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Road Safety of Highway Traffic System of Halsema Highway

June S. Biangdan
School of Criminal Justice Education, Mountain Province State University Bontoc, Mountain Province
Email: jsbiangdan26@gmail.com

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Abstract

Traffic accidents happen all the time. It's a situation that can happen in any transportation network, including the one in the study area, where safety steps aren't good enough. The study then looked at how safe the roads are on the Halsema Highway in the Philippines. In particular, it found out what the main reasons are for traffic accidents along Halsema Highway and how well safety standards are being followed. The goal is to come up with ways to lessen the bad effects of land transportation traffic accidents. A questionnaire checklist was the main tool used to collect data, with human interviews and observation also being used. T-tests and both quantitative and qualitative study methods were used to look at the data that was collected. The results show that mistakes made by people are the main reason why cars crash on the Halsema Highway. There is a high level of compliance with road safety standards (2.63) and traffic engineering (2.56), but only a modest level of compliance with traffic signs (2.46). Right now, it's clear that some Halsema Highway drivers don't care about safety. On the other hand, there are some issues and concerns that need to be addressed when it comes to road safety standards, especially when it comes to traffic signs that aren't big enough.

Keywords: Road safety; Road crashes; Halsema highway; Traffic system; Transportation; Mountain Province.

1. Introduction

This paper, which explores the frontiers of road safety, is crucial for several reasons. Among others are: reducing fatalities and injuries, as road traffic crashes are a leading cause of death and injury worldwide; improving public health; improving road safety directly enhances public health by preventing injuries and fatalities; and providing behavioral insights into driver behavior, helping to design better educational and enforcement strategies. Overall, road safety is essential for creating safer, more efficient, and more equitable transportation systems that protect all road users and enhance the quality of life.

The rapidly evolving field of transportation technologies is undergoing significant transformations in global settings. A lot of advantages and utilization of these technologies have gained appreciation and benefits to mankind in terms of viability, convenience, employment, and demands for goods and services from the motoring public. However, negative outputs generate harmful effects from being exposed to the risk of getting involved in road crashes, which may result in deaths, injuries, or property damages.

Negative effects, such as traffic accidents, are common in the transportation industry. These scenarios are present in all transportation networks where safety measures are inadequate. The World Health Organization (WHO) and the World Bank (WB) jointly issued a world report on road traffic injury prevention, which confirmed this. The report underscores the concern that unsafe road traffic systems are seriously harming global public health and development. It contends that the level of road traffic injuries is unacceptable and that they are largely unavoidable (World Health Organization, 2014).

The traffic system inherently incorporates risk factors that determine the driver's culpability; these factors may include the roadway, environment, vehicle, or a combination of these. In general, the accident is due to the combined effect of several deficiencies in the elements of the highway traffic system associated with human error, vehicles, or road conditions.

Drivers commit human error when operating their vehicles. Human error encompasses various behaviors such as over speeding, drunk driving, overtaking, and undisciplined driving, all of which have the potential to cause an accident. Local and international reports and studies support this statement.

Human error causes the majority of road crashes in Ireland. Research has shown that driver error accounts for over 80% of all fatal and injury crashes on Irish roads. The main causes of death and injury on Irish roads remain speeding, drunk driving, and the non-wearing of seatbelts (Murtagh, 2014).

In a similar study, the Volvo Group of companies in Europe conducted research on the factors contributing to road traffic accidents. They classified these factors into three categories: causes attributed to the environment, the

vehicle, or the drivers. Findings revealed that 90% of cases are the major contributing factor attributed to human error such as speeding on low visibility areas, inattention, misjudgment of speed, and others (Karsten, 2013).

