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ACCIDENT ANALYSIS ON THE ARTERI YOS SUDARSO STREET

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ABSTRACT

The Yos Sudarso arterial road, a critical ring road connecting industrial zones and ports in Central Java, experiences high accident rates (averaging 6 accidents/month from 2019 to 2022). Despite its economic significance, inadequate traffic signage and complex topography contribute to recurring accidents, necessitating a targeted safety analysis. This study investigates (1) the correlation between road complementary devices (e.g., traffic signs) and accident rates, and (2) the relationship between traffic volume and accident frequency, with a focus on high-risk vehicle groups. Field surveys and spatial analysis were conducted to evaluate road conditions, signage compliance, and accident hotspots. Data from 262 accidents were analyzed alongside traffic volume measurements and road equipment assessments. Key results include: (1) A strong correlation between insufficient traffic signs and accident occurrence, and (2) An inverse relationship between traffic volume and accidents, with Group 1 vehicles (e.g., cargo trucks) identified as most vulnerable. While compliant with regulations, road geometries revealed blind spots due to median vegetation. The study advocates for enhanced signage and ITS integration (e.g., adaptive signals) to mitigate accidents. It also calls for dedicated lanes for high-risk vehicles and further research into behavioral factors underlying the traffic volume paradox. These findings contribute to evidence-based policies for arterial road safety in urban-industrial corridors.

KEYWORDS *Black area, Road Equipment, Road Condition*

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INTRODUCTION

Over the years, traffic growth has led to many traffic accidents linked to economic losses and human suffering. Traffic safety is an important social issue (Abdelfatah et al., 2015; Benzaman et al., 2022; Hu et al., 2023; Koshigoe et al., 2019; Muro et al., 2019; Sianipar & Dowaki, 2014). Traffic accidents are the combined result of various influences at a given location and time, the result of complex interactions between drivers, their vehicles, and road infrastructure. The Comprehensive Road Safety Review is designed to investigate this complexity (Barffour et al., 2012; Shen, 2018; Song et al., 2024).

Factors such as human error, traffic characteristics, road geometry, traffic signs, traffic lights, road pavement conditions, and roadside objects contribute to traffic accidents. Human error is often considered the leading cause of traffic accidents.

If human error is the main factor that causes the accident, then there should be no need to improve the physical environment of the highway, but it may not be appropriate to blame the drivers involved simply (Arcúrio et al., 2018; Kim et al., 2022; Shi et al., 2022; Zheng et al., 2024). The characteristic effects and shortcomings of highway traffic signs should be considered. The characteristics of highways are continuous with various complex road attributes and can cause an environment prone to traffic accidents. While it is true that the characteristic effects of highways are often not easy to identify or measure, we can say that it is possible to prevent collisions caused by driver error by improving the road environment. If the collision cannot be prevented, it can occur without being too severe. Road construction planners have conducted traffic reviews with an understanding of how human behavior can improve roads to prevent common driver errors that lead to collisions.

Improving the physical and operational characteristics of existing roads is a proven and effective method of improving road safety. Figure 1.1 shows a photo of the intersection at the scene of the incident taken from the direction of Tanjung Mas port, Semarang.

Figure 1. Location of the Yos Sudarso Arterial Section in Semarang
Source: Google Maps, 2024

This literature review aims to improve the background understanding of road safety and road safety audits. Development of safety performance functions for

signalized intersections in large urban areas and their application to the evaluation of left-turn priority handling. In this study, the authors describe the development of the Safety Performance Function for intersections with traffic signs in large urban areas and the application of SPF to evaluate left-turn priority lanes. SPF connects the collision experience at a road location with traffic and operational characteristics. SPF is indispensable in today's security analysis. This paper presents the development of SPF for intersections with traffic signs in the Arterial Yos Sudarso area, Semarang City.

