MOTORCYCLIST'S WILLINGNESS TO PAY FOR SLIGHT INJURIES REDUCTION DUE TO MOTOR VEHICLE ACCIDENTS (CASE STUDY: DENPASAR, BALI)

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Abstract: This study investigates motorcyclist's willingness to pay (WTP) for slight injuries reduction due to motor vehicle accidents in the city of Denpasar, Bali Province, using logistic regression technique. The study found that total travel distance per day by all motorcyclists in the household, groups of motorcyclists aged between 25 and 34 years old, between 35 and 44 and between 55 and 64 years old influenced about 50%, 36%, 35% and 86% respectively on motorcyclist's WTP for 25% slight injuries reduction and about 50%, 64%, 65% and 14% respectively on motorcyclist's WTP for 15% slight injuries reduction. Total travel distance per day by all motorcyclists in the household shared equal probabilities in influencing motoryclist's WTP for both 15% and 25% slight injuries reductions. Groups of motorcyclists aged between 55 and 64 years old prefered 25% to 15% slight injuries reduction compared with younger motorcyclists.

Keywords: Willingness to Pay, Motorcyclists, Slight Injuries Reduction, Logistic Regression

KEMAUAN MEMBAYAR DARI PENGENDARA SEPEDA MOTOR UNTUK PENGURANGAN KECELAKAAN LALU LINTAS RINGAN

Abstrak: Studi ini meneliti tentang kemauan membayar pengendara sepeda motor di kota Denpasar Provinsi Bali dalam rangka mengurangi kemungkinan terlibat dalam kecelakaan ringan pada suatu kejadian kecelakaan lalu lintas. Model yang digunakan pada studi ini adalah regresi logistik. Kesimpulan dari studi ini adalah kemauan membayar tersebut dipengaruhi oleh total jarak tempuh per hari oleh semua pengendara sepeda motor yang ada dalam suatu rumah tangga, pengendara sepeda motor usia 25-34 tahun, usia 35-44 tahun dan usia 55-64 tahun berturut-turut sebesar 50%, 36%, 35% dan 86% untuk pengurangan 25% kecelakaan ringan dan berturut-turut sebesar 50%, 64%, 65% dan 14% untuk 15% pengurangan kecelakaan ringan. Total jarak tempuh per hari oleh semua pengendara sepeda motor yang ada dalam suatu rumah tangga mempunyai peluang yang sama untuk pengurangan 15% dan 25% kecelakaan ringan. Pengendara sepeda motor usia 55 dan 64 tahun cenderung memilih pengurangan 25% daripada 15% kecelakaan ringan.

Kata kunci: Kemauan untuk membayar, Pengendara sepeda motor, Pengurangan kecelakaan ringan, Regresi logistik

INTRODUCTION

Motorcycle is reported for almost 85% of the total registered vehicles with an average annual growth rate of approximately 11% in Bali Province. In 2007, there were 1,166,694 motorcycles of the total 1,377,352 registered vehicles in Bali (Statistics of Bali Province, 2008). In the capital city of Denpasar, the number of registered motorcycles was 390,000 of the total number of 457,000 registered vehicles in 2007. In addition, during the daytime on weekdays, the number of vehicles tends to be doubled about 800,000 units considering trips made by commuters and students to and from Denpasar (Statistics of Bali Province, 2008).

During period 2004-2007, 845 road accidents and 1400 casualties were reported in the city of Denpasar in which 29.7%, 34.5% and 35.8% involving fatal, serious and slight injuries respectively. Of these road accidents, on average there were 70% motorcycle accidents (State Police of Bali Province, 2008). A motorcyclist in Denpasar, therefore, could be regarded as a vulnerable road user.

Meanwhile, in order to prevent motor vehicle accidents, in many countries it has been developed Benefit-Cost Analysis for Road Safety Improvement Programs (O'Reilly et.al, 1994; Rizzi, and Ortuzar, 2006). The programs were intended to quantify both cost and benefit of road safety improvement programs into monetary values. For instance, the benefit of the programs accounts for reductions in road accidents including fatal accidents, while the costs comprise road infrastructure improvement such as putting new road signs and road marking.