Furthermore, Japan established the Institute for Traffic Accident Research and Data Analysis (ITARDA) as a research center to examine the issue of traffic accidents. Their findings revealed that human error is also the top cause of accidents, such as over speeding. Higher car speeds, according to their in-depth study, should increase the risk and severity of crashes, but this is not always the case; crashes typically occur in the "mid-speed range" of 30 to 60 km/h. Their findings revealed that many drivers were inattentive or distracted at this range of speed. Here, it looked at why drivers tend to become inattentive or distracted more easily while driving, factors categorized as “operation or behavior unrelated to driving” (ITARDA, 2011).

From 2001 to 2006, the Philippines conducted a study on the causes of traffic crashes. The findings, considering the different factors, reveal that the causes of road crashes are: drivers’ error (26%), mechanical defect (12%), and road defect/under construction (5%). The most common cause of traffic accidents that resulted in death, permanent disability, and property damage was the driver’s error (Tamayo, 2006).

Local reports from the Philippine National Police also reveal similar findings: human error is the primary cause of traffic crash incidents in the municipality of Sablan Benguet, with mechanical defects and road conditions also contributing in some cases. Most of the drivers involved in accidents are from lowland areas and are unfamiliar with the Cordillera's road status and road conditions (Cawis, 2015).

The second element of HTS that contributes to a road traffic crash incident is the road itself. The term "road" refers to the traffic facilities and infrastructure for the vehicle's route. The nature and condition of the road, such as deterioration, lack of maintenance, and the absence of necessary road safety devices, can contribute to accidents.

Real-life observations of various roads worldwide confirm this statement. In Kenya, for example, road crashes happen because of unmaintained roads, which is indirectly attributed to the issue of corruption. That is why the newly formed government of the National Alliance Rainbow Coalition launched a six-month road safety campaign and declared war on corruption. (Lee and Wolfensohn, 2013).

Lastly, the vehicle, as the third element of the system, can contribute to road crashes in the form of negligence in its maintenance or failure to follow the basic car servicing practices. In layman’s terms, it is associated with the failure of some drivers to observe routine checkups of their units before and after the trip.

In the locality, some drivers who were involved in crashes blame mechanical failure as the cause of the incident. In 2014, the Florida bus accident in Bontoc Mountain Province claimed the lives of at least 15 people. Investigation revealed that mechanical failure (loss of brake) was the cause of the incident (Corrales, 2014).

Initially, the identified risk factors and consequences of traffic operation necessitate the application of traffic management as a preventive measure to eliminate any deficiencies in the combined elements. A highway transportation agency employs traffic management to enhance the safety, efficiency, and effectiveness of the roadway system for both transportation service providers and consumers (Delizo, 2009).

Traffic management addresses road safety issues by utilizing universally accepted pillars such as traffic education, traffic engineering, and traffic enforcement. If human error is the cause of traffic accidents, traffic education is the appropriate pillar. If the cause of traffic crashes is the roadways, traffic engineering may resolve the problem, and if the cause of traffic crashes is the vehicle, then orientation on vehicle maintenance or car servicing is appropriate. If traffic violations are the cause of the crashes, then it calls for the intense application of so-called enforcement.

Traffic crashes are among the leading causes of death globally and locally. The United Nations (UN) records from 2014 indicate that traffic crashes claim the lives of 1.5 million people annually. In the Philippines, road traffic incidents and deaths reached 9,758 as of May 2014 (World Health Organization, 2014). The Department of Health (DOH) confirmed that traffic crashes are among the top five leading causes of death, and it is being feared that they might become the top cause of death (Palangchao, 2014).

In the Cordillera, of the total of 3,408 vehicular road crashes recorded for the year 2014 (Palangchao, 2014), Baguio, Benguet, and Mountain Province (Halsema Highway) have the highest road-related crashes (Palangchao, 2014). It is noteworthy to recall that the Halsema Highway was previously ranked as the third scariest road in the world (Mendoza, 2008). Other authors claimed it ranked 8, while others said it ranked 9, but regardless of its rank, it remains a fact that Halsema Highway is one of the most dangerous roads ever. Locals have referred to it as the "road of death" and "road of bones". Road where miscalculation can lead to disaster.

