introducing and enforcing legislation on helmet use is effective at increasing helmet-wearing rates and reducing head injuries (Hyder, Waters, Phillips & Rehwinkel, 2007; Kanitpong, Boontob & Tanaboriboon, 2008; Liu et al ., 2008).

“While there has been progress in adopting helmet legislation globally, only about one-third of countries rate the enforcement of helmet laws as ‘good’ (8 or above on a scale of 0 to 10), showing that this critical component of road traffic safety remains neglected” (WHO, 2013a, p.18). There is a need to better understand the status of helmet use and associated factors among motorcyclists in ASEAN, which can in turn provide information

for appropriate helmet use interventions in the region. In this paper, we aim to assess the current status, associated factors and interventions of helmet use in ASEAN.

## **METHODS**

### **LITERATURE SEARCH**

We performed a search of the literature to identify reviews and original studies that reported data regarding the prevalence and interventions of motorcycle (two- or three-wheeled) helmet use in ASEAN countries. The relevant studies were identified through the following electronic databases: MEDLINE, EMBASE, SCI Web or Science, NLM Gateway, Google scholar and Google. The last search was conducted in November 2013. In addition, relevant articles from the list of references of the initially retrieved papers were identified.

Two different search strategies using the following keywords were used: (1) Helmet use AND motorcycle AND country (Brunei Darussalam OR Cambodia OR Indonesia OR Lao PDR OR Malaysia OR Myanmar OR Philippines OR Singapore OR Thailand OR Vietnam) OR Asia, (2) Helmet use AND motorcycle AND intervention AND country (Brunei Darussalam OR Cambodia OR Indonesia OR Lao PDR OR Malaysia OR Myanmar OR Philippines OR Singapore OR Thailand OR Vietnam) OR Asia.

### **SELECTION OF STUDIES**

Inclusion criteria for the selection of studies included studies reporting on the prevalence of motorcycle helmet use and intervention evaluations to promote motorcycle helmet use in ASEAN countries. There were no restrictions on date and language of the paper. The two authors of the current article evaluated the eligible studies obtained from the literature search. They independently scanned all abstracts and obtained full-text papers. In cases of discrepancy, agreement was reached by consensus.

### **DATA EXTRACTION**

The two authors of this paper independently extracted and compiled the data. For each study that met the inclusion criteria, details were extracted on study design, characteristics of study population, non-helmet use prevalence, risk factors for non-helmet use, intervention methods and outcomes.

## RESULTS

### MOTORCYCLE HELMET LAWS AND LAW ENFORCEMENT

All ASEAN countries have a national motorcycle helmet law. In one country (Cambodia) the motorcycle helmet law does not apply to passengers, and one country (Laos) does not have mandated helmet standards (WHO, 2013a). The effectiveness of the enforcement of helmet laws in ASEAN countries was rated an average 7.2 (on a scale of 0 to 10, where 0 is not effective at all and 10 is highly effective), with the highest (10) in Brunei Duressalam, followed by Singapore and Vietnam (9), Indonesia and Laos (8), Myanmar and Thailand (6), and Malaysia and Philippines (5) (WHO, 2013a).

### PREVALENCE AND RISK FACTORS OF MOTORCYCLE HELMET USE

Across ASEAN countries a significant proportion of motorcycle drivers did not wear a helmet; this ranged from 11–20% in Indonesia, 35–66% in Cambodia, 25–97% in Laos, 24.2–67.2% in Malaysia, 44.2%–56.3% in Thailand, and 10–70.1% in Vietnam. While rates of non-use of helmets were higher in motorcycle passengers, ranging from 25% in Vietnam, 38.1% in Malaysia, 48–80% in Indonesia, 72–81% in Thailand, and 91% in Cambodia (see Table 3). Cambodia is the only ASEAN country where helmet use among motorcycle passengers is not legislated, which may explain the high rates. Barriers of helmet use identified in the various studies in the region included sociodemographics (younger age, lower education), being unaware of helmet law, lack of helmet law enforcement, physical discomfort, type of road, travelling time (shorter distance), and helmet characteristics (quality, price, style, experience) (see Table 2).

