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journal homepage: www.elsevier.com/puhe

Original Research

Trends in motorcycle helmet use in Vietnam: results from a four-year study☆

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ARTICLE INFO

Article history:
Received 14 September 2016
Received in revised form
21 December 2016
Accepted 6 January 2017

Keywords:
Road injury
Helmets
Drink driving
Vietnam

ABSTRACT

Objectives: Helmet use is a major risk factor for road traffic injuries and fatalities. This study sought to determine the state of helmet use in Ha Nam and Ninh Binh provinces in Vietnam, and ascertain knowledge, attitudes, and practices of helmet use over time.
Study design: Observational helmet use studies, and roadside knowledge, attitudes, and practice surveys.
Methods: Data were collected through observational helmet use studies at multiple sites in Ha Nam and Ninh Binh provinces over 14 rounds between June 2011 and December 2014. Six rounds of knowledge, attitude, and practice surveys were administered at gas stations between December 2011 and July 2014. Trend analysis and negative binomial regressions were used to analyze trend data.
Results: Between June 2011 and December 2014, 301,981 helmet-use observations were conducted in Ha Nam and Ninh Binh. Correct helmet use increased significantly ($P < 0.01$) in Ha Nam from 34.3% to 76.9% ($P < 0.01$), while use in Ninh Binh increased from 68.9% to 72.2% ($P > 0.05$).
Conclusion: Helmet use has improved statistically significantly in Ha Nam but not in Ninh Binh. Ceiling effects may have limited the scope of improvements in Ninh Binh province.

Introduction

Globally, 1.3 million deaths are caused by road traffic injuries (RTIs) annually, and RTIs are the 5th leading cause of overall deaths in the region, accounting for over a third of all disability-adjusted life years (DALYs) lost due to injury.[1–3] RTIs in the Western Pacific Region remain the leading cause of mortality for the groups aged 15–29 and 30–44 years.[3] Vietnam's rapid urbanization and development has led to a stark increase in the number of motorized two-wheelers, representing 95% of all

☆ Open Access provided for this article by the Johns Hopkins International Injury Research Unit through a grant from Bloomberg Philanthropies.
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http://dx.doi.org/10.1016/j.puhe.2017.01.010

registered vehicles in the country.[4] The National Traffic Safety Committee of Vietnam (NTSC) reported 14,690 deaths related to road traffic crashes in 2008.[5] Injuries are among the ten leading causes of death for all ages in Vietnam and RTIs account for approximately half of those deaths.[1]

Head-related trauma is a significant cause of injury and death in road traffic injuries and contributed to 88% of deaths involving motorized two-wheeler crashes in low- and middle-income countries (LMICs).[6] Large-scale ecological studies have shown that increases in helmet use when brought on by legislation or enforcement changes are accompanied by decreases in mortality and morbidity, suggesting that helmets represent a viable method of reducing head injuries from two-wheeled motorized vehicle crashes.[7] In a global evaluation, Abbas et al. found that helmet non-use was the most significant factor affecting a motorcyclists death rate in a RTI and that helmets reduce the risk of death in a crash.[8] A 2009 Cochrane systematic review concluded that motorcycle helmets reduced the risk of death and injury in motorcycle riders who crash.[9] Helmet wearing among those surviving motorcycle crashes was also found to lower hospitalization costs compared to those without helmets in the United States.[10] In addition, a study in Taiwan reported motorcyclists without helmets were four and ten times as likely to have head and brain injuries, respectively, in a crash.[11] Further, the use of substandard helmets and correct fastening of helmets are additional secondary issues that are particularly relevant in LMICs.[9]

In Vietnam, two-wheeled motorcycle users are left vulnerable to head injuries and fatalities resulting from RTIs. Given the proven effectiveness of helmet use in reducing mortality, morbidity, and costs, it is crucial to assess and improve the use of helmets across Vietnam.