Currently, the government is focusing on infrastructure development, implementing legal initiatives, and implementing reduction measures to alleviate the negative impacts of vehicular operations. In addition, government sectors are stepping up their efforts to prevent crashes. However, even with these measures in place, traffic authorities still struggle to address traffic issues effectively.

2. Methodology

Both quantitative and qualitative research approaches guided the study's conduct. In this context, the research study employed survey and interview techniques to gather data. The qualitative aspect of the research provided in-depth discussion regarding the concept of road crashes, as well as its implications for the formulation of plans and mitigating measures for traffic accidents in the locality. The quantitative component of the research activity involved quantifying concepts and ideas that are otherwise immeasurable within the qualitative paradigm. The utilization of both approaches provided a holistic and comprehensive understanding of the selected research topic's problems.

The survey method assessed the common cause of traffic accidents, considering factors such as human errors, roadways, and vehicles; and the extent of compliance with road safety standards, considering the road condition and traffic engineering.

2.1. Delimitation and Scope of the Study

The study was conducted on the Halsema Highway, otherwise known as the Baguio-Bontoc-Banaue Road. These are adjacent to each other and located in the midland of northern Luzon. The researcher selected the two provinces, which include a portion of the Banaue route, for the study due to the high number of road traffic crashes in the area compared to other provinces in the region, as evidenced by the data on traffic crashes in 2014.

Drivers and commuters traversing the route are among the study's respondents. The respondents to this study were transport groups such as buses, van drivers' associations plying Baguio and Mountain Province via Abatan Buguias, Benguet, private companies, and governments.

2.2. Instrumentation

The questionnaire checklist served as the primary tool for data collection. Part I gathered data on the common causes of traffic accidents, considering human error, roadways, and vehicles. Part II gathered data on the extent of compliance with road safety standards, taking into account the road condition, traffic engineering, and traffic signs.

The researcher supplemented the questionnaire checklist with participatory observation and personal, informal interviews with the respondents and conducted the participatory observation by personally distributing the questionnaires to the respondents, ensuring prompt resolution of any queries. Furthermore, the researcher has accounted for the ocular inspection of cities, particularly the vehicular hotspot areas within the locale.

The study's specific problems influenced the development of the questionnaire, which measured the degree of adherence to road safety standards using the Department of Public Works and Highways' "blue book," a standard specification for highways.

2.3. Data Collection

With the permission of the heads of the concerned offices of the Municipal-Philippine National Police (PNP) and substations about the conduct of this study, a copy of their traffic crash data and/or traffic investigation report has been obtained and copied for reference and attachments.

The researcher also sought permission to extract data from the records of the Municipal Traffic Incident Investigation, the Philippine National Police (PNP), and substations along the Halsema Highway. The data gathering period commenced in the years 2018, 2019, and 2020. Most of the Municipal PNP-registrars started filling out their system of all reports from the year 2014.

2.4. Statistical Analysis

To analyze and answer the extent of compliance on road safety, the extent of human error resulting in a traffic crashes, the roadway condition, and the vehicle's defect.

The weighted mean made use of the formula:

$$X = \frac{\sum fx}{N}$$

Where: f are frequencies
N is number of cases

The analysis of the findings was computed based on the Likert Technique with a 4-point scale. The answers are interpreted with the statistical range as follows:

Scale	Statistical Range	Interpretation
4	3.26 – 4.00	Very Much Complied
3	2.51 – 3.25	Much Complied
2	1.76 – 2.50	Moderately Complied
1	1.00 – l.75	Not complied

3. Results

The human error appeared to be the most contributory factor on matters of traffic crashes in Halsema highway with a record of 1,117 cases in the last three years commencing from the year 2018, 2019, and 2020, a total of 1117 or its equivalent to 76.77% (see Table 1 in the Discussion).

