

VALUE OF LIFE OF MALAYSIAN MOTORISTS: ESTIMATES FROM A NATIONWIDE SURVEY

Nor Ghani MD. NOR
Associate Professor
Faculty of Economics
Universiti Kebangsaan Malaysia
Bangi 43600 Selangor Malaysia
Fax: 603-8929-3161
E-mail: norghani@ukm.my

Mohd Faudzi MOHD YUSOFF
Senior Lecturer
Faculty of Business Management
Universiti Teknologi Mara
Shah Alam 40450 Selangor Malaysia
Fax: 603-5544-2057
E-mail: mfaudzi@salam.uitm.edu.my

Abstract: In the past three decades, there has been a more than twenty-fold increase in the number of registered motor vehicles in Malaysia. Paralleling this trend is the observed increase in the number of accidents and fatalities on the road. Policy makers often struggle with the question of what is the appropriate monetary value to be associated with reduced fatalities. From the perspective of cost benefit analysis, investments in safety must be justified by quantifiable economic benefits, say in the monetary value of reduced fatalities. In the past, due to the lack of reliable estimates on the value of life, the benefits arising from the expected reduction in fatalities through investment in safety have, in most cases, been neglected in transport project evaluation. This paper aims at providing a reliable monetary estimate of the value of a statistical life to facilitate policy makers in safety project evaluation. By doing so, this paper also hopes to fill an obvious gap in the literature on road safety in Malaysia. This study utilizes the willingness to pay (WTP) method as a vehicle to determine the appropriate value of a statistical life. Data was collected by way of an extensive nationwide survey. Direct questionnaire interviews were administered on households that were selected using a stratified random sampling method. Following results from subsequent analysis, this study proposes a value of about RM1.3 million (US\$342,105) as an estimate for the mean value of a statistical life for public policy analysis involving safety for motorists in Malaysia. Compared with other estimates of value of life obtained by studies done in other countries, the current estimate appears quite low in the first instance. However, controlling for the effect of inter-country variation in income, the mean value of statistical life found in this study is certainly quite reasonable.

Key words: Value of life, Contingent Valuation, Accident Cost

1. INTRODUCTION

In year 2000 there were 250,429 cases of road accidents reported in Malaysia. A total of 6,029 people died, 9,790 seriously injured and 34,375 slightly injured. The number of road accidents had increased more than four fold from 1980 to 2000 while that for fatalities had more than doubled within the same period (PDRM 2000). Despite a clear policy on the promotion of traffic safety, traffic safety programs and initiatives is only one among many priorities that compete for scarce public funds. Policy makers are, therefore, confronted with difficult choices in dispensing such funds since reliable estimates of the benefits of safety programs including the value of lives saved are not available. In particular, they struggle with the question of what is the appropriate monetary value to be associated with the benefit of reduced fatalities? In the past, due to the lack of reliable estimates on the value of life, the benefits arising from the expected reduction in fatalities have, in most cases, been neglected in project evaluation. As a result, a disproportionate number of road safety projects had been

abandoned in favor of other types of project as they all compete for a limited amount of public funds. Safety, as a basic ingredient of the quality of life, has generally taken a back seat.

This paper tries to overcome this deficiency by proposing a monetary value for fatality avoided derived from the willingness to pay method based on data collected through an extensive nationwide survey. This paper attempts to provide policy makers with a reliable estimate of the value of a statistical life. It is expected that the use of such estimate will divert resources towards investment in traffic safety that should transcend itself into greater road safety for motorists leading to reduced accidents.

Presently, there is no proper valuation on the benefits arising from fatalities avoided from reduced road accidents in Malaysia. The only, and therefore, often quoted figure was taken from a study conducted by the United Nations Economic and Social Commission for Asia and Pacific (ESCAP) in 1983. The human capital costing was based on per capita gross national product and mean loss of life expectancy amongst road accident fatal casualties. This approach assumes that the economic value of life is equal to the average loss of life expectancy multiplied by per capita gross national product. This method valued the costs of a fatality at RM145,000. This amount when compared to the values estimated in the United Kingdom, United States as well as other countries was too low even after adjusting for differences in income across countries and the growth in per capita income of Malaysians ever since the first estimation was made.

Exclusive use of this method in valuing the cost of life had been criticised by economists like Mishan (1971) and Schelling (1968) because it is inconsistent with the principles of cost benefit analysis. They argued that costs should reflect the amounts the road user themselves are willing to pay for a reduction in the risk of a fatal accident or injury. Most people value safety more out of an aversion to death than out of a wish to preserve future levels of income. Later, other economists argued that this method belittle the contributions of the elderly and the younger generations by giving negative values since their consumption generally exceed their contributions (Rice et al. 1989) and using human capital alone will create significant resource misallocation (Miller 1996). At best, according to Haight (1994) the method can be considered as giving a lower bound to the value of life.

