Traffic Accident Analysis in the City of Yogyakarta, Indonesia

Ahmad Munawar, *Member, IAENG*

***Abstract*—Accident rate in the city of Yogyakarta is relatively high. It is, therefore, to investigate the correlation of traffic accident and the driver background. Interview surveys were carried out by interviewing around 5000 household about their background and their driver behavior, i.e. whether they have been involved in traffic accident or not. According to the modal split, 87 % of traffic accidents are caused by motorcycles, 8 % by car and 5 % by bicycle. Male drivers have more probability to involve an accident. Order probit model has been employed to get the relationship between traffic accident and the age of the drivers, occupation, education and the observance of the traffic rules. It is found that young, unemployment, less educated and disobedient traffic rule people have more accidents. It is recommended, therefore to educate (especially young people) about traffic regulation and the dangerous of the accident. It is also recommended to give more punishment for breaking traffic regulation. It is also suggested to improve public transport facilities, to change the transport mode from using motor cycle to public transport.**

***Index Terms*—** accident rate, traffic regulation, traffic rule

I. Introduction

INDONESIA has very high accident rate, more than 28,000 people death per year because of the traffic accident [1].The traffic accident cost in Indonesia is very high [2]. It is also happened in the City of Yogyakarta, which is situated in the middle of Java Island. According to the statistics, more than 70 percent of the accident in Indonesia is caused by motorcycle [3].There are many factors influencing the traffic accidents, i.e. riding knowledge, travel purpose and gender [4]. Therefore, it is important to analyze the correlation between driver background and the traffic accident.

II. Methodology and Analysis

A. Surveys

Surveys were carried out in urban agglomeration of the city Yogyakarta (Greater Yogyakarta) with the population around 1 million. Home interview surveys were conducted by interviewing 5000 households (one or two persons per household) by random sampling. A set of questions used are:

a. Age
b. Gender
c. Education
d. Occupation
e. How many times being involved in an accident, accident type and vehicle involved.
f. How many times breaking traffic regulation

The total respondents, who have been interviewed, were 6850.

B. Analysis

From 6850 respondents, 72 % of them were never involved in traffic accident, 26 % were involved in traffic accident but only with slight injuries and only 2 % of them were involved in traffic accident with heavy injuries. The result is shown in Fig. 1.

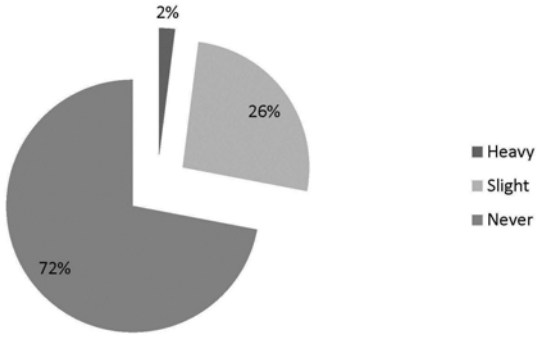

Fig. 1. Percentage in Accident Involved

There is also a correlation between gender and accident rate. It is shown in Figure 3 below. Only 21.14 % of female respondents have involved in traffic accident, compared to 31.45 % of male respondents have involved in traffic accident. Also compared to male respondents, less female respondents have involved in heavy injury accident.

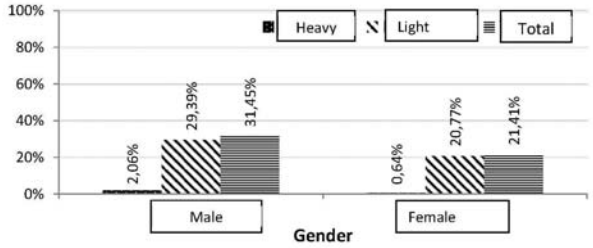

Fig. 2. Accident vs Gender

It has been also analyzed between traffic accident and educational background. The results are shown in Figure 3. There is a slightly different between more educated people and less educated people.

Manuscript received March 4, 2018, revised March 26, 2018.