Because there were uncertainty on which individual could be identified and saved by the programs, the concepts of Value of Statistical Life (VOSL) were introduced. The concepts measure a monetary value of the individual risk on road accidents. The objectives were to reveal a monetary value which reflecting preference of the society with regard to the improvement programs. Furthermore, the VOSL values were represented with Willingness to Pay (WTP) in which measuring on how a person willing to pay such amount of money for changing his/her risk of road accidents (O'Reilly, et.al, 1994; Rizzi, and Ortuzar, 2006). WTP approach, however, has not been widely studied for road safety improvement in Indonesia (Widyastuti and Mulley, 2005; Widyastuti, et.al, 2007).

Because number of motorcycle slight injuries were higher than fatal or serious injuries in the city of Denpasar (State Police of Bali Province, 2008), this study aimed to analyse on motorcyclist's WTP for slight injuries reduction due to motor vehicle accidents. Motorcycle fatal and serious injuries are significant to be analysed, however, in order to explain methodology, these types of injuries should be considered separately. The study used primary data which collected by means of Revealed Preference/Stated Preference (RP/SP) surveys. These surveys were conducted by distributing questionnaires to households owning motorcycles in the city of Denpasar. The RP/SP data were modelled and analysed using logistic regression model.

LITERATURE REVIEW

Previous Studies

There are significant differences between motorcyclists in developing and developed countries. For example, pillion passengers are very uncommon in western countries. In addition, motorcycles in developing countries are more popular for commuting or utilitarian trips as opposed to recreational trips (Quddus, et.al, 2002). Consequently, values perceived by motorcyclists in both countries, particularly in terms of road safety aspect, are considerably different.

In relation to WTP approach, many studies have been carried out to estimate motorist's willingness to pay related accidents in developed countries. For example, a study carried out in Santiago, Chile conducting an external validity test based on the results of three different studies (Rizzi, and Ortuzar, 2006). This study found that people can internalise risk, expressed as fatal crashes, in a consistent way from an economic point of view. In addition, this study suggested the differences between their values and figures obtained in developed countries, highlighting the importance of conducting local studies rather than transferring imported values.

In contrast, only few studies have been found in Indonesia. In a study conducted in Surabaya (Widyastuti, and Mulley, 2005; Widyastuti, et.al, 2007), logistic regressions were used to analyse motorcyclist's WTP for 25% and 50% slight injury risk reduction respectively. This study employed age, total income and number of children as predictor variables. The study found that older motorcyclists had lower WTP than younger motorcyclists. However, motorcyclists who had higher income would have higher WTP than those of the lower incomes. In addition, the higher number of children the higher WTP for slight injury reduction.

Logistic Regression Model

Logistic regression is useful for predicting a binary dependent variable as a function of predictor variables. The goal of logistic regression is to identify the best fitting model that describes the relationship between a binary dependent variable and a set of independent or explanatory variables. The dependent variable is the population proportion or probability (P) that the resulting outcome is equal to 1. Parameters obtained for the independent variables can be used to estimate odds ratios for each of the independent variables in the model (Washington, et.al, 2003).

The specific form of the logistic regression model is:

$$\pi(x) = P = \frac{e^{\beta_o+\beta_1 x}}{1+e^{\beta_o+\beta_1 x}} \text{ ....} \quad (1)$$

The transformation of conditional mean $\pi(x)$ logistic function is known as the logit transformation. The logit is the *LN* (to base *e*) of the odds, or likelihood ratio that the dependent variable is 1, such that

$$\text{Logit (P)} = LN\left(\frac{P_i}{1-P_i}\right) = B_o + B_i.X_i \text{ ....} \quad (2)$$

where:

B_o	:	the model constant
B_i	:	the parameter estimates for the independent variables
X_i	:	set of independent variables (i = 1,2,.........,n)
P	:	probability ranges from 0 to 1
$\left(\frac{P_i}{1-P_i}\right)$	:	the natural logarithm ranges from negative infinity to positive infinity

The logistic regression model accounts for a curvilinear relationship between the binary choice Y and the predictor variables Xi, which can be continuous or discrete. The logistic regression curve is approximately linear in the middle range and logarithmic at extreme values. A simple transformation of equation (1) yields:

$$\left(\frac{P_i}{1-P_i}\right) = \exp^{B_o+B_i.X_i} = \exp^{B_o}.\exp^{B_i.X_i} \text{ ......} \quad (3)$$

The fundamental equation for the logistic regression shows that when the value of an independent variable increases by one unit, and all other variables are held constant, the new probability ratio $[P_i/(1-P_i)]$ is given as follows:

$$\left(\frac{P_i}{1-P_i}\right) = \exp^{B_o+B_i(X_i+1)} = \text{xp}^{B_o}.\exp^{B_i.X_i}.\exp^{B_i} \text{ ..} (4)$$

When independent variables X increases by one unit, with all other factors remaining constant, the odds $[P_i/(1-P_i)]$ increases by a factor $\exp^{B_i}$. This factor is called the odds ratio (OR) and ranges from 0 to positive infinity. It indicates the relative amount by which the odds of the outcome increases (OR>1) or decreases (OR<1) when the value of the corresponding independent variable increases by 1 unit.

