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Enhancing Road Safety Decision-Making through Analysis of Youth Survey Data: A Descriptive Statistical Approach

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Abstract: Unsafe roads have posed a significant threat to public health, economic stability, societal well-being, and national interests for numerous decades. Road traffic accidents constitute the primary cause of death among Morocco's youth population. This study facilitates a comprehensive exploration of the opinions held by youth in Morocco with regard to decision-making in road safety. Through a rigorous analysis of their perspectives, the research endeavors to scientifically categorize these opinions. 97.8% of the surveyed youth strongly agree that road safety holds national importance and 58% recognize road safety as a personal responsibility. The overarching aim is to provide decision-makers with valuable insights to enhance the implementation of effective strategies and actively involve youth in shaping future road safety initiatives.

Keywords: road safety; youth; Morocco; traffic accident; decision-making



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1. Introduction

One of the main issues facing the world today is the frequency of traffic accidents and fatalities. Approximately 1.3 million people die each year as a result of road traffic crashes [1]. Road traffic accidents have a disproportionate impact on low- and middle-income countries, accounting for 90% of all road traffic deaths despite these nations having only 60% of the world's vehicles [2].

Mobility promotes economic growth by allowing each individual to actively participate in the societal environment [3]. This significance is particularly evident among the young, underscoring their critical role in promoting societal progress [4]. However, scientific data suggest that mobility has significant negative consequences as well [5–7]. Every year, an estimated 400,000 people aged 15 to 29 die in road traffic incidents worldwide, highlighting the adverse impact of mobility on this demographic [8].

The high rate of injuries and deaths caused by road traffic accidents constitutes a global road safety emergency [9,10]. Traffic crashes are the primary cause of death for children and youths aged 5 to 29 [1,2,11]. Prevention efforts aimed at improving road safety have often focused on modifying the behavior of youth crossing the street [12]. Meaningful involvement with young people may help foster a sense of ownership of the road safety issue while also cultivating a new cohort of road safety activists with a fresh perspective on the future of mobility [13].

Focusing on the specific case of Morocco, recent statistics from 2022 indicated an alarming number of 3499 fatalities caused by road traffic accidents [14]. Furthermore, The

country bears a substantial economic burden due to road accidents, with estimated costs of 2 billion EUR in 2019, equal to 2% of the country's GDP (gross domestic product) [15]. Additionally, Morocco has a very young population, with around 30% of Moroccans aged 15 to 29 years. This age group is significant, comprising around 9 to 10 million youths [16].

Moroccan youth, like their counterparts worldwide, constitute the age group most affected by road accidents, with a considerable fatality rate among those aged 15 to 34, reaching 38.15% in 2022. Individuals aged 15 to 24 accounted for 17.37% of the deaths in this age group [14].

Multiple indicators have been identified as important contributors to road accidents among young people in an investigation conducted by the National Committee for the Prevention of Traffic Accidents (CNPAC), now known as the National Road Safety Agency (NARSA). These indicators include driving under the influence, with 2% attributable to alcohol intake, 2% to drug usage, and 2% to sleep deprivation and fatigue. Furthermore, 19% of the events were attributed to excessive speed. The survey also found that 10% of the incidents were caused by a lack of safety precautions [17].

Involving youths in planning processes significantly benefits community health and well-being, individual youth development, and society as a whole [18]. However, challenges with youth involvement arise when it comes to genuine participation and access to decision-making in political parties and parliament [16]. To address this, the present study measured Youth Attitudes toward Road Safety and Decision-Making in Morocco. Data were collected using a questionnaire aimed at gathering youth opinions and perceptions of road safety issues and analyzed through descriptive statistics. The focus on youth is paramount due to their unique position as both vulnerable road users and future drivers shaping road safety strategies. By understanding their attitudes and behaviors, we can gain valuable insights into how to effectively target road safety interventions and policies.

