# Towards Safer Roads: A Study on Road Safety Knowledge and Practices among Public Transport Users in Namibia

Robert Ambunda [1] and Kevin Chomore [1]

[1] Present address: University of Namibia, Department of Civil and Mining Engineering, Namundjembo Mengela Street, Ongwediva, 9000, Namibia

*Corresponding author: Tel: +264 (0)65 232-4017; Email address: rambunda@unam.na

## Abstract

Road traffic injuries are a leading public health concern in Namibia, which has one of the highest road fatality rates per capita in the world. This study examines the level of road safety knowledge and the safety practices of public transport users and operators in Namibia, identified as the most common mode on national rural roads. A cross-sectional survey was conducted on respondents from six Namibian regions, identified as having the most hazardous national rural road sections, to assess their awareness of road safety rules and their self-reported behaviours. The study reveals that despite most respondents recognising the general importance of road safety, there are significant gaps in specific knowledge, such as the perception that speeding does not impact crash risk severely. Generally, an inadequate level of road safety knowledge and poor road safety practices was identified among teenagers and young adults (15 to 29 years). These poor practices predispose young road users to higher crash risks. Although teenagers and young adults exhibited poor road safety behaviours, statistical odds ratios indicated that desirable road safety knowledge and practices improved with age. The study found that the poor road safety status quo was exacerbated by infrequent road safety campaigns, limited enforcement of traffic rules, and unsafe road safety practices by public transport operators. The study identified possible shortcomings in existing road safety programmes and highlighted areas that require attention to effectively promote proactive road safety reforms. Furthermore, the study established baseline measures of the levels of knowledge, attitudes, and perceptions regarding national rural roads. The baseline measures developed in the study can serve as a base comparison tool for future studies, to guide the development of proactive safety measures as advancements and transformations take effect in road safety.

*Keywords*: Road safety, user knowledge, user attitudes, user perceptions, national roads, odds ratios, Namibia.

*Received: October 2024*
*Received in revised form: March 18, 2025*
*Accepted: April 17, 2025*
*Published: April 24, 2025*

## 1. Introduction

Road safety is a fundamental aspect of transportation and plays a significant role in the social and economic development of any country. An estimated 1.3 million road-related traffic deaths are recorded annually, according to the Global Status Report on Road Safety (Peden *et al*., 2017). Despite low levels of motorisation in low- and middle-income countries (LMICs), LMICs account for 90 % of all road-related traffic deaths globally, with a high fatality risk to the young population in the prime working age between 21 and 45 years (Butchart and Mikton, 2014; Peden *et al.,* 2017). In

Namibia, road traffic injuries (RTIs) have become a critical public health and development concern, consistently ranking amongst the countries with the highest road fatality rates (estimated at 23.9 per 100 000 population) in the region and globally (Adanu, Jones, and Odero, 2020; Ambunda and Sinclair, 2022). Furthermore, a 2012 statistical report on road traffic crashes by the Namibian National Road Safety Council (NRSC) revealed that motorists and passengers accounted for the majority of fatal injuries in road crashes, making up 54 % of cases (Namibia National Road Safety Council, 2012). RTIs are currently the third leading cause of death in Namibia, accounting for a significant share of injury-related mortalities (Chatukuta *et al.,* 2022).

Public transport (PT), being the most dominant mode of transport in Namibia, plays a vital role in mobility for many Namibians. Several studies have found that more than half commuters in Namibia rely on public transport for daily travel (Jones *et al.,* 2022; Ambunda, Knoell, and Kost, 2023). In urban areas and long-distance routes, the public transport system is dominated by informal taxi services and minibuses, which account for roughly 90 % of all public transport trips (Jones *et al.*, 2022). However, this predominantly informal public transport sector is beset with several challenges, with previous studies citing poor service quality and low levels of safety (GIZ, 2015; ITS and BP Consulting Engineers, 2018; Ambunda and Nakale, 2020). Many of the underlying factors influencing road safety in Namibia are attributed to driver behaviour and poor road safety culture (Ambunda and Sinclair, 2020). These poor road safety practices must be addressed through social and economic remedial programmes to mitigate the negative impacts of road safety on communities and to create a safe system for all users (Amweelo, 2016; Adanu, Jones, and Odero, 2020). Therefore, given the stark road safety issues, it is a challenge that cannot be tackled by any single stakeholder (Legal Assistance Centre, 2016). Road safety is a multi-sectoral issue, influenced by numerous factors such as management of road infrastructure and traffic, road user behaviour and awareness, vehicle conditions, legislation and law enforcement, and the provision of efficient and effective health care services (Shetty *et al*., 2017; Papadimitriou *et al*., 2018).

Relatively limited research to date has examined the awareness and practices of public transport users (operators and passengers) in the Namibian context. Even if drivers are trained and road conditions improved, a lack of knowledge and unsafe behaviour by public transport users (such as not wearing seatbelts or distracting drivers) could negate safety gains (Atombo *et al.,* 2016; Ambunda and Sinclair, 2024). Understanding the level of road safety knowledge among public transport users, and how they perceive and practice safety measures, is crucial for designing comprehensive interventions. Thus, the study aims to investigate the level of road safety knowledge and practices among public transport users in Namibia. This aims to support law enforcement officers and policymakers in identifying critical road safety areas that may need improvement and guide necessary reforms of road safety frameworks.

## 2. Literature review

Road users' road safety knowledge and practices have a significant impact on road safety outcomes. This is highlighted in the "safe system" approach, which recognises the importance of road user behaviour as a critical element alongside safe roads and safe vehicles in effective road safety management (Adanu *et al.,* 2019). Several studies have highlighted that improving road user knowledge and compliance with traffic rules can lead to substantial reductions in crashes and casualties (Small and Runji, 2014; Bonnet, Lechat, and Ridde, 2018; AfDB, 2020). It is estimated that if all road users strictly adhered to traffic laws and regulations, road crash related injuries and fatalities would decline by up to 27 % and 48 % respectively (WHO, 2013; Abebe and Belayneh, 2018). This implies that a significant portion of crashes and crash severity could be prevented through better knowledge and behaviour alone.

Road safety knowledge encompasses the understanding of traffic laws, safety practices (such as seatbelt use, proper child restraints, and safe crossing procedures), and awareness of the risks associated with behaviors like speeding or drunk driving (Bax, Leroy, and Hagenzieker, 2014; Heydari *et al.,* 2019). Importantly, knowledge serves as a precursor to safe attitudes and practices. Several studies have shown that a lack of road safety knowledge often leads to unsafe road behaviour. Thus, education and awareness, strengthened through legislation, are considered as key foundational pillars for road injury prevention (WHO, 2013; Wegman, 2017; WHO, 2023). Despite the emphasis on strengthening legislation to support the safe system approach, the 2023 Global Status Report on Road Safety highlighted that only 7 countries globally have legislation enacted that meet the World Health Organisations (WHO) best practices for key risk road safety risk factors such as speeding, drinking and driving, helmet and seatbelt usage and child restraint systems (WHO, 2023).