One effort to improve the use of helmets globally is through the Global Road Safety Programme (GRSP) funded by Bloomberg Philanthropies. Implemented from 2010 to 2015, the project targeted key risk factors for road safety in nine countries with the highest burden of road traffic injuries. In Vietnam, the GRSP focused on interventions for helmet use and drink-driving in Ninh Binh and Ha Nam provinces.

Methods

Primary data collection in the two study areas, Ha Nam and Ninh Binh provinces, included observational helmet wearing studies and roadside knowledge, attitude, and perceptions (KAP) surveys on helmet use.

Observational studies were used to determine the prevalence of helmet use through systematically observing road users at randomly selected study district locations. The methodology is highlighted in a prior publication.[12] Fourteen rounds of data collection were completed from June 2011 to December 2014. The locations of helmet observations were predetermined through a systematic process and held constant for every round of observations. Study teams comprised two data collectors, and each round had one weekday and one weekend day. During an observation day, collectors captured data during 120-minute intervals to account for variations in traffic volume and composition throughout the day. Data were only recorded for vehicles traveling in one direction to avoid double counting and ensure quality data collection. Data were recorded on correct helmet use and substandard helmet use with stratification by age (adult/child), gender, time of day, and time of week. Children were defined as individuals perceived to be under 17 years of age, inclusive. The outcome of interest is correct helmet use and was assessed as such if drivers (or passengers) wore a helmet with protective elements, which was not a substandard helmet and was properly fastened.

The KAP surveys aimed to capture road users' knowledge, attitudes, and practices regarding road safety and helmet use. Road users 18 years of age and older were surveyed at gas stations in Ha Nam and Ninh Binh provinces. Within each province, each district consisted of seven gas station locations for data collection with each location being supported by two to three data collectors depending on the expected traffic volume at each location. Oral consent was obtained by trained data collectors and a closed-ended questionnaire was administered. The structure, sampling scheme, and content of the survey have been previously described in detail.[13,14] Questions focused on capturing drivers' self-reported knowledge, attitudes, and practices regarding road safety, traffic laws and regulations focused around helmet use, regardless if they were on a two-wheeled motorized vehicle at the time of interview. The interviews also contained a component about users' knowledge, attitudes, and practices regarding drink-driving, results of which are not reported here. Interviews lasted approximately 30 min, and sampling continued until the target of 210 per province was achieved in accordance with sample size calculations.

For longitudinal data collected from observational helmet wearing studies, descriptive data analyses, tabulations, and trend analyses were conducted. Following a descriptive analysis of risk factors and outcomes, regression analysis (negative binomial regression) was used to assess trends. Negative binomial regression tested whether the series of 13 observation rounds were significant in predicting a trend in helmet use. All data were managed and analyzed using STATA 12 (StataCorp, 2010) and Microsoft Excel®.

The study was approved by the Institutional Review Boards at the Johns Hopkins Bloomberg School of Public Health and the Hanoi School of Public Health. Approval for the study was also obtained from the National Traffic Safety Committee in Vietnam.

Results

Over the period of June 2011 and December 2014, 13 rounds of helmet observation, comprising of 301,981 helmet observations were conducted in the two provinces of Ha Nam and Ninh Binh. Negative binomial regression analysis was used to assess the trends of helmet use over time in Ha Nam and Ninh Binh. For comparing proportions across categories such as weekday-weekend and adult-child, we used z statistics.

Correct helmet use

Correct helmet use trends

Table 1 presents the prevalence of correct helmet use over the period of June 2011–December 2014, where correct wearing

Table 1 – Prevalence of helmet use and type in Ha Nam and Ninh Bin Provinces, Vietnam.

