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By Phyu Phyu Thwe & Kunnawee Kanitpong

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Keywords: *road crashes, poverty, yangon, myanmar.*

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Impact of Road Crashes on Poverty in Myanmar: A Case Study in Yangon

Phyu Phyu Thwe [α] & Kunnawee Kanitpong[σ]

Abstract- This paper reveals the impacts of road crashes on poor people in Yangon, Myanmar. The study aims to investigate whether poor people are more likely to be involved in road crashes and to identify whether the consequences of road crashes have higher impacts on poor households than on non-poor households. The study was based on a questionnaire survey conducted in Yangon. To identify involvement in road crashes and impacts on the households of poor and non-poor people, hypothesis tests were applied. A linear regression model and logit model were applied to evaluate contributing factors to a declining situation of household income after road crash involvement. The results show that lower social economic groups are more involved in road crashes in Yangon than are higher social economic groups. The costs and impacts of road crashes are higher burdens for poor people. The findings can assist policy makers in determining appropriate policies to mitigate the impacts and improve poverty alleviation actions. Other than that, transportation planning, such as the improvement of public transport and basic road infrastructure, could reduce the road crash problem for poor people who are the main group of road users in Yangon.

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I. Introduction

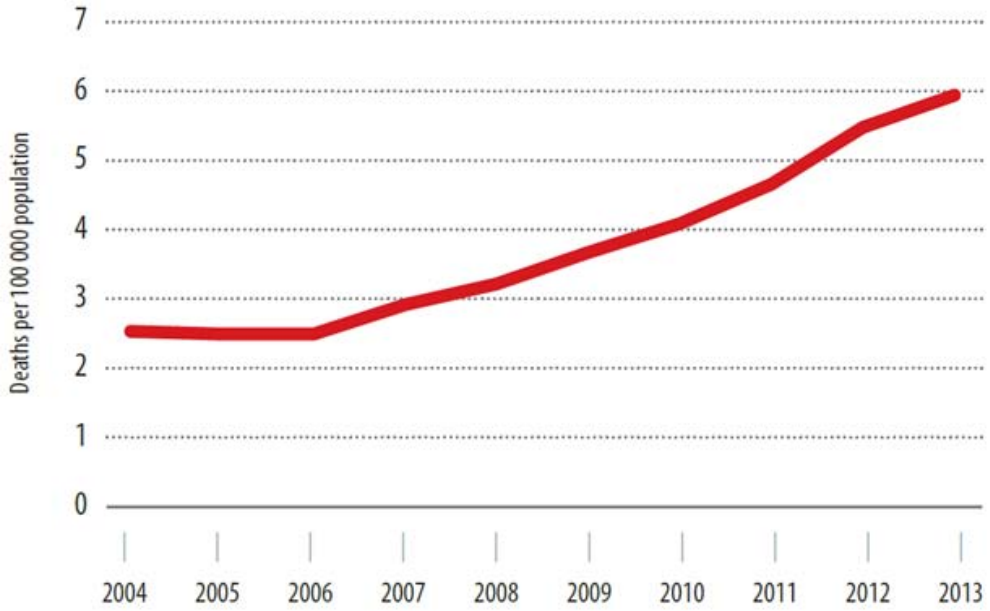
According to WHO's recent Global Status Report on Road Safety (WHO, 2015), over 1.2 million people die each year in road crashes and 20–50 million people suffer non-fatal injuries. Findings from the Global Status Report state that more than 90% of world fatalities on the roads occur in low-income or middle-income countries where the number of registered vehicles is low. Over one-third of road traffic deaths in low-income and middle-income countries are vulnerable road users, such as pedestrians, cyclists and users of motorized two-wheelers or three-wheelers, and the proportion of vulnerable road users is higher in poor countries.

In addition to suffering from crashes, road crashes can cause poverty to families that have had members killed or seriously injured. The long-term consequences of crashes include funeral expenses, the cost of medical treatment and rehabilitation, and the loss of family breadwinners or family members whose earnings are the primary income sources of families. Therefore, the impact of a road crash is more likely to be serious if the victim is a breadwinner or a member from a poor family. In recent research studies, little work has been done to understand the socio-economic status of road crash victims and the impact of road crashes on poverty, especially in low-income countries. A similar study to the present one was conducted in Bangladesh and India by Thomas et al. (2004). The findings clearly illustrate a great impact of road crashes on the poor. Road crashes can even cause poverty to non-poor families involved in crashes. This problem has been a major concern in terms of economic development in many low-income countries as road crashes are found to be serious obstacles for poverty reduction.

Myanmar is one of the countries, which is classified by the World Bank as a low-income country. The number of fatalities due to road crashes was 3,612 in 2013, and the death rate has shown an increasing trend in recent years (Figure 1). Road crashes cause great losses in the economic development of the country; the estimated annual economic loss is 3% of GDP (ADB, 2004). About 58% of road crash victims in Myanmar are vulnerable road users as presented in Figure 2. It is more likely for these victims to be poor people who cannot afford to travel using safer modes, and a road crash can push a family to poverty due to the loss of income from the family breadwinner. Moreover, poverty represents a major barrier to the implementation of road safety in the country. An impact study of road crashes on poverty in Myanmar is, therefore, needed to better understand the socio-economic status of road crash victims and the impact of road crashes on victims and their families. This study can assist policy makers in determining appropriate policies to mitigate the impacts and improve poverty alleviation actions.