In logistic regression, there is no true R^2 value as there is in Ordinary Least Squares (OLS) regression. However, because deviance is analogous to MSres (or MSE) in regression analysis, Pseudo R square can approximate an R-squared based on lack of fit indicated by the deviance (-2LL) as shown in Equations (4) and (5). In this study, there are two versions of Pseudo-R^2, one is Cox & Snell Pseudo-R2 and the other is Nagelkerke Pseudo-R^2.

Cox & Snell Pseudo-R^2 = 1 - $\left[\dfrac{-2LL_{null}}{-2LL_k}\right]^{2/n}$ .... (5)

Where the null model is the logistic model with just the constant and the *k* model contains all predictors in the model. According to Cox & Snell R^2 value cannot reach 1.0, Nagelkerke can be used to modify it.

Nagelkerke Pseudo-R^2 = $\dfrac{1-\left[\dfrac{-2LL_{null}}{-2LL_k}\right]^{2/n}}{1-(-2LL_{null})^{2/n}}$ .... (6)

Hosmer-Lemeshow Test is used to carry out to measure the goodness of fit. The null hypothesis for this test is that the model fits the data, and the alternative is that the model does not fit. The test statistic is constructed by first breaking the data set into roughly 10 (g) groups. The groups are formed by ordering the existing data by the level of their predicted probabilities. So the data are first ordered from least likely to have the event to most likely for the event. The equal sized groups are formed. From each group, the observed and expected number of events is computed for each group. The test statistic is,

$$\hat{C} = \sum_{k=1}^{g} \frac{(O_k - E_k)^2}{v_k} \quad \text{.......................... (7)}$$

Where:

$\hat{C}$	=	The Hosmer-Lemeshow test (H-L test)
O_k	=	Observed number of events in the k^{th} group
E_k	=	Expected number of events in the k^{th} group
v_k	=	Variance correction factor for the k^{th} group

If the observed number of events differs from what is expected by the model, the H-L test will be large and there will be evidence against the null hypothesis.

CASE STUDY AREA & DATA DESCRIPTION

Case Study Area

Province of Bali has an area of 5,634.40 km^2 and a population of about 3.4 million. The island is widely known as a tourist destination. Most of popular tourist destinations are also located in southern areas including Kuta, Sanur, and Nusa Dua. Therefore, these areas are the most densely populated than any other parts of Bali. The capital city Denpasar is also located in the southern Bali as shown in Figure 1. The city of Denpasar has an area of 127 km^2 with the population of 608,595 (Statistics of Bali Province, 2008).

Data Description

The proportion of motorcycle in the city Denpasar accounted for about 81% of total registered vehicles and motorcycle accidents were reported about 67% of motor vehicle accidents (State Police of Bali Province, 2008). Figure 2 shows motorcycle accident during period 2006-2008 in the city of Denpasar. It shows that the number of motorcycle accidents increased about 61% from 2006 to 2007 and decreased slightly about 7% from 2007 to 2008. This declining motorcycle accident perhaps because of the safety riding campaign in Bali which was commenced in 2007. The proportion of motorcycle fatal accidents for 2006, 2007 and 2008 were 38%, 29% and 32% respectively. Thus, the average motorcycle fatal accident were 33% during period 2006-2008.