The objective of this exploratory study included (i) analyzing the anticipated impact of youth perspectives on road safety decision-making, (ii) employing descriptive statistical methods to summarize and present the findings of youth attitudes towards road safety and decision-making findings effectively, and (iii) exploring the potential implications of the survey results for enhancing road safety strategies.

The remainder of the paper is organized as follows: Section 2 provides an overview of the existing literature. Section 3 explains the research demographics, data collection, and processing methods used. Section 4 presents the results of the analysis of youth survey data using quantitative research. Section 5 discusses the results and their significance, followed by a conclusion drawn from the paper.

2. Literature Review

The World Health Organization (WHO) global consensus statement on adolescent and youth engagement defines meaningful engagement as an inclusive, intentional, mutually respectful partnership between adolescents, youths, and adults. This partnership involves sharing power, valuing respective contributions, and integrating young people's ideas, perspectives, skills, and strengths into the design and delivery of programs, strategies, policies, funding mechanisms, and organizations that affect their lives and their communities [19].

The Safe System Approach advocated by Green et al. emphasizes the importance of integrating a safe system into the policy environment to ensure optimal outcomes. This approach views road safety issues as stemming from human fallibility, human tolerance, and potentially harsh road networks that require an accommodating transportation system [20]. Road safety risk assessment is crucial for reducing casualties and property damage [21].

Macauley et al. have analyzed several studies that explored the viewpoints of young individuals regarding policy co-creation [22], while Horwath et al. found that young people described the "ideal facilitator" as someone who embraces a "democratic approach". In their efforts to engage young people in a community research project [23], Charles et al. compiled a set of essential principles for ethical collaboration, and their research was perceived by young people as a genuine "partnership", wherein "each party can have their

voices heard” [24]. They established key principles to create an “ethical framework” that grants young people agency and ownership of the research output, ensuring their basic protection throughout the research process [24].

Previous studies provide valuable insights, primarily focusing on general youth engagement and ethical collaboration in research. In contrast, our study makes a novel contribution by specifically investigating how youths anticipate the impact of road safety decisions and delineating the ramifications of their perceptions for enhancing road safety strategies. By employing descriptive statistical methods to effectively analyze youth attitudes, our research pushes the boundaries of current knowledge, offering unique insights into a critical aspect of road safety decision-making that remains underexplored in existing literature.

2.1. Global Overview of Road Safety and Its Impact on Sustainable Development

According to WHO statistics, the number of global deaths and injuries from road traffic accidents is projected to be reduced by half by 2030 [25]. Notably, one of the fundamental pillars within the United Nations (UN) road safety strategies encompasses the cultivation of safer road users. Various organizations within the UN system are dedicated to implementing comprehensive awareness programs and training initiatives aimed at fostering a pervasive road safety culture among their personnel [26]. Based on these characteristics, the road safety sector represents a significant contributor to achieving the sustainable development goals (SDGs) of reducing poverty (SDG 1), lowering hunger (SDG 2), ensuring healthy lives and promoting well-being for all at all ages (SDG 3), promoting economic growth and decent work (SDG 8), and making cities and human settlements inclusive, safe, resilient, and sustainable (SDG 11) [27,28].

The UN defines sustainable development as a holistic strategy to satisfy today’s requirements without risking future generations’ ability to fulfill their own needs [29]. It involves combining economic, social, and environmental factors to build vibrant and resilient communities. The UN emphasizes that involving youth in decision-making is vital for a sustainable future. By engaging youth in decision-making processes, their needs and aspirations are considered, contributing to the advancement of overall societal sustainability [30].

Accident victims frequently include the most economically active citizens, with severe consequences for their families. Morocco’s cultural and economic growth, as well as tourist demand, have increased demand for automobile use, which has had a detrimental impact on the environment [31].

2.2. Morocco’s Overview

Accidents are a worrying reality in Morocco, causing severe harm. It has been demonstrated that an increasing rate of accidents on major roads has raised concerns about various plans [31], with 11 deaths per 100,000 inhabitants [32]. This is particularly alarming considering the number and age group of victims, as well as people with disabilities (PWDs) [33].

