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Original Article

Analysis of the Costs of Traffic Accidents in the City of Dili, Timor-Leste

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Abstract

The Value of Statistical Life (VSL) of residents in Dili City, Timor-Leste is examined in this research using the Willingness to Pay (WTP) method to determine how the public values reducing the risk of fatal traffic accidents. Data collection involved conducting structured face-to-face interviews in various offices and schools. Each respondent was presented with three hypothetical traffic safety programs offering risk reductions of 20%, 50%, and 65%. The associated WTP amounts were USD 12, USD 15, and USD 20, respectively. VSL was computed by dividing WTP by the corresponding percentage of risk reduction. The data were further analyzed using a binary logistic regression model, executed in R Studio software, to estimate the probability of WTP based on socioeconomic variables such as gender, age, education level, occupation, income, and cost of the proposed intervention. The regression results demonstrated a statistically significant and negative relationship between the program's cost and the willingness to pay, indicating that greater expenses lowered public acceptance. The average individual VSL was calculated at USD 524.83 for female respondents and USD 398.07 for males. Using official records of 102 traffic-related fatalities in Dili during the 2022–2024 period, the Social Value of Statistical Life (SVSL) was estimated at USD 17,830.70 for females and USD 13,524.02 for males. Based on these findings, six policy recommendations are proposed: improved road infrastructure, strengthened law enforcement, public safety education, clearer traffic signage, adequate street lighting, and enhanced pedestrian protection.

Keywords: Value of Statistical Life (VSL), Willingness to Pay (WTP), Traffic Safety, Public Policy.

1. Introduction

The evaluation of economic losses suffered by victims and their families in the context of accidents or incidents that result in death or serious injury can be carried out using the Value of Statistical Life (VSL) method. The Value of Statistical Life (VSL) estimates the economic value of reducing the risk of death or fatal injury by calculating how much people are willing to pay to reduce such risks. The amount of loss caused by a victim's death can be determined by multiplying the Value of Statistical Life (VSL) with the number of preventable fatalities, whereas the costs associated with severe injuries can be assessed by taking into account the decrease in the standard of living for the individuals who survive.

Moreover, the Value of Statistical Life (VSL) is also used to assess the economic losses experienced by the victim's family, such as the loss of household income if the victim was the primary breadwinner, and the costs of medical care and long-term recovery. By using the Value of Statistical Life (VSL), economic losses can be calculated more objectively and measurably, providing a clearer picture of the financial impact of such incidents on both the victims and the families left behind. This method is often used in public policy analysis to

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evaluate the benefits of policies aimed at reducing the risk of death or injury (Utanaka & Widyastuti, 2018).

In Dili City, the roads connecting the city center with residential areas and educational institutions are among the main routes frequently used by motor vehicles. With a recorded number of 28,719 motorcycles and 7,063 cars, and a total population of 342,505 people, the level of traffic congestion in the city is relatively high. This congestion, combined with undisciplined driving behavior, exacerbates the safety conditions on major roads. Many drivers do not comply with traffic regulations such as speeding, not wearing helmets, or ignoring traffic lights which significantly increases the potential for accidents. The high intensity of traffic on these roads increases the likelihood of traffic accidents, which not only affect public safety but also cause significant economic losses (Kariyana et al., 2024). The complexity of this issue highlights the importance of conducting an accident cost analysis on major road segments to obtain a clear and comprehensive picture of the social and economic losses incurred. The objective of this study was to estimate the Value of Statistical Life (VSL) VSL in Dili City of Timor-Leste, using the Willingness to Pay (WTP) method to measure the economic loss associated of traffic accidents and for evidence-based in the recommendation of road safety policy in Timor-Leste. As such, the findings of this analysis are particularly useful for both the government and stakeholders in developing road safety policies that are more focused and data-driven (Krug, 2012).

2. Literature Review

2.1. Traffic Safety

Road safety ensures that everyone using the road is kept safe from accidents and harm. Indonesian Law No. 22 of 2009 defines traffic safety as the implementation of measures to prevent accidents by planning, regulating, and educating the public. It also encompasses the maintenance of infrastructure, adherence to road rules by users, and oversight by authorities to guarantee safe travel and efficient traffic flow (Sugiyanto & Fadli, 2017).

Traffic safety is about more than just lowering the number of accidents - it also involves promoting a safe system approach (Natallia Rungkat et al., 2023). This method acknowledges that mistakes will happen, so the traffic system should be built to adapt and minimize the severity of injuries (Zein et al., 2024). To reach the aim of zero fatalities, factors like road user habits, infrastructure standards, vehicle health, and traffic control need to be combined (Renaldy et al., 2024).

In Indonesia, there are initiatives aimed at enhancing traffic safety such as the implementation of the National Road Safety Program and the integration of advanced technologies in traffic control. The assessment of dangerous areas, as outlined in the Indonesian National Traffic Police Regulation Number 43 of 2016, aids in pinpointing high-risk locations and determining which infrastructure upgrades should be prioritized. Inter-agency collaboration and public awareness are also essential to building a safer and more sustainable transportation system (Fariz & Kusmayadi, 2023).