Ahmad Munawar is with Gadjah Mada University, Jln. Grafika No. 2 Kampus UGM Bulaksumur Yogyakarta 55281 INDONESIA (corresponding author to provide phone: 62 811 286 745; fax: 62 274 518993; e-mail: munawarugm@gmail.com).

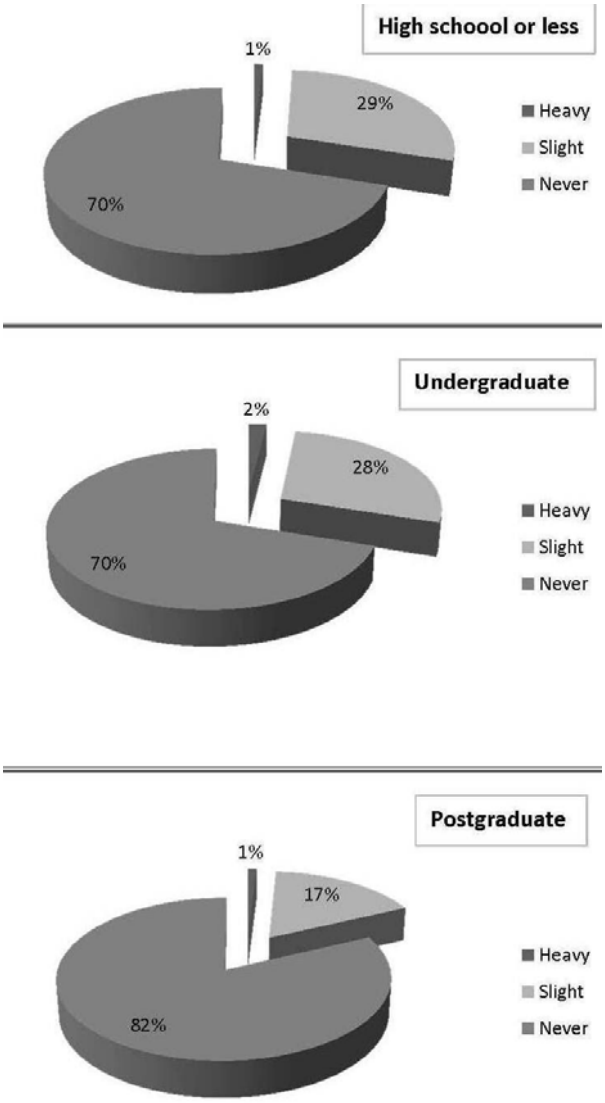

Fig. 3. The Correlation between Education and Traffic Accident Involved

According to the vehicle type, 87 % of the accident is caused by motorcycle, 8 % by car and 5 % by bicycle. The result is shown in Fig. 4.

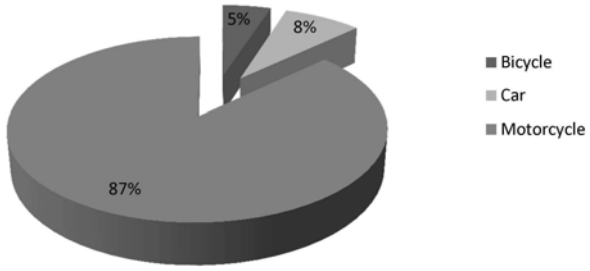

Fig. 4. Traffic Accident versus Vehicle Type

It is also analyzed the correlation between the adherence to the traffic regulation and traffic accident. The respondents who never break the traffic regulation have less opportunity to involve in traffic accident. The result is shown in Figure 5.

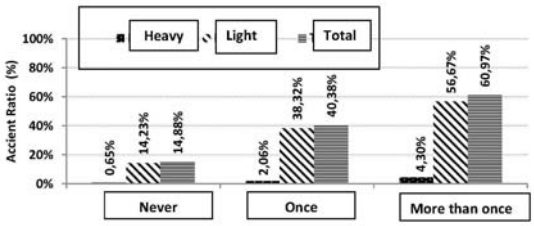

Figure 5. Traffic Accident vs Breaking Traffic Regulation

To obtain the correlation between traffic accident and the influenced factors, we use one of the discrete choice models, i.e. ordered probit model. From the methodological standpoint, discrete choice models are the most commonly used-tools to analyze the traffic accident. There are numerous studies in the literature that have used discrete choice techniques in modeling injuries and severities, including binary logit model [5] and ordered probit model [6].