In Morocco, road transportation is the predominant mode of travel for 90% of the populace [34]. Furthermore, on the African continent, Morocco stands out as a leading nation in terms of its extensive road and transportation networks. This includes a network of 60,000 km of roads, 1800 km of motorways, and 1000 km of highways [35–37]. The country boasts a total of 1540 transportation companies, with an additional 2400 public vehicles facilitating the daily commute for approximately 122,000 individuals [38]. In comparison to other nations, Morocco exhibits more pronounced indicators of severity in terms of motorization rate and vehicle fleet [39].

Comprehending the extent of road safety challenges confronting the youth in Morocco is essential for devising effective interventions. Recent estimates highlight that the age group encompassing individuals aged 15 to 24 years constitutes approximately 16.2% of the country’s total population up until 2021 [40]. Notably, this demographic faces a disproportionately elevated risk of road accidents, evident from a mortality rate of 37%

among those aged 15 to 34 in 2019 [41], which increased to 38.15% in 2022, with 17% of these fatalities concentrated within the 15-to-24 age bracket (Figure 1) [14].

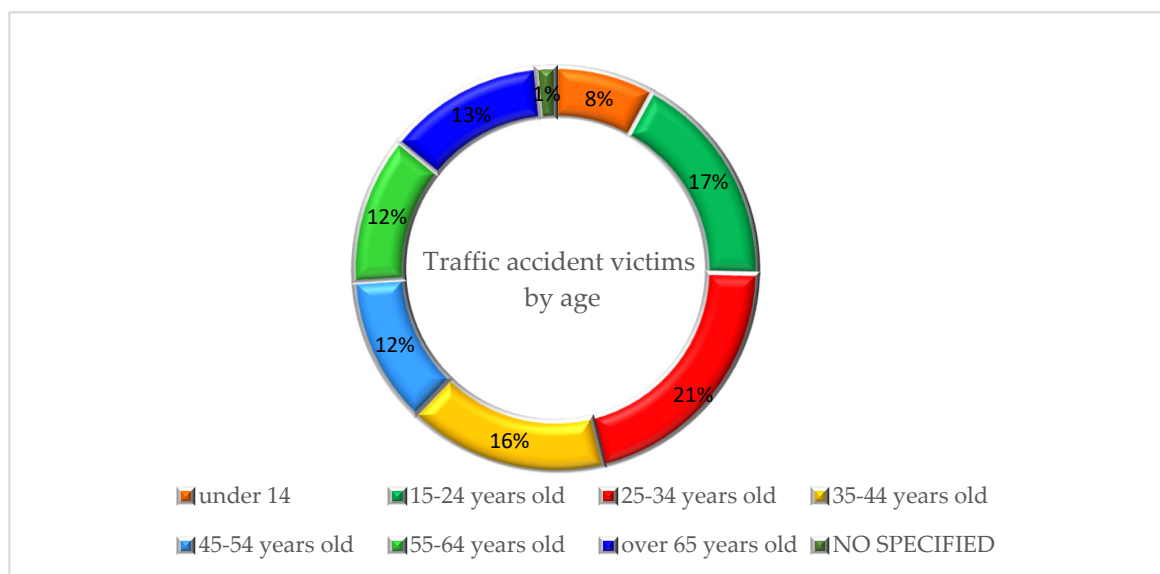


Figure 1. Rates of victims of traffic accidents by age of road users during 2022 in Morocco.

To delve into the behavioral indicators of road users among Moroccan youth, the ensuing percentages provide valuable insights: 19% of respondents reported engaging in illegal speeding, 2% admitted to driving under the influence of alcohol, 2% acknowledged driving under the influence of drugs, 4% cited fatigue and exhaustion as factors, and 10% confessed to non-compliance with safety belt and helmet regulations [41].