In Namibia, several interventions and programmes have been implemented in an effort to raise public awareness to road safety, with the National Road Safety Council (NRSC) and the Motor Vehicle Accident Fund of Namibia (MVA) involved in several awareness activities on encouraging safe driving and road behaviour (MVA, 2018). However, a study on the effectiveness on these programmes found that despite a high percentage of Namibian road users claiming to be aware of road safety in general, they showed a low awareness for specific road safety rules and regulations , revealing a concerning gap with regard to road safety knowledge (Iipinge and Owusu-afriyie, 2014). This indicated that users might acknowledge the importance of road safety, yet not understand key regulations and safe practices. The gap between the general awareness and specific knowledge on road safety is important, because specific knowledge (such as knowing the legal requirement to wear a seatbelt in the back seat, or knowing how to safely board and alight from a bus) directly informs actual behaviour (WHO, 2015; Segui Gomez *et al.,* 2021). This is particularly concerning in Sub Saharan Africa (including Namibia), where the relationship between road safety attitudes and behaviours is sometimes also associated to traditional beliefs and cultural norms, often influencing riskier road behaviours and downplaying the risk of non-compliance with traffic laws (Heydari *et al.,* 2019).

Furthermore, a challenge exists for public transport users, particularly in Sub Saharan Africa, where passengers often tolerate and, in several instances, expect minor inconveniences as part of using informal public transport (Madejski, Amushila, and Kulatau, 2014). This is more so a concern in Namibia, as public transport accounts for 47 % of road crashes, often involving young and inexperienced drivers (Adanu, Jones, and Odero, 2020). A culture can develop where unsafe behaviour is normalised, with users may not demand that drivers slow down, and they may board vehicles even when they are clearly overcrowded or the driver is driving recklessly. Over time, this normalisation can erode the perceived importance of safety measures among the public.

In summary, significant deficits in specific knowledge and in the adoption of safe practices among road users. Particularly within the popular informal public transport environment, where passengers often do not practice basic safety measures and may not be fully aware of their importance and responsibilities regarding road safety (WHO 2015). This study builds on the literature by investigating what public transport users in Namibia know and how they behave regarding road safety. Understanding these aspects and insights is a prerequisite for designing interventions that truly make public transport safer for the people who depend on it.

## 3. Materials and methods

### *3.1. Study design and area*

A quantitative cross-sectional survey design was employed in the study to assess road safety knowledge, attitudes, and practices among road users on national rural roads in Namibia. The quantitative approach was selected to allow for the objective measurement of the study data,

enabling statistical analysis to identify trends, associations, and key risk factors among Namibian road users. The cross-sectional survey was undertaken from November 2019 to December 2019 in six Namibian regions (see **Figure 1**). The regions selected for the study were identified to account for the highest fatal road incidences per 100 000 population. A geospatial analysis, using the planar Kernel Density Estimation (KDE) technique, was conducted to identify road crash incidence hotspots on the Namibian national road network (see **Figure 2**), facilitating the selection of study areas. A KDE bandwidth of 500 m and a cell size of 20 m by 20 m were applied in Quantum Geographic Information System (QGIS) for the spatial analysis. A detailed summary of all the study sites (settings) where the cross-sectional survey was conducted, along with the corresponding regions, is provided in **Table B.1** and illustrated in **Figure A.1** in the Appendices.