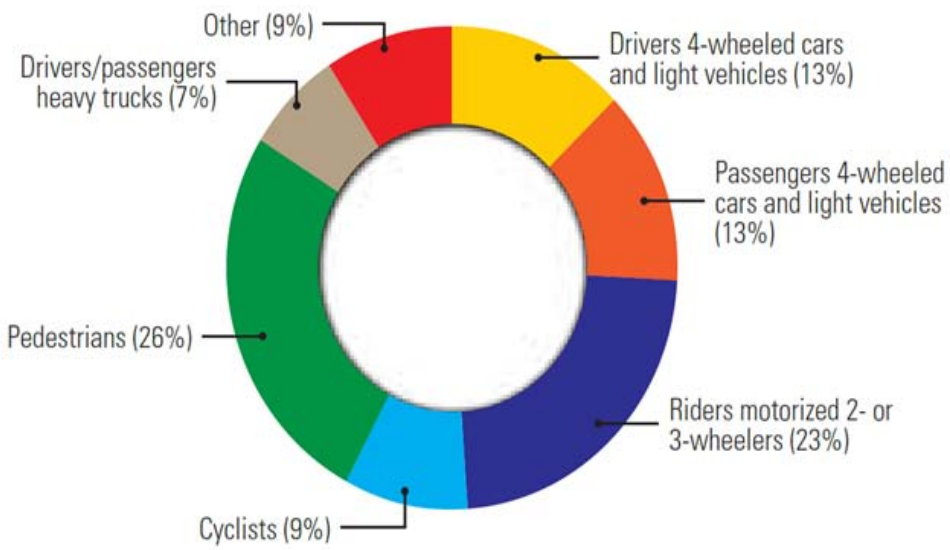
Author α: Graduate Student Transportation Engineering Program Asian Institute of Technology Thailand. e-mail: phyuthwe13@googlemail.com
Author σ: Associate Professor Transportation Engineering Program Asian Institute of Technology Thailand. e-mail: kanitpon@ait.ac.th

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source: who global status report on road safety (who, 2015)

Figure 1: Road Accident Situation In Myanmar



(Source: WHO Global Status Report on Road Safety (WHO, 2015)

Figure 2: Number of deaths classified by road user type

II. Objectives

The objective of this paper is to investigate whether poor people in the city of Yangon, Myanmar are more likely to be involved in road crashes and to identify whether social consequences of road crashes (e.g., household income and quality of life) are more severe for poor families than for non-poor families. The paper is intended to understand the current situation of road crashes in Myanmar and the differences between the impact of road crashes on poor and non-poor families. A questionnaire survey of the economic status of households involved in road crashes was carried out in Yangon. A statistical technique has been applied to the survey data in an attempt to establish a link between the socio-economic characteristics of road crash victims and the consequences of road crashes on socio-economic status and quality of life.

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The next section will summarize the findings from recent research studies related to road crashes and poverty. Then, the overall research methodology will be described. Finally, the results and analysis will be discussed.

III. Research on Road Crashes and Poverty

Little work has been done to study the socio-economic status of road crash victims in low-income countries. However, in developed countries, much evidence shows that lower social economic groups are at higher risk due to road crash deaths or serious injuries. There is an increasing fatality rate in lower social economic groups among children, youth, and early adults in Sweden (Elmen and Sundh, 1994). Another study shows that, in the Netherlands, higher social economic groups are associated with lower fatality levels (Van Beeck et al., 1991). Laflamme and Diderichsen (2000) and Laflamme and Engstrom (2002) also state that most traffic injuries are borne by children from disadvantaged communities and poorer social economic areas. Doughterty et al. (1990) found that, in urban Canada, the injury rate of children aged 0–14 years living in the poorest neighbourhoods was four times that of children living in the least poor neighbourhoods. Ghee et al. (1997) studied the socio-economic aspects of road crashes in Bangladesh, Fiji, Ghana, Indonesia, Peru, and Zimbabwe, and they indicated that road crashes have substantial economic and social impacts in developing countries.

Many previous studies have illustrated the strong relationship between road crashes and poverty. As most victims involved in road crashes are poor people, road crashes can also cause poverty to victims. Many road crash victims at higher risk are the sole earners of families, and their deaths often radically diminish family incomes. Similarly, serious injuries can also have long-term negative impacts on family incomes and severe consequences on household quality of life, especially for low-income families. The death of breadwinners, the cost of health treatment, and the loss of jobs and/or incomes resulting from road crashes have unpleasant economic and social consequences on households (ADB, 2005). Evidence shows that the costs incurred from road crashes push families into poverty (Nantulya and Reich, 2003). Thomas et al. (2004) have assessed the impacts of road crashes on poor households in Bangladesh and India and found that household income and food consumption were reduced for road crash victims' families. It is also estimated that, in Bangladesh and India, many families who were not poor previously became poor after death or serious injury resulting from crashes. It is stated that road crashes have been obstacles to poverty reduction in many low-income countries (Thomas et al., 2004). Road crash injuries can cause family poverty, resulting in debt, cutting back on nutrition, taking children out of school, and sacrificing future prospects.