The area of compliance that obtained the highest mean is road condition with a weighted mean of 2.63, interpreted as much complied (see Table 2 in the Discussion).

4. Discussion

Throughout the entire process of conceptualizing, constructing, upkeeping, and extending a road, it is imperative to consider traffic safety, as stated by Du *et al.* (2023). In their research paper, they discussed the limitations of traditional road safety evaluation methods that rely on crash and conflict technologies. These methods fail to consider the many environmental aspects that contribute to road safety. According to them, a novel approach to assessing road safety has emerged, which relies on evaluating individuals' driving behavior. Extensive research is currently being conducted to enhance road safety through the examination of driver conduct. This is due to the fact

that drivers' behaviors can vary based on their individual characteristics and the circumstances in which they are operating their vehicles.

4.1. Common causes of Traffic Crashes in the Halsema Highway

A substantial fraction of traffic accidents can be attributed to human error. This pattern of the highest numbers resulting from other contributing variables to traffic accidents is widespread in almost all jurisdictions, regardless of whether they are at the local, national, or global level. Lu *et al.* (2022), study documented an elevated occurrence of transportation and car accidents in the Philippines. Motorcycles provide a significant risk of fatalities and injuries because they lack safety equipment for both the driver and passengers, making them the main cause of such incidents. These accidents also result in injuries to pedestrians. This is concerning because these two groups of drivers are believed to be the most vulnerable to sustaining injuries in a car crash. According to a study conducted in 2023 by Agustin (2023), driver demographics, weather conditions, and road infrastructure were identified as the main elements that contribute to road accidents. To resolve this problem, it is advisable to establish and give priority to an improved driver education and awareness initiative, specifically focusing on male drivers aged 29 to 54. Are these connected to human errors? This study investigates the influence of drivers' attitudes on their engagement with the road environment, considering the attributes and state of the route.

Many drivers neglect safety measures, especially when overtaking, navigating on winding roads, speeding, and indulging in other hazardous driving habits. These behaviors contribute to the incidence of road accidents in the region. The prevalence of traffic accidents resulting from human error might be attributed to a lack of sufficient traffic education and proper driving orientation. Several drivers who acquired their licenses through intermediaries, commonly referred to as "fixers," could not pass the written and practical driving examinations conducted by the Land Transportation Office (LTO). Acquiring driver education necessitates dedicating several months to being acquainted with and adopting safe driving practices. The current predicament occurs when earning a driver's license is impractical due to the restricted period of traffic instruction seminars. An assessor from the Land Transportation Office (LTO) in Baguio City has stated that two hours is not enough time to thoroughly comprehend traffic. In addition, the drivers who often travel on these road lines often view it as a habitual route, and their knowledge of the road causes them to ignore the possible hazards of getting in accidents. Navigating the Halsema Highway requires increased attentiveness and skill in order to properly maneuver the road. Any lapses in judgment or lack of attentiveness have the potential to lead to a life-threatening situation.

Additional evidence was provided by a traffic inspector from the Municipalities of Atok and Buguias, both located in Benguet Province, to substantiate this observation. Both of them shared the conviction that human error is the main factor responsible for traffic accidents within their respective jurisdictions. The agencies stated above often attribute speeding, negligence, and lack of attention as typical causes that contribute to accidents.

The study conducted by the Regional Unit of the Highway Patrol Group-Ilocos area likewise found human errors as a significant component in causing accidents (RU1 FS#1, 2001). A recurring concern regularly raised by drivers on the Halsema Highway is the widespread incidence of high speed and reckless conduct, both of which are typical human mistakes. Bus passengers have filed concerns regarding instances of high speed, particularly among van transportation associations.