2. THE WILLINGNESS TO PAY STUDY

2.1 WTP-based Value of Statistical Life Defined

There are several methods that can be used to estimate the value of life saved from increased traffic safety. The WTP method is a variant of a popular value solicitation technique known as the contingent valuation method. The method has particularly gained popularity in valuation research since the late nineties. It appeals to researchers because of the general ease of application in valuing a good (e.g. a small reduction in fatality risk) in the absence of existing market data. In addition, it also allows for valuation to be done for any population subgroup and provides for some flexibility in the specification of the good to be valued by the respondents. The willingness to pay (WTP) for a given reduction in the risk of death is defined as the total amount of money that individuals would be willing to pay for a safety improvement that will result in the reduction of the risk of a premature death. The willingness to accept (WTA) for a given increase in the risk of death, on the other hand, can be defined as

the total amount of money that individuals would require as compensation in order to accept the given increase in the risk of a premature death. Both measures are determined using direct solicitation of individual's preferences usually by way of a questionnaire survey.

2.2 The Survey

The study was carried out for the whole of Peninsular Malaysia. A survey questionnaire was prepared following similar format laid down by Jones-Lee et al. (1985, 1993) during the national survey in Great Britain with some adjustments to suit local needs. It was designed to accommodate for an interview that would last between 15 to 20 minutes. It contained multi parts questions that fall into four broad categories:

1. Contingent Valuation questions – to provide estimates of the relevant marginal rates of substitution of wealth for fatal accidents.
2. Perception questions – to test the perception of individuals on risk and the understanding of probability concept.
3. Demographic and vehicle ownership questions – to collect data on age, income, vehicle's engine size and age and other demographic and vehicle details.

Contingent Valuation (CV) questions were posed to respondents to determine their willingness to pay for small risk reduction and hence provide the basis for direct estimation of their marginal rates of substitution of wealth for a reduction or an increase in the risk of fatality. This survey only focused on own risk and does not consider possible WTP valuation for other people's safety as had been done in the UK (Jones-Lee et al. 1985). The exclusion is in line with recent theoretical works that raise doubt whether WTP-based values of safety intended for use in public sectors decision making should take any account at all of people's willingness to pay for others' safety (Jones-Lee et al. 1992 and Bergstrom 1982).

Once selected, respondents were briefed on the purpose and techniques of valuation to ensure commitment on their part to complete the valuation exercise. The appropriate concept of risk was then explained by using two A4-sized show cards. The first card showed 20 shaded grid boxes (out of 100,000) depicting 20 deaths per annum for every 100,000 members of the population. The second card had 30 shaded grid boxes representing 30 deaths involving all road users for every 100,000 members of the population. This was intended to give respondents information about their present level of risk. Two questions (Question B2 and B3) were then posed to the respondents to test their comprehension of the risk concepts before valuation exercises were conducted.

The survey proceeded by asking the respondents to state their willingness to pay to reduce a pre-specified risk of death. Before attempting the valuation questions, respondents were advised to state their valuation by considering only his or her safety and to ignore financial effects as a direct consequence of the accident. In Question C4 respondents were asked to imagine that they were given RM300 for their travelling expenses on an excursion bus tour around all states in Peninsula Malaysia. They were then given the name of a bus company that will take them to their destination for exactly RM300. They were also told that the bus company had a safety record such that a passenger had a 10 in 100,000 chance of getting killed in a trip. Subsequently, they were asked to state whether they would be willing to pay RM50 extra in order to travel on a safer bus service with a safety record of 5 in 100,000 (50% lower risk of death). If the answer is "Yes", a payment card showing higher amounts (in RM5 increment) was shown to the respondents. They were then asked to state the actual amount

they would be willing to pay for the safer bus service. A payment card showing successively lower amounts were shown if they initially answered “No”. A further question (C8) required them to state whether they would be willing to pay RM50 extra in order to travel on a safer bus service with a safety record of 8 in 100,000 (20% lower risk of death). This second question was also intended to check if the respondents were sensitive to small variations in probability. Finally, two sets of questionnaires were prepared. The sets only differ in the sequence in risk reduction to check whether the respondents are consistent in their answers.