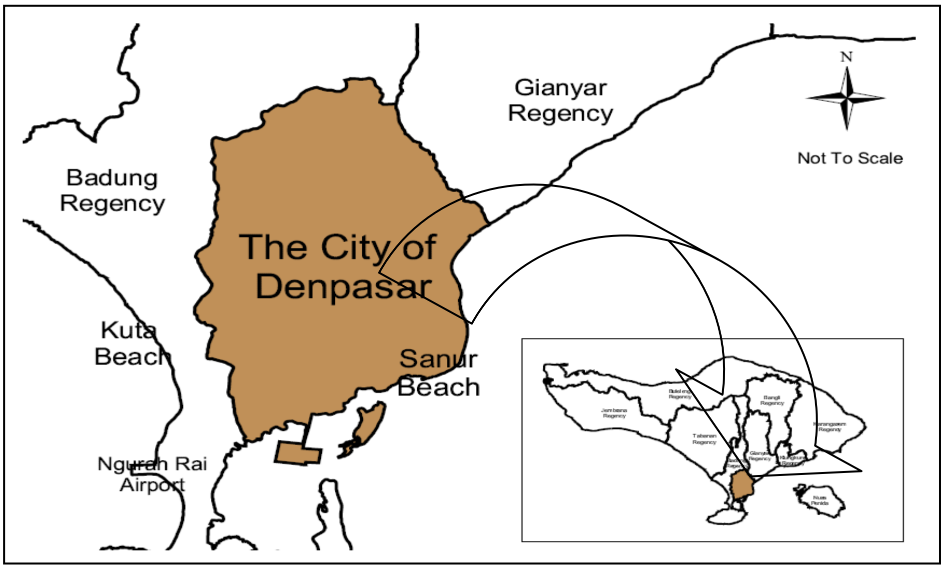

Figure 1. Case Study Area – The City of Denpasar

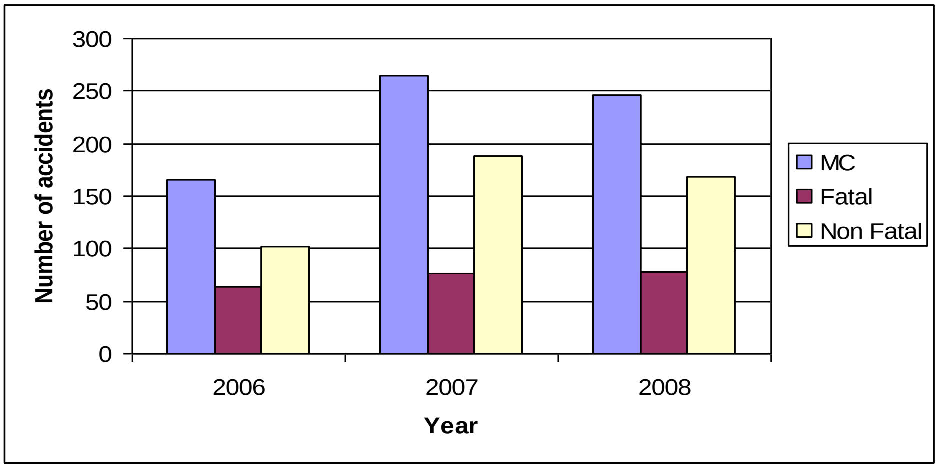

Figure 2. Road Accidents Based on Modes of Transport

MODEL DEVELOPMENT

Predictors in this study represented the characteristics of local household in the city of Denpasar including motorcycle ownership, the structure of household (ages, number of children, number of dependents, employment), total household income per month, total travel distance by all household's members and fuel cost for number of motorcycle(s) owned by the household. Choices for motorcyclist to reduce the probability involving in slight injuries due to motor vehicle accidents were represented with two WTP scenarios. These scenarios comprise motorcyclists paying the amount of Rp 900,000 p.a and Rp 650,000 p.a for 25% and 15% slight injuries reductions respectively. The former WTP is based on the assumption that a motorcyclist's WTP such amount of money (price in 2008) for motorcycle maintenance costs using genuine spare parts, while the latter is for the imitation ones. These maintenance costs include replacement on engine oil, a spark-plug, brake disks, clutch, tires, turn indicators, and a battery.

In this study, accident factors including human, vehicles, roads and environment were considered evenly to influence accidents occurrences. For instance, a vehicle was a factor contributed 25% to accidents occurrence. Consequently, a regular maintenance using a genuine spare parts would result a proper motorcycle condition. This is assumed relevant for 25% motorcyclist's slight injury reduction. Meanwhile, based on interviews conducted on some mechanics, the imitation spare parts considered to worth as half as the genuine ones. Once motorcyclists prefer to use the imitation spare parts, that would be considered relevant for 15% motorcyclist's slight injury reduction.