2.3. National Road Safety Strategy of Morocco

Morocco has witnessed a significant increase in the number of road accident casualties over the past decade, prompting policymakers to respond. In response to this serious issue, Morocco's Ministry of Transport has developed the National Road Safety Strategy 2017–2026 [42].

Previously, Moroccan authorities had implemented periodic policies for execution since 2003 [43], characterized by short- and medium-term objectives. This was known as the Road Safety Strategy for the years 2003–2013, referred to formally as the “Integrated Emergency Strategic Plan (IESP) 2003–2013” and known in French as “Plan Stratégique Intégré d’Urgence (PSIU)” [44]. Among the primary areas of action contemplated by the PSIU are legislation, enforcement, penalties, education, and information. PSIU I, PSIU II, and PSIU III were the three-year plans for this approach [44–46].

This long-term approach aims to reduce traffic mortality and combat the epidemic of traffic accidents. The strategy specifically targets a 25% and 50% reduction in deaths by 2020 (to fewer than 3000 road deaths) and 2026 (to fewer than 1900 road deaths), [47] respectively. This translates to a 28% decrease in pedestrian fatalities, a 24% decrease in two- or three-wheeled motorcycle fatalities, and a 10 percent decrease in deaths among youths under the age of 14. Morocco seeks to make significant progress in its efforts to deal with climate change by establishing a comprehensive and ambitious strategy [48].

The Kingdom of Morocco experienced an increase in traffic accidents between 2016 and 2022, as shown in Figure 2, from 80,680 in 2016 to 113,625 in 2022, with the exception of 2020, which saw a reduction due to the challenges posed by the COVID-19 pandemic [14].