IV. Research Methodology

Data collection in this study was conducted through a questionnaire survey in Yangon, Myanmar. Yangon was selected as the study area because it is a major economic city of Myanmar and the previous capital city. In this study, poor and non-poor households were classified by the national poverty line, which is defined in terms of per capita monthly income of a road crash victim's family. A country-wide survey of 18,660 households in Myanmar was conducted in 2009–2010 by the Ministry of National Planning and Economic Development and the UN Development Program (UNDP) in coordination with UNICEF and the Swedish International Development Cooperation Agency, and, afterwards, the government of Myanmar defined the poverty line as 754 kyats (or 0.9 USD) per day or an average monthly income of 22,600 kyats (26 USD) or less for one adult person (1 USD = 873 MMK). Fatality is classified with the definition of death within a 30-day period, and serious injury is defined as disability for 30 days or more.

This study is divided into two parts. The first part studies the involvement of 'poor' people in road crashes. The second part assesses the impact of road crashes on poor and non-poor families in terms of social consequences, household income and quality of life after the crashes. Factors affecting the consequences of road crashes are also determined. Data collection of each part is presented separately in the following sections.

Part 1: Involvement of Poor People in Road Crashes

Data collection for the first part is from respondents whose household members were involved in road crashes, resulting in either death or serious injury within the past three years (from 2008 to 2010). The list of casualties in the area of Yangon was identified by traffic police and hospital records, and, then, data were obtained by interviews by phone or a direct household survey. From the casualties list, a survey of 510 people, who were either seriously injured victims or the relatives of fatal victims, was done by randomly selecting from among households involved in road crashes. It should be noted that a large number of households were surveyed but few casualties were found. Level of crash severity, gender, age, education, occupation, road user type, and household income per capita were asked to identify which groups of people are at higher risk to be involved in road crashes. In this part of the study, the proportion of poor and non-poor was determined to compare between different characteristics of casualties involved in accidents.

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Part 2: Impact of Road Crashes on Poor and Non-Poor Households

This part of the study uses the questionnaire survey to identify differences in the impacts of road crashes on poor and non-poor households and to assess the economic status of households before and after involvement in road crashes.

a) Data Collection

Data collection focused only on death and serious injuries within the past one year after accident occurred so that road crash victims or their family members could remember their social economic status before crashes and the consequences after crashes. The lists of road crash victims were obtained from traffic police records for the past one year. The data were then collected from the household survey of road crash victims in eight districts of Yangon, Shwe Pyi Thar, North Okkalapa, South Okkalapa, Mingalardon, Hlaing Thar Yar, Thingyungun, Insein, and Thekata. The selected districts included both poor and non-poor households. A total of 76 poor households and 74 non-poor households were equally selected by using post-crash household income per capita to classify between poor and non-poor.

b) Questionnaire Design

The questionnaire survey was designed to include information, which could be grouped into five sections as follows:

Section 1: Respondent information such as name, relationship to victims, household district, gender, number of people in the household.

Section 2: Victim information such as type of crash severity, victim's gender, victim's age and marital status, education, and occupation, road user type, and household responsibility.

Section 3: Loss of cost such as medical treatment cost, funeral cost, transportation cost for medical treatment, and vehicle damage cost.

Section 4: Consequences of road crashes to households. The following questions were asked to the respondents:

- How long is the disability period of the victim?
- Does the family need to borrow money?
- Does the family need to pawn assets?
- What is the time period for the injury treatment?
- Is there at least one family member who has taken leave from a job to take care of the victim?
- Is there a loss of income for the person who has taken leave from the job to take care of the victim?
- After the crash, have the children in the family permanently taken leave from school?
- Has the victim lost a job that he/she had before the crash?
- Has the victim received any compensation from the road crash?

Section 5: Household assets. The respondents were expected to answer the following questions regarding three periods: before the crash, post-crash within the recovery period, and post-crash after the recovery period. These questions were to compare the economic conditions and quality of life before and after the crash and within and after recovery periods.

- Household income
- Food consumption
- Number of household assets (e.g. car, motorcycle, bicycle, refrigerator, washing machine, TV)
- Housing condition (e.g. brick and concrete, wooden, thatch roof and bamboo)

It is expected that victims may have more financial difficulties within the recovery period rather than after recovery period.