Another form of dangerous driving behavior is recklessness, which is driving without regard for the safety of other motorists. Inattentiveness, on the other hand, refers to engaging in activities while driving. The study conducted by Cruz (2022) examined reckless driving behavior among Filipino drivers. They reviewed 23 studies and found that reckless driving, which involves drivers exceeding the speed limit without considering road conditions, is a widespread issue in the Philippines. Factors such as age, gender, and educational level were identified as contributors to the prevalence of this behavior.

The research conducted by Yap (2020) investigated the factors linked to reckless driving behavior in Filipino college students. The study found that male students, individuals with a history of traffic violations, and those who consumed higher amounts of alcohol were more likely to engage in reckless driving. Additionally, the study conducted by Reyes *et al.* (2019) revealed that age, education level, and the type of vehicle driven were significantly associated with reckless driving behavior among Filipino drivers.

The "labeling theory" is sometimes associated with reckless driving and/or excessive speeding, as explored by Hamil, Miller, and Wright in their 2020 study. They investigate how the labeling theory influences individuals' views on reckless driving and their own conduct when driving. The researchers conducted a thorough examination of interviews conducted with 30 male drivers who had been found guilty of reckless driving. They discovered that the participants' self-identification as either "reckless" or "responsible" had a significant impact on their attitudes towards speeding and other dangerous driving behaviors. As stated by Livesey (2003), when a person is given a label, they will internalize it and behave in a way that supports the label. This idea, when applied to traffic operations, identifies certain drivers who can be referred to as the "dominant drivers."

Another factor contributing to traffic accidents on the Halsema Highway, as identified by a traffic investigator in Atok, Benguet, is the high number of local tourists who are unfamiliar with the road. The outcome of being unfamiliar with the route is comparable to the situation in Sablan, Benguet, as described by Cawis (2015), where the individuals involved were from the lowland area and were not acquainted with the condition of the road. The findings about human error on the Halsema Highway align with studies from the United Nations and research on traffic crashes, which indicate that 80% to 90% of traffic accidents are caused by human mistake.

Another study conducted by Lafadchan (2020) further validates that accidents on the Halsema highway are attributed to multiple variables, including driver behavior characterized by inattentiveness, excessive speed,

improper turning, and encroachment on lanes. A study conducted by Karsten (2013) at the Volvo Group of Company in Europe yielded a similar result, indicating that 90% of the occurrences were caused by human mistake. The error encompasses a range of behaviors, including exceeding the speed limit, lack of focus, driving under the influence of alcohol, poor driving habits, using a telephone while driving, and other related factors.

The aforementioned factors contributing to traffic accidents, particularly those related to human error, are significant concerns for ensuring road safety and require immediate attention. Therefore, as stated by Ramsey (2015), the solution to address this harmful driving behavior is to respond appropriately to individuals who, via their actions, endanger others. Kofi (2009), also states that addressing unsafe driving can reduce accidents. The key to successful prevention is the unwavering dedication of all pertinent sectors to ensure the implementation of road safety measures.

Below is the summary of common traffic crashes in Halsema Highway (see Table 1).

Table-1. Summary of Common Causes of Traffic crashes

CAUSES	***Years***			***Total***	***%***
	2018	2019	2020		
Human error	377	369	371	1117	76.77
Roadway condition	59	51	50	160	10.99
Vehicle defect	59	59	60	178	12.23
Total	***495***	***479***	***481***	***1,455***	

To summarize, the data indicates that human error was the primary factor contributing to accidents, comprising 76.77% of all events during the three-year timeframe. The second most frequent reason of events was the condition of the roadway, accounting for 10.99% of the total. The third most prevalent cause was vehicle defect, making for 12.23% of the total incidents. These findings emphasize the need of giving priority to reducing human error and improving infrastructure in road safety programs.

4.2. The Extent of Compliance on Road Safety Standards Considering the Road Condition, Traffic Engineering, and Traffic Signs

The Halsema Highway has experienced significant enhancements under the leadership of the former female President of the Philippines. These changes have considerably contributed to the economic growth of the region by improving access to goods and services and promoting tourism development. The project held significant strategic value for the country's main transportation networks in the northern region of Luzon. Those drivers and commuters who experienced the worst road conditions in the past would undoubtedly recognize the substantial improvement in the current road network.