### MOTORCYCLE HELMET USE INTERVENTIONS

The effect of the introduction of helmet use legislation for drivers and passengers was reported in Thailand and Vietnam, and in both evaluations significant increases in helmet use were found compared to prior the legislation in both countries. Multisectoral or community intervention programmes in localised areas in Laos and Thailand lead to significant increases in motorcycle helmet use in pre-post and controlled study designs. Finally, a school-based programme combining teacher and student safety education and the provision of helmets in Laos lead to significant increases in helmet use as compared to prior to the intervention (see Table 3).

## DISCUSSION

The review found that across ASEAN countries a significant proportion of motorcycle drivers and passengers did not wear a helmet. This compares with similar rates in other

countries in Asia, e.g., China (Li, Li & Cai, 2008; Xuequn, Ke, Ivers, Du & Senserrick, 2011), India (Sreedharan, Muttappillymyalil, Divakaran & Haran, 2010) and Iran (Zamani-Alavijeh, Bazargan, Shafiei & Bazargan-Hejazi, 2011). Barriers of helmet use found in this review also compare with other studies such as sociodemographics (younger age, lower education) (Nakahara, Chadbunchachai, Ichikawa, Tipsuntornsak & Wakai, 2005), location and time of day (Li, Li, Cai, Zhang & Lo, 2008; Nakahara et al., 2005), and helmet-related characteristics (Ali, Saeedmj, Ali & Haidar, 2011; Oginni, Ugboko & Adewole, 2007). The effectiveness of the enforcement of helmet laws in ASEAN countries was rated highest in Brunei Duressalam, Singapore and Vietnam. According to Law, Noland and Evans (2013), improvements in democracy, education levels, per capita income, political stability, and income distribution within a country, as probably in Brunei Duressalam and Singapore, are associated with the enactment of the motorcycle helmet.

Several evaluations in Thailand and Vietnam have found that the introduction of helmet use legislation for drivers and passengers significantly increased motorcycle helmet use. This is in line with the global findings that the introduction and enforcement of legislation on helmet use is effective at increasing helmet-wearing rates (Kanitpong et al., 2008; Mayrose, 2008). Further, a number of multisectoral or community intervention programmes addressing helmet use have shown promising results and could ensure sustainability (Moghisi, Mohammadi & Svanström, 2014b), and should be investigated in future studies with rigorous study designs. In addition, a school-based programme combining teacher and student safety education and the provision of helmets in Laos showed promising results, and should also be further investigated and implemented (Germeni et al., 2010). Community-based initiatives using the safe community concept could help to promote the use of helmets among motorcyclists at the population level (Lindqvist, Timpka & Schelp, 2001; Moghisi, Mohammadi & Svanström, 2014a). A safe community can include multi-sectoral groups, including private, governmental, social, educational and other organisations committed to work on the promotion of helmet use in the form of law enforcement, public education, and accessibility to helmets among motorcyclists at the local level in a safe community initiative (Moghisi et al., 2014a, 2014b). Similar interventions, including stakeholders in road safety, jointly intensifying education and enforcement on helmet use have been proposed for helmet use promotion of motorcyclists in Africa (Akaateba, Amoh-Gyimah & Yakubu, 2014; Forjuoh, 2003).

## **STUDY LIMITATIONS**

This review has several limitations. Helmet use was measured by observation and by self-report, while self-report is an unreliable measure of helmet use. For some of the ASEAN countries no or not sufficient information could be found on the issue of motorcycle

helmet use. In addition, the use of non-standard helmets was not assessed (Kulanthayan, See, Kaviyarasu & Nor Afiah, 2012). A recent review found that “the widespread use of non-standard helmets in low- and middle-income countries may limit the potential gains of helmet use programmes” (Road Traffic Injuries Research Network Multicenter Study Collaborators et al., 2013, p.158).

## CONCLUSION

The review of the available evidence found sub-optimal motorcycle helmet use in ASEAN countries, and half of the ASEAN countries rated their motorcycle helmet law enforcement as sub-optimal. National and community interventions to increase motorcycle helmet use seem effective and promising and should be expanded.