V. Results and Analysis

Part 1: Involvement of Poor People in Road Crashes

Table 1 summarizes the results of study in the first part to determine the involvement of poor people in road crashes. As the poverty line was used to classify poor and non-poor casualties, it was observed that, among the 510 people surveyed, 66% of them were poor casualties and 34% of them were non-poor casualties. From the results, poor people appear to have been more involvement in road crashes than non-poor people. However, it should be noted that the findings do not consider the amount of trips made in terms of the number of trips and trip lengths. Therefore, the comparison made between poor and non-poor does not represent exposure to risk in terms of poor and non-poor people.

For crash severity, 25% of poor people were involved in fatalities, while 14% of non-poor people were involved in fatalities. In fatal cases, the deaths were higher for the poor than the non-poor, while, in serious injury cases, the inverse proportion was observed between poor and non-poor. The reason for a higher proportion of deaths among the poor may be due to the costs of full medical treatment, which is not affordable for poor people.

In the comparison between males and females, the proportion of males involved in road crashes was higher than that for females for both poor and non-poor people. The age groups of 21–30 and 31–40 were the highest risk groups involved in road crashes with proportions of 27% and 20% among the poor and 22% and 22% among the non-poor respectively. A similar trend for age was observed in poor and non-poor groups. As age increases, the number of casualties decreases. Therefore, the highest risk group for road crashes is the group of people in early and middle age.

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Such individuals are working as main income earners for their families.

According to Table 1, 73% of the poor casualties were educated at a lower level than high school, while this figure was 17% for non-poor casualties. This finding implies that most of the poor involved in the road crashes were less educated people. Occupation also shows that 63% of the poor casaulties were labourers, sellers, and drivers and that 21% were unemployed. For the non-poor, the causalities were distributed in many occupations, such as government servants (21%), the unemployed (21%), the self-employed (14%), students (11%), government officers (10%), and others. The findings support previous studies in other countries, which found that most casualties are people who are of a lower social economic class.

Pedestrians are the highest risk group involved in road crashes for both the poor and non-poor. 60% of the poor and 50% of the non-poor casualties were pedestrians. The second highest group of casualties is public car users for the poor. For the non-poor it is bicycle users followed by passenger car users and public car users. This shows that both poor and non-poor vulnerable road users are at higher risk in terms of road crashes in Yangon.

In this part of the study, the poor people seem to have more involvement in the road crashes than the non-poor people. Poor people have greater chance of dead in the road crashes than non-poor people which could be due to the fact that poor people cannot afford to pay for the full medical treatment or poor people are more often vulnerable road users (pedestrians or in bicycles). In Yangon, most people involved in the road crashes are those in the age between 21-40 years old which is early and middle age of the working group in the country. Most of the poor involved in the road crashes are lower educated people, and work as labors, sellers, and drivers, while non-poor people involved in the road crashes are higher educated, and work in higher class of occupations. Pedestrian is in the highest risk group involved in the road crashes for both poor and non-poor.

Table 1: Survey results to determine the involvement of poor people in road crashes

	Poor		Non-Poor	
	Number	Percent	Number	Percent
Involvement in road crashes	335	66	175	34
Crash Severities				
Fatality	84	25	24	14
Serious Injury	251	75	151	86
Total	335	100	175	100
Gender				
Male	245	73	112	64
Female	90	27	63	36
Total	335	100	175	100
Age				
0-10	15	4	7	4
11-20	43	13	24	14
21-30	91	27	38	22
31-40	67	20	38	22
41-50	52	16	28	16
51-60	39	12	23	13
61-70	21	6	12	7
71-80	7	2	4	2
Over 80	0	0	1	1
Total	335	100	175	100
Education				
Higher than Bachelor	0	0	3	2
Bachelor	3	1	66	38
College level	12	4	35	20
High school	78	23	42	24
Secondary school	129	39	21	12
Primary school	91	27	5	3
No education	22	7	3	2
Total	335	100	175	100
Occupation				
Farmer	10	3	1	1

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Government officer	0	0	18	10
House keeper	7	2	9	5
State enterprise employee	7	2	15	9
Self-employed	4	1	25	14
Student	12	4	19	11
Unemployed	72	21	36	21
Others (government servant)	13	4	37	21
Others (labor, seller, driver, etc.)	210	63	15	9
Total	335	100	175	100
Road User Type				
Pedestrian	200	60	88	50
Bicycle	43	13	25	14
Motorcycle	4	1	13	7
Three wheelers	17	5	2	1
Passenger car	5	1	22	13
Public car	55	16	22	13
Truck	11	3	3	2
Total	335	100	175	100

Part 2: Impact of Road Crashes on Poor and Non-Poor Households

The impact of a road crash can affect a household economically, socially, and emotionally, even if only one person in the family is involved in the crash. Particularly if the road victims are sole earners or family leaders, their deaths can possibly reduce household incomes and increase other expenses, such as funeral costs and/or medical treatment costs. On the other hand, serious injuries also have long-term negative impacts on household incomes, food consumption, number of household assets, and housing conditions. Moreover, serious consequences of road crashes can cause debt to households due to borrowing money or pawning assets to cover expenses from crashes.