2.2. Accident

An accident refers to an unforeseen incident that creates harm, such as bodily harm, property harm, or loss of life, happening suddenly and without warning. Under Indonesian Law No. 22 of 2009, a traffic accident is described as an unplanned occurrence on the road involving a vehicle, with or without other road users, leading to injuries or property damage (Rhoma, 2018). Meanwhile, according to the World Health Organization (WHO), an accident

is defined as an unintentional and unexpected event that results in injury or harm. Traffic accidents can be caused by various factors, including driver behavior, road conditions, and vehicle condition (Sawin et al., 2010).

2.2.1. Factors Causing Traffic Accidents

a. Human Factors: Driver behaviors such as speeding, lack of attention, driving under the influence of alcohol or drugs, and traffic violations are dominant causes of accidents. Psychological conditions such as stress or fatigue also play a role (Jumadil et al., 2022)
b. Vehicle Factors: Technical issues such as brake failure, worn tires, or faulty steering systems can cause accidents. Regular vehicle maintenance is crucial in preventing incidents (Sabir Gazali et al., 2022)
c. Environmental Factors: Poor weather, potholes, low lighting, and unclear road signs increase the risk of accidents. Environmental conditions should be considered in road design (Astarina et al., 2018).
d. Road Factors: Road design and infrastructure, such as sharp turns, water puddles due to poor drainage, and inadequate markings or signage, can increase accident potential (Astarina et al., 2018)

2.2.2. Types of Traffic Accidents

Based on Government Regulation No. 43 of 1993, Article 93, traffic accidents are classified as follows:

a. Minor Accidents: Involving minor damage without serious injuries. These often occur due to simple negligence, such as ignoring traffic lights or lane errors (Kusuma et al., 2018).
b. Moderate Accidents: Resulting in injuries that require medical attention but are not life-threatening. These may be caused by poor weather conditions or driver error.
c. Severe Accidents: Resulting in serious injuries or fatalities. Often involve heavy vehicles or high speeds and serious violations of traffic rules.

2.2.3. Characteristics of Accidents

The severity level of an accident is categorized into three groups: minor injury, serious injury, and death (Law No. 22 of 2009, Article 229). According to Government Regulation No. 43 of 1993, Article 93, causes of accidents may stem from human, vehicle, road, or environmental factors (Putri, 2014). Accident characteristics include the types of vehicles involved, the location of the incident (intersection or straight road), time of occurrence (day or night), and weather conditions. This information is vital for designing more effective intervention and prevention strategies.

2.3. Value of Statistical Life (VSL)

The Value of Statistical Life (VSL) is a concept used to assess the monetary value of reducing the risk of death. Within the framework of VSL research, the main focus is to understand how society values life and safety in the context of specific risks. VSL does not assign value to an individual's life directly, but rather serves as an estimate derived from the broader societal preferences regarding the reduction of mortality risks. Therefore, this conceptual framework must take into account the social, economic, and cultural factors that influence public perception of the value of life (Utanaka & Widyastuti, 2018).

2.3.1. Variables in VSL Research

a. Risk Level

Risk level is a key variable in Value of Statistical Life (VSL) research, referring to the likelihood of death resulting from a specific event, such as a traffic accident, exposure to pollution, or other health-related risks. In the context of VSL, measuring risk level is crucial because people often make decisions based on their perception of risk. The higher the perceived risk, the greater the amount individuals or society are willing to pay to reduce it. This research often uses historical data on accidents or related incidents to calculate the probability of death and assess the impact of policies or interventions aimed at reducing risk (Budhi & Utanaka, 2022).

b. Willingness to Pay (WTP)

Willingness to Pay (WTP) is a variable that reflects the maximum amount an individual is willing to pay to reduce the risk of death. WTP is commonly used in surveys and contingent valuation methods to measure the economic value of safety or health improvements. In the context of VSL, WTP helps assess how much people value risk reduction and reflects individual preferences toward safety. By aggregating WTP values from many individuals, researchers gain a more accurate perspective on the value of safety for the far larger population as a whole (Lestari et al., 2019).

c. Demographic Factors

Demographic factors such as age, gender, income, education, and geographic location also play a significant role in VSL research. These variables influence individuals' perceptions of risk and the value they place on safety for instance, older individuals may value safety more than younger ones, or those with higher incomes may be more willing to pay for risk reduction. Analyzing demographic factors allows researchers to understand variations in WTP and identify groups with specific preferences or needs related to safety. By considering these factors, VSL research can offer deeper insights into how life and safety are perceived across different segments of society, thereby informing more relevant and effective policy decisions (Budhi & Utanaka, 2022).