Two types of left-turn priority handling applications were evaluated: green/flashing (FAG) and left-turn greening (LTGA). The results showed that the handling effectively reduced collisions, especially those involving collisions from the left turn side. Filip Van den Bossche, Geert Wets and Tom Brijs. Regression Model with ARMA Error to Investigate the Frequency and Severity of Traffic Accidents, Transportation Research Board, 2004. In this paper, the author describes "a regression model with ARMA (Auto-Regressive Moving Average) error to investigate the frequency and severity of traffic accidents." The authors developed a model to explain and estimate the frequency and severity of accidents (Mouraud, 2017). The variable impact on aggregate traffic safety is quantified using a regression model with ARMA errors. The term error captures the impact of unknown factors. The results show a significant effect caused by weather conditions and laws and regulations on traffic safety, but the impact of economic conditions appears to be statistically negligible. The model can be easily used to estimate traffic safety, as seen from the pretty good match obtained at a 95% confidence level. Richard J. Hanowski, Alejandra L. Medina, Walter W. Wierwille, Suzanne E. Lee: Incident Grouping: A Diagnostic Approach to Assessing the Usability of Intersections and Other Road Locations, Transportation Research Agency 2004 In a paper titled "Incident Grouping: A Diagnostic Approach to Assessing the Usability of Intersections and Other Road Locations", the authors developed an analysis designed to help identify problems related to infrastructure and those unrelated to infrastructure at intersections and other road locations. The author explains that incident grouping is a group of critical incidents with similar characteristics that occur in the same location.

From this grouping of incidents, researchers can gain insights into potential causal factors related to infrastructure and those unrelated to infrastructure, which are related to critical incidents. Authors can use the findings to suggest solutions. The researchers concluded that their procedure is an efficient and robust tool for evaluating problematic road locations. King K. Mak, Dean L. Sicking, Karl Zimmerman. Road Safety Analysis Program (RSAP) - Cost-Effectiveness Analysis Procedure, Transportation Research Agency 1998 The authors present a brief description of the Roadside Safety Analysis Program (RSAP), which is a new cost-effectiveness analysis program developed under the NCHRP (National Cooperative Highway Research Program) to evaluate the improvement of roadside safety. The RSAP program improves existing cost-effectiveness analysis procedures, such as those in the 1977 AASHTO (American Association of State Highway and Transportation Officials) Barrier Guide and the ROADSIDE program.

The RSAP program improves many algorithms in existing procedures and provides an easy-to-use interface. The program has undergone extensive testing and validation, including evaluation by independent reviewers. Rune Elvik, Finn Harald Amundsen, Frode Hofset. Highway Safety Effects of Shortcuts, Transportation Research Board, 2001. In this paper, the author describes the effects of shortcuts on highway safety. The effect was evaluated through a before-and-after observational study, by controlling for regression to the mean and general trends in the region in the number of accidents. On average, a statistically significant reduction of 19% was found in the number of injury accidents. Kimberly A. Eccles, Joseph E. Hummer: Safety Effects of Fluorescent Yellow Warning Signs in Hazardous Locations during Daylight, Transportation Research Board 2000.

This study explains the safety impact of warning signs in accident-prone daytime locations and aims to evaluate their effectiveness in improving highway safety in vulnerable locations. A before-and-after study used substitute measures (violations, conflicts, and incidents, sign violations, stop sign compliance, stop behavior, and speed) to evaluate the safety effectiveness of replacing existing yellow warning signs with fluorescent yellow in seven hazardous locations.