The Impact of Road Crashes: A Comparison between the Poor and Non-Poor

Table 2 shows the comparison of the loss of cost and the consequences of road crashes between poor and non-poor households. A hypothesis test was conducted to test the difference of sample means. The results of the t-test reveal that, in the fatal cases, funeral costs and vehicle damage costs were significantly different between poor and non-poor households at the 10% level. The non-poor households spent more on funeral costs and vehicle damage costs than did the poor households. Medical treatment costs and transportation costs for the medical treatment were not significantly different between poor and non-poor households. It is observed that these costs incurred were considerably higher than their average family incomes resulting to the fact that the road crashes become a serious burden for lower income households.

For the serious injury cases, medical treatment costs and transportation costs were significantly different between poor and non-poor households at the 5% level. The non-poor households spent more on medical treatment costs and transportation costs for medical treatment than did poor households. However, the medical cost of 437,027 kyats and transportation cost of 32,351 kyats are also a greater burden, especially for poor households, because the sum of these costs is much higher than their average household income (Table 2).

Comparing the consequences of road crashes in the fatal cases between poor and non-poor households, Table 2 shows that poor households are more likely to borrow money or pawn assets than are non-poor households. A similar trend was observed in the serious injury cases. Nevertheless, it seems that at least one household member has to take care of a victim in the case of serious injury, and that that person will face a significant loss of income, especially for non-poor people. Even though the difference is not statistically significant, it is likely that more victims from poor households will lose a job after road crashes (32.4%) than is the case with those from non-poor households (29.7%). Due to the great burden to a victim's family, 13.5%–16.2% of children in the family have to permanently leave school, and this impact seems to be more serious for the poor. About 50% of poor and non-poor households receive compensation for road crashes in the case of fatalities. In the case of serious injury, a higher number of non-poor households (62.2%) receive compensation for road crashes as compared to the case with poor households (43.2%).

Table 3 shows the changes in the economic conditions and quality of life for poor and non-poor households. The comparison was made between before crash and post-crash within the recovery period, and before crash and post-crash after the recovery period. For the serious injury cases, the recovery period is the time duration when the victims are still under medical

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treatment due to injuries from road crashes. For the fatal cases, the recovery period is the time duration when the families are taking care of funeral costs and facing difficult situations because of the loss of their family members.

The results from Table 3 illustrate that household income, food consumption, the number of household assets, and the quality of housing decrease after road deaths or serious injuries. Although the reduction of some of these economic conditions is not significant when comparing poor and non-poor families, the proportion of the reduction seems to be larger for poor households than for non-poor households. According to the results, the impact on poor people seems to be more serious than for non-poor people both within the recovery period and after the recovery period.

Table 2: Comparison of loss of cost and consequences of road crashes between poor and non-poor

	Fatal			Serious Injury		
	Poor	Non-Poor		Poor	Non-Poor	
Average Household Income	67,846	106,432		65,351	105,676	
Loss of Cost						
Medical Treatment Cost (Kyats)						
Mean	25,128	59,730		437,027	704,054	**
Funeral Cost (Kyats)						
Mean	344,359	409,459	*			
Transportation Cost for Medical Treatment (Kyats)						
Mean	2,308	8,378		32,351	57,811	**
Vehicle Damage Cost (Kyats)						
Mean	4,103	10,405	*	7,162	40,135	
Consequences of Road Crashes						
Need to Borrow Money						
Yes	46.2%	21.6%	**	67.6%	40.5%	**
No	53.8%	78.4%		32.4%	59.5%	
Need to Pawn Assets						
Yes	33.3%	16.2%	*	29.7%	40.5%	
No	66.7%	83.8%		70.3%	59.5%	
Taking Care Person Income Loss (Kyats)						
Mean				31,330	76,486	***
Victim lost a job						
Yes				32.4%	29.7%	
No				67.6%	70.3%	
Children in a household permanently taken leave from schools						
Yes	16.2%	5.1%		13.5%	10.8%	
No	83.8%	94.9%		86.5%	89.2%	
Compensation Receipt						
Yes	51.3%	51.4%		43.2%	62.2%	
No	48.7%	48.6%		56.8%	37.8%	

*Note: *** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.*

Table 3: Economic status of the households after the crash

	Fatal			Serious Injury		
	Poor	Non-Poor		Poor	Non-Poor	
Within Recovery Period						
Household Income Reduction						
Yes	84.6%	70.3%		97.3%	97.3%	
No	15.4%	29.7%		2.7%	2.7%	
Food Consumption						

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Reduction						
Yes	94.9%	89.2%		81.1%	56.8%	**
No	5.1%	10.8%		18.9%	43.2%	
Reduction in Number of Household Assets						
Yes	20.5%	16.2%		32.4%	13.5%	*
No	79.5%	83.8%		67.6%	86.5%	
Lower Quality of Housing Condition						
Yes	33.3%	10.8%	**	40.5%	24.3%	
No	66.7%	89.2%		59.5%	75.7%	
After Recovery Period						
Household Income Reduction						
Yes	84.6%	70.3%		51.4%	29.7%	*
No	15.4%	29.7%		48.6%	70.3%	
Food Consumption Reduction						
Yes	94.9%	89.2%		83.8%	43.2%	***
No	5.1%	10.8%		16.2%	56.8%	
Reduction in Number of Household Assets						
Yes	23.1%	21.6%		32.4%	13.5%	*
No	76.9%	78.4%		67.6%	86.5%	
Lower Quality of Housing Condition						
Yes	35.9%	13.5%	**	45.9%	27.0%	*
No	64.1%	86.5%		54.1%	73.0%	