Round	Date	Helmet observation data							
		n		Correct use		Child correct wearing		Substandard caps	
		Ha Nam	Ninh Binh	Ha Nam	Ninh Binh	Ha Nam	Ninh Binh	Ha Nam	Ninh Binh
1	June 2011	9709	17,219	34.3%	68.9%	—	—	47.3%	12.4%
2	December 2011	9151	9259	57.9%	72.4%	37.7%	39.0%	25.8%	14.0%
3	March 2012	9359	16,564	60.3%	71.3%	48.3%	53.3%	25.8%	17.3%
4	June 2012	9266	16,707	59.0%	71.9%	47.8%	43.1%	26.5%	15.4%
5	September 2012	16,239	8946	67.5%	51.4%	31.4%	17.4%	24.5%	18.4%
6	December 2012	15,906	10,033	62.2%	55.6%	29.2%	41.3%	29.3%	16.6%
7	April 2013	15,616	8989	76.0%	56.9%	36.0%	22.6%	15.9%	11.8%
8	June 2013	16,018	8964	69.5%	60.0%	37.0%	26.2%	13.6%	14.0%
9	October 2013	10,012	11,956	44.4%	43.2%	25.3%	25.8%	19.0%	19.1%
10	December 2013	10,490	9408	69.3%	56.3%	26.3%	32.3%	15.3%	14.1%
11	April 2014	11,678	9688	70.6%	56.7%	24.2%	31.5%	17.2%	13.6%
12	July 2014	11,191	9197	76.3%	65.6%	23.9%	23.7%	13.8%	6.0%
13	September 2014	9440	10,976	68.0%	66.0%	25.5%	29.0%	18.0%	5.2%
14	December 2014	10,642	12,281	76.9%	72.2%	27.8%	29.8%	11.4%	5.3%

rates among all populations observed (regardless of age and driver/passenger status) increased in both provinces. Correct helmet use increased in Ha Nam from 34.3% to 76.9% ($P < 0.01$, $n = 164{,}717$), whereas in Ninh Binh, helmet use fluctuated between 68.9% and 72.2% ($P > 0.05$, $n = 160{,}187$). Data were also collected on the use of substandard helmets. Overall, substandard helmet use decreased significantly, from 47.2% to 11.5% ($P < 0.01$) in Ha Nam and from 12.3% to 5.3% ($P < 0.01$) in Ninh Binh between December 2011 and December 2014 (Table 1).

Correct helmet use by time of day

When helmet use was disaggregated by time of day, there was higher correct helmet use in the early hours from 7:00 to 9:00 whereas correct helmet use was lowest in the evenings 19:00–21:00 ($P > 0.05$). When disaggregated by day of week (weekday vs weekend), there was no consistent trend for higher or lower prevalence of correct helmet wearing.

Child and adult helmet use

While adult helmet use remained steady in the two provinces, a major gap was observed in helmet use among children. Helmet use among children in Ha Nam province fell significantly from 85.7% in December 2011 to 35.9% in December 2014 ($P < 0.01$; Fig. 1).

Substandard helmet use

During December 2011–December 2014, the prevalence of substandard helmet use among all riders was higher during weekdays (16.6%) compared to weekends (16.0%; $P < 0.01$, $n = 277{,}168$) among both sites. This difference held true when considering substandard helmet use among all helmet wearers, with 18.9% using substandard helmets during weekdays and 18.1% during weekends ($P < 0.01$, $n = 265{,}574$). Overall, substandard helmet use was higher in adults