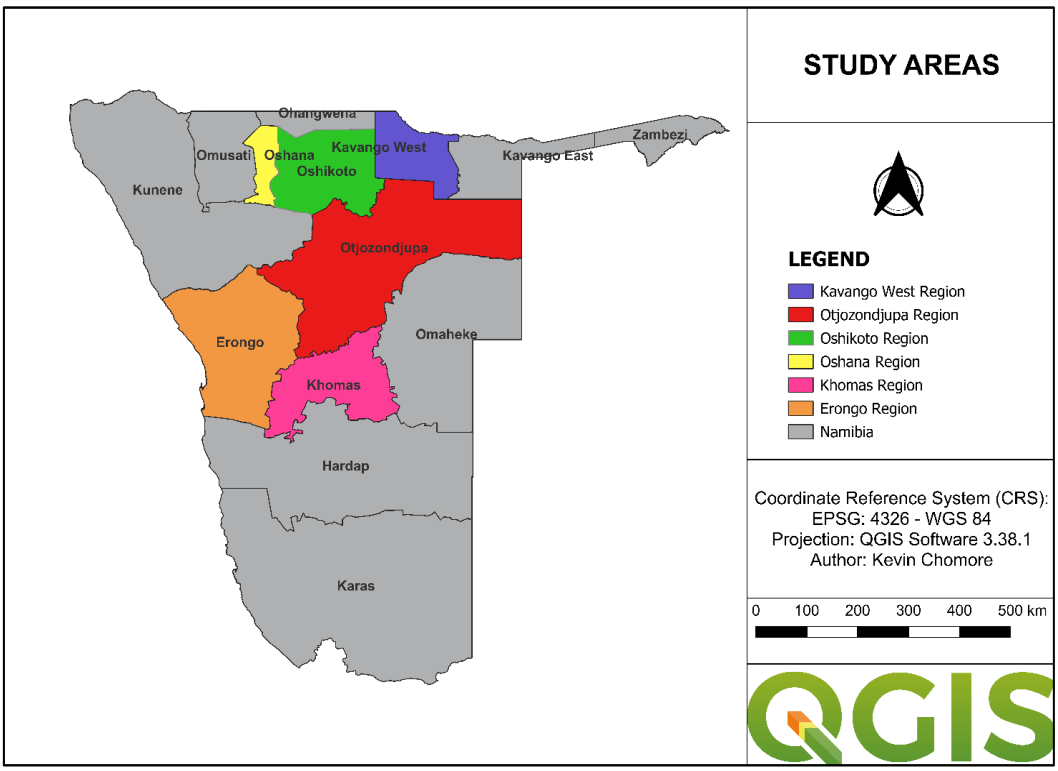


**Figure 1**: Study Areas – 6 Namibian Regions

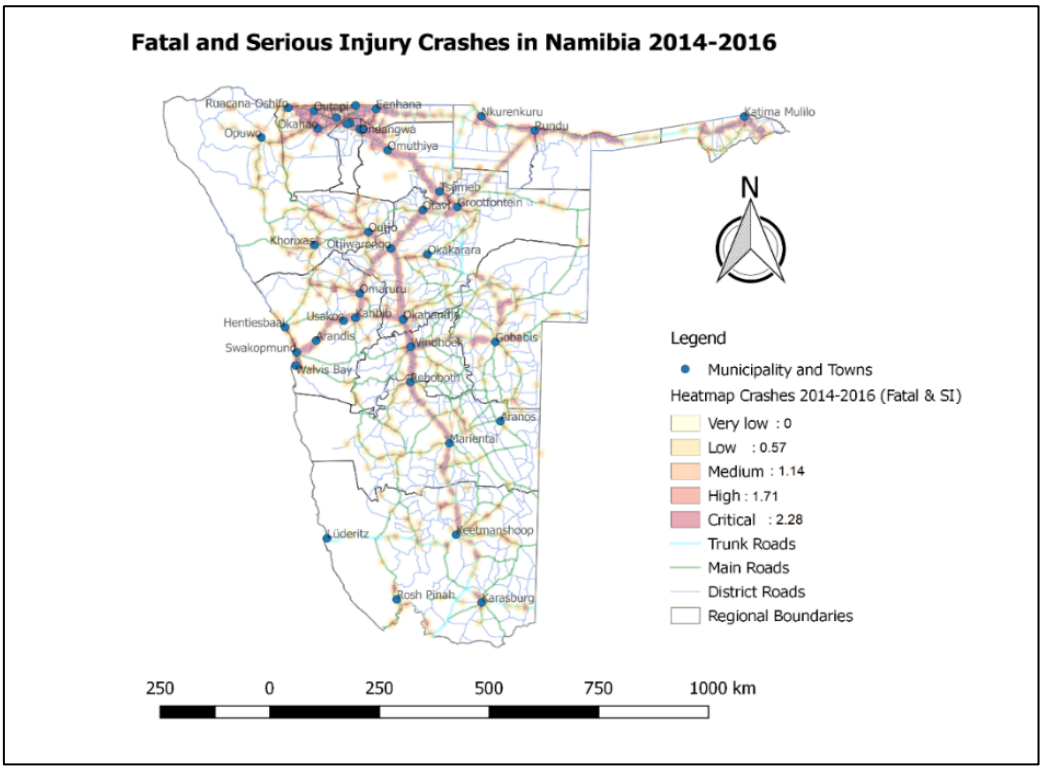


**Figure 2:** Fatal and serious injury crashes on Namibia national rural roads 2014-2016

### *3.2. Sampling approach*

A single-stage cluster sampling method was used to select individuals for the cross-sectional survey. Survey data was collected without regard for the population density. The sampling strategy allowed for the exclusion of population density of the study points as participants on the national roadway had different origins and destinations within the study regions. The minimum sample size was determined using the Statistical Power Analysis (SPA) test, which accounts for Type II error. The maximum acceptable p-value for a Type II error was set at 0.2 (20 %), implying that to ensure accurate and reliable effect detection, the statistical test power (1- β) had to be at least 0.8 (80 %). The α-level for the power analysis was set at 0.05, with a desired 0.8 (80 %) power, ensuring a strong likelihood of detecting a statistical effect if one existed. Based on these parameters, the required minimum sample size was calculated to be 1,592 participants across the six regions (see **Table 1**), achieving a 95 % confidence level with a ± 2 % margin of error and a 5 % non-response rate. Ultimately, data was collected from 1 637 participants for this study.

**Table 1** Results of statistical power analysis

| | **Sample Size Calculation<br>One Proportion, Z, Chi-Square Test<br>H0: Pi = Pi0** |
|---|---|
| | ***Value*** |
| **Null Proportion (Pi0)** | 0.5000 |
| **Population Proportion (Pi)** | 0.5299 |
| **Alpha (Nominal)** | 0.0500 |
| **Actual Alpha (Exact)** | 0.0502 |
| **Power Goal** | 0.8000 |
| **Actual Power (Normal Approx.)** | 0.8643 |
| **Actual Power (Exact)** | 0.8658 |
| **Required Sample Size (N)** | **1 592** |

The power goal versus sample size (exact) plot (see **Figure 3**) indicated that accurate inferences could be drawn from the study population, as the actual sample size (1 637 respondents) exceeded the required minimum sample size (1 592) at an 80 % power level.

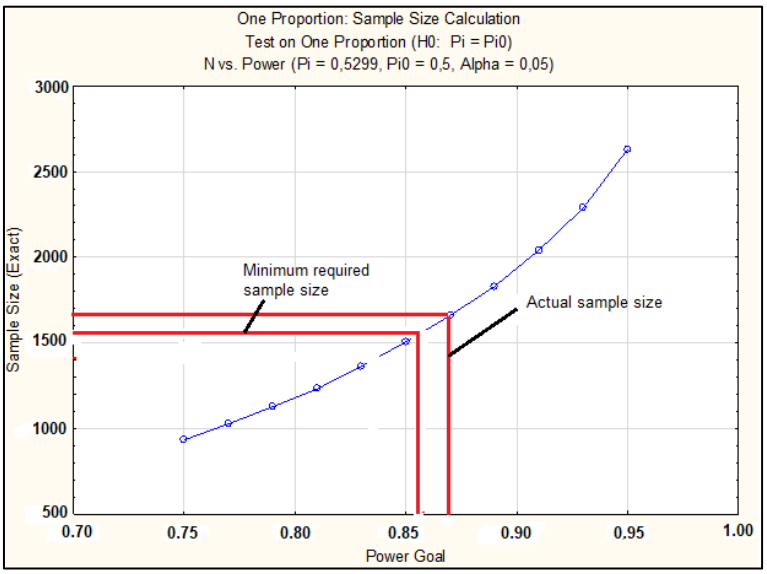


**Figure 3** Statistical power analysis for minimum sample size

### *3.3. Data collection methods*

The data for this study was collected using a cross-sectional survey conducted through a questionnaire. The study questionnaire sought to assess the level of road safety knowledge, attitudes, and practices of the study participants. Thus, the questionnaire included questions about the general perceptions and attitudes toward road safety, levels of road safety knowledge and education, as well as traffic law enforcement and speed. Additionally, the questionnaires collected participants' demographic information such as age, gender, modes of transport, and places of origin. Responses regarding the impact of certain practices on road safety were categorised using a scale – No problem (0), Mild (1 to 3), Moderate (4 to 7), and Severe (8 to 10) – to measure the level of knowledge and general road safety attitudes of participants. The categories ranging from 0 to 7 were grouped to indicate poor to average road safety knowledge, while categories from 8 to 10 were representative of desirable road safety practices and knowledge levels. This classification facilitated the analysis of associations between various road safety risk factors and participants' knowledge levels and practices. The fieldwork for the cross-sectional survey was conducted by research assistants (see **Figure A.2**). Interviews were conducted on both weekdays and weekends to ensure a more representative dataset of participants traveling on different days and to assess their knowledge and practices concerning road safety.

### *3.4. Management and analysis of data*

Data collected from survey participants was tabulated and analysed using SPSS version 25, with results presented as frequencies and proportions. The study employed Multinomial binary logistics regression to compute Odds Ratios, assessing the strength of associations between various risk factors and road safety knowledge levels and practices. Associations were tested at a 95 % confidence level, with a probability value of less than 5 % (p-value < 0.05) considered statistically significant in the study.