## REFERENCES

- Abbas, A.K., Hefny, A.F. & Abu-Zidan, F.M. (2012). Does wearing helmets reduce motorcycle-related death? A global evaluation. *Accident Analysis and Prevention*, 49, 249–252.
- Akaateba, M.A., Amoh-Gyimah, R. & Yakubu, I. (2014). A cross-sectional observational study of helmet use among motorcyclists in Wa, Ghana. *Accident Analysis and Prevention*, 64, 18–22.
- Ali, M., Saeedmj, M.M., Ali, M.M. & Haidar, N. (2011). Determinants of helmet use behaviour among employed motorcycle riders in Yazd, Iran based on theory of planned behaviour. *Injury*, 42(9), 864–869.
- Ambak, K. (2011). *Pemodelan persamaan struktur dalam intervensi kelakuan penggunaan topi keledar dengan betul*. PhD thesis, Universiti Kebangsaan Malaysia.
- Association of Southeast Asian Nations. (2013). ASEAN member states. Retrieved July 10, 2013 from <http://www.aseansec.org/>.
- Bachani, A.M., Branching, C., Ear, C., Roehler, D.R., Parker, E.M., Tum, S. & Hyder A.A. (2013). Trends in prevalence, knowledge, attitudes, and practices of helmet use in Cambodia: Results from a two year study. *Injury*, 44(Suppl 4), S31–S37.
- Bachani, A.M., Tran N.T., Sann, S., Ballesteros, M.F., Gnim, C., Ou, A. & Hyder, A.A. (2012). Helmet use among motorcyclists in Cambodia: A survey of use, knowledge, attitudes, and practices. *Traffic Injury Prevention*, 13(Suppl 1), 31–36.
- Conrad, P., Bradshaw, Y.S., Lamsudin, R., Kasnyiah, N. & Costello, C. (1996). Helmets, injuries and cultural definitions: Motorcycle injury in urban Indonesia. *Accident Analysis and Prevention*, 28(2), 193–200.
- Forjuoh, S.N. (2003). Traffic-related injury prevention interventions for low-income countries. *Injury Control and Safety Promotion*, 10(1–2), 109–118.
- Germei, E., Lionis, C., Kalampoki, V., Davou, B., Belechri, M. & Petridou, E. (2010). Evaluating the impact of a school-based helmet promotion program on eligible adolescent drivers: Different audiences, different needs? *Health Education Research*, 25(5), 865–876.

Hamzah, A., Ahmad, Y. & Voon, W.S. (2009). *Child helmet efficacy for motorcycle use in Malaysia (MIROS review report; Mrev 04/2009)*. Sengalor Darul Ehsan, Malaysia: Malaysian Institute of Road Safety Research (MIROS).

Hung, D.V., Stevenson, M.R. & Ivers, R.Q. (2006). Prevalence of helmet use among motorcycle riders in Vietnam. *Injury Prevention*, 12(6), 409–413.

Hung, D., Stevenson, M. & Ivers, R. (2008). Barriers to, and factors associated, with observed motorcycle helmet use in Vietnam. *Accident Analysis & Prevention*, 40(4), 1627–1633.

Hyder, A.A., Waters, H., Phillips, T. & Rehwinkel, J. (2007). Exploring the economics of motorcycle helmet laws – implications for low and middle-income countries. *Asia Pacific Journal of Public Health*, 19(2), 16–22.

Ichikawa, M., Chadbunchachai, W. & Marui, E. (2003). Effect of the helmet act for motorcyclists in Thailand. *Accident Analysis and Prevention*, 35(2), 183–189.

Ichikawa, M., Nakahara, S., Phommachanh, S., Mayxay, M. & Kimura, A. (2013). Roadside observation of secondary school students' commuting to school in Vientiane, Laos. *International Journal of Injury Control and Safety Promotion*. [Epub ahead of print]

Indonesia Road Safety Report (2012) Indonesia road safety report. Retrieved November 10, 2013 from [http://www.ino.searo.who.int/LinkFiles/Injury\\_and\\_Violence\\_Prevention\\_-\\_Disability\\_and\\_Rehabilitation\\_\\_Country\\_Profile4\\_May\\_2012.pdf](http://www.ino.searo.who.int/LinkFiles/Injury_and_Violence_Prevention_-_Disability_and_Rehabilitation__Country_Profile4_May_2012.pdf).