Prior to the full survey, a pilot test was also conducted. Thirty respondents were interviewed during the pilot test where it was discovered that the questionnaire form needed to be fine-tuned to overcome the following problems:

1. It became obvious that respondents from amongst the elderly and uneducated Chinese and Indians found it hard to communicate in Malay or English.
2. The actual average time taken to complete the questionnaire was between 40-45 minutes. Respondents were found to be quite reluctant to spend more time beyond 30 minutes.

In order to overcome the problems:

1. Several research assistants fluent in Chinese and Indian were employed to interview elderly and uneducated Chinese and Indians.
2. The number of multi parts probability questions on risk was reduced without compromising the real purpose of the study. This was done to reduce the expected amount of time required to complete the questionnaire form.

A total of twenty-eight trained enumerators were fielded for over a month to solicit responses from the pre-determined sample. The questionnaires were administered on 1000 respondents obtained through a stratified random sampling method drawn from a nationwide population. Assistance from the Department of Statistics, Malaysia was obtained in coming up with the sampling frames. The sampling frames were essentially randomly selected blocks of residential units drawn from a national database. The selection process was so designed so that the resulting sample properly represented the entire national population.

3. RESULTS

Eight hundred and fifty five respondents were eventually selected for analysis; 429 from the first set and 426 from the second set of questionnaires. Some of the responses were discarded because the respondents incorrectly answered two questions on the basic understanding of probability concept. Contrary to prior belief, however, findings from the pilot test and subsequently the survey indicated that an overwhelming number of respondents had no problems in comprehending and hence responding to the probability questions. In question B2 respondents were asked which road is more dangerous given a probability of 2/100 and 8/100 fatal accidents. Ninety seven percent of the respondents gave the correct answer. Question B3 was much tougher where they have to do a simple calculation in order to arrive at the probabilities of fatal accidents. Ninety five percent of the respondents correctly answered the question. It could generally be concluded that the respondents had a good understanding of the probability concept of risk.

The MRS of wealth for self-only risk of death implied by the amounts respondents would pay for risk reduction can be calculated by dividing WTP with the change of risk in the probability of death for which the respondents pay where $MRS = WTP/\Delta p$.

The results in terms of the marginal rate of substitution of wealth for risk of death (i.e. the value of a statistical life) are shown in Tables 1 and 2. The figures are presented in means, median and trimmed means values. The estimated mean figures from all valuation questions ranges from a minimum of RM1,283,776 to the maximum of RM3,125,875. From the tables it can be seen that the means for all MRS figures are generally higher than the medians, which attests to a positively skewed distribution. This could be due to the influence of outliers in the upper tails of the distribution. Notice also that there are some difference (although relatively small) between the values of mean, median and trimmed means.

Given the difference between the mean and median, it is natural to ask which of these two central tendencies be used to value life? Miller and Guria (1991) suggested the median as the best estimate if the survey does not weed out high values but if these have been performed then the mean is more reliable. Otherwise, the mean value is the most appropriate and is consistent with social-cost benefit analysis as emphasized by Jones Lee et al. (1992). If a single conservative value is required then RM1.2 million would perhaps be appropriate as an estimate for the value of a statistical life for motorists in Malaysia.

Table 1. The Marginal Rate of Substitution of Wealth for Risk of Death (MRS)

Question	Cases	Means	Medians	Trimmed Means
C4 (10-5) 50% risk reduction	429	1,283,776	1,200,000	1,218,312
C8 (10-8) 20% risk reduction	429	2,955,595	2,586,830	2,830,678

Table 2. The Marginal Rate of Substitution of Wealth for Risk of Death (MRS): Risk Reduction in Reverse Order

Question	Cases	Means	Medians	Trimmed Means
C4 (10-5) 20% risk reduction	426	3,125,875	2,903,263	2,992,943
C8 (10-8) 50% risk reduction	426	1,392,820	1,161,305	1,302,461

The results also show that the respondents were not sensitive to different risk reductions as can be deduced by comparing Tables 1 and 2. It is obvious that after considering the probability difference in risk reduction, the majority of respondents seem to be insensitive to the difference in the magnitude of the reduction in risk. The MRS is generally larger by a factor of 2.3 for the scenario that offers a 20% risk reduction compared to the one with a 50% reduction. Persson et al. (1995) also experienced this phenomenon and suggested that WTP is a diminishing function of the size of the risk reduction. As to whether respondents were sensitive or otherwise to the probability of risk reductions, paired sample t-test was performed on the MRS values between the two risk reductions. Results of the test showed that the t-statistics are within the range of 12.18 to 22.99. This statistically significant result rejects the hypothesis of non-sensitivity of respondents to the difference in risk reduction in fatal injury.