2.3.2. Dependent Variable (Accident Cost)

Accident cost refers to all expenditures incurred as a result of an accident, whether by the individuals involved, the public, or the government. The expenses can be divided into three primary categories: explicit costs, indirect costs, and immaterial expenses (Sugiyanto, 2010).

a. Direct Costs

Direct costs include all expenses directly associated with the accident. These comprise medical expenses for victim care, such as hospital treatment, medication, rehabilitation, and funeral costs in the event of fatalities. Additionally, direct costs also cover material losses such as damage to vehicles and road infrastructure. These expenditures are generally easy to measure and record, making them a vital component in the assessment of accident costs (Swantika et al., 2023).

b. Indirect Costs

Indirect costs refer to losses that are not directly linked to the accident but still impact the economy. These include loss of productivity due to the victim's inability to work post-accident, the cost of employee replacement, and the operational inefficiencies companies may face as a result. Furthermore, indirect costs also affect third parties—for example, road users who are delayed due to traffic congestion caused by the accident. Measuring indirect costs is often more complex than direct costs, as it involves projections and estimates (Badan Litbang PU Dinas Pekerja Umum Indonesia, 2003).

c. Non-Material / Intangible Costs

Non-material or intangible costs refer to impacts that cannot be measured numerically or monetarily but still have significant consequences for individuals and society. These include diminished quality of life for victims and their families, psychological trauma resulting from the accident, and a general sense of insecurity within the community that may influence driving behavior. Additionally, intangible costs encompass broader social impacts, such as eroding public trust in the transportation system and road safety. Recognizing intangible costs is essential to fully understand the consequences of accidents and to support more comprehensive mitigation efforts (Ristiyanto, 2023).

2.4. Previous Research

The study by Yang et al. (2016) in Nanjing, China, estimated the social value of the Value of Statistical Life (VSL) using a willingness to pay approach through a stated preference survey. The research involved respondents from both vehicle users and non-users, who were interviewed face-to-face at various public locations. The analysis was conducted using both the binary logit model and the mixed logit model, with the mixed logit model proving more accurate in capturing individual preference variations. The results showed that the average VSL for vehicle users was 3,729,493 RMB and 3,281,283 RMB for non-users. Furthermore, the study also considered the contribution of different income groups through the tax system, leading to an estimated social VSL of 7,184,406 RMB (Yang et al., 2016).

The study conducted by Budhi & Utanaka (2022) analyzes the cost of traffic accidents experienced by private vehicle users in Semarang City using the Willingness to Pay (WTP) approach. This research aims to determine how much people are willing to pay to reduce the risk of accidents by using roadworthy and safe vehicles. The data used consists of secondary data in the form of traffic accident records in Semarang City and primary data obtained from respondent questionnaires. The analysis methods used include binary logistic regression and WTP cost analysis. The results show that as a person's age increases, the tendency to reduce accident risk also increases. However, an increase in income and the number of children tends to reduce this tendency. The estimated WTP values indicate that people are willing to pay Rp119,842,000.00 to reduce the risk of serious injuries and Rp11,902,000.00 for minor injuries caused by traffic accidents (Budhi & Utanaka, 2022).

The study by Sugiyanto & Fadli (2017) analyzed traffic accident costs by comprehensively considering both economic and social aspects. The research used accident data and combined direct costs (medical expenses, property damage, funeral, and legal administration) and indirect costs (loss of productivity up to the age of 65 with an annual income increase of 5%). Most accidents involved motorcycle users on main roads, with victims predominantly being males of productive age. The cost per accident case could reach tens of millions of rupiah, depending on the severity. The largest component for fatalities was long-term productivity loss, while for serious injuries it was medical costs. The study recommended improving road safety and optimizing compensation from PT Jasa Raharja (Sugiyanto, 2010).

3. Methods

The various research methods used to address the topic at hand can be outlined by the following steps in the research process.

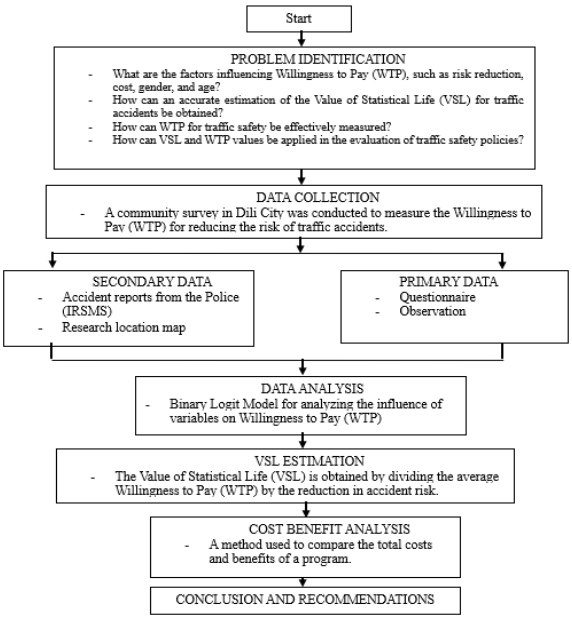


Figure 1. Research Steps

3.1 Research Design

This study uses a quantitative descriptive and exploratory approach. The quantitative method is used to estimate the Willingness to Pay (WTP), which helps calculate the Value of Statistical Life (VSL) and Social VSL. The descriptive aspect provides an overview of traffic conditions and accident risk perceptions in Dili City, while the exploratory approach identifies the economic losses caused by traffic accidents. Data were collected via surveys and analyzed statistically to support road safety policy-making.