## 4. Results and discussion

### *4.1. Baseline characteristics*

A total of 1 637 participants were recruited for the study, with their baseline characteristics summarised in **Table 2**. Over two-thirds (70 %) of respondents were between the ages of 15 and 40 years, and the majority (61 %) were male. A more detailed breakdown of age and gender distribution of the participants is shown in **Figure A.3**. Nearly half (48 %) of the participants originated from rural areas, while fewer than a quarter (14 %) were from large towns. Passenger cars were the most commonly used mode of transport, used by 44 % of participants, followed by sedan taxis (23 %), and long-distance buses (14 %), with bicycles being the least common mode of transport at just 1 % (see **Table 2**).

**Table 2** Respondents' baseline characteristics

| Variables | Categories | No. (%) |
|---|---|---|
| **Age groups (Years)** | 15-19 | 55(3) |
| | 20-24 | 138(8) |
| | 25-29 | 389(24) |
| | 30-39 | 571(35) |
| | 40-49 | 296(18) |
| | 50-59 | 93(6) |
| | 60+ | 48(3) |
| | Unknown | 47(3) |
| **Gender** | Male | 1 003(61) |
| | Female | 634(39) |
| **Place of origin** | Big city | 235(14) |
| | Large town | 224(14) |
| | Small town | 390(24) |
| | Country side (rural area) | 788(48) |
| **Participants who reported to know how to drive** | Yes | 1 065(65.) |
| | No | 572(35) |
| **Participants (Drivers) assessment of their driving skills** | Excellent | 265(25) |
| | Good | 632(59) |
| | Average | 155(15) |
| | Below Average | 13(1) |
| **Most common mode of transport** | Passenger cars | 727(44) |
| | Walking | 184(11) |
| | Bus | 230(14) |
| | Sedan taxi | 380(23) |
| | Cycle | 22(1) |
| | Minibus taxi | 37(3) |
| | Other | 57(4) |

Among the 65 % of participants who reported knowing how to drive, the majority (84 %) rated their driving skills as above average, while fewer than a fifth (15 %) perceived their driving skills as “average” or “below average” (see **Figure A.4**). Drivers often view their own standards of good driving as superior to other drivers, as there is no standard definition for “good driving”. Instead, individuals develop their own standards – a slow and cautious driver could have a totally different definition of “good driving” than someone who tends to drive fast and aggressively (Roy and Liersch, 2013). Even though the majority of respondents who drive perceived their driving skills as “above average”, they did not regard other drivers as equally skilled. The majority (84 %) of participants

perceived the driving behaviour and skills of other drivers as a hazard to safety on the roads, as they described them as “not very good” or “terrible” on the roads (see **Figure A.5**).

*4.2. Road safety attitudes, knowledge (education), and perceptions*

The majority (61 %) of participants acknowledged road safety as a major issue on Namibian roads, attributing most concerns (70 %) to driver behaviour and unsafe road safety practices (see **Figure A.6**). Public transport operators were identified as the most notable road rules offenders, followed by poor road conditions (10 %) and the presence of animals (wild and domestic) on roadway environments (9 %). When asked about the level of knowledge of road safety (see **Table 3**), more than half of the participants in the Khomas (56 %) and Erongo (54 %) regions reported that they had an “average” knowledge of road safety. These regions also had the highest proportion (13 % each) of participants reporting a “very high” level of road safety knowledge. However, a concerning majority (53 %) of participants in the Kavango West region reported a “below average” or lower level of road safety knowledge.

**Table 3** Respondents' road safety knowledge by study regions

| | Study Regions | | | | | |
|---|---|---|---|---|---|---|
| **Participants road safety knowledge rating** | **Kavango West** | **Otjozondjupa** | **Oshikoto** | **Oshana** | **Khomas** | **Erongo** |
| Very high | 3 % | 7 % | 10 % | 11 % | 13 % | 13 % |
| Above average | 26 % | 30 % | 23 % | 10 % | 23 % | 18 % |
| Average | 19 % | 34 % | 41 % | 46 % | 56 % | 54 % |
| Below average | 34 % | 9 % | 11 % | 18 % | 5 % | 12 % |
| Limited | 19 % | 20 % | 15 % | 14 % | 3 % | 3 % |

In Namibia, several published learners and drivers test manuals are available to help applicants prepare for both the licence tests (Beutel *et al*., 2017). Participants reported varying perceptions regarding the quality of road user education (see **Figure A.7**). More than half (57 %) of the participants reported a “good” or “very good” quality education. The learner’s licence test in Namibia assesses knowledge of road rules, traffic signs, traffic signals, road markings, and vehicle controls (Tjozongoro, 2016). The low levels of road safety education among road users (see **Table 3**) may be attributed to the infrequent dissemination of road safety messages and programmes within communities (see **Figure A.8**). More than two-fifths (45 %) of respondents noted that they saw/heard road safety-related messages once a month, with more than a third (36 %) of respondents stating that they “hardly ever” heard or saw such messages. A markedly low number (19 %) of respondents reported frequent exposure (every day or a few times a week) to road safety messages and campaigns.

The study found that more than half (57 %) of participants aged 20 to 24 and half (50 %) of the participants aged 25 to 29 reported speeding as a “mild” danger to road safety. Young adults (20 to 29 years) demonstrated a lower understanding of how high speeds influence the safety of road users compared to participants aged 30 years and above. In contrast, over 80 % of participants in the older age groups (30 years and above) displayed a better comprehension of the dangers of speeding on road safety, as they reported that driving fast had a “severe impact” on road safety (see **Figure A.9**).

The poor understanding of the impact of speed among the young road user population predisposes this proportion of the road users to higher crash risks. A statistical report by the Namibian National Road Safety Council (NRSC, 2012) on road crashes in Namibia also highlights the high crash risk and casualty rates among young road users (aged 15 to 29) on Namibian roads.

The study examined factors influencing road safety knowledge and practices among the study population using Odds Ratios (see **Table 4**). Taking a poor score as the reference category, demographic variables were analysed for association with the road safety knowledge at 95 % confidence level. Several significant associations such as age groups, ability to drive, and place of origin, were identified between demographic variables and participants' desirable knowledge levels. For the continuous variable age, for every one year added to age, the odds of a participant's road safety knowledge level being desirable rather than poor was 1.036 times higher. For the categorical variable "can you drive", while holding other demographic variables constant, the odds of a participant demonstrating desirable road safety knowledge levels and practices was 2.714 times higher for those with the ability to drive, at a statistically significant level ($p < 0.05$). Conversely, the odds of participants from larger towns and cities demonstrating desirable knowledge was 0.653 (1-0.347) times less, compared to those from smaller towns and rural areas. Further analysis revealed that the odds of a male participant demonstrating desirable knowledge was 1.083 times higher than a female participant. Despite male participants exhibiting a higher desirable knowledge odds ratio, the association between participants' gender and knowledge level was not statistically significant in the observation.