Jiwattanakupaisarn, P., Kanitpong, K., Ponboon, S., Boontob, N., Aniwattakulchai, P. & Samranjit, S. (2013). Does law enforcement awareness affect motorcycle helmet use? Evidence from urban cities in Thailand. *Global Health Promotion*, 20(3), 14–24.

Kanitpong, K., Boontob, N. & Tanaboriboon, Y. (2008). Helmet use and effectiveness in reducing the severity of head injuries in Thailand. *Transportation Research Record: Journal of the Transportation Research Board*, 2048/2008 Developing Countries 2008, 66–76.

Kim, P., Sidik, M., Sim, S., Carr, M., Parker, E. & Roehler, D. (2013). *From zero to ninety percent: Evaluation of the helmets for kids school-based initiative in Cambodia*. Retrieved November 10, 2013 from <http://asiainjury.org/wp-content/uploads/2013/08/From-Zero-to-Ninety-Percent-Evaluation-of-the-Helmets-for-Kids-School-based-Initiative-in-Cambodia.pdf>

Kulanthayan, S., Radin, U.R.S., Ahmad, H.H., Mohd, N.M.T. & Harwant, S. (2000). Compliance of proper helmet use in motorcyclists. *Medical Journal of Malaysia*, 55(2), 40–44.

Kulanthayan, S., See, L.G., Kaviyarasu, Y. & Nor Afiah, M.Z. (2012). Prevalence and determinants of non-standard motorcycle safety helmets amongst food delivery workers in Selangor and Kuala Lumpur. *Injury*, 43(5), 653–659.

Law, T.H., Noland, R.B. & Evans, A.W. (2013). Factors associated with the enactment of safety belt and motorcycle helmet laws. *Risk Analysis*, 33(7), 1367–1378.

Le, L.C. & Blum, R.W. (2013). Road traffic injury among young people in Vietnam: Evidence from two rounds of national adolescent health surveys, 2004-2009. *Global Health Action*, 6, 1–9.

Le, L.C., Cuong, C. V., Linnan, M.J., Do, D.V., Le, P.N. & La, H.H. (2002). Vietnam profile on traffic related injury: Facts and figures from recent studies and their implication for road traffic injury policy. In: *Road traffic injury and health equity conference* (p. 22). Cambridge, MA.