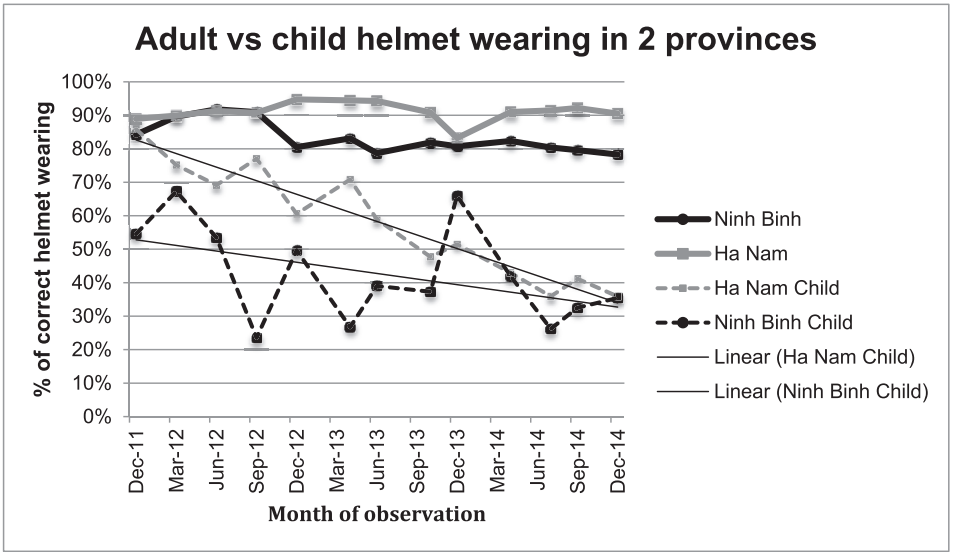

Fig. 1 – Adult vs child helmet use in Ha Nam and Ninh Binh provinces, Vietnam.

(16.4%) compared to children (13.7%). However, differences exist at the provincial level, where in Ha Nam province, substandard helmet use was similar among both groups (19.2% in adults, 20.2% in children) whereas in Ninh Binh, helmet use was much higher in adults (13.3%) compared to children (5.7%).

Knowledge, attitudes, and practices

From December 2011 to July 2014, 2730 roadside surveys were administered over six rounds of data collection.

KAP survey: Respondents were aged 18 years and over, with the most prevalent primary vehicles among respondents being motorcycles (85.1%), cars and taxis (11.6%), and buses/trucks (2.7%). Overall, 1744 (64%) respondents claimed that they always wore a helmet when traveling by motorcycle. Common reasons for wearing a helmet were to ensure their own safety (79%) and avoid fines from police (40%; Table 2).

Reasons for low helmet usage rates observed among children were further explored through KAP surveys. Approximately, 35% of respondents claimed that they always had their children wear helmets when riding on motorcycles, whereas 35% claimed they sometimes had children wear helmets. Several reasons were provided for not wearing helmets including, forgetting to wear a helmet, no perceived need for a helmet, the child does not want to wear a helmet, no helmet available, and afraid to hurt child's neck (Table 2).

Despite this, there has been little public awareness of the need to wear a helmet for children, with only 19% having seen, heard of, or they themselves being fined for carrying children without helmets. Yet, 74% believe there is a need to strengthen enforcement and traffic fines for carrying children without helmets (Table 2).

Discussion

The observational data showed mixed progress in correct helmet use in Ninh Binh, although considerable improvement has been made in Ha Nam. Substandard helmet use decreased considerably, but attention needs to be drawn to increasing helmet use among children. Specifically, there were large differences in baseline helmet wearing rates between Ha Nam and Ninh Binh provinces. This difference could be due to a variety of reasons including differing enforcement levels of helmet legislation, economic conditions (although both provinces are located in the Red River Delta region of Vietnam, the level of economic development varies significantly with Ninh Binh enjoying a relatively high level of economic

Table 2 – Knowledge, attitudes, and practices around helmet use in Ha Nam and Ninh Binh provinces, Vietnam.