**Table 4** relationship between respondents' demographics and road safety knowledge and practices

| **Participants Covariates** | | **Knowledge level** | | **Sig. (P <0.05)** | **Exp (B)/ Odds Ratio (95% CI)** |
|---|---|---|---|---|---|
| | | Poor (Score <8) n (%) | Desirable (Score ≥8) n (%) | | |
| **Age groups** | <40 | 738 (64) | 415 (36) | *0.000* | 1.036 (0.914-1.072) |
| | ≥40 | 318 (72.8) | 119 (27.2) | | |
| **Gender** | Male | 611 (60.9) | 392 (39.1) | 0.293 | 1.083 (0.888-1.134) |
| | Female | 233 (36.8) | 401 (63.2) | | |
| **Can you drive** | Yes | 409 (38.5) | 652 (61.5) | *0.003* | 2.714 (0.641-1.671) |
| | No | 375 (65.6) | 197 (34.4) | | |
| **Place of origin** | Larger towns & Cities | 129 (28.1) | 330 (71.9) | *0.041* | 0.347 (0.084-1.582) |
| | Smaller towns and rural areas | 517 (43.9) | 661 (56.1) | | |

## 5. Conclusion and recommendations

The study has revealed an inadequate level of road safety knowledge and poor road safety practices among a significant number of the study participants. As evidenced by the findings, more than half of the teenagers and young adult participants (15 to 29 years) demonstrated poor road safety practices, lacking an understanding of speed as a risk factor for road users and perceived fast driving as having only mild effects on road safety. Poor road safety training and education among the lower age groups should be urgently addressed, as they are the most exposed road users and exhibit poor road safety practices. Moreover, the road safety situation was exacerbated by poor law enforcement and a lack of road safety campaigns. These two major concerns need to be prioritised and addressed in policy and intervention efforts, as they were frequently highlighted by the study

participants. Public transport (PT) was observed as a vital and popular mobility mode in almost all the regions of Namibia. Almost half of all the participants noted its importance in providing mobility to road users using the national roads. A study by Ambunda and Nakale (2020) corroborates the importance of PT in the Namibian mobility sector. Despite the regular use of public transport among the survey participants, the safety offered by the PT modes leaves much to be desired, as a significant proportion of the users reported experiencing poor and dangerous driving behaviour in PT modes regularly. This literature review underscores the multifaceted nature of road safety challenges in Namibia. Key factors contributing to road safety include inadequate knowledge and awareness, unsafe practices, and enforcement gaps. Lessons from regional and international contexts provide valuable insights for developing effective interventions. Future research should focus on behavioural studies, evaluations of existing campaigns, and targeted strategies for vulnerable road users. To address these challenges, the study recommends periodic community-based awareness campaigns and regular assessments of road users on good road safety practices. A tailored, regular road safety campaign, supported by stringent policy measures, may need to be developed to address the shortcomings observed in the study in the various regions.

## Practical applications

Road safety is a shared responsibility, and this study underscores the role of all users should not be overlooked in efforts to create safer roads in Namibia. More so due to the high levels of poor road safety practices among teenagers and the young adult populations highlighted in the study. The study finding have several practical implications towards (i) targeted education and campaigns to address poor road safety practices and knowledge gaps among young users, and (ii) strengthening enforcement, which if coupled with road safety knowledge, can incentivise behavioural change. Policymakers and enforcement agencies in Namibia will have to develop more robust enforcement strategies and relatable road safety measures and campaigns, geared towards addressing negative road user and driving cultures among the existing driver community and instilling safe road user qualities.

## Conflict of interest

The authors declare no conflict of interest. This study received no external funding.

## Acknowledgements

The authors acknowledge the Namibian National Road Safety Council for providing the road crash data utilised in the study.

## References

Abebe, Mandefro Terefe, and Moltot Zewdie Belayneh. 2018. “Identifying and Ranking Dangerous Road Segments a Case of Hawassa-Shashemene-Bulbula Two-Lane Two-Way Rural Highway, Ethiopia.” *Journal of Transportation Technologies* 08 (03): 151–74. https://doi.org/10.4236/jtts.2018.83009.

Adanu, Emmanuel Kofi, Steven Jones, and Kenneth Odero. 2020. “Identification of Factors Associated with Road Crashes among Functionally Classified Transport Modes in Namibia.” *Scientific African* 7: e00312. https://doi.org/10.1016/j.sciaf.2020.e00312.

Adanu, Emmanuel Kofi, Praveena Penmetsa, Dustin Wood, and Steven L. Jones. 2019. “Incorporating Systems Thinking Approach in a Multilevel Framework for Human-Centered

Crash Analysis.” *Transportation Research Interdisciplinary Perspectives* 2. https://doi.org/10.1016/j.trip.2019.100031.

AfDB. 2020. “Road Safety Framework and Guidelines.”

Ambunda, R, and M Sinclair. 2022. “Traffic Safety and the Rural Road Environment: Assessing the Impact of Combined Roadway Conditions on Crash Incidence.” *Journal of the South African Institution of Civil Engineering* 64 (4): 38–48. https://doi.org/10.17159/2309-8775/2022/v64n4a4.

———. 2024. “THE IMPACT OF EXISTING AND ‘ IDEAL ’ ROAD DESIGN CHARACTERISTICS ON ROAD SAFETY : THE CASE OF NAMIBIA.” In *42nd Southern African Transport Conference*. Pretoria, South Africa.

Ambunda, Robert, Verena Knoell, and Chris Kost. 2023. “Africa Regional Overview.” In *Transport, Climate and Sustainability Global Status Report - 3rd Edition*.

Ambunda, Robert, and Eveline Nakale. 2020. “Towards Safe, Inclusive and Sustainable Public Transport Solutins in Namibia.” In *8th International Conference on Sustainable Development*. http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI.

Ambunda, Robert, and Marion Sinclair. 2020. “Road Safety Perceptions and Attitudes in Namibia.” *Namibia Road Safety Project*. Stellenbosch.

Amweelo, Moses. 2016. “Invited Article The Road Safety in Namibia : Focus on Road Traffic Accidents,” 103–19.

Atombo, Charles, Chaozhong Wu, Ming Zhong, and Hui Zhang. 2016. “Investigating the Motivational Factors Influencing Drivers Intentions to Unsafe Driving Behaviours: Speeding and Overtaking Violations.” *Transportation Research Part F: Traffic Psychology and Behaviour* 43: 104–21. https://doi.org/10.1016/j.trf.2016.09.029.

Bax, Charlotte, Pieter Leroy, and Marjan P. Hagenzieker. 2014. “Road Safety Knowledge and Policy: A Historical Institutional Analysis of the Netherlands.” *Transportation Research Part F: Traffic Psychology and Behaviour* 25 (PART B): 127–36. https://doi.org/10.1016/j.trf.2013.12.024.