3.2. Research Location and Period

The research took place in Dili City, Timor-Leste, a central urban area with high traffic density and a significant accident rate. It focused on major roads with high accident risks. The study was conducted from January 10 to May 30, 2025, involving primary surveys and secondary data (accidents, vehicles, demographics), with analysis carried out alongside data collection to ensure accurate results.



Figure 2. Research Location Map

3.3. Population and Sample

The population in this study includes all road users in Dili City, such as motorcycle riders, car drivers, and pedestrians, as each group has different levels of traffic accident risk. The sampling technique used is either random sampling or stratified sampling to ensure representation across various groups based on age, gender, education, occupation, and income. The sample size is determined using the Slovin formula with a 5% margin of error to ensure accurate estimation of the Willingness to Pay (WTP) and Social Value of Statistical Life (SVSL) values.

3.4. Data Collection Method (Simplified Translation)

This study uses both primary and secondary data. Primary data is collected directly from respondents through questionnaires, interviews, or observations to ensure relevance and accuracy. Secondary data is obtained from existing sources such as official reports, journals, or traffic accident records from relevant agencies like the police.

3.5. Data Analysis Technique (Translation)

Data analysis technique refers to the steps used to process and interpret data in order to draw conclusions relevant to the research objectives. This process transforms raw data into useful information for decision-making. The chosen method depends on the type of data collected either quantitative or qualitative.

3.5.1. Binary Logit Regression Analysis

Binary Logit Regression is a statistical model used to estimate the probability of an event with two possible outcomes (e.g., Yes/No, 0/1, Accident/No Accident). It is applied when the dependent variable is binary, while the independent variables can be either continuous or categorical.

$$P\ (i/C\mathrm{n}) = Pr(U\mathrm{in} \geq U\mathrm{jn}\ \forall j \in C\mathrm{n}\ )$$

In this study, since only two options are considered—willing to pay and not willing to pay this model is used.

$$U\mathrm{yes} = V\mathrm{yes} + \varepsilon\mathrm{yes} = \beta' X\mathrm{yes} + \varepsilon\mathrm{yes}$$

$$U\mathrm{no} = V\mathrm{no} + \varepsilon\mathrm{no} = \beta' X\mathrm{no} + \varepsilon\mathrm{no}$$

Thus, the option chosen by the respondent in expressing a value or cost to reduce the risk of accidents can be modeled using the following formula.

$$\mathrm{P_{n\,(i\,)}} = \mathrm{P_{yes}} = \frac{e^{\beta' x_{yes}}}{e^{\beta' x_{yes}} + e^{\beta' x_{no}}}$$

3.5.2. Calculating Average WTP

Willingness to Pay (WTP) refers to the maximum amount an individual or community is willing to pay to obtain a benefit or to reduce a negative risk, such as accidents, pollution, or other environmental impacts. Calculating the average WTP provides an estimate of the economic value of a policy or intervention that may be implemented (Budhi & Utanaka, 2022). Data from the WTP survey is processed to obtain the average WTP per respondent.

$$\text{Average } \boldsymbol{W} = \sum_{n=1}^{k} [\ \sum_{i}^{n} P_n\ (i) W\ (i)]/k$$

3.5.3. Calculating Value of Statistical Life (VSL)

The Value of Statistical Life (VSL) is an economic measure used to estimate the monetary value of reducing the risk of death. It does not assign a value to any specific individual's life, but rather reflects the amount society is willing to pay to reduce mortality risk in the context of safety, health, and public policy (Utanaka & Widyastuti, 2018).

$$\text{VSL} = \frac{\text{Average WTP}}{\Delta\text{Risk}}$$

3.5.4. Preference Survey

The Stated Preference Survey took place in Dili, the capital of Timor-Leste, in April 2025. The main goal of this research was to calculate the subjective worth of statistical life (VSL), indicating the financial value people are ready to pay to lower the chances of dying in traffic incidents. Instead of using questionnaires, the survey involved face-to-face interviews conducted in government buildings, businesses, and educational facilities throughout different parts of Dili. People from different age groups and socio-economic statuses were randomly chosen to participate in the interviews.

Prior to the interviews, participants were briefed on the goals of the study, the status of traffic accidents in Dili, and possible road safety initiatives that could lower the likelihood of fatalities. To make it easier to grasp, risk mitigation was described as a reduction in the percentage of traffic fatalities annually. The interview consisted of three sections: (1) socio-economic characteristics of respondents, (2) previous experience with traffic accidents (personally or involving family), and (3) a choice-based scenario asking whether respondents would be willing to pay certain amounts (e.g., $20/year for a 20% reduction, $15/year for 50%, or $12/year for 65%) to support road safety programs. These programs include infrastructure improvements, traffic signage, and street lighting enhancements.