4. INTERNATIONAL COMPARISON

Authorities in many developed countries like the United States, Switzerland, New Zealand, Australia, Great Britain, Sweden have begun to use the WTP approach as the basis of official economic valuation of statistical life. Table 3 below provides a list of the mean values of a statistical life found by different studies in various developed countries.

The suggested value of RM1.2 million per statistical life for Malaysia is relatively low compared to estimated valuations from other developed countries. However, after adjusting for the differences of the GDP per capita across countries, the VOSL estimate is quite reasonable by the international standard. Closer examination showed that the ratio of per capita GDP to VOSL for Malaysia falls within the range registered in other countries.

Table 3: Estimated Values of Statistical Life, By Country
(in Millions 1999 Malaysian Ringgit)

Country	Number of Studies	Mean Value	Value Range	GDP Per Capita ('000)	Per capita GDP/ VOSL
All	52	6.9	1.2-11.1	-	
Australia	1	6.5	6.5	80.6	12.40
Austria	1	8.5	8.5	86.3	10.15
Canada	1	8.9	8.9	85.1	9.56
Sweden	1	4.5	4.5	74.9	16.64
Taiwan	1	3.0	3.0	62.7	20.90
U. Kingdom	6	7.4	4.5-11.1	80.6	10.89
United States	39	6.7	3.2-10.6	119.7	17.87
New Zealand	2	3.5	3.5	64.6	18.46
Malaysia	1	1.2	1.2-3.1	20.1	16.75

Source: Adapted from Miller (1990) and Miller et al (1991); GDP per capita from CIA The World Facts Book 1999

5. SUMMARY

This paper estimates the value of life among motorists in Malaysia with the objective of providing the policy makers with a reliable figure for VOSL as input in the decision making process. To the extent that the benefit of lives saved had been ignored in the past for lack of reliable estimate, the finding of this paper (if adopted by policy makers) should result in more funds being allocated to road safety. Ultimately, improvement in motorists' safety on the roads should have a desirable effect on the quality of life of Malaysians. The willingness to pay method (also known as the contingent valuation method) was adopted in the questionnaire design, survey methodology and the valuation analysis. The value of life found under different assumptions ranges from RM1.2 million to RM3.1 million and it was argued that adopting a value of RM1.2 million per fatality avoided for policy analysis is perhaps the most appropriate.

REFERENCES

- Bergstrom, T.C. (1982) When is a Man's Life Worth More than his Human Capital? In Jones Lee, M.W. (ed) **The Value of Life and Safety**, North Holland, Amsterdam.
- Haight, F. A. (1994) Problems in Estimating Comparative Costs of Safety and Mobility, **Journal of Transport Economics and Policy**, 7-30.
- Jones-Lee, M. W., Hammerton, M. and Philips, P. R. (1985) The Value of Safety: Results of a National Sample Survey. **The Economic Journal**, **95**, 49-72.
- Jones-Lee, M. W. (1992) Paternalistic Altruism and the Value of Statistical Life. **The Economic Journal**, **102**, 80-90.
- Jones-Lee, M. W., Loomes, G., O' Reilly, D. M. and Philips, P. (1993) The Value of Preventing non Fatal Road Injuries: Findings of a Willingness to Pay National Sample Survey. TRL Contractor Report No.330. Crowthorne, Berkshire.
- Miller, T.R and Guria, J.C. (1991) The Value of Statistical Life in New Zealand: Market Research on Road Safety. Wellington: Land Transport Division, Ministry of Transport.
- Miller, T. R. (1996) Injury Cost Estimation: A Pain in the Neck. **Proceedings of the Conference on Measuring the Burden of Injury**. Road Accident Prevention Research Unit, The University of Western Australia. 15-16 February 1996.
- Mishan, E. J. (1971) Evaluation of Life and Limb: A Theoretical Approach. **Journal of Political Economy**, **79**. 687-705.
- Rice, Dorothy, P., Ellen J., MacKenzie and Associates. (1989) Cost of Injury in the United States: A Report to Congress, San Francisco, CA: Institute for Health and Aging, University of California and Injury Prevention Center, The John Hopkins University.
- Royal Malaysia Police (PDRM), (2000) Statistic Report Road Accidents, Malaysia: 1998, Traffic Branch , Bukit Aman, Kuala Lumpur.
- Schelling, T. (1968) The Life You Save May Be Your Own. **Problems in Public Expenditure Analysis**. Brookings Institute, Washington. DC.
- United Nations Economic and Social Commission for Asia and Pacific Report (ESCAP), (1985) Improving Traffic Accidents Recording and Analysis System in Malaysia, Thailand.