- Li, G.L., Li, L.P. & Cai, Q.E. (2008). Motorcycle helmet use in Southern China: An observational study. *Traffic Injury Prevention*, 9(2), 125–128.
- Li, L.P., Li, G.L., Cai, Q.E., Zhang, A.L. & Lo, S.K. (2008). Improper motorcycle helmet use in provincial areas of a developing country. *Accident Analysis and Prevention*, 40(6), 1937–1942.
- Lindqvist, K., Timpka, T. & Schelp, L. (2001). Evaluation of inter-organizational traffic injury prevention in a WHO safe community. *Accident Analysis and Prevention*, 33(5), 599–607.
- Liu, B.C., Ivers, R., Norton, R., Boufous, S., Blows, S. & Lo, S.K. (2008). Helmets for preventing injury in motorcycle riders. *Cochrane Database Systematic Review*, 1, CD004333.
- Mayrose, J. (2008). The effects of a mandatory motorcycle helmet law on helmet use and injury patterns among motorcyclist fatalities. *Journal of Safety Research*, 39(4), 429–432.
- Moghisi, A., Mohammadi, R. & Svanström, L. (2014a). Impact of safe community program on motorcyclists' safety with focus on helmet usage in 14 cities of IR Iran. *International Journal of Injury Control and Safety Promotion*, 21(2), 110–114 .
- Moghisi, A. Mohammadi, R. Svanstrom, L. (2014b). Motorcyclists' safety in Iran: Implication of haddon matrix in safe community setting. *Medical Journal of the Islamic Republic of Iran*, 28, 37.
- Nakahara, S., Chadbunchachai, W., Ichikawa, M., Tipsuntornsak, N. & Wakai, S. (2005). Temporal distribution of motorcyclist injuries and risk of fatalities in relation to age, helmet use, and riding while intoxicated in Khon Kaen, Thailand. *Accident Analysis and Prevention*, 37(5), 833–842.
- Nguyen, H.T., Passmore, J., Cuong, P.V. & Nguyen, N.P. (2013). Measuring compliance with Viet Nam's mandatory motorcycle helmet legislation. *International Journal of Injury Control and Safety Promotion*, 20(2), 192–196.
- Oginni, F.O., Ugboko, V.I. & Adewole, R.A. (2007). Knowledge, attitude, and practice of Nigerian commercial motorcyclists in the use of crash helmet and other safety measures. *Traffic Injury Prevention*, 8(2), 137–141.
- Pervin, A., Passmore, J., Sidik, M., McKinley, T., Nguyen, T.H. & Nguyen, P.N. (2009). Viet Nam's mandatory motorcycle helmet law and its impact on children. *Bulletin of the World Health Organization*, 87(5), 369–373.
- Pitaktong, U., Manopai boon, C., Kilmarx, P.H., Jeeyapant, S., Jenkins, R., Tappero, J. & van Griensven, F. (2004). Motorcycle helmet use and related risk behaviors among adolescents and young adults in Northern Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health*, 35(1), 232–241.
- Plianbangchang, P., Poempholniran, W., Chaijinda, K., Kitikannakorn, N., Lopattananon, H., Chokebandanchai, B. & Kanchalee, J.M. (2011). Motorcycle helmet wearing behavior among Naresuan university students. *Jetyianon. Journal of Health Science*, 20(1), 15–22.
- Ratanavaraha, V. & Jomnonkwao, S. (2013). Community participation and behavioral changes of helmet use in Thailand. *Transport Policy*, 25, 111–118.
- Road Traffic Injuries Research Network Multicenter Study Collaborators: Ackaah, W., Afukaar, F., Agyemang, W., Thuy Anh, T., Hejar, A.R. & Yu, J. (2012). The use of non-standard motorcycle helmets in low- and middle-income countries: A multicentre study. *Injury Prevention*, 19(3), 158–163.
- Roehler, D.R., Sann, S., Kim, P., Bachani, A.M., Campostrini, S., Florian, M. & Ballesteros, M.F. (2013). Motorcycle helmet attitudes, behaviours and beliefs among Cambodians. *International Journal of Injury Control and Safety Promotion*, 20(2), 179–183.

Siviroj, P., Peltzer, K., Pengpid, S. & Morarit, S. (2012). Helmet use and associated factors among Thai motorcyclists during Songkran festival. *International Journal of Environmental Research and Public Health*, 9(9), 3286–3297.

Slesak, G., Slesak, R.M., Inthalad, S., Somsavad, S., Sisouphanh, B., Kim, J.H. & Barennes, H.A. (2011). Hospital-initiated multisectoral road safety campaign with speed-adapted coconut drop test in Northern Laos. *International Journal of Injury Control and Safety Promotion*, 18(1), 37–43.

Sreedharan, J., Muttappillymyalil, J., Divakaran, B. & Haran, J.C. (2010). Determinants of safety helmet use among motorcyclists in Kerala, India. *Journal of Injury and Violence Research*, 2(1), 49–54.

Suriyawongpaisa, P., Thakkinstian, A., Rangueng, A., Jiwattanakupaisarn, P. & Techakamoluk, P. (2013). Disparity in motorcycle helmet use in Thailand. *International Journal of Equity and Health*, 12(1), 74.

Swaddiwudhipong, W., Boonmak, C., Nguntra, P. & Mahasakpan, P. (1998). Effect of motorcycle rider education on changes in risk behaviours and motorcycle-related injuries in rural Thailand. *Tropical Medicine and International Health*, 3(10), 767–770.

Tan, K.W. (2004). *Motorcycle Safety in Malaysia*. (BCE thesis, Faculty of Engineering and Surveying, University of Southern Queensland). Retrieved April 7, 2014 from <https://eprints.usq.edu.au/89/1/KokWeiTan-2004.pdf>.