4. Results and Discussion

4.1. Research Results

4.1.1. Respondent Characteristics

The participants in this research were comprised of 55% males and 45% females. None of them were below the age of 20, 17% were aged between 21–30, 31% were aged between 31–40, 31% were between 41–50, and 21% were over 51 years old. In terms of occupation, 51% were employed in the private sector, 49% were government employees, and none were students. When it came to education, none had only completed elementary or junior high school, 5% had finished high school or vocational school, 64% held a diploma or bachelor's degree, and 31% possessed a master's or doctoral degree. In regard to their monthly earnings, 9% made less than $250.00, 72% earned between $250.00–$500.00, 19% brought in between $500.00–$1000.00, and none earned over $1000.00.

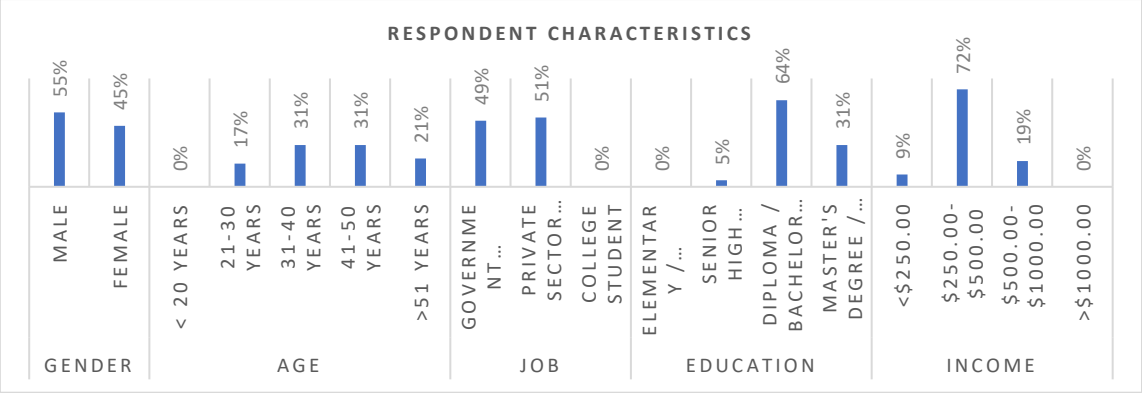


Figure 3. Percentage of Respondents' Characteristics

4.1.2. Accident Severity Level and Main Causes of Accidents

The survey findings indicate that a significant portion of respondents have never been involved in an accident, while others have experienced minor, moderate, or fatal accidents. The leading causes of these accidents are attributed to human, vehicle, road, and environmental factors. Specifically, human factors, including negligent behavior and traffic violations, play a significant role in causing accidents. These results underscore the importance of enhancing awareness about road safety and making infrastructure enhancements to prevent accidents in Dili City.

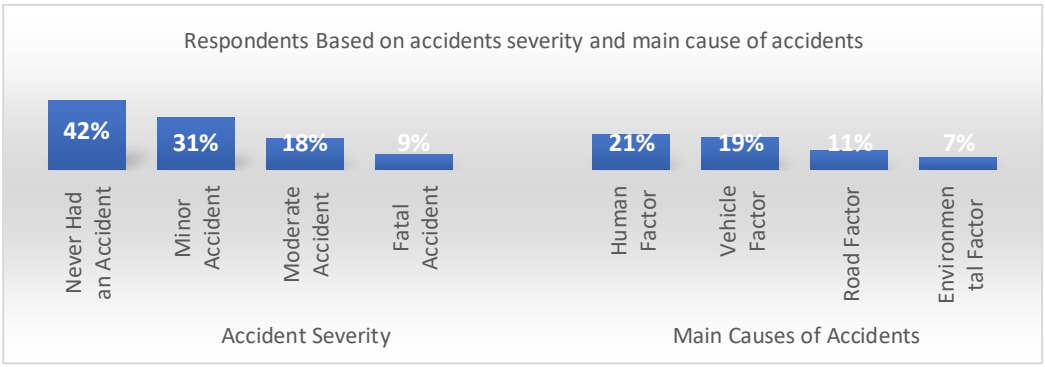


Figure 4. Percentage of Respondents Based on Accident Severity Level and Main Causes of Accidents

4.1.3. Factors Influencing Willingness to Pay for Risk Reduction

The study examined people's readiness to spend money on lowering the chances of traffic accidents by using binary logit models. Elements such as gender, age, job, education, and income were looked into, as they impact personal preferences and the financial ability to invest in road safety enhancements. Surveys showed that the public is highly aware of traffic dangers, with many individuals ready to invest in better infrastructure and education. It was discovered that on average, people were willing to pay between USD 12.00-15.00 annually for a 50% decline in risk. The main factors affecting people's willingness to pay included the reduction in risk percentage, cost, gender, and age. Men and older participants were more inclined to contribute financially. On the other hand, job, education, and income did not have a notable effect on willingness to pay. These results emphasize the significance of taking socio-economic aspects into account when creating public safety policies, indicating that involving the public can enhance safety measures on the roads of Dili.

