Case Studies on Transport Policy 7 (2019) 301–309

Contents lists available at ScienceDirect

Case Studies on Transport Policy

journal homepage: www.elsevier.com/locate/cstp

Estimating the willingness to pay and the value of fatality risk reduction for car drivers in Myanmar

Ei Ei Mon[a], Sajjakaj Jomnonkwao[a], Buratin Khampirat[b], Thaned Satiennam[c], Vatanavongs Ratanavaraha[a,*]

[a] School of Transportation Engineering, Institute of Engineering, Suranaree University of Technology, 111 University Avenue, Suranaree Sub-district, Muang District, Nakhon Ratchasima 30000, Thailand

[b] School of General Education, Institute of Social Technology, Suranaree University of Technology, 111 University Avenue, Suranaree Sub-district, Muang District, Nakhon Ratchasima 30000, Thailand

[c] School of Civil Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 123 Moo 16 Mittapap Rd., Nai-Muang, Muang District, Khon Kaen 40002, Thailand

ARTICLE INFO

Keywords:
Fatality risk reduction
Road safety
Structural equation modeling
Value of statistical life
Willingness to pay

ABSTRACT

To curb the rising road traffic accident trend in Myanmar, there is an urgent need to improve road safety. This study aims to evaluate current government road safety interventions. The contingent valuation-payment card method was used to elicit car drivers' willingness to pay (WTP) for fatality risk reduction. The value of statistical life (VSL) was then estimated and the factors influencing the WTP were examined using structural equation modeling. The estimated range for VSL was found to be MMK 104.167 million (US$ 86,805) to MMK 195.771 million (US$ 163, 142). Gender (male), mediating good driving behavior, and age indicators were found to negatively influence the WTP, whereas socioeconomic characteristics, good driving behavior, and risk perception factors were found to positively influence the WTP. The proposed model explained 33.7% of the variance and traffic accident risk perception was found to have the strongest influence on the WTP. This study can serve as a decision making tool for road safety improvement policies.

1. Introduction

With the rapid increase in vehicle ownership, traffic accidents in Myanmar have been commensurately increasing. In the past 10 years, there has been a five-fold increase in the number of vehicles on the road (0.978 million in 2005 and 5.385 million in 2015), which has resulted in a dramatic increase in traffic accidents (5755 in 2005 to 15,677 in 2015). Official statistics report that in 2015, there were 5037 traffic fatalities, with a further 25,612 injuries (CSO, 2016; RTAD, 2016). Therefore, road safety has become a major issue in Myanmar as in other developing countries because of the severe burden on the economy and the negative impact on victims, their families, and the nation (Parsekar et al., 2015).

Experts from the Asian Development Bank estimated that the number of fatalities was expected to double by 2020 and reach 15,000 per year by 2025 if immediate action were not taken to improve road safety. Therefore, "strong, well-managed and well-funded road safety efforts" are needed to reverse the increasing traffic accident trend (Gururaj, 2014; ADB, 2016). Although Myanmar's authorities have been trying to resolve these problems, crash rates have continued to rise. Therefore, it has become necessary to develop a more strategic focus based on data, research evidence, and proven successful practices (ADB, 2016).

An estimate of the economic losses due to road accidents is necessary to understand the magnitude of the road safety problems in the country (Chaturabong et al., 2011). As fatal accidents results in substantial traffic accident costs, any fatal accident cost evaluations requires a monetary valuation for the loss of life or the value of a statistical life (VSL) (de Blaeij et al., 2003). Moreover, because of the scarcity of resources, policy makers need to prioritize different social benefit policies (Svensson and Vredin Johansson, 2010). Therefore, policy makers have generally used cost benefit analyses to evaluate the benefits of proposed regulations and public investment in road safety. Therefore, a monetary traffic safety valuation is required to compare the value in reducing the traffic mortality risk with the costs of implementing road safety measures (de Blaeij et al., 2003; Svensson, 2009;

* Corresponding author.
E-mail addresses: d5840069@g.sut.ac.th (E.E. Mon), sajjakaj@gmail.com (S. Jomnonkwao), buratink@sut.ac.th (B. Khampirat), sthaned@kku.ac.th (T. Satiennam), vatanavongs@g.sut.ac.th (V. Ratanavaraha).

https://doi.org/10.1016/j.cstp.2019.02.010
Received 19 October 2017; Received in revised form 23 May 2018; Accepted 17 February 2019
Available online 18 February 2019

Wijnen and Stipdonk, 2016). Many economists have focused on the willingness to pay (WTP) concept and the concept of the value of statistical life (VSL) to monetize mortality risk reduction (Mishan, 1971; Jones-Lee, 1974; Andersson, 2007). VSL refers to the individual integrated marginal WTP value of avoiding one statistical road traffic accident death (Andersson, 2007; Svensson, 2009; Yang et al., 2016). VSL can be also calculated by dividing the WTP by the risk change value (Milligan et al. 2014). Furthermore, Wijnen et al. (2009) and Wegman (2017) found that it was difficult to compare VSL estimates across countries as the valuation depended on many factors that differed significantly (such as local conditions and circumstances), and strongly recommended that the VSL be evaluated separately for each country and be updated regularly.