The domain of traffic engineering has the second greatest level of conformity with road safety requirements, with a weighted mean of 2.56, indicating a high level of compliance. The improved and safer road conditions are credited to the involvement of technical experts who contributed to the design process. The DPWH office predominantly consists of highly skilled engineers who are experts in their particular areas of competence. They are assumed to possess expertise in their respective fields of employment.

While there is certain engineering challenges associated with road safety, efforts are being made to address these difficulties progressively. During an informal conversation with a District Engineer in the Cordillera Administrative Region, it was said that plans are in place to improve the road conditions in Benguet, including the installation of concrete guard rails to enhance safety. This enhancement will specifically address the need from certain drivers to implement engineering solutions for dangerous sections of the road.

The area of road safety with the lowest level of compliance is traffic signs, with a weighted mean of 2.46. This level of compliance is considered modest. The primary worry of motorists on the Halsema Highway is the insufficient or absent traffic signage along the road. The uproar accurately reflects the actual condition of the highway, which can only be refuted through direct visual examination. The issue is clearly evident. At this juncture, the motorist can infer that the government lacks the "political will" to address traffic issues.

Moreover, it may be deduced that traffic signs may be seen as lower in priority in the hierarchy of government projects and activities. Ofelia (2015), confirmed this discovery in her article in the Midland Courier, stating that the scarcity of signage along the main highways of Benguet contributes to the high number of automotive accidents and fatalities in the province. According to her, a Board Member in Benguet Province stated that road users have been consistently demanding the placement of more signage to address the matter. Therefore, the provincial board has authorized a resolution directed towards the Department of Public Works and Highway-Benguet to rectify the flaws and incorporate supplementary signage along Halsema Highway. According to Ofelia (2015), the two engineering districts in the province also emphasized the importance of painting the center of the roadways to provide guidance to motorists, especially during nighttime and wet conditions when visibility is limited.

Moreover, the construction of extra signs is also a result of comparable comments received from drivers and transportation organizations traveling on the roadways to Mountain Province and Ifugao. Ofelia (2015), expresses this outcry in her column, where she references not only the motorists from Benguet who attribute the insufficiency of traffic signs, but also motorists from the neighboring provinces.

The aforementioned uproar was confirmed by the DPWH Regional office- Cordillera through the report and findings of the Inspectorate team from DPWH-Bureau of quality and safety central office Manila who conducted an audit on the Halsema Highway, concluding that traffic signs must be put. The Halsema Highway is recognized as an instance of infrastructure where vehicle accidents are frequent, partially because to a deficiency of suitable signs and directional indicators. The construction of the Halsema Highway was finished in 2008, and the necessary road accessories, traffic signs, and safety devices were gradually installed. However, it has been noted that there is a lack of suitable signage.

Overall, the road markings on the Halsema Highway are officially deemed secure for transportation. The Department of Public Works and Highways National Office awarded this safety clearance. However, the warning emphasized the need of ensuring that motorists' vehicles are in optimal condition. Additionally, the office assured that they will continue to prioritize road repair along the cordillera route in the upcoming years.

Below is the result of the summary of compliance on road safety standard (see Table 2).

Table-2. Summary of Compliance on Road Safety Standard

Areas of compliance	Weighted mean	Interpretation
Road condition	2.63	Much complied
Traffic engineering	2.56	Much Complied
Traffic signs	2.46	Moderately complied
Grand mean	*2.55*	*Much complied*

The examination of the table indicates that the areas of compliance have a high level of compliance, as evidenced by a grand mean of 2.55. These findings indicate that the state of the road, traffic engineering, and traffic signs are typically well-preserved and adhere to established criteria. The findings suggest that most of these places are in compliance with the anticipated criteria, which is a favorable indication for guaranteeing public safety and promoting efficient traffic movement.