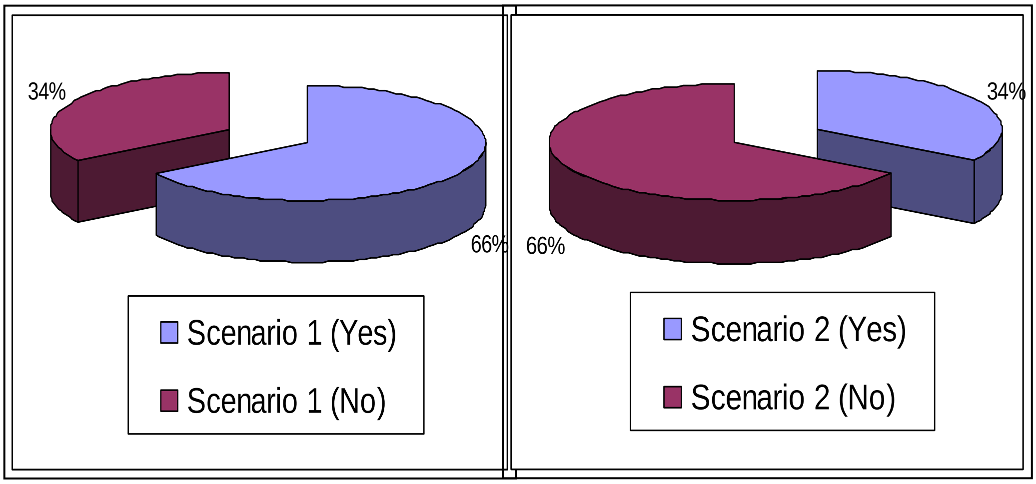

Figure 3. Motorcyclists's Willingness to Pay

For model development, response variables were scenarios 1 and 2 representing motorcyclist's WTP for 25% and 15% slight injury reductions respectively as shown in Figure 3. These scenarios were binominal in nature. The figure shows that 66% respondent have chosen scenario 1 (yes) or scenario 2 (no) and 34% for scenario 1 (no) or scenario 2 (yes). In other words, 66% of the respondents are willing to pay such amount of money for 25% slight injury reduction. The independent variables were continuous (age, number of workers and travel distances) and categorical for the rest. In order to represent categorical variables, dummy variables are created following the coding system in SPSS, software used in this study. Study variables and their coding are shown in Table 1.

Table 1. Variables Selected for the Study

No.	**Dependent Variables**	**Title, Code and Categories**
1.	Scenario 1	Skn1 = 0 if not to choose scenario 1, Skn1 = 1 if choose scenario 1
2.	Scenario 2	Skn2 = 0 if not to choose scenario 2, Skn2 = 1 if choose scenario 2
No.	**Independent Variables**	
1.	Age composition within the household (persons)	U<16 = number of household's member under 16 years old U16-24 = number of household's member between 16-24 years old U25-34 = number of household's member between 25-34 years old U35-44 = number of household's member between 35-44 years old U45-54 = number of household's member between 45-54 years old U55-64 = number of household's member between 55-64 years

		old
		U>65 = number of household's member above 65 years old
2.	Number of workers (persons)	JPkr (persons)
3.	Travel distance m (km)	JPER (km)
4.	Numbers of Child within the household (persons)	JANK = 0 if none JANK = 1 if has 1 child JANK = 2 if has 2 children JANK = 3 if has 3 children JANK = 4 if has 4 children JANK = 5 if has > 4 children
5.	Total Income of the household per month (Rupiahs/Rp)	Pend = 0 if < Rp.1 million Pend = 1 if between Rp. 1 – Rp. 2 million. Pend = 2 if between Rp. 2 – Rp. 3 million. Pend = 3 if between Rp. 3 – Rp. 4 million. Pend = 4 if between Rp. 4 – Rp. 5 million. Pend = 5 if > Rp. 5 million
6.	Number of Dependents (persons)	JTANG = 0 if none JTANG = 1 if 1 person JTANG = 2 if 2 persons JTANG = 3 if 3 persons JTANG = 4 if 4 persons JTANG = 5 if > 4 persons
7.	Motorcycle ownership (units)	JSPM = 0 if household owns 1 motorcycle JSPM = 1 if household owns 2 motorcycles JSPM = 2 if household owns 3 motorcycles JSPM = 3 if household owns > 3 motorcycles
8.	Excpenditure for fuel per month (Rupiahs/Rp)	BTRANS = 0 if < Rp. 100 thousands BTRANS = 1 if between Rp. 100 – Rp. 200 thousands BTRANS = 2 if between Rp. 200 – Rp. 300 thousands BTRANS = 3 if between Rp. 300 – Rp. 400 thousands BTRANS = 4 if between Rp. 400 – Rp. 500 thousands BTRANS = 5 if > Rp. 500 thousands

For continuous independent variables, multicollinearity test were undertaken to ensure that these variables significantly independent to each other. As shown in Table 2, none of values higher than 0.8, hence multicollinearity was not a problem.