Table 1. Binary Logit Model Equation for Reducing Traffic Accident Risk

Variable	Estimate	Std. error	t value	Pr(> t)
ASC.DILI	1.7258	0.1354	12.749	< 2e-16 ***
Percentage	2.0675	0.1389	14.885	< 2e-16 ***
payment amount	-1.0533	0.1234	-8.537	< 2e-16 ***
Gender	0.3217	0.1061	3.032	0.00243 **
Age	0.2396	0.1048	2.287	0.02221 *
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				

$$Logit\ (P) = \ln(\frac{p}{1-p}) = 1.7258 + 2.0675 * percentage$$

$$-1.0533 * Payment\ amount + 0.3217 * Gender + 0.2396 * Age$$

4.1.4. Analysis of Respondents' Perceptions of Road Safety Strategies in Dili, Timor-Leste

According to the poll results, most participants showed enthusiastic backing for the six suggested methods to enhance road safety. Many emphasized the importance of upgrading infrastructure, listing it as the primary concern. A total of 78 individuals believed that the presence of damaged roads or potholes greatly adds to the occurrence of traffic accidents. More than 70 respondents emphasized the importance of law enforcement, particularly in addressing violations such as illegal street racing and riding without a helmet. Road safety education was also considered necessary, with 65 respondents noting that current campaigns are not widespread enough, especially among students and young drivers.

In addition, 60 respondents supported the installation of clearer traffic signs, pointing out that many high-risk areas lack adequate warnings or directional signs. Approximately 72 respondents highlighted poor street lighting as a major factor in nighttime accidents and supported the addition of more streetlights. Lastly, 68 respondents emphasized the need for better pedestrian and non-motorized vehicle facilities, citing the lack of proper crosswalks and sidewalks. Overall, this analysis reflects strong public support for the proposed strategies and a desire for their prompt implementation to reduce traffic accident risks in Dili.



Figure 5. Percentage of Respondents' Perceptions Based on Road Safety Strategies in Dili City

4.1.5. Subjective Value of Statistical Life (VSL)

Based on the analysis of respondents' Willingness to Pay (WTP) data, an estimate of the subjective Value of Statistical Life (VSL) was obtained. This represents the economic value that the public is willing to pay to reduce the risk of death due to traffic accidents. The Value of Statistical Life (VSL) estimate was calculated by comparing the amount of accident risk reduction offered in the scenario with the stated Willingness to Pay (WTP) from respondents. Since WTP values and risk perceptions vary among individuals, the resulting VSL is also not fixed and forms a distribution. The analysis of the Value of Statistical Life (VSL) in Dili for the period of 2022 to 2024 provides a comprehensive picture of the economic value placed by the public on reducing the risk of traffic-related fatalities. VSL estimates were calculated in two forms per capita and total based on three valuation scenarios: 20%, 50%, and 65%.

According to the average per capita VSL for females in Dili shows an increasing trend year by year. In 2022, the estimated per capita VSL for females was USD 305.25 at the 20% level, USD 396.18 at the 50% level, and USD 461.13 at the 65% level. In 2023, this increased to USD 313.49 at 20%, USD 406.87 at 50%, and USD 473.57 at 65%. The upward trend continued in 2024, with the per capita VSL for females reaching USD 321.95 at 20%, USD 417.86 at 50%, and USD 486.36 at 65%.

According to the data presented in Figure 5, there is a clear correlation between the cost of the program and the willingness of women to participate, with reductions in risk ranging from 20% to 65%. The regression analysis found that as the cost variable increases, women are less likely to pay for the program. This aligns with economic principles that suggest higher prices lead to decreased demand. While women prioritize safety, financial constraints play a significant role in their decisions. Therefore, policies aimed at road safety should be affordable and accessible to all, including vulnerable groups like women.

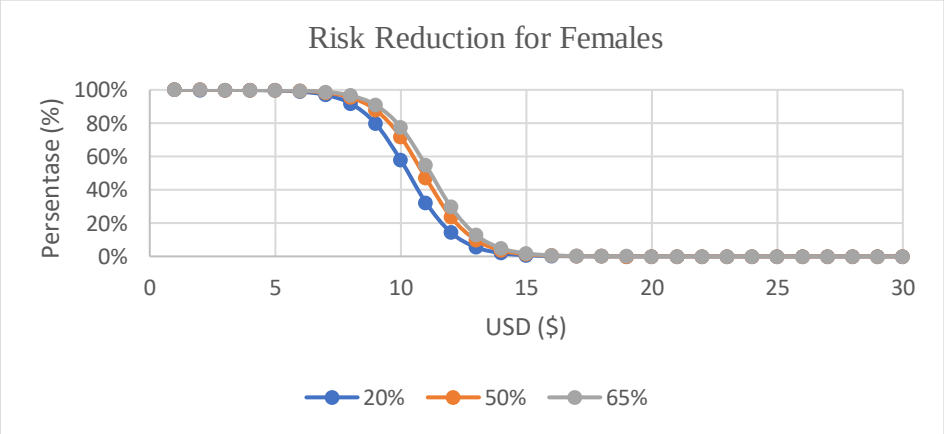


Figure 6. The Relationship Between Cost and Women's Willingness to Pay (WTP) for Risk Reduction in Traffic Accidents