Knowledge, attitudes, and practices for helmet use							
Survey question	Answers – percentage (count)	Survey (#)					
		4	5	6	7	8	9
Do you wear helmet at all time traveling by motorcycle (to be driver or passenger)?	Yes	53.7 (338)	85.7 (361)	58.1 (245)	79 (332)	66.1 (278)	69.5 (292)
	No	46.2 (291)	14.2 (60)	41.8 (176)	20.9 (88)	33.8 (142)	30.4 (128)
Why do you wear helmet at all time traveling by motorcycle?	Avoid penalties from police	45.5 (164)	–	37.1 (91)	35.4 (149)	25.1 (70)	25.2 (74)
	Personal safety	51.4 (174)	–	68.5 (168)	74.2 (312)	95.6 (266)	74.7 (219)
	Other	–	–	–	0.4 (2)	0.3 (1)	0 (0)
When do you wear helmet for child under 6 years old when you carry he/she by motorcycle?	Always	23 (145)	61 (257)	26.6 (112)	50.8 (210)	43.5 (183)	41.1 (173)
	Sometimes	28.4 (179)	–	48.2 (203)	23 (95)	39 (164)	38.3 (161)
	Never	48.4 (305)	38.9 (164)	25.1 (106)	26.1 (108)	17.3 (73)	20.4 (86)
Why do you not want to wear helmet for child aged under 6 years when you carry he/she by motorcycle? (multiple answers)	No helmet available	17.1 (83)	18.2 (30)	27.2 (57)	12.8 (26)	20.6 (49)	19.4 (48)
	Afraid to affect child's neck	9.9 (48)	10.3 (17)	29.6 (62)	14.7 (30)	6.3 (15)	2.8 (7)
	Child does not want to wear	15.2 (74)	10.3 (17)	72.7 (152)	20.6 (42)	31.6 (75)	28.3 (70)
	Forget to wear	22.3 (108)	6.7 (11)	87.5 (183)	29 (59)	40 (95)	36 (89)
	No need to wear	43.8 (212)	44.5 (73)	42.5 (89)	36.4 (74)	35.4 (84)	21 (52)
	Other	3.5 (17)	11.5 (19)	14.8 (31)	7.3 (15)	0.8 (2)	6.8 (17)
Have you ever heard any information about the children must wear helmets when travel by motorcycle?	Yes – 1	33.5 (211)	56 (236)	66.5 (239)	79.8 (333)	55.9 (235)	47.8 (201)
	No – 2	66.4 (418)	43.9 (185)	33.4 (120)	20.1 (84)	44 (185)	52.1 (219)
What are the sources of these messages? (multiple answers)	Television	91.4 (193)	86 (203)	43.9 (105)	90.3 (301)	85.9 (202)	82.5 (166)
	Radio/newspaper	30.3 (64)	27.1 (64)	20.9 (50)	22.5 (75)	26.3 (62)	16.4 (33)
	Leaflets	0.9 (2)	5 (12)	3.3 (8)	9.6 (32)	3.8 (9)	1.4 (3)
	Billboards	2.8 (6)	10.5 (25)	3.3 (8)	18 (60)	5.1 (12)	8.4 (17)
	Posters	3.3 (7)	12.2 (29)	1.2 (3)	24 (80)	8.9 (21)	6.4 (13)
	Don't remember	1.8 (4)	6.7 (16)	1.6 (4)	3.6 (12)	1.7 (4)	6.9 (14)
	Other	3.7 (8)	1.6 (4)	1.6 (4)	6.6 (22)	3.8 (9)	2.9 (6)
Have you ever seen/heard/or yourself been fined for carrying children traveling without helmet?	Yes	17.4 (110)	22.8 (96)	10.3 (37)	30.8 (128)	24.5 (103)	24.2 (102)
	No	82.5 (519)	78.3 (330)	89.6 (321)	69.1 (287)	75.4 (317)	75.7 (318)
From your personal opinion, is there a need to strengthen enforcement and traffic fine for not wearing helmet for young children?	Yes – 1	72.9 (459)	78.3 (330)	76.6 (275)	83 (344)	70.2 (295)	78.8 (331)
	No – 2	27 (170)	21.6 (91)	23.3 (84)	16.9 (70)	29.7 (125)	21.1 (89)

development while Ha Nam has been less prosperous), knowledge of the law and benefits of correctly wearing standard helmets, among others.

In 2000, Vietnam's first helmet legislation was introduced making helmet use compulsory for motorcycle riders on certain major roads and highways.[16] In 2003, a fine of 10,000–20,000 Vietnamese Dong (approximately 1 USD) was introduced for violations, although evidence of enforcement is limited.[16,17] At the time of the study, there was no law or penalty for substandard helmet or incorrect use (e.g. not fastened, improperly positioned/sized), although this has since been introduced in 2014. Helmet use prevalence data in Vietnam have been limited. In 2006, Hung et al. conducted an observational study in Hai Duong province that found 29.9% of motorcyclists wore helmets, with males and adults being more likely to wear helmets compared to females and the young.[18] In 2008, Hung et al. found that helmet use remained low at 23.3%, despite a high prevalence of helmet ownership.[18] This study found significantly higher levels of helmet use as recently as December 2014, though it is premature to suggest that these improvements can be fully attributed to the helmet legislation. Since the beginning of widespread helmet enforcement in Vietnam in December 2007, there has been no difference in enforcement levels or initiatives among Provinces. However, it was only in 2010 that Ninh Binh and Ha Nam were supported by the 'Road Safety in 10 Countries' initiative to strengthen police capacity in enforcement, implement social marketing campaigns.