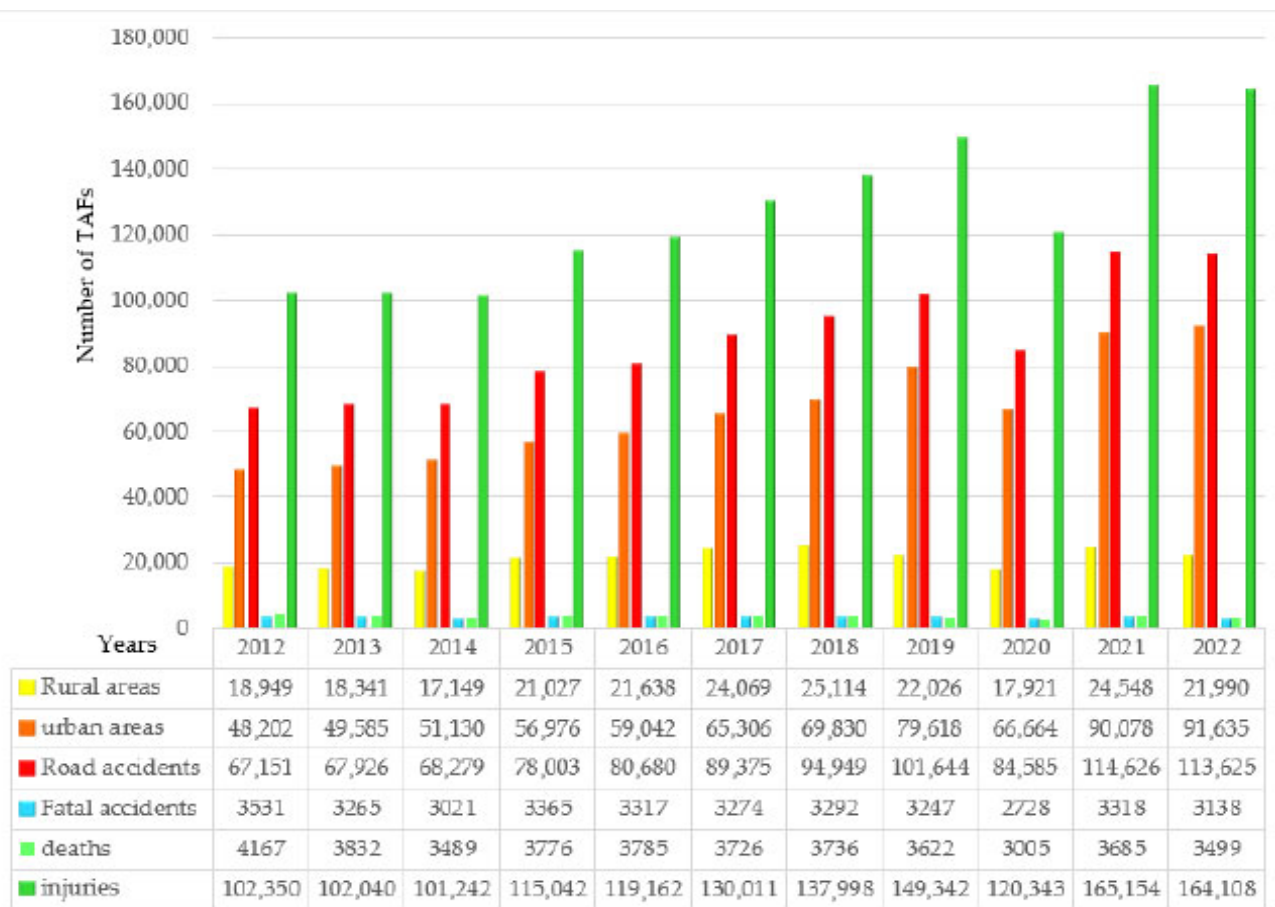


Figure 2. The number of traffic accidents and fatalities (TAFs) from 2012 to 2022.

As presented in Figure 3, the statistical analysis demonstrates a shared concern about the National Road Safety Strategy's ability to achieve its set goals. The graph compares the Strategy's expected achievements, based on yearly percentage goals and numbers of deaths, to the actual statistics. While the Strategy achieved one of its goals in 2020, with a 25% reduction, this outcome was influenced by the COVID-19 pandemic. As such, the extent to which the Strategy genuinely fulfills its objectives remains uncertain.

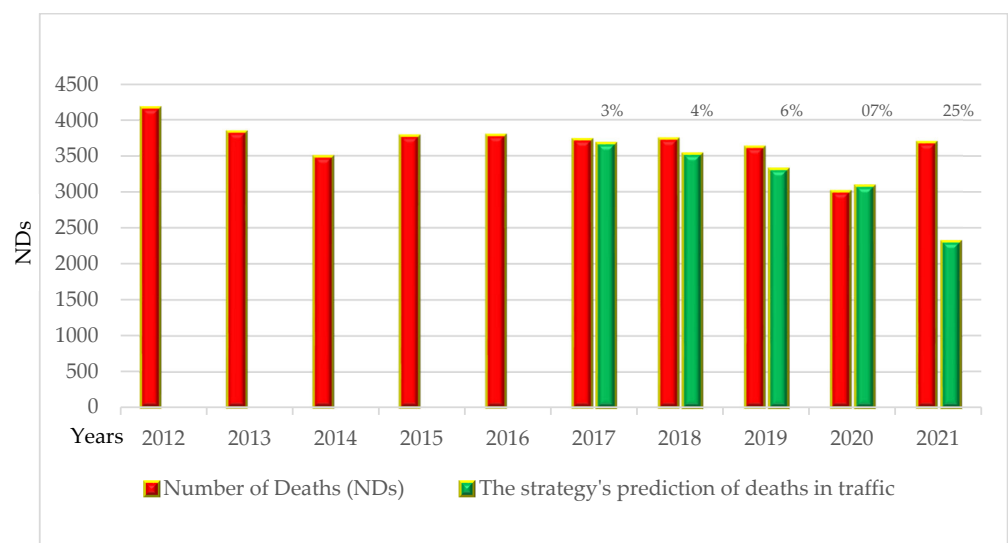


Figure 3. A comparison of the number of deaths with the strategy's estimations.