Table 2. Test of Multicollinearity

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.00								
X_2	-0.14	1.00							
X_3	-0.04	-0.55	1.00						
X_4	-0.10	0.40	-0.61	1.00					
X_5	-0.43	-0.30	0.13	-0.38	1.00				
X_6	-0.16	-0.19	0.16	-0.05	-0.06	1.00			
X_7	-0.04	-0.06	0.07	-0.08	0.02	-0.02	1.00		
X_8	-0.21	-0.21	0.43	-0.10	0.40	0.15	0.07	1.00	
X_9	-0.34	0.00	0.04	0.22	0.23	0.01	-0.01	0.29	1.00

Where

X_1	:	Group of under 16 years old in the household
X_2	:	Group of 16 – 24 years old in the household
X_3	:	Group of 25 – 34 years old in the household
X_4	:	Group of 35 – 44 years old in the household
X_5	:	Group of 45 – 54 years old in the household
X_6	:	Group of 55 – 64 years old in the household
X_7	:	Group of above 65 years old in the household
X_8	:	Total number of workers in the household
X_9	:	Total travel distance per day by all motorcyclists in the household

According to data related statistics shown in Table 3, some variable categories (classifications) can be neglected because of their small proportion. The hypothesis testing technique for proportions was used in this study to decide whether a classification could be reduced. The following typical test was used:

H_0: $p_i = 0$ and

H_a: $p_i \neq 0$,

where, p_i is the proportion of a variable classification.

Table 3. Hypothesis Testing: Data Statistics

Description	X	N	P- Value	95% Confidence Interval Lower	Upper
Number of children					
None*	3	250	0.012	0.0	0.0
1 child	46	250	0.180	0.1	0.2
2 children	134	250	0.536	0.5	0.6
3 children	60	250	0.240	0.2	0.3
4 children*	7	250	0.028	0.0	0.0
> 4 children*	1	250	0.004	0.0	0.0
Total household income					
< Rp. 1 million*	0	250	0.0	0.0	0.0
Rp. 1 – Rp. 2 million	101	250	0.404	0.3	0.5
Rp. 2 – Rp.3 million	142	250	0.568	0.5	0.6
Rp. 3 – Rp.4 million	7	250	0.028	0.0	0.0
Rp. 4 – Rp. 5 million*	0	250	0.0	0.0	0.0
> Rp. 5 million*	0	250	0.0	0.0	0.0
Number of dependents					
None*	0	250	0.0	0.0	0.0
1 person*	4	250	0.016	0.0	0.0
2 persons	47	250	0.188	0.1	0.2
3 persons	134	250	0.536	0.5	0.6
4 persons	58	250	0.232	0.2	0.3
> 4 persons*	7	250	0.028	0.0	0.0
Motorcycle ownership					
1 motorcycle	32	250	0.128	0.1	0.2
2 motorcycles	95	250	0.380	0.3	0.4
3 motorcycles	101	250	0.404	0.3	0.5
> 3 motorcycles	22	250	0.088	0.1	0.1
Fuel costs per month					
< Rp. 100 thousands*	0	250	0.0	0.0	0.0
Rp. 100– Rp. 200 thousands	25	250	0.100	0.1	0.1
Rp. 200– Rp. 300 thousands	81	250	0.324	0.3	0.4
Rp. 300– Rp. 400 thousands	120	250	0.480	0.4	0.5
Rp. 400– Rp. 500 thousands	22	250	0.088	0.1	0.1
> Rp. 500 thousands*	2	250	0.008	0.0	0.0

* Statistically insignificant at the 5% level; the 95% confidence limits include 0.

where: X = number of classification (yes=1), N = sample size

Based on the test, there were two categories of number of children excluded from the model development stage including '4 and more than 4 children'. This exclusion is carried out with merging and putting these categories as reference for the rest of classification within each variable. For instance, within number of children factor, '4 and more than 4 children' were merged with '3 children' and generated a new category '≥ 3 children'. In addition to total household income factor, '< Rp 1 million' was merged with 'Rp 1-2 million and generated '< Rp. 2 million'. Categories 'Rp4-5 million and '> Rp 5 million' were merged with 'Rp3-4 million' and generated a new category '≥ Rp.3 million'. For number of dependent factor, categories 'none' and '1 person' were merged with '2 persons' and generated a new category '< 2 persons'. Category '> 4 persons' was merged with '4 person' and generated a new category '≥ 4 persons'. For fuel costs factor, category '< Rp 100 thousands' was merged with 'Rp100-200 thousands' and generated a new category ' < Rp 200 thousands'. Category '> Rp500 thousands' was merged with 'Rp400-500 thousands' and generated a new category '≥ Rp 400 thousands'.