Thailand Road Safety Observatory. (2011). *Road accident situation in Thailand 2010*. Bangkok Thailand: National Health Foundation.

World Health Organization (WHO). (2013a). *Global status report on road safety 2013: Supporting a decade of action*. Geneva, Switzerland: WHO.

World Health Organization (WHO) (2013b). *Road traffic injuries*. Retrieved November 15, 2013 from <http://www.who.int/mediacentre/factsheets/fs358/en/>.

Xuequn, Y., Ke, L., Ivers, R., Du, W. & Senserrick, T. (2011). Prevalence rates of helmet use among motorcycle riders in a developed region in China. *Accident Analysis and Prevention*, 43(1), 214–219.

Zamani-Alavijeh, F., Bazargan, M., Shafiei, A. & Bazargan-Hejazi, S. (2011). The frequency and predictors of helmet use among Iranian motorcyclists: A quantitative and qualitative study. *Accident Analysis and Prevention*, 43(4), 1562–1569.

**Table 1: Asian Association country characteristics (source: WHO, 2013a)**

| Country                          | Population  | Income group | Gross national income per capita in US\$ | [Total registered vehicles] Motorized 2- and 3-wheelers | Death by road user category: Riders motorized 2- or 3-wheelers |
|----------------------------------|-------------|--------------|--|---|--|
| Brunei Darussalam                | 398 920     | High         | 31 800                                   | [349 279]   | ?  |
| Cambodia                         | 14 138 255  | Low          | 750                                      | [1 652 534]<br>1 372 525                                | 67%  |
| Indonesia                        | 239 870 944 | Middle       | 2 500                                    | [72 692 951]<br>60 152 752                              | 36%  |
| Lao People's Democratic Republic | 6 200 894   | Low          | 1 010                                    | [1 008 788]<br>812 629                                  | 74%  |
| Malaysia                         | 28 401 017  | Middle       | 7 760                                    | [20 188 565]<br>9 441 907                               | 59%  |
| Myanmar                          | 47 963 010  | Low          | ?  | [2 326 639]<br>1 911 040                                | 23%  |
| Philippines                      | 93 260 800  | Middle       | 2 060                                    | [6 634 855]<br>3 482 149                                | ?  |
| Singapore                        | 5 086 418   | High         | 39 410                                   | [ 945 829]  | 46%  |
| Thailand                         | 69 122 232  | Middle       | 4 160                                    | [28 484 829]<br>17 322 538                              | 74%  |
| Vietnam                          | 87 848 460  | Middle       | 1 160                                    | [33 166 411]<br>31 452 503                              | 60% <sup>1</sup>   |

<sup>1</sup> For motorcyclists (Le et al., 2002)

**Table 2: Epidemiology of helmet use among motorcyclists in ASEAN countries**

| Country, Reference   | Sample and assessment methods   | Non-helmet use  | Risk factors   |
|--|---|---|--|
| <b>Cambodia</b><br>(WHO, 2013a)                                      | Ministry of Health (2010)   | 35% Drivers<br>91% Passengers   |  |
| <b>Cambodia</b><br>(Bac hani et al. 2012, 2013; Roehler et al. 2013) | Helmet observations (day and night) in 6 observation sites in 5 provinces. (Drivers: N = 454 026; Passengers: N: 229 948)<br>Roadside interviews on knowledge, attitudes, and practice in 3 locations | 36.2% Drivers<br>93.6% Passengers   | Helmet use: life-saving potential, legal duty, police fines.<br>Non-helmet use: depended on where to drive, forget to wear it, inconvenient/uncomfortable; helmet quality, price, style, and colour. |
| <b>Indonesia</b><br>(Conrad et al., 1996)                            | Street observations and interviews with motorcyclists (N = 9242) and passengers (N = 3541) in Yogyakarta  | 11% Drivers<br>80% Passengers<br>45% Drivers did not wear helmets correctly | At night, physical discomfort and absence of police surveillance.  |
| <b>Indonesia</b><br>(Indonesia Road Safety Report, 2012)             | Sub-national study on helmet wearing in 2007  | 20% Drivers<br>48% Passengers   |  |
| <b>Laos</b><br>(WHO, 2013a)  | Road Safety Project (2008)  | 40% All riders<br>25% Drivers   |  |
| <b>Laos</b><br>(Ichikawa et al., 2013)                               | Roadside observation in front of a school gate in Vientiane. Of the 195 students who commuted by motorcycle, 45 (23%) drove it themselves   | 97% Drivers   |  |
| <b>Malaysia</b><br>(Kulanthayan et al., 2000)                        | Observations of 500 motorcyclists in a typical Malaysian town   | 24.2% Drivers   |  |
| <b>Malaysia</b><br>(Tan, 2004)                                       | Observations of 107 motorcyclists and 21 passengers in Kuala Lumpur   | 29.0% Drivers<br>38.1% Passengers   | Younger age  |