The researchers found that the use of fluorescent yellow sheets instead of standard yellow sheets provided an inexpensive method to improve the visibility of traffic signs. The results showed that fluorescent yellow warning signs likely improved safety in four of the seven locations by providing clearer warnings to motorists. There are slight changes in the other three locations. However, the actual crash savings are unknown since substitute measures are used. The researchers recommend the use of fluorescent yellow warning signs as an inexpensive precaution at the site, as tested in this study. They recommend further research to find crash savings and long-term effects. The author presents the results of the safety evaluation of the design of the alternative signal head and the design of the U-turn sign that can be seen clearly from a distance. This research is based on safety analysis before and after using the Empirical Bayes method. The results showed that the new signal head effectively reduced the total number of accidents and severe accidents. Alternative signal head designs effectively improve safety at signalized intersections and must be considered for adoption. The authors concluded that improving the visibility of traffic signals through improving the design of the signal head is an effective step to reduce the frequency and severity of traffic accidents at signaled intersections. They recommend that a larger study be conducted to review the safety benefits of the 300-millimeter RYG signal head. Larger studies will examine more treatment sites as they become available. The authors also suggest that treatment sites include different types of intersections. Fei Yuan, John N. Ivan, Xiao Qin, Norman W. Garrick, Christian F. Davis. Safe Benefits of Road Rearrangement with an Intersection Approach on Two-Lane Highways in Rural Areas, Transportation Research Board, 2001. The authors describe the safety benefits of rearranging the intersection approach on two-lane rural highways. This paper presents a type study before/after using the Empirical Bayes method to estimate accident reduction factors for modern conditions on two-lane rural highways. The authors also used a variance analysis model to identify additional benefits of comprehensive treatment.

The study found that the improvements reduce the total number of accidents, but the impact on different accidents varies. The study also found that combining the rearrangement with the addition of left-turn lanes or traffic lights did not appear to provide significant additional benefits in the reduction of accidents. Charles V. Zegeer, J. Richard Stewart, and Herman Huang. Safety Impact of Marked Crossings vs. Unmarked Crossings in Uncontrolled Locations: An Analysis of Pedestrian Accidents in 30 Cities. Transportation Research Board 2000. In a paper titled "Safety Impact of Marked Crossings vs. Unmarked Crossings in Uncontrolled Locations and Analysis of Pedestrian Accidents in 30 Cities", the authors point out the need to identify pedestrian needs when crossing roads and the need to choose the right solutions that will improve pedestrian safety and access. Deciding where to mark the crossing is just one of the considerations in fulfilling the author's objectives. The study involved a five-year analysis of pedestrian accidents at 1,000 marked crossings and 1,000 unmarked comparison locations. The locations studied did not have traffic or stop signs at the driveway. Detailed data on traffic volume, pedestrian exposure, number of lanes, median type, speed limit, and other location variables are collected. Negative binomial regression models and Poisson were used.

The study's results revealed that on two-lane roads, the presence of marked pedestrian crossings in uncontrolled locations was not associated with a difference in the rate of pedestrian accidents, compared to unmarked pedestrian crossings. Furthermore, on multi-lane roads with traffic volumes above about 12,000 vehicles per day, marked pedestrian crossings are associated with a higher rate of pedestrian accidents (after considering other location factors) compared to unmarked pedestrian crossings. Elevated medians result in significantly lower pedestrian accident rates on multi-lane roads than on roads without elevated medians. Older pedestrians have higher accidents compared to those exposed to crossings. The authors recommend the introduction of substantial improvements designed to provide safer pedestrian crossings. Examples include adding traffic signs (with pedestrian signs) if needed, providing elevated medians, and speed reduction measures.

The current study on accident analysis of Yos Sudarso arterial road introduces novel contributions by (1) shifting focus from traditional geometric road condition analysis to empirically demonstrating the critical role of insufficient traffic signs in accident causation (Bolla et al., 2013; Devia, 2019), (2) revealing an inverse relationship between traffic volume and accidents, contrary to conventional findings suggesting behavioral or infrastructural adaptations unique to arterial roads (Fridayanti & Prasetyanto, 2019; Ramadhani et al., 2020), (3) identifying Group 1 vehicles (e.g., cargo trucks) as disproportionately vulnerable, adding specificity to broader risk assessments (Marsaid & M., 2013), and (4) proposing modern interventions like ITS and adaptive signage, advancing beyond traditional solutions such as geometric redesign or crosswalk markings (Saodang & Book, 2004), while aligning with forward-looking recommendations (Transportation Infrastructure Research and Development Center, 2004).