The entry method of logistic regression was followed using SPSS version 15. The Omnibus Tests of motorcycle fatal accidents model coefficients is analysed in order to assess whether data fit the model as shown in Table 4. The specified model is significant (Sig. < 0.05) so it is concluded that the independent variables improve on the predictive power of the null model.

Table 5 contains the two pseudo R^2 measures that are Cox and Snell and Nagelkerke. The former measure frequently does have a maximum less than one. It is therefore usually better to assess Nagelkerke's measure as this divides Cox and Snell by the maximum to give a measure that really does range between zero and one. In this example, both scenarios explain 16% of the variance in the dependent variable. In addition, Hosmer-Lemeshow (H-L) test shows the significance of the developed logistic regression models (Sig. > 0.05).

Table 6 gives the overall percent of cases that are correctly predicted by the full model. The percentages have increased from 66.0 to 67.6 for both models.

Table 4. Omnibus Tests of Model Coefficients

	Motorcycle fatal accidents	
	Chi-square	**Sig.**
Model	31.326	.000

Table 5. Goodness of Fit (Pseudo R^2 and H-L Test)

	Pseudo R^2 Test		
	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
Scenarios 1 and 2	289.192	0.118	0.163
	Hosmer and Lemeshow Test (H-L Test)		
	Chi-square	df	Sig. (p-value)
Scenarios 1 and 2	10.011	8	.264

Table 6. Classification Accuracy

		Predicted		% Correct
	Observed	**Not to choose scenario 1**	**Choose scenario 1**	
SKN1	Not to choose scenario 1	0	85	.0
	Choose scenario 1	0	165	100.0
			Overall Percentage	66.0
	Observed	**Not to choose scenario 2**	**Choose scenario 2**	
SKN2	Not to choose scenario 2	165	0	100.0
	Choose scenario 2	85	0	.0
			Overall Percentage	66.0
Full Model		**Not to choose scenario 1**	**Choose scenario 1**	
SKN1	Not to choose scenario 1	25	60	29.4
	Choose scenario 1	21	144	87.3
			Overall Percentage	67.6

Full Model		Not to choose scenario 2	Choose scenario 2	
SKN2	Not to choose scenario 2	144	21	87.3
	Choose scenario 2	60	25	29.4
			Overall Percentage	67.6

RESULTS AND DISCUSSIONS

Table 7 indicates that multicollinearity was not detected since all standard errors (S.E) values were less than 2.0 for both scenarios (Washington, et.al, 2003). The model results shows that at 95% confidence level, total travel distance per day by all motorcyclists in the household, motorcyclists aged between 25 and 34 years old and between 35 and 44 years old in the household were negatively related to motorcyclist's WTP for 25% reduction in slight injuries while group of motorcyclists aged between 55 and 64 years in the household were positively related to WTP for 25% reduction in slight injuries. These were opposite to motorcyclist's WTP for 15% reduction in slight injuries.

The scenario 1 results indicated that total travel distance per day by all motorcyclists in the household influenced about 50% on motorcyclist's WTP for 25% reduction in slight injuries. The equation used to arrive such values is $\frac{p}{1-p} = \exp.^{(JPer)} = 0{,}983$, which resulting p = 0.496. In addition, groups of motorcyclists aged between 25 and 34 years old, between 35 and 44 and between 55 and 64 years old in the household influenced about 36%, 35% and 86% respectively on WTP for 25% reduction in slight injuries.

Table 7. Estimation Results

Variabel	β	S.E.	Sig.	Exp(β)
Scenario 1				
JPer	-.017	.005	.001	.983
U25-34	-.581	.216	.007	.559
U35-44	-.605	.249	.015	.546
U55-64	1.787	.820	.029	5.971
Constant	2.554	.494	.000	12.855

Variabel	β	S.E.	Sig.	Exp(β)
Scenario 2				
JPer	.017	.005	.001	1.017
U25-34	.581	.216	.007	1.788
U35-44	.605	.249	.015	1.831
U55-64	-1.787	.820	.029	.167
Constant	-2.554	.494	.000	.078

Where:
S.E = standard error
Sig = p- value = significance level

Jper	=	Total travel distance per day by all motorcyclists in the household
U25-34	=	Group of 25 – 34 years old in the household
U35-44	=	Group of 35 – 44 years old in the household
U55-64	=	Group of 55 – 64 years old in the household

The scenario 2 results indicated that total travel distance per day by all motorcyclists in the household, groups of motorcyclists aged between 25 and 34 years old, between 35 and 44 and between 55 and 64 years old in the household influenced about 50%, 64%, 65% and 14% respectively on WTP for 15% reduction in slight injuries.