|   |   |  |  |
|---|---|--|--|
| <b>Malaysia</b><br>(Hamzah, Ahmad & Voon., 2009)            | Observation of helmet use among primary school children (7–12 years) (Urban: N = 309; Suburban: N = 493) in Klang Valley                                | 74.4% urban<br>60.0% suburban  |  |
| <b>Malaysia</b><br>(Ambak, 2011)                            | Observations of 1 150 motorcycle drivers  | 42.3 %   |  |
| <b>Myanmar</b><br>(WHO, 2013a)                              | Health department, study in Yangon General hospital (2011)  | 49.5% All riders   |  |
| <b>Philippines</b><br>(WHO, 2013a)                          | Survey of road users in the Province of Guimaras  | 49% All riders<br>13% Drivers  |  |
| <b>Thailand</b><br>(Pitaktong et al. 2009)                  | 1,725 students, aged 15–21 years, from 3 vocational schools in Chiang Rai Province completed a classroom-based computer-assisted self-interview (ACASI) | Of men 72.7% and of women 64.4% reported unprotected motorcycle riding 3 times or more in the past week  | History of ever riding after having had 3 or more alcoholic drinks; living with the family, and having ever had a traffic accident   |
| <b>Thailand</b><br>(Plianbangchang et al., 2011)            | Helmet wearing behaviour and attitudes among 224 Naresuan University students   | During the past six months, the majority never wore, or wore helmet sporadically such as when travelling long distance or when spotting the police. Very few reported wearing helmets whenever they travelled on motorcycles | Travelling short distances, for example within the campus; physical discomforts; and unnecessary. More than half of the sample agreed with compulsory helmet wearing on campus |
| <b>Thailand</b><br>(Thailand Road Safety Observatory, 2011) | Observational survey of helmet use conducted in 30 provinces of Thailand  | 48% Drivers<br>84% Passengers  |  |

|   |   |   |   |
|---|---|---|---|
| <b>Thailand</b><br>(Siviroj, Peltzer, Pengpid & Morarrit, 2012) | Helmet use observations and interview among motorcycle drivers (N = 18,998) during four days of the Songkran festival                 | 44.2% Drivers<br>72.5% Passengers                               | Demographics, environmental factors, helmet use experiences and attitudes and recalling a lower exposure to road safety awareness (RSA) campaign were associated with non-helmet use  |
| <b>Thailand</b><br>(Jiwattanakulipaisarn et al., 2013)          | Interviews on helmet use behaviour (N = 2,429 drivers, N = 1,328 passengers) in urban cities nationwide                               | 40% Drivers and 72% Passengers [not always wear]                | Drivers: non-awareness of helmet law, low risk perception of being caught, perception that the checkpoints take place at the same times and locations<br>Passengers: non-awareness of helmet law for passengers, perception that the law was not enforced by the police |
| <b>Thailand</b><br>(Suriyawongpaisa et al. 2013)                | National roadside observation (N = 945 956) at 3 252 selected sites Injured surveillance data (26 sentinel sites)                     | 46,7% Drivers<br>80,7% Passengers<br>66% (Drivers & Passengers) | Lower conviction rate and lower police density  |
| <b>Vietnam</b><br>(Hung, Stevenson & Ivers, 2006)               | Roadside observations of motorcycle drivers (N = 16 560) in Hai Duong province across 37 road sites (incorporating 5 road categories) | 70.1%   | Female, younger age, non-compulsory roads   |
| <b>Vietnam</b><br>(Hung, Stevenson & Ivers, 2008)               | Observed motorcycle helmet use among motorcyclists (N = 716) in Hai Duong Province  | 77%   | Inconvenience and discomfort, younger age, riding on a non-compulsory road, shorter trips (< 10 km), lower levels of education  |
| <b>Vietnam</b><br>(Pervin et al., 2009)                         | Roadside observations (N = 18734) among adults and children in four major centres   | 1–10% Adults<br>46–62% 8–14 years<br>46–85% < 8 years of age    | The fear of neck injury (by parents of their children)  |
| <b>Vietnam</b><br>(WHO, 2013a)                                  | Helmet observation surveys in 3 provinces (Hanoi School of Public Health, 2011)   | 10% Drivers<br>25% Passengers                                   |   |