*Note: *** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.*

Factors Affecting the Consequences of Road Crashes

The data obtained from the survey were analysed using a multiple linear regression model and a logit model to determine the factors that contribute in deterioration of the economic conditions and quality of life of households due to road crashes. Both types of model were applied due to the fact that different types of dependent variables (both continuous and binary variables) were included in the study. The dependent variables in these regression models are listed in Table 4. The independent variables considered in the analysis, as summarized in Table 5, include individual characteristics of the road crash victims, such as gender, marital status, education, occupation, household responsibility, and severity type, economic condition, and income loss of the person taking care. However, the test of multicollinearity indicates the existence of a strong correlation between two variables: type of severity and income loss of the person taking care (i.e. the pair-wise correlation coefficient is higher than 0.6). Only one of these two variables is, therefore, included in the preferred model selection.

Table 6 presents estimation results from the linear regression models and the logit models. The relative magnitude of estimated coefficients indicates the extent to which social economic characteristics of victims affect the consequences of road crashes in terms of the economic conditions and quality of life of victims' households.

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Table 4: Definitions of the dependent variables

Variables	Definition	Category
Y1	Household income reduction within recovery period (Household Income $_{\text{before crash}}$ –Household Income $_{\text{post-crash in recovery period}}$)	Continuous variable
Y2	Household income reduction after recovery period (Household Income $_{\text{before crash}}$ –Household Income $_{\text{post-crash after recovery period}}$)	Continuous variable
Y3	Food consumption reduction within recovery period (Food Consumption $_{\text{before crash}}$ –Food Consumption $_{\text{post-crash in recovery period}}$)	Continuous variable
Y4	Food consumption reduction after recovery period (Food Consumption $_{\text{before crash}}$ –Food Consumption $_{\text{post-crash after recovery period}}$)	Continuous variable
Y5	Amount of money that the household needs to borrow from others	Continuous variable
Y6	Need to pawn the assets (1 if the household needs to pawn the assets, 0 otherwise)	Binary variable
Y7	Housing condition within recovery period (1 if the housing condition is in lower quality, 0 otherwise)	Binary variable
Y8	Housing condition after recovery period (1 if the housing condition is in lower quality, 0 otherwise)	Binary variable

Table 5: Definitions of the independent variables

Variables	Definition
X1	Gender (1 if the victim is male, 0 otherwise)
X2	Marital status (1 if the victim is married, 0 otherwise)
X3 X4 X5 X6 X7	No Education (1 if the victim is non-educated, 0 otherwise) Primary School (1 if the victim graduated at primary school level, 0 otherwise) Secondary School (1 if the victim graduated at secondary school level, 0 otherwise) High School (1 if the victim graduated at high school level, 0 otherwise) College (1 if the victim graduated at college level and higher, 0 otherwise) – Base case
X8 X9 X10 X11	Business owner (1 if the victim is business owner, 0 otherwise) Student (1 if the victim is student, 0 otherwise) Unemployed (1 if the victim is unemployed, 0 otherwise) Seller/labour (1 if the victim is seller or labor, 0 otherwise) – Base case
X12	Household responsibility (1 if the victim is sole earner, 0 otherwise)
X13	Type of severities (1 if the victim is fatal, 0 otherwise)
X14	Income loss of a person who need to take care of a victim after the crash. (1 if there is an income loss, 0 otherwise)
X15	Economic condition of victim's household (1 if the victim household is poor, 0 otherwise)

In Model 1, a dependent variable in this multiple linear regression analysis is the reduction of household income within the recovery period. It is found that the coefficients of all independent variables except 'gender' are statistically significant at the 1–10% level; however, the signs are varied depending on the effect of each variable. Victims with less education suffer less impact on their household income reduction. This could be explained by the fact that that victims with less education earn less income, thus, the result of less of an impact on the reduction of household income. There is little impact on the reduction in household income for students and unemployed victims because they do not earn any income for their families. If the victims are business owners, there will be a great impact on their household income reduction as the victims could have but are now not able to earn income for their families. If the road crash victims are sole earners of families, great losses in household income are observed. Within the recovery period, if there is at least one family member who has taken leave from his/her job to take care of a road crash victim, household income is significantly reduced. The results also show that it is likely to have more household income reduction in non-poor families than in poor families. This could be explained by the fact that victims from non-poor households earn higher incomes than those from poor households, and this causes a great loss to non-poor household incomes.