A person's WTP for traffic death risk reduction is directly related to the valuation of their own life, their personal risk perceptions (Hensher et al., 2009), and their preferences toward road safety (Andersson and Lindberg, 2009). Therefore, understanding people's road safety preferences as well as their individual characteristics is important to road safety policy measures (Andersson and Lindberg, 2009) such as traffic regulations and legislation that targets different driver groups (Zhang et al., 2013). Consequently, as shown in Table 1, there has been a great deal of research into the impact of people's characteristics, behaviors, and risk perceptions on the WTP for road accident death risk reduction.

The WTP can be divided into two categories: revealed preference (RP) and stated preference (SP) (Wijnen et al., 2009). As RP refers to actual behavior and the choice of market goods (Cnaan and Kang, 2011), it has been commonly used to study consumer behavior; therefore the applicability of RP to road safety has been limited (Wijnen et al., 2009). An alternative approach to RP is SP, which is based on hypothetical surveys that use different payment mechanisms and designs to value both market goods and non-market goods (Svensson, 2009; Wijnen et al., 2009), and has the ability to match survey questions to policy risk contexts to achieve broad representation (Milligan et al., 2014); therefore, SP has been commonly used to value travel time, safety (such as fire, road, work), pollution (such as air, water, noise), and natural resources (Wijnen et al., 2009). The SP method can be further divided into contingent valuation (CV) and choice modeling (CM) or stated choice (SC). In the CV approach, respondents are directly asked to state the maximum amount they are willing to pay for particular goods or risk reduction (Beattie et al., 1998; Carthy et al., 1998; Wijnen et al., 2009; Haddak et al., 2016). In the CM approach, respondents are asked to make a choice between different goods or alternatives, such as different levels of travel time, costs, and accident risk (Wijnen et al., 2009). The CM approach, however, is not suitable for Myanmar respondents as they might select randomly without due consideration. There are many approaches to CV elicitation, such as open-ended, iterative bidding or bidding game, payment cards, and dichotomous choice (Bateman et al., 2002). In open-ended elicitation, without being given a clue as to the value, respondents are directly asked the amount that are willing to pay for the goods or services. Therefore, people not familiar with the risk reduction valuations and who had never thought about such valuations before may have difficulties and may give protest answers or no answer, which could result in a large non-response rate and outliers (Bateman et al., 2003; Vloerbergh et al., 2007). In the bidding game approach, people are asked whether or not (yes/no) they are willing to pay a certain amount over several rounds of discrete choice questioning until their maximum WTP is reached. However, this method has been found to have anchorage bias and a large number of outliers because of false responses (Bateman et al., 2003; Vloerbergh et al., 2007). In the payment card format, people can choose what they are willing to pay from a list of amounts and there is also a space to write an alternative amount if the choices are not suitable, which makes the valuation task easier. The payment card format has been found to have a higher response rate, avoids a starting point bias, reduces outliers, and has a lower cognitive burden on respondents (Bateman et al., 2002; Vloerbergh et al., 2007; Mofadal et al., 2015). Of these, the payment card format has been found to be superior to open-ended and bidding game approach (Bateman et al., 2002). Therefore, this study used the payment card approach to elicit the WTP for fatality risk reduction.

From the literature review, a WTP-CV payment card questionnaire was found to be the most suitable method as Myanmar residents are unfamiliar with risk reduction valuations. Because of the difficulty in getting reliable data, no previous research has been conducted regarding the estimation of car driver's VSL for traffic accident risk reduction in Myanmar.

This study aimed: (1) to inform traffic safety policy by examining the influence various factors on each other and the degree to which they influence the WTP for traffic accident fatality risk reduction; and (2) to gather information for national authority road safety resource allocation decision making by estimating the statistical value of life of Myanmar car drivers. A contingent valuation-payment card questionnaire approach was used to elicit the WTP for fatality risk reduction by Myanmar car drivers. Then, the VSL of car drivers was estimated based on the accident rate in Myanmar during 2015. A structural equation modeling (SEM) approach was used to assess the factors that influenced the WTP.

2. Materials and methods

In this study, a WTP-CV questionnaire using a modified payment card format was employed to elicit car drivers' willingness to pay for road traffic fatality risk reduction. As Myanmar respondents were unfamiliar with the WTP and risk reduction value concepts, face-to-face interviews were conducted to ensure a complete understanding of the questionnaire so that respondents would choose an appropriate WTP value.

Table 1
Factors associated with WTP on previous research.

Item	Author	Indicators	Association with WTP	
			Positive	Negative
Socioeconomic Characteristic				
1	Persson et al. (2001), Bhattacharya et al. (2007), Andersson and Lindberg (2009), Chaturabong et al. (2011), Haddak et al. (2016)	Income, Education, Government staff	✓	
	Persson et al. (2001), Bhattacharya et al. (2007), Andersson and Lindberg (2009), Chaturabong et al. (2011), Haddak et al. (2016)	Age, Gender (male), Number of adult in a household, Number of dependent in a household,		✓
Travel/Driving Behavior				
2	Bhattacharya et al. (2007), Chaturabong et al. (2011)	Often helmet usage, Exposure to traffic	✓	
	Chaturabong et al. (2011)	Alcohol impaired driving		✓
Accident experience & Risk perception				
3	Persson et al. (2001), Andersson and Lindberg (2009), Haddak et al. (2016)	Accident experience, Risk perception or subjective risk, Close community accident experience	✓	
	Andersson and Lindberg (2009)	Lower risk perception		✓