Table 3: Interventions of helmet use in ASEAN countries

| Country, Reference  | Intervention  | Evaluation design and sample  | Results   |
|---|---|---|---|
| <b>Cambodia</b><br>(Kim et al., 2013)                                     | School-based programme: Teacher and student safety education (Helmets for Kids) and helmet provision to all students in selected elementary schools   | Pre- and post-intervention of 6 853 observations of helmet use  | Helmet use increased from 0% at baseline to 87% at 10–12 weeks follow-up.   |
| <b>Laos</b><br>(Slesak et al., 2011)                                      | Multisectoral road safety campaign in one district: Offering motorcycle helmets at 50% cost; road safety education; demonstration of helmet protectiveness, helmet law enforcement                      | Pre- and post -intervention of 4 247 observations of helmet use   | Helmet use increased from 11,2 to 42,5%.  |
| <b>Thailand</b><br>(Swaddiwudhipong, Boonmak, Nguntra & Mahasakpan, 1998) | Community-based health education on injury prevention and control including traffic laws and effectiveness of helmet use for motorcycle riders delivered by village health communicators and mass media | Pre- and post-intervention of interview-assessed motorcyclists (N = 1141) in intervention villages in 3 subdistricts and motorcyclists (N = 1297) in control villages in 3 subdistricts | Self-reported always wearing of helmets increased to 32,8% in motorcyclists in intervention villages compared to 14,1% in control villages. |
| <b>Thailand</b><br>(Ichikawa, Chadbunchachai & Marui, 2003)               | Helmet act for motorcyclists and passengers in December 1994; enacted, publicity raising, fining law-breakers   | Pre- and post-intervention of 7 208 pre-act motorcycle crashes and 4 794 post-act motorcycle crashes from the trauma registry of a regional hospital                                    | Helmet-wearers increased from 4,5% to 22,6%.  |

|  |   |  |   |
|--|---|--|---|
| <p><b>Thailand</b><br/>(Ratanavaraha &amp; Jomnonkwao, 2013)</p> | <p>Community participation approach:</p> <ul style="list-style-type: none"> <li>- Community leader meetings to find solutions for helmet-wearing problems</li> <li>- Two campaigns to provide understanding of the benefits of helmet use and proper decisions of purchasing and wearing helmets (with the use of mass media, print media, specialized media and activity media)</li> </ul> | <p>Pre- and post-intervention of 3874 driver and 2004 passenger observations of helmet use in 3 districts</p>  | <p>Increase of 13,2% in the rates of helmet usage.</p>  |
| <p><b>Vietnam</b><br/>(Le &amp; Blum, 2013)</p>                  | <p>Helmet legislation to require all motorcycle riders and passengers to wear helmets from end of 2007</p>  | <p>Pre- and post-intervention of interview national survey of helmet use among 7 584 youth (15–24 years) in 2004 and 10 044 youth (15–24 years) in 2009</p> <p>Pre- and post-intervention of 665 428 drivers and passenger observations of helmet use in 45 sites nationally between November 2007 and February 2011</p> | <p>Self-reported frequent helmet use increased from 26,2% in to 73,6%.</p> <p>Increase in correct helmet wearing from 40,1% to 92,5%.</p> |