In Model 2, a dependent variable is also the reduction of household income, but in this case, after the recovery period. The coefficient signs of the significant variables 'business', 'student', and 'unemployed' remain unchanged from those in Model 1. In addition, the 'severity' variable is found to be

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significant at the 1% level, and the positive sign implies that if a victim dies due to a crash, there will be a greater impact on household income than in a case of serious injury. This is because, after the recovery period, seriously injured victims can recover from crashes and return to work, resulting in less impact on their household incomes.

Models 3 and 4 present factors affecting food consumption reduction within and after the recovery periods. In the case of student and unemployed victims there is less reduction in food consumption of households in both models. However, in Model 3, the negative sign of the 'sole earner' variable shows that when victims are the sole earners of the families, there is less impact on food consumption reduction. In Model 4, the 'severity' and 'economic condition' variables significantly affect food consumption reduction after the recovery period.

In Model 5, a dependent variable is the amount of money that a victim's family has to borrow from others to cover the burden due to a road crash. 'Business' and 'severity' variables are significant at the 1–5% level. The negative coefficients of both variables reveal that if the victims are business owners, or if they die in road crashes, their families will borrow less money to cover expenses due to road crashes.

Models 6, 7, and 8 present the estimation results from the logit models. A dependent variable in Model 6 is the need to pawn assets. It is found that if the victims are the sole earners of families, the households tend to pawn assets after road crashes. In addition, if at least one family member has to leave a job and take care of a victim, there is a potential that the household has to pawn assets as well. Models 7 and 8 reveal that when the victims are sole earners of families, when at least one family member has to leave a job and take care of victims, or when the victims come from poor households, the households tend to have negative impacts in terms of lower quality of housing. This could be due to the impact of lower incomes on poor households after crashes that could push victims' families into living in poorer housing conditions.

It was observed that the adjusted R^2 of all linear regression models is rather low (Table 6), ranging from 0.386 to 0.019, indicating that the model does not sufficiently predict the variance of the dependent variables, probably due to the relationships are not linear.

Table 6: Coefficients of models for consequences of road crashes

Variables	Model 1: Household Income Reduction within Recovery Period (Y1)	Model 2: Household Income Reduction after Recovery Period (Y2)	Model 3: Food Consumption Reduction within Recovery Period (Y3)	Model 4: Food Consumption Reduction after Recovery Period (Y4)	Model 5: Amount of Money borrowed from Others (Y5)	Model 6: Pawn the Assets (Y6)	Model 7: Housing Condition within Recovery Period (Y7)	Model 8: Housing Condition after Recovery Period (Y8)
Gender (X1)	-266.65	1,314.80	-1,452.77	-865.74	20,918.27	-0.405	-0.759	-0.465
Marital Status (X2)	7,133.19 *	1,657.57	-1,389.34	-756.22	6,795.90	0.358	0.027	-0.264
No Educated (X3)	-18,130.00 **	497.18	3,783.69	2,825.42	-23,916.15	-0.258	0.516	-0.092
-20,129.06 ***	-7,227.12	77.39	115.48	-7,481.58	1.708 **	1.575 **	1.298	
Secondary (X5)	-18,961.78 ***	-6,168.91	142.90	1,395.78	-19,452.38	1.009	0.522	0.100
High Sch. (X6)	-17,111.03 ***	-7,733.49	1,960.88	1,506.51	-39,044.07	1.804 **	0.730	0.649
Business (X8)	16,647.22 **	13,109.52 **	-4,673.01	-3,229.03	-181,853.30 **	-0.521	0.228	0.921
Student (X9)	-19,699.16 ***	-10,762.64 *	-11,454.30 ***	-9,012.37 ***	-75,724.50	-0.674	-0.208	-0.603
Unemployed (X10)	-23,107.81 ***	-24,730.18 ***	-5,435.10 **	-6,619.07 ***	-22,930.11	-0.987	-0.444	-0.495
Sole earner (X12)	19,170.27 ***	-733.72	-5,454.81 **	-3,693.60	-8,116.97	1.440 **	1.948 ***	1.818 ***
Severity (X13)		19,889.21 ***		8,899.63 ***	-146,535.50 ***			
Income loss of taking care person (X14)	15,769.45 ***		-2,407.55			1.354 ***	1.272 ***	1.442 ***
Economic Condition	-8,598.59 **	-606.43	2,458.34	4,168.76 **	-6,445.11	0.173	0.985 **	1.225 **

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(X15)								
No. of obs.	150	150	150	150	150	150	150	150
Adj. R^2	0.386	0.278	0.122	0.303	0.019			
Log likelihood						-77.280	-74.062	-75.51

*Note: *** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.*

VI. Summary and Discussion

This paper attempts to investigate if poor people in the city of Yangon, Myanmar are more likely to be involved in road crashes and to identify the social consequences of road crashes in poor and non-poor households. The study is divided into two parts. The first part studies the involvement of 'poor' people in road crashes. The second part assesses the impact of road crashes on poor and non-poor families in terms of social consequences such as household income reduction and reduction in quality of life after crashes.