Meanwhile, total travel distance per day by all motorcyclists in the household shared equal probabilities in influencing motoryclist's WTP for both 15% and 25% slight injury reductions. In addition, groups of motorcyclist aged between 55 and 64 years old preferred 25% to 15% slight injury reduction compared with younger motorcyclists i.e. between 25 and 34 years old and between 35 and 44 years old. The high value of constant (± 2.55) indicated that there were some other significant factors that may influence motorcyclist's WTP for slight injuries reduction.

Based on the two scenarios results, age and total travel distance per day by all motorcyclists in the household significantly influenced on motorcyclist's WTP for slight injuries reduction. This is consistent with previous study conducted in the city of Surabaya, East Java, Indonesia (Widyastuti, et.al, 2007) which found that ages were significant factor of WTP for motorcycle slight accident reduction. Furthermore, introducing an educational campaign or an awareness programs about the risk of motorcycle accident is necessary, in particular for younger persons. In order to carry out such programs, coordination among educational institution, the police and department for transport would be an advantage to prevent motorcycle accidents.

CONCLUSIONS

This study employes a logistic regression model to analyse motorcyclist's WTP for slight injury reduction due to motor vehicle accidents in the city of Denpasar, Bali Province. Based on the RP/SP surveys data, eight predictor variables were employed in the logistic regression models. The model results found that four significant factors influenced on motorcyclist's WTP for both 25% and 15% slight injury reduction. The analyses show that total travel distance per day by all motorcyclists in the household, groups of ages between 25 and 34 years old, between 35 and 44 and between 55 and 64 years old in the household influenced about 50%, 36%, 35% and 86% respectively on motorcyclist's WTP for 25% slight injuries reduction and about 50%, 64%, 65% and 14% respectively on motorcyclist's WTP for 15% slight injuries reduction.

Total travel distance per day by all motorcyclists in the household shared equal probabilities in influencing motorcyclist's WTP for both 25% and 15% slight injury reductions. In addition, groups of motorcyclist aged between 55 and 64 years old preferred 25% to 15% slight injury reduction compared with younger motorcyclists i.e. between 25 and 34 years old and between 35 and 44 years old. The study also found that there were some other significant factors that may influence motorcyclist's WTP for slight injuries reduction other than these four significant factors. The result would be expected to develop strategies to prevent and reduce motorcycle accidents in Bali.

REFERENCES

O'Reilly, D., Hopkin, J., Loomes, G., Jones-Lee, M., Philips, P., McMahon, K., Ives, D., Soby, B., Ball, D., and Kemp, R. 1994. The Value of Road Safety UK Research on the Valuation of Preventing Non-Fatal Injuries". *Journal of Transport Economics and Policy*, pp. 45 – 59.

Quddus, M.A., Noland, R.B., and Chin, H.C. 2002. An Analysis of Motorcycle Injury and Vehicle Damage Severity Using Ordered Probit Models. *Journal of Safety Research*, Vol. 33**,** p, 445-462.

Rizzi, L.I., and Ortuzar, J.D. 2006. Road Safety Valuation Under A Stated

Choice Framework. *Journal of Transport Economics and Policy*, Volume 40, Part 1, pp. 69–94.

State Police of Bali Province, 2008. Accident Data Report.

Statistics of Bali Province, 2008. Bali in Figures.

Washington, S.P., Karlaftis, M.G., and Mannering, F.l., 2003. *Statistical and Econometric Methods for Transportation Data Analysis*, Chapman & Hall, USA.

Widyastuti, H. and Mulley, C. 2005. Evaluation of Casualty Cost of Motorcyclist's Slight Injury in Indonesia. *Journal of the Eastern Asia Society for Transportation Studies*, Vol.6

Widyastuti, H., Mulley, C., and Dissanayake, D. 2007. Binary Choices Model To Value Motorcyclist's Slight Injury Cost in Surabaya. *Proceedings of the Eastern Asia Society for Transportation Studies*, Vol.6.