Limdep software has been used to analyze the statistic regression variables [7]. The variables are shown in Table 1. The dependent variable is accident rate (Y) and the independent variables are shown in Table 1.
The result is shown in equation 1 below.

$$Y = 1{,}183 + (-0{,}004)\, X_1 + 0{,}244\, X_2 + 0{,}003 X_3 + (-0{,}006)\, X_4 \quad (1)$$

TABLE 1
DESCRIPTIVE STATISTICS OF EXPLANATORY VARIABLES

Symbol	Type	Descriptions
Y	dependent	Accident rate, classified as: 0 = never 1 = slight injuries 2 = heavy injuries
x_1	independent	Age of respondent, classified as: 0 = 16 – 20 years 1 = 21 – 40 years 2 = 41 – 65 years 3 = > 65 years
x_2	Independent	Breaking traffic regulation, classified as: 0 = never 1 = once 2 = more than once
x_3	Independent	Occupation, classified as: 0 = worker 1 = student or school children 2 = unemployment
x_4	independent	Education, classified as: 0 = high school or less 1 = undergraduate 2 = postgraduate

It is shown that the most probable accident rate is for the young people who has broken the law more than once, with no occupation (unemployment) and less educated with Y = 1.921.

III. CONCLUSIONS AND RECOMMENDATIONS

A. *Conclusions*

It is concluded that potential accident mainly for:
a. Less educated person
b. Young people

ISBN: 978-988-14047-9-4
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

c. The people who does not obey the traffic regulation
d. Motorcyclist
e. Male, rather than female.

B. Recommendations

It is therefore, recommended to:

a. give education for young people, by giving speech at schools about traffic regulation and the dangerous of the traffic accident
b. be harder to get a driving license
c. give more punishment for breaking the traffic rule
d. reduce the use of motorcycle by improving urban public transport

REFERENCES

[1] S.P. Santosa, A.I. Mahyuddin and F.G. Sunoto, " Anatomy of Injury Severity and Fatality in Indonesia Traffic Accidents" Journal of Eng.Technol. Sci., Vol. 49, No. 3, 2017, pp. 412 - 422.

[2] G. Sugiyanto, "The Cost of Traffic Accident and Equivalent Accident Number in Developing Countries (Case Study in Indonesia), ARPN Journal of Engineering and Applied Sciences, Vol. 12, No 2, January 2017.

[3] E. Rusyanto (March, 2017), "Motor Nyumbang 71 % Kecelakaan di Indonesia". Available: https://edorusyanto.wordpress.com/2017/03/29/motor-nyumbang-71-kecelakaan-di-indonesia/

[4] A. K. Indriastuti and H. Sulistyo, "Influencing Factor in Motorcycle Accidents in Urban Areas of Malang, Indonesia", International Journal of Academic Research, Vol. 2, No. 5, September 2010, pp. 253 – 255.

[5] W. Zhu, X. Wang and D. Zhang, "Truck Severity in New York City: An Investigation of the Spatial and the Time of Day Effects", Accident Analysis and Prevention, 99, 2017, pp. 249 – 261

[6] A. J. Anarkooli, M.H. Husseinpour and A. Kardar, "Investigation of Factors Affecting the Injury Severity of Single-vehicle Rollover Crashes: A random-effects Generalized Ordered Probit Model" , Accident Analysis and Prevention, 106, 2017, pp. 399 – 410

[7] W.H. Greene, "Econometric Analysis/Limdep User Manual", Available: http://cee.eng.usf.edu/faculty/flm/CE697N_files/ealimdep.pdf

ISBN: 978-988-14047-9-4
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)