Beutel, Vanessa, Alexandra Chretien, Melissa Daigle, Michael Morlock, Sarah Jane Wodin-Schwartz, and Robert Kinicki. 2017. “A Roadside Observation Study for Measuring Seat Belt & Child Restraint Use,” no. May. http://www.wpi.edu/Academics/Projects.

Bonnet, Emmanuel, Lucie Lechat, and Valéry Ridde. 2018. “What Interventions Are Required to Reduce Road Traffic Injuries in Africa? A Scoping Review of the Literature.” *PLoS ONE* 13 (11). https://doi.org/10.1371/journal.pone.0208195.

Butchart, Alexander, and Christopher Mikton. 2014. “Global Status Report on Violence Prevention 2014.” Geneva, Switzerland.

Chatukuta, Mitchel, Nora Groce, Jennifer S. Mindell, and Maria Kett. 2022. “Perceptions of Healthcare Workers on Road Traffic Injuries in Namibia: An Untapped Source of Expertise.” *Disability and Rehabilitation* 44 (18): 5184–90. https://doi.org/10.1080/09638288.2021.1929512.

GIZ. 2015. “Capacity and Network Development of Non-Motorised Transport in Northern Namibia.” Windhoek, Namibia.

Heydari, Shahram, Adrian Hickford, Rich McIlroy, Jeff Turner, and Abdulgafoor M. Bachani. 2019. “Road Safety in Low-Income Countries: State of Knowledge and Future Directions.” *Sustainability* 11 (22): 1–29. https://doi.org/10.3390/su11226249.

Iipinge, Sakaria M, and Petrina Owusu-afriyie. 2014. “Assessment of the Effectiveness of Road Safety Programmes in Namibia : Learners ’ Perspective.” *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)* 5 (6): 532–37.

ITS, and BP Consulting Engineers. 2018. “City of Windhoek Non-Motorised Transport Strategy.” Windhoek, Namibia.

Jones, S, E Adanu, A Adams, and R Ambunda. 2022. “Safe, Inclusive Public Transport in Africa-Challenges and Opportunities Identified in Ghana and Namibia.” In *Transport and Mobility Futures in Urban Africa*, edited by R A Acheampong, K Lukas, M Poku-Boansi, and C Uzondu, 217–33. Springer. https://link.springer.com/chapter/10.1007/978-3-031-17327-1_14.

Legal Assistance Centre. 2016. “Proposals for Enhancing Road Safety in Namibia.” Vol. 20. Windhoek.

Madejski, Eugene, R Amushila, and L Kulatau. 2014. “The Effect of Regulations on the Efficiency of Bus and Taxi Services in Windhoek.” Polytechnic of Namibia. http://ir.polytechnic.edu.na/handle/10628/480.

MVA. 2018. “Annual Report 2018.” Windhoek, Namibia. https://doi.org/10.1017/CBO9781107415324.004.

Namibia National Road Safety Council. 2012. “Road Accidents in Namibia Statistical Report 2012.” Vol. 1. Windhoek. https://doi.org/10.1017/CBO9781107415324.004.

Papadimitriou, E, K Machata, R Bauer, S Stadlbauer, A Soteropoulos, S Daniels, R Elvik, A Ziakopoulos, A Theofilatos, and G Yannis. 2018. “Safety Effects of Infrastructure Road Safety Measures.” In *7th Transport Research Arena TRA 2018*. Vienna.

Peden, Margie, Richard Scurfield, David Sleet, Dinesh Mohan, Adnan Hyder, Eva Jarawan, and Colin Mathers. 2017. “World Report on Road Traffic Injury Prevention.” *World Health Organisation*. Geneva. https://doi.org/10.1016/j.puhe.2005.09.003.

Roy, Michael M., and Michael J. Liersch. 2013. “I Am a Better Driver than You Think: Examining Self-Enhancement for Driving Ability.” *Journal of Applied Social Psychology* 43 (8): 1648–59. https://doi.org/10.1111/jasp.12117.

Segui Gomez, Maria, Tawia Addo-Ashong, Veronica Ines Raffo, and Pieter Venter. 2021. “Road Safety Data In Africa.” *Road Safety Data In Africa*. https://doi.org/10.1596/37235.

Shetty, Ranjitha S., Vandita Pahwa, Vibha S. P., Asha Kamath, and Suma Nair. 2017. “Road Safety and the Community: An Awareness Survey among the Coastal Population of Karnataka.” *International Journal Of Community Medicine And Public Health* 5 (1): 116. https://doi.org/10.18203/2394-6040.ijcmph20175767.

Small, M, and J Runji. 2014. “Managing Road Safety in Africa: A Framework for National Lead Agencies-SSATP Working Paper No. 101.”

Tjozongoro, F.W. 2016. *Namibian Learner’s & Driving Licence Manual*. 4th ed. Windhoek.

Wegman, Fred. 2017. “The Future of Road Safety: A Worldwide Perspective.” *IATSS Research* 40 (2): 66–71. https://doi.org/10.1016/j.iatssr.2016.05.003.

WHO. 2013. “Strengthening Road Safety Legislation: A Practice and Resource Manual for Countries.” *WHO Library Cataloguing* 3 (4): 99. http://apps.who.int/iris/bitstream/10665/85396/1/9789241505109_eng.pdf.

WHO. 2015. “Road Safety in the African Region.” https://doi.org/10.4324/9781003025566-29.

WHO. 2023. *Global Status Report on Road Safety 2023*. *World Health Organization, Geneva, Switzerland*. Vol. 15.