Based on the average results of the Value of Statistical Life (VSL) per capita for males in Dili City, there is a year over year increasing trend. In 2022, the estimated per capita VSL for males was USD 305.25 at the 20% level, USD 396.18 at the 50% level, and USD 461.13 at the 65% level. In 2023, the values increased to USD 313.49 at the 20% level, USD 406.87 at the 50% level, and USD 473.57 at the 65% level. This upward trend continued in 2024, with the per capita VSL for males reaching USD 321.95 at the 20% level, USD 417.86 at the 50% level, and USD 486.36 at the 65% level.

Based on Figure 6, which illustrates risk reductions of 20%, 50%, and 65% for males, the regression results indicate that the cost variable has a negative effect on willingness to pay

(WTP) in traffic risk reduction programs. The higher the proposed cost, the lower the likelihood that males are willing to pay, suggesting that rational consideration of expenses plays a significant role in their decision-making. Although the average WTP values for males are generally lower than those for females, their response patterns remain consistent with microeconomic principles, where increasing costs lead to decreased interest in participation or consumption. These findings highlight the importance of designing road safety programs that take into account the payment capacity of different social groups, ensuring that policies are broadly accepted and do not hinder participation due to excessive financial burdens.

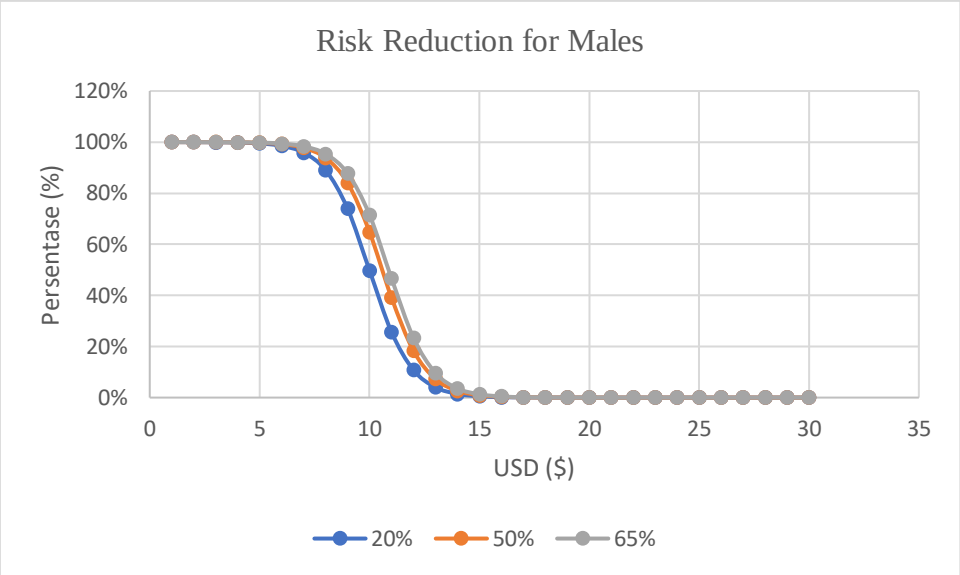


Figure 7. The Relationship Between Cost and Male Willingness to Pay (WTP) for Risk Reduction

Comparative analysis shows that the per capita Value of Statistical Life (VSL) for women in Dili City consistently exceeds that of men at all levels (20%, 50%, and 65%) during the 2022–2024 period. The average VSL for women is approximately USD 524.83, while for men it is around USD 398.07, resulting in a difference of about USD 126.76. This gap reinforces the regression results indicating that the gender variable has a positive and significant effect on the Willingness to Pay (WTP) value, meaning that women (as the reference category) tend to have a higher willingness to pay for reducing the risk of death. This reflects that women are more sensitive to safety risks and assign greater economic value to risk mitigation efforts, making it essential for policymakers to consider gender perspectives in the evaluation and planning of public participation-based safety programs in Dili City.

4.1.6. Social Value of Statistical Life (VSL)

The Value of Statistical Life (VSL) in Dili City changes according to different scenarios and observation years, as shown in research results. The Social Value of Statistical Life (SVSL) method is employed to assess the overall impact, calculating the economic worth of lives lost in traffic accidents within society. SVSL is calculated by multiplying the individual VSL by the actual number of fatalities in a given year.

According to the SVSL results for females, in 2022, with 38 fatalities, the estimated SVSL was USD 13,080.45 for the 20% scenario, USD 18,016.46 for the 50% scenario, and USD 27,148.10 for the 65% scenario. In 2023, with 29 fatalities, the female SVSL values were recorded at USD 10,251.79, USD 14,120.39, and USD 21,277.30 respectively. Meanwhile, in

2024, with 35 fatalities, the estimated female SVSL reached USD 12,706.94, USD 17,502.01, and USD 26,372.89.