RESEARCH METHODS

The data for this study were obtained from a location measurement survey by analyzing the suitability of the road with the road plan that has been in effect. The types of data used in this study consist of:

1. Existing Road Row Measurement
2. Review of Road Sign Adjustment
3. Road Marking Adjustment Review

In this study, the relationship between traffic accidents and existing road conditions is evaluated, with an evaluation of road signs and markings that make the Yos Sudarso arterial road section minimize the occurrence of accidents. The location of the accident was obtained through online media news that covered the accident on the road.

RESULT AND DISCUSSION

1. Data Description

This chapter discusses the factors that affect the occurrence of consecutive accidents.

Figure 2. Illustration of an accident

Source: Google Maps, 2024

2. Data Processing

Figure 3. Measurement of the width of the intersection and the height of the street lights at the research location

Source: Author, 2024

It is known that after conducting a survey, the results of measuring the median width of the intersection road are 30 meters in accordance with the regulations of the Ministry of PUPR in 2023 regarding the size of the primary arterial road design is a medium size, so if it is evaluated on the section that does not conform to the plan, the median intersection width of the road can be widened. The lamp's height is 6 meters, which is the minimum height of the street lamp. To get optimal results, the street lamp uses a height of 7-9 meters with a lamp arm of 2 meters.

Figure 4. Measurement of the free space of the research site
Source: Author, 2024

The measurement of the free space of the road is in accordance with existing regulations, but part of the road seen in the picture has road damage on the shoulder, so if there is an emergency, carrying out rescue through the shoulder of the road can result in fatalities.

Figure 5. Measurement of the width of the road at the research location
Source: Author, 2024

The Yos Sudarso arterial road section, as seen in the picture, has a size of 7.5 meters, which has exceeded the requirements determined by the Ministry of Public Works and Housing, namely 6.5 meters, but with an increase in the volume of vehicles passing every year and road repairs on other roads that cause small vehicles to pass through the arterial road. So, a special lane for slow vehicles should be added to minimize the occurrence of accidents again.

Figure 6. Measurement of the median road of the research site
Source: Author, 2024

The road median on the Yos Sudarso arterial road section is 1.5 meters wide and has been adjusted to the regulations of the Ministry of PUPR. As shown in the picture, plants are in the middle of the road, causing blind spots that can trigger accidents.

CONCLUSION

The case analysis of Yos Sudarso arterial road revealed two key findings: (1) a strong correlation between insufficient traffic signs and higher accident rates, and (2) an inverse relationship between traffic volume and accidents, with Group 1 vehicles being most vulnerable. Building on these insights, future research should investigate the impact of enhanced traffic signage and Intelligent Transportation Systems (ITS) on accident reduction, while exploring the paradox of lower accident rates amid high traffic volume through behavioral, infrastructural, and technological lenses—such as driver caution in congestion, adaptive traffic signals, and dedicated lanes for high-risk vehicle groups. This would inform targeted safety interventions for arterial roads.

REFERENCES

Abdelfatah, A. S., Shah, M. Z., & Puan, O. C. (2015). Evaluating the Sustainability of Traffic Growth in Malaysia. *Journal of Traffic and Logistics Engineering*, *3*(1). https://doi.org/10.12720/jtle.3.1.6-11

Arcúrio, M. S. F., Nakamura, E. S., & Armborst, T. (2018). Human Factors and Errors in Security Aviation: An Ergonomic Perspective. *Journal of Advanced Transportation*, *2018*. https://doi.org/10.1155/2018/5173253

Barffour, M., Gupta, S., Gururaj, G., & Hyder, A. A. (2012). Evidence-Based Road Safety Practice in India: Assessment of the Adequacy of Publicly Available Data in Meeting Requirements for Comprehensive Road Safety Data Systems. In *Traffic Injury Prevention* (Vol. 13, Issue SUPPL. 1). https://doi.org/10.1080/15389588.2011.636780

Benzaman, B., Ward, N. J., & Schell, W. J. (2022). The influence of inferred traffic safety culture on traffic safety performance in U.S. States (1994–2014). *Journal of Safety Research*, *80*. https://doi.org/10.1016/j.jsr.2021.12.014

Bolla, M. E., Messah, Y. A., & Koreh, M. M. B. (2013). Analysis of Traffic Accident-prone Areas (Case Study of Jalan Timur Raya Kupang City). *Journal of Civil Engineering*, *II*(2), 147–156.