## Appendices

*Appendix A: Figures*

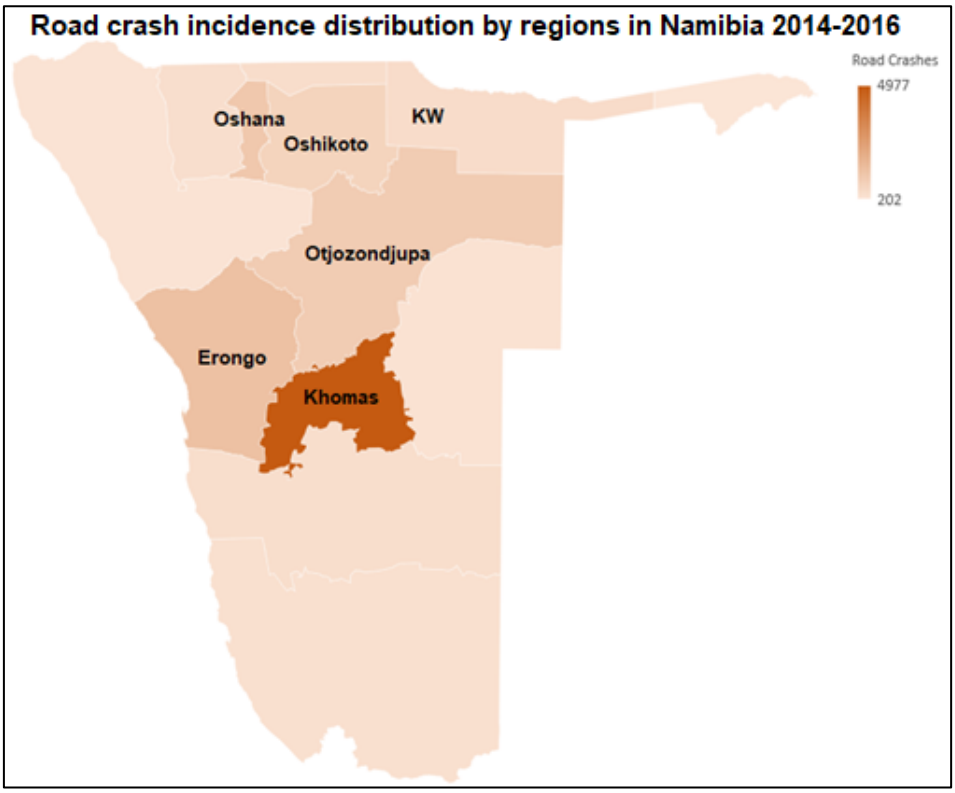


**Figure A.1:** Road crash incidence distribution by regions in Namibia 2014 -2016


**Figure A.2:** Research assistant interacting with respondents

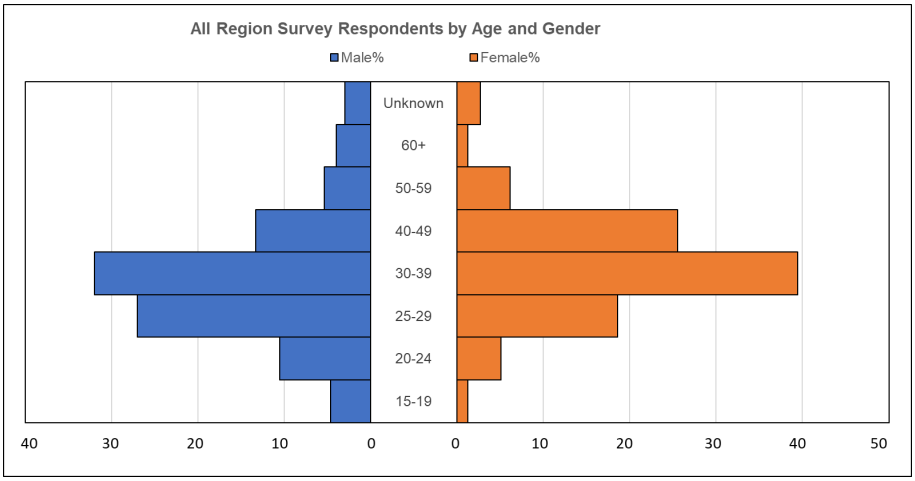


**Figure A.3:** Respondents distribution by age and gender

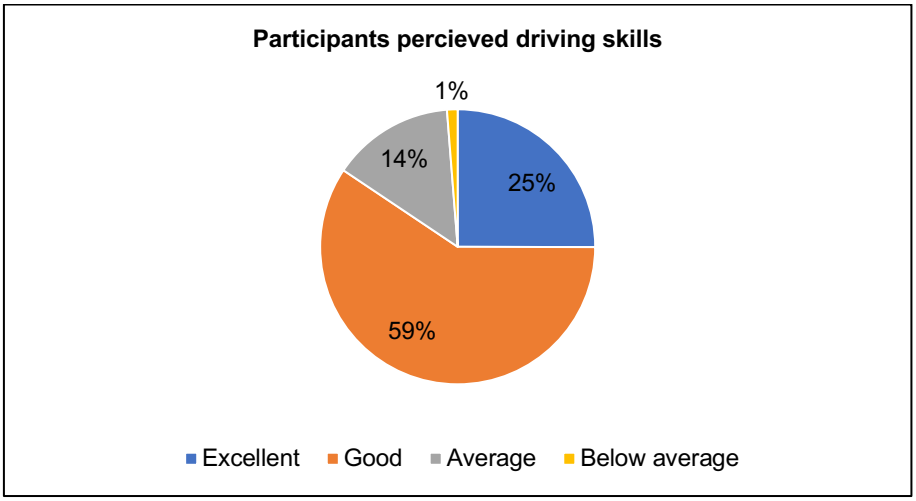


**Figure A.4:** Respondents perception of their driving skills

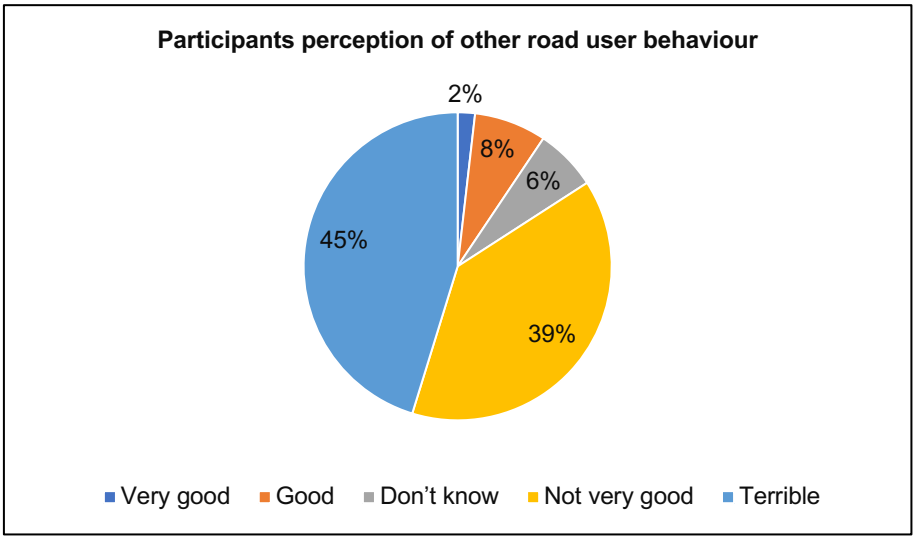


**Figure A.5:** Respondents perception of other road user's behaviour

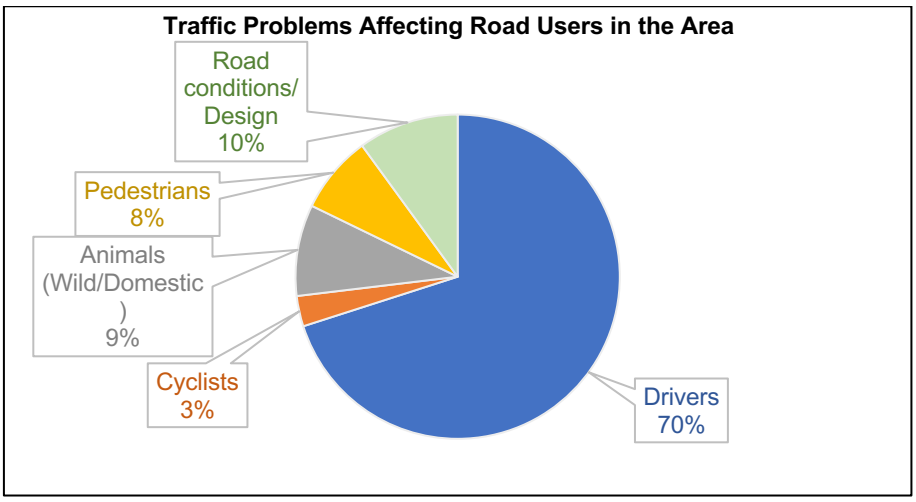


**Figure A.6:** Traffic problems reported to affect road users

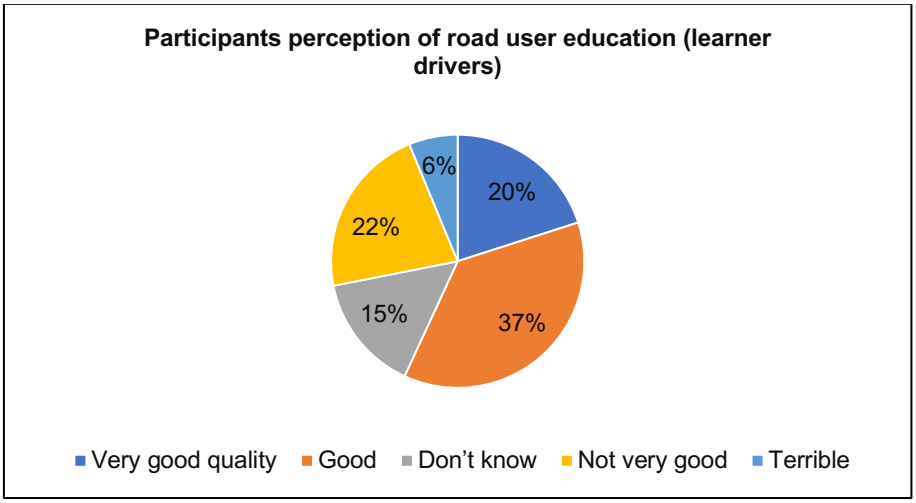


**Figure A.7:** Respondents perception of road user education

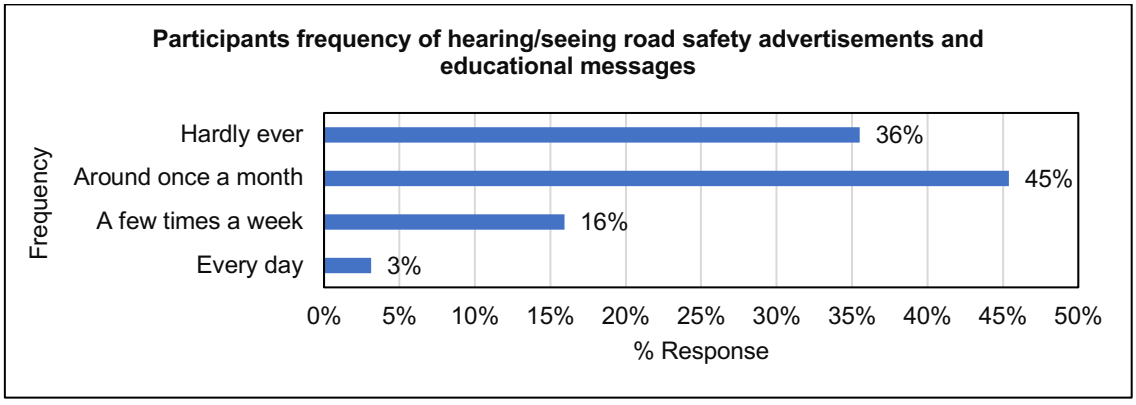


**Figure A.8:** Regularity of road safety messages / advertisements

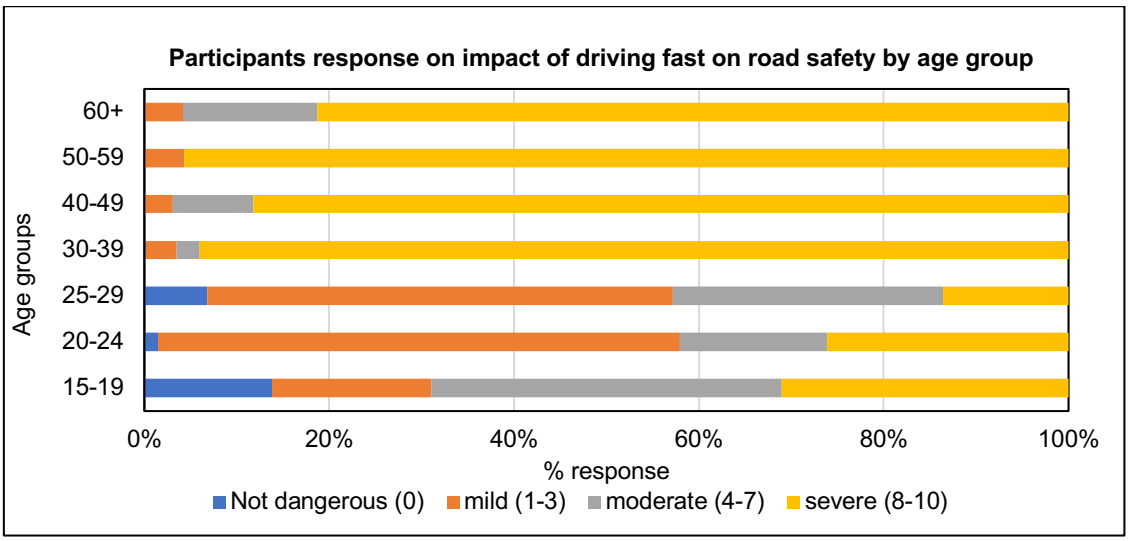


**Figure A.9:** Speed impact on road safety by age group

*Appendix B: Tables*

**Table B.1:** Survey locations

| Regions | Survey Locations |
|---|---|
| Erongo | 1. Karibib Engen Service Station<br>2. Total Karibib Service Station |
| Kavango West | 1. Rundu Engen Service Station<br>2. Rundu Puma Filling Station |
| Khomas | 1. Monte Christo Service Station (Katutura)<br>2. Total B1 City (Katutura)<br>3. Engen Presidents Crossing (Klein Windhoek)<br>4. Shell Petron station (Eros) |
| Otjozondjupa | 1. Shell Service Station<br>2. Puma Service Station (Opposite Otjiwarongo Spar) |
| Oshana | 1. Engen Service Station (Next to Oshakati Spar)<br>2. Thomas Filling Station (Oshakati)<br>3. Shell Select (Ongwediva)<br>4. Omwandi Service Station (Next to Cashbuild Ondangwa) |
| Oshikoto | 1. Engen Fuel Station (Next to Shoprite Tsumeb) |