Morocco's National Road Safety Strategy outlines its priorities, encompassing a range of aspects such as pedestrians, motorcyclists, motorists, children under 14, and professional drivers. These priorities have been identified through dual criteria. The first criterion places a strong emphasis on preserving the maximum number of lives, while the second underscores the achievement of the most significant advancements in road safety.

3. Materials and Methods

Youth's knowledge of road safety, behavior, perspective on the matter, readiness to make decisions, and experiences were assessed using a self-report questionnaire. The questionnaire was designed to collect data from a diverse sample of young individuals aged 18–35 and to fit Moroccan conditions using existing international literature on road safety.

The selection of questions was informed by diverse theoretical bases, including insights from the Vision Zero for Youth Movement report [49] and Moroccan legal documents [50–53], as well as plans and strategies [26,46,47]. Each question was meticulously crafted to gather information rationally, considering Morocco's specialization in road safety within its societal context.

This section presents the methodology and scope adopted for the present study, offering insights into the survey design and data collection methods, as well as the rationale behind utilizing descriptive statistical tools to explore road safety and its link with the youth in Morocco.

3.1. Survey Design

The survey design was tailored to ensure local relevance by framing questions accordingly. The questionnaire comprised 24 carefully crafted questions aimed at capturing road safety knowledge. These queries were distributed across five distinct sections, as illustrated in Figure 4. The questionnaire form was created in Arabic to ensure easy understanding by Moroccan youth. The survey development and validation process relied on the expertise of the authors and incorporated consultations with specialists in youth engagement and road safety, as detailed in the shared survey (Appendix A). This collaborative approach ensured the integrity and reliability of the survey instrument.

3.2. Data Collection

The survey was distributed through an online platform to a diverse population of youths from different parts of the country. A total of 272 responses were collected and analyzed. The online survey was launched on 8 December 2022, and the survey link was shared via social media in Morocco. Network members were encouraged to further disseminate the survey to interested youths on the subject of road safety. The survey closed on 31 January 2023. The completed online survey results were downloaded, and descriptive statistics were produced for each question.