In the first part of the study, poor people appear to be more involved in road crashes than non-poor people. Poor people are more likely to die in road crashes than non-poor people. This could be due to the fact that poor people cannot afford to pay for full medical treatment. In Yangon, most people involved in road crashes are those in the age range of between 21–40 years old, the early and middle ages of workers in the country. Most of the poor involved in road crashes are less educated people and work as labors, sellers, and drivers, while the non-poor people involved in road crashes are more highly educated and work in higher classes of occupation. Pedestrians are the highest risk group involved in road crashes for both the poor and non-poor.

The second part of the study uses a questionnaire survey to identify differences in the impacts of road crashes on poor and non-poor households and to assess the economic status of households before and after involvement in road crashes. The results reveal that non-poor households spend more on funeral costs and vehicle damage costs than do poor households in cases of fatalities, and that non-poor households spend more on medical treatment costs and transportation costs for medical treatment than do poor households in cases of serious injuries. Poor households are more likely to borrow money or pawn assets after crashes than are non-poor households. The consequences of road crashes, such as household income reduction, food consumption reduction, decrease in the number of household assets, and decrease in the quality of housing, seem to be worse in both fatal and serious injury cases. However, the reductions in these economic conditions are not significantly different between the poor and non-poor.

To evaluate the significant factors affecting the consequences of road crashes, multiple linear regression and logistic regression techniques were applied in this study. The occupations of victims seem to affect the consequences of road crashes in terms of household income reduction, food consumption reduction, and the amount of money borrowed from others. Household responsibility as sole earner significantly affects household income reduction, food consumption reduction, reduction in the quality of housing, and the need to pawn assets. If at least one family member takes leave from his/her job to take care of a road crash victim, it is more likely that the consequences of the road crash are worse. Non-poor families tend to have greater losses in household incomes than poor families due to the fact that, before crashes, the victims from non-poor households earned more income than those from poor households.

Even though, there was a limitation in this study that the statistical analysis cannot be applied to compare between the risk level to encounter to the road crashes by poor and non-poor, some evidences were found based on the descriptive analysis that the poor are at higher risk from road crashes than the non-poor, and that non-poor families can become poorer after crashes due to significant losses of their incomes. This study provides implications that there is a great impact of road crashes on both poor and non-poor families. Road crashes can cause increased poverty to families whose family members are involved in crashes. To alleviate this poverty problem, especially in developing countries like Myanmar, more efficient road safety policies should be implemented. This will reduce the number of deaths and injuries from road crashes. For example, road safety education, such the teaching of rules and regulations, is needed, especially for poor people. Alternative transportation modes, such as public transport, and safer road infrastructure for pedestrians should be provided. Lastly, providing better pre-hospital and trauma care, including rehabilitation programs especially for poor casualties who normally have difficulties accessing full medical services, is needed.

References Références Referencias

1. Asian Development Bank (2004) ADB-ASEAN Regional Road Safety Program: Myanmar.
2. Asian Development Bank (2005) Technical Assistant for Socioeconomic Impact of Road Crashes.
3. Dougherty, G., Pless, I.B., and Wilkins, R. (1990) Social Class and the Occurrence of Traffic Injuries and Deaths in Urban Children, *Canadian Journal of Public Health*, Vol. 81, pp.204–209.
4. Elmen, H., and Sundh, V. (1994) Mortality in Childhood, Youth and Early Adulthood: Social

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Inequality in a Swedish City, *European Journal of Public Health*, Vol.4, pp. 274-80.
5. Ghee, C., Silcock, D., Astrop, A., and Jacobs, G. (1997) Socio-Economic Aspects of Road Accidents in Developing Countries, TRL Report 247, Transport Research Laboratory, Crowthorne.
6. Laflamme, L. and Diderichsen, F. (2000) Social Differences in Traffic Injury Risks in Childhood and Youth – A Literature Review and a Research Agenda, *Injury Prevention*, Vol.6(4), pp.293-298.
7. Laflamme, L. and Engstrom, K. (2002) Socio-economic Differences in Swedish Children and Adolescents Injured in Road Traffic Incidents: Cross Sectional Study, *British Medical Journal,* Vol. 324, pp. 396-397.
8. Nantulya, V.M. and Reich, M.R. (2003) Equity Dimensions of Road Traffic Injuries in Low- and Middle-Income Countries, *Injury Control and Safety Promotion*, Vol. 10, No. 1-2, pp.13-20.
9. Thomas, A.A., Jacobs, G.D., Sexton, B., Gururaj G., and Rahman F. (2004) The Involvement and Impact of Road Crashes on the Poor : Bangladesh and India Case Studies, Transport Research Laboratory, Published Project Report.
10. Van Beeck, E., Mackenbach, J.P., Looman, C.W.N. (1991) Determinants of Traffic Accident Mortality in the Netherlands: A Geographical Analysis, *International Journal of Epidemiology*, Vol.20, pp. 698-706.
11. World Health Organization (2013) *Global Status Report on Road Safety 2013: Supporting a Decade of Action,* World Health Organization.

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