This helmet wearing study showed low child helmet use rates, which decreased over the study period despite increasing overall helmet use. In May 2010, the government of Vietnam passed Decree 34, which mandated that children over the age of 6 years must wear helmets while on motorcycles. However as of December 2014, child helmet use was 36% and 35% in Ha Nam and Ninh Binh, respectively, while correct child helmet use was only 28% and 30%. Although the mechanism behind these decreasing child helmet use trends is unclear, the KAP study highlighted potential contributory factors including belief that children do not need to wear helmets, children not wanting to wear helmets, a lack of child helmets, and notably, poor enforcement behind helmet legislation. Additionally, current helmet legislation excludes children under 6 years of age. Children younger than 6 years are routinely motorcycle passengers, putting them at the same or potentially greater risk for injuries or death in the event of a crash. This issue is not isolated to Vietnam and is one that warrants additional research to develop appropriate helmets and/or protective mechanisms for young children on motorcycles.

Police enforcement and fines are seen as one of the most effective ways to improve behavioral risk factors for road traffic.[19] Compulsory helmet use legislation coupled with enforcement and fines has shown to increase the likelihood of helmet use fivefold.[20] In 2007, Resolution 32 was passed which introduced mandatory helmet wearing across Vietnam. Also, Decree 71 requires children to wear helmets and Decree 34 provides grounds for enforcement and administration of fines to all riders for non-compliance. There is a significant opportunity to improve helmet use through enhanced enforcement of this existing legislation. However, KAP surveys indicate that 76% of respondents have not seen, heard of, or themselves been fined for children not wearing helmets. Future efforts should focus on working alongside the NTSC and relevant local enforcement bodies to improve helmet use enforcement according to these established laws.

Substandard helmet use is undermining the success of improved helmet use trends in Vietnam. Although helmets adhering to international or regional quality standards exist in Vietnam, seals are often counterfeited and are poorly understood by consumers. Substandard helmets in Vietnam, lack the protective layers that absorb and dissipate the energy from impacts.[15] The prevalence of substandard helmets peaked at 47% in Ha Nam and 18% in Ninh Binh over the course of the project but has since declined to 11% and 5%, respectively, suggesting that national social marketing campaigns focusing on the dangers of substandard helmet use, as part of the Global Road Safety Program, may have contributed to the decline. As substandard helmet use was higher in the evening hours (19:00–21:00) compared to morning hours (07:00–09:00), enforcement efforts could first be concentrated during night time hours.

It should be noted that Ha Nam and Ninh Binh provinces are both located in the Red River Delta region of Vietnam, representing just one of six regions in the country. Thus, the results may not be generalizable to the other parts of the country, especially mountainous or coastal terrains. However, as government legislations are applied to all regions of the country equally, the results of the roadside surveys may be used as a starting point for policy.

This study has several limitations. First, the helmet observations were only conducted during days that were not rainy, and thus, helmet use results cannot be extrapolated for rainy weather conditions, which are common in Vietnam's tropical climate. Second, incorrect helmet use may be underestimated because it was difficult at times to ascertain usage status of high speed motor vehicles. Similarly, the categorization of motorcycle riders/passengers into adult and child categories may have been subject to error because it is often difficult to determine the difference between a teenager and young adult through observation only, and often, a proxy such as a school uniform during weekdays would have been a helpful indicator.