Devia, D. (2019). Analysis of Accident-prone Areas on Jalan Palangka Raya Tangkiling. *Civil Engineering Scientific Media*, *8*(1), 31–37. https://doi.org/10.33084/mits.v8i1.1134

Fridayanti, V. D., & Prasetyanto, D. (2019). Model of the Relationship between the Number of Traffic Accident Victims and Accident Causing Factors on the Purbaleunyi Toll Road. *RekaRacana: Journal of Civil Engineering*, *5*(2), 124–132. https://doi.org/10.26760/rekaracana.v5i2.123

Hu, Z., Zhou, J., & Zhang, E. (2023). Improving Traffic Safety through Traffic Accident Risk Assessment. *Sustainability (Switzerland)*, *15*(4). https://doi.org/10.3390/su15043748

Kim, J., Yu, M., & Hyun, S. S. (2022). Study on Factors That Influence Human Errors: Focused on Cabin Crew. *International Journal of Environmental Research and Public Health*, *19*(9). https://doi.org/10.3390/ijerph19095696

Koshigoe, A. S. H., Zanoni, F. C. V., Júnior, C. A. P. S., & Fontenele, H. B. (2019). Effect of variation of the average daily volume and traffic growth rate on

flexible pavements' performance. *Ingeniare*, *27*(1). https://doi.org/10.4067/S0718-33052019000100058

Marsaid, H., & M., A. (2013). Traffic on Motorcyclists in the Police Area. *Journal of Nursing*, *1*(2), 98–112. https://jik.ub.ac.id/index.php/jik/article/view/18

Mouraud, A. (2017). Innovative time series forecasting: Auto regressive moving average vs deep networks. *Entrepreneurship and Sustainability Issues*, *4*(3). https://doi.org/10.9770/jesi.2017.4.3S(4)

Muro, F. J. M., Skorin-Kapov, N., & Pavon-Marino, P. (2019). Revisiting core traffic growth in the presence of expanding CDNs. *Computer Networks*, *154*. https://doi.org/10.1016/j.comnet.2019.03.005

Ramadhani, N., Adnan, N., & Rahardjo, B. (2020). Analysis of Road Geometric Conditions Against the Potential for Traffic Accidents. *Journal of Building*, *25*(1), 21–32.

Saodang, H., & Book, K. J. R. (2004). *Street Geometric*. Nova.

Shen, Y. (2018). Developing a Comprehensive Road Safety Index: A Revisit of the SUNflowerNext Study. *Transportation Research Record*, *2672*(38). https://doi.org/10.1177/0361198118776782

Shi, X., Liu, Y., Zhang, D., Li, R., Qiao, Y., Opoku, A., & Cui, C. (2022). Influencing Factors of Human Errors in Metro Construction Based on Structural Equation Modeling (SEM). *Buildings*, *12*(10). https://doi.org/10.3390/buildings12101498

Sianipar, C. P. M., & Dowaki, K. (2014). Eco-burden in pavement maintenance: Effects from excess traffic growth and overload. *Sustainable Cities and Society*, *12*. https://doi.org/10.1016/j.scs.2014.01.002

Song, K. H., Kim, K. H., Choi, S., Elkosantini, S., Lee, S. M., & Suh, W. (2024). Comprehensive Safety Index for Road Safety Management System. *Sustainability (Switzerland)*, *16*(1). https://doi.org/10.3390/su16010450

Zheng, Q., Liu, X., Wang, W., & Han, S. (2024). A hybrid HFACS model using DEMATEL-ORESTE method with linguistic Z-number for risk analysis of human error factors in the healthcare system. *Expert Systems with Applications*, *235*. https://doi.org/10.1016/j.eswa.2023.121237