5. Conclusion

Human mistake is the primary cause of road crashes. The drivers on the Halsema Highway exhibit a lack of traffic education and a deficiency in safety-oriented attitudes.

The road condition and traffic engineering are in compliance with road safety regulations. The agencies responsible for public safety are diligently performing their jobs. However, there are challenges and concerns that need to be addressed in the field of traffic signs.

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References

Agustin (2023). Factors contributing to road accidents: A study of demographics, weather conditions, and road infrastructure. Available: https://www.irejournals.com/formatedpaper/1704728.pdf

Cawis, R. M. (2015). PNP reminds motorist to drive safely. Available: http://gov.ph/article/view/41438879329

Corrales, J. (2014). Bontoc bus accident kills at least 15 people. The philippine star. Available: https://www.philstar.com/nation/2014/04/26/1314425/bontoc-bus-accident-kills-least-15-people

Cruz, A. E. (2022). Prevalence and correlates of reckless driving behavior among Filipino drivers: A systematic review. *Journal of Transportation and Health*, 22: 1-12.

Delizo, S. (2009). Traffic management: A key to efficient and safe transportation. *Journal of Transportation Engineering*, 135(4): 247-53.

Du, Y., Zhang, J. and Zhang, X. (2023). A comprehensive review of traffic safety considerations in road construction and maintenance. *Journal of Transportation Engineering, Part B: Pavements*, 149(2): 04022025.

ITARDA (2011). *Operation or behavior unrelated to driving in japan's traffic accidents.* Institute for Traffic Accident Research and Data Analysis.

Karsten, A. (2013). Analysis of the causes of road accidents. *Journal of Safety Research*, 46: 67-74.

Kofi, A. (2009). Road safety is no accident. Available: www.un.org/press/en/2004/sgsm9224.doc.htm
Lafadchan, C. K. (2020). Mapping traffic accident in the halsema highway.
Lee, Y. and Wolfensohn, J. (2013). Fighting corruption: A report on the international experience. World bank publications.
Livesey, K. (2003). Self-fulfilling prophecies and the labeling approach in traffic psychology. *Journal of Applied Psychology*, 88(3): 555-63.
Lu, J. L., Herbosa, T. J. and Lu, S. F. (2022). Analysis of transport and vehicular crash cases using the online national electronic injury surveillance system (oneiss) from 2010 to 2019. Acta medica Philippina. Available: https://actamedicaphilippina.upm..edu.ph
Mendoza, J. (2008). *The world's most terrifying roads.* Lonely Planet.
Murtagh, B. (2014). Road crashes in ireland: A review of the literature. *Irish Journal of Psychology*, 35(3): 114-24.
Ofelia, E. (2015). Inadequate signages blamed for accidents in major highways. Available: http://www.baguiomidlandcourier/com.ph/cached
Palangchao, J. (2014). Traffic crashes now top 5 killer in ph. Manila standard. Available: https://www.manilastandard.net/news/top-stories/165131/traffic-crashes-now-top-5-killer-in-ph.html
Ramsey, R. (2015). The effects of aggressive driving on road safety. *Journal of Safety Research*, 53: 37-44.
Reyes, L. M., Santos, J. R. and Reyes, J. M. (2019). Factors associated with reckless driving behavior among Filipino drivers. *Journal of Traffic and Transportation Engineering*, 6(3): 235-44.
Tamayo, V., 2006. "Causes of road crashes in the Philippines." In *Paper presented at the 8th International Conference on Traffic and Transportation Engineering, Manila, Philippines.*
World Health Organization (2014). Road traffic injuries. Available: http://www.who.int/gho/road_traffic_collisions/en/
Yap, M. L. (2020). Factors linked to reckless driving behavior in Filipino college students. *Journal of Safety Research*, 76: 101-08.