This study provides useful new information and lessons for future initiatives addressing helmet use in Vietnam. There needs to be a continued focus on ensuring that consumers know not only the importance of helmets but also the importance of quality helmets that will be sufficiently protective in the event of a crash. Steps can be taken to: (1) increase consumer awareness of the harms of a substandard helmet; (2) educate consumers on how to recognize and purchase a quality helmet; (3) make quality helmets more widely available; and (4) continue regular and visible enforcement activities.

Author statements

Ethical approval

The study was approved by the Institutional Review Boards at the Johns Hopkins Bloomberg School of Public Health and the

Hanoi School of Public Health. Approval for the study was also obtained from the National Traffic Safety Committee in Vietnam.

Funding

Publication of this paper was supported by Bloomberg Philanthropies through a grant to the Johns Hopkins International Injury Research Unit at the Johns Hopkins Bloomberg School of Public Health, USA.

Competing interests

None declared.

REFERENCES

1. *Institute for health metrics and evaluation*. GBD Compare; 2013.
2. Murray CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. *Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010*. 2014. p. 1990–2010.
3. World Bank. *World Bank indicators database*. World Bank; 2013.
4. *Monthly report for August 2008 on transport injuries [in Vietnamese]. Hanoi*. 2008.
5. World Health Organization. *Road safety in 10 countries: Vietnam*. 2010.
6. World Health Organization. *Helmets: a road safety manual for decision-makers and practitioners. Geneva*. 2006.
7. Branas CC, Knudson MM. Helmet laws and motorcycle rider death rates. *Accid Anal Prev* 2001;**33**:641–8.
8. Abbas AK, Hefny AF, Abu-Zidan FM. Does wearing helmets reduce motorcycle-related death? A global evaluation. *Accid Anal Prev* 2012;**49**:249–52.
9. Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. *Cochrane Database Syst Rev* 2008 Jan;**23**(1). http://dx.doi.org/10.1002/14651858.CD004333.pub3. CD004333.
10. Brandt M-M, Ahrns KS, Corpron CA, Franklin GA, Wahl WL. Hospital cost is reduced by motorcycle helmet use. *J Trauma* 2002;**53**:469–71.
11. MacLeod JBA, Digiacomo JC, Tinkoff G. An evidence-based review: helmet efficacy to reduce head injury and mortality in motorcycle crashes: EAST practice management guidelines. *J Trauma* 2010;**69**:1101–11.
12. Hanoi School of Public Health. *Road safety in 10 countries: evaluation report 2011. Hanoi, Viet Nam*. 2011.
13. Bachani AM, Jessani NS, Pham VC, Quang LN, Nguyen PN, Passmore J, et al. Drinking & driving in Viet Nam: prevalence, knowledge, attitudes, and practices in two provinces. *Injury* 2013 Dec;**44**(Suppl 4):S38–44. http://dx.doi.org/10.1016/S0020-1383(13)70211-0.
14. Tran NT, Bachani AM, Pham VC, Lunnen JC, Jo Y, Passmore J, et al. Drinking and driving in Vietnam: public knowledge, attitudes, and practices. *Traffic Inj Prev* 2012 Jan;**13**(Suppl. 1):37–43.
15. Ministry of Transport. *Guiding the compulsory wearing of helmet. Viet Nam*. 2000.
16. Ministry of Transport. *Guiding the compulsory wearing of helmet. Viet Nam*. 2001.
17. Ministry of Transport. *Guiding the compulsory wearing of helmet. Viet Nam*. 2003.
18. Hung DV, Stevenson MR, Ivers RQ. Prevalence of helmet use among motorcycle riders in Vietnam. *Inj Prev* 2006;**12**:409–14.
19. Nelson TF, Xuan Z, Babor TF, Brewer RD, Chaloupka FJ, Gruenewald PJ, et al. Efficacy and the strength of evidence of U.S. alcohol control policies. *Am J Prev Med* 2013;**45**:19–28.
20. Ichikawa M, Chadbunchachai W, Marui E. Effect of the helmet act for motorcyclists in Thailand. *Accid Anal Prev* 2003;**35**(2):183–9.