Based on the SVSL results for males, in 2022, with a total of 38 deaths, the male SVSL was recorded at USD 11,599.64 for the 20% scenario, USD 15,054.85 for the 50% scenario, and USD 17,522.86 for the 65% scenario. In 2023, with 29 fatalities, the SVSL values were USD 9,091.21, USD 11,799.23, and USD 13,733.53, respectively. Meanwhile, in 2024, with 35 fatalities, the estimated male SVSL increased to USD 11,268.41 for the 20% scenario, USD 14,624.96 for the 50% scenario, and USD 17,022.50 for the 65% scenario.

Based on the analysis of the Value of Statistical Life (VSL) and the Social Value of Statistical Life (SVSL), which reflect the public's willingness to pay for reducing the risk of death caused by traffic accidents in Dili City, several strategic policy recommendations can be formulated. The values of VSL and SVSL serve as quantitative foundations to assess the cost-benefit feasibility of safety interventions and strengthen evidence-based decision-making that aligns with public preferences.

The research findings indicate that the people of Dili highly value the preservation of life, as reflected in the high VSL and SVSL figures. This suggests that policies that can effectively reduce the risk of traffic accidents will provide significant social and economic benefits. Therefore, policy recommendations that may be implemented include: (1) improvement of road infrastructure such as installation of zebra crossings, safe sidewalks, traffic lights, and facilities for people with disabilities; (2) consistent enforcement of traffic laws, including monitoring helmet use, compliance with speed limits, and prohibition of drunk driving; (3) road safety education targeting young drivers through culturally and linguistically appropriate approaches; (4) installation of clear signage at strategic points; (5) adequate street lighting in high-risk accident areas; and (6) protection of pedestrian pathways to improve safety for non-motorized road users. Through this approach, road safety policies can become more inclusive, responsive, and aligned with the perceptions and values of the people of Dili City.

4.2. Discussion

The results of this study indicate that the people of Dili City have a high level of awareness regarding the importance of traffic safety, as reflected in the significant values of VSL and SVSL. These findings suggest that the public is willing to pay to reduce the risk of death from traffic accidents, meaning they consider safety a priority.

The difference in VSL values between men and women also reflects varying preferences based on gender, with women showing higher VSL values. This can be interpreted as an indication that women are more concerned with personal or family safety. In addition, the trend of increasing values over the years shows a growing public perception of the importance of safety.

From a policy perspective, these results provide a strong foundation for the government to allocate budgets to more targeted traffic safety programs. VSL and SVSL values can be used as indicators in cost-benefit analyses, so decisions related to infrastructure development, education, and law enforcement can be more effective and aligned with public preferences.

5. Conclusion

This study aims to analyze the Value of Statistical Life (VSL) of the people in Dili City, Timor-Leste, using a Willingness to Pay (WTP) approach for reducing the risk of death due to traffic accidents. The survey was conducted through direct interviews with respondents in offices and schools, presenting three scenarios of risk reduction: 20%, 50%, and 65%.

Respondents' WTP ranged between USD 12, USD 15, and USD 20, depending on the level of risk reduction offered. The survey results indicate that the people of Dili are willing to pay a certain amount to reduce the risk of death from traffic accidents, reflecting their awareness of the importance of road safety.

The logit model estimation results show that the percentage of risk reduction, cost, gender, and age significantly influence the WTP of Dili residents. Risk reduction percentage and age have a positive effect, cost has a negative effect, and women show a higher WTP than men. This indicates that socio-economic characteristics influence preferences for reducing accident risk.

The analysis results indicate that the people of Dili are willing to pay (WTP) to reduce the risk of death from traffic accidents, with an average WTP of USD 1.2 for the 20%, 50%, and 65% risk reduction scenarios. The estimated VSL reflects the subjective value placed on safety, with women having a higher VSL (USD 524.83) than men (USD 398.07). These findings highlight the economic importance of safety perception and gender differences in preferences.

The analysis of the Social Value of Statistical Life (SVSL) shows that the people of Dili place high economic value on reducing fatalities from traffic accidents. With a total of 102 fatalities during 2022–2024, the average SVSL for women reached USD 17,830.70 and for men USD 13,524.02 across the 20%, 50%, and 65% risk reduction scenarios. This value difference reflects gender sensitivity to safety and underscores the importance of SVSL as a data-driven and equitable basis for policy formulation.

The increasing trend in VSL from year to year reflects the growing public awareness in Dili of the importance of life safety. These findings reinforce the urgency of strengthening road safety policies through infrastructure development, public education, and more effective law enforcement, as well as interventions that align with the preferences and willingness of the public to reduce accident risk.

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5.2. Competing interests

This research was conducted solely to fulfill one of the graduation requirements of the study program and does not involve any personal, financial, or institutional interests that could influence the results. The author declares that there are no competing interests in the preparation of this report.

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