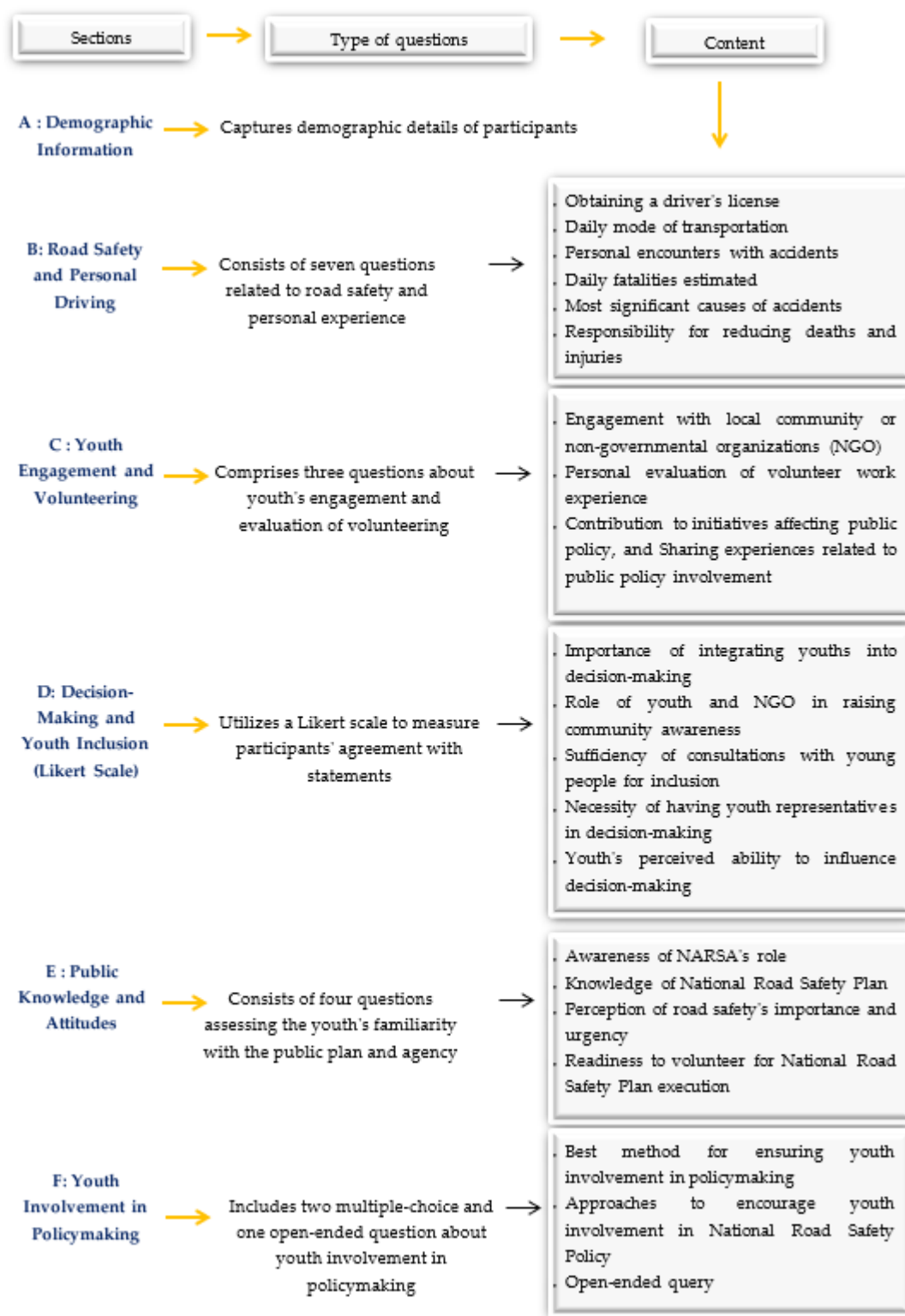


Figure 4. Survey design.

4. Results of the Quantitative Research

The descriptive analysis of the collected data is presented through the responses of our participants. This section provides a comprehensive analysis of road safety among youth in Morocco. It begins with an examination of demographic characteristics, followed by an exploration of road safety perceptions. Additionally, it discusses the involvement of youth in road traffic accidents. Finally, it presents outcomes from open-ended questions to

further enrich the findings and capture participants' opinions and experiences related to road safety in qualitative detail.

4.1. Demographic Profile

Based on the results of the survey provided in this study, the following data were collected about the study's sample. the characteristics of the respondents are presented in Table 1:

Table 1. Age groups filling out the survey.

	Variables	Respondents	Percentage
Age	15–18	23	8.5%
	19–23	98	36%
	24–29	95	34.9%
	30–35	56	20.6%

It was found that 62% of the youths who participated in the survey have a driver's license. While only 6% have been involved in a traffic accident that resulted in death or serious injury, 76% of the participants stated that they or their acquaintances had been involved in a car accident.

4.2. Road Safety Perceptions

In terms of youths' understanding of the national road safety agency's role, 57% stated that they fully comprehend it. More than 70% are uninformed of the National Road Safety Strategy. Still, 98% of youths believe that road safety should be a key national priority.

Regarding volunteer action, 74% of the participating youths have no ties with any non-governmental organizations, while 76% indicate a readiness to participate in volunteer activities in the future. Only 17% of participants have previously worked on a project that influenced public policy or decision-making.

Youths consider speeding as the primary cause of traffic accidents, prioritizing it over other factors such as weather, road conditions, vehicles, and driver behavior (Table 2).

Table 2. The main causes of road collisions.

	Frequency	Percent	Valid Percent	Cumulative Percent
Weather	1	0.4	0.4	0.4
Speeding	156	57.4	57.4	57.7
Vehicles	4	1.5	1.5	59.2
Driver behavior	97	35.7	35.7	94.9
Road conditions	14	5.1	5.1	100.0
Total	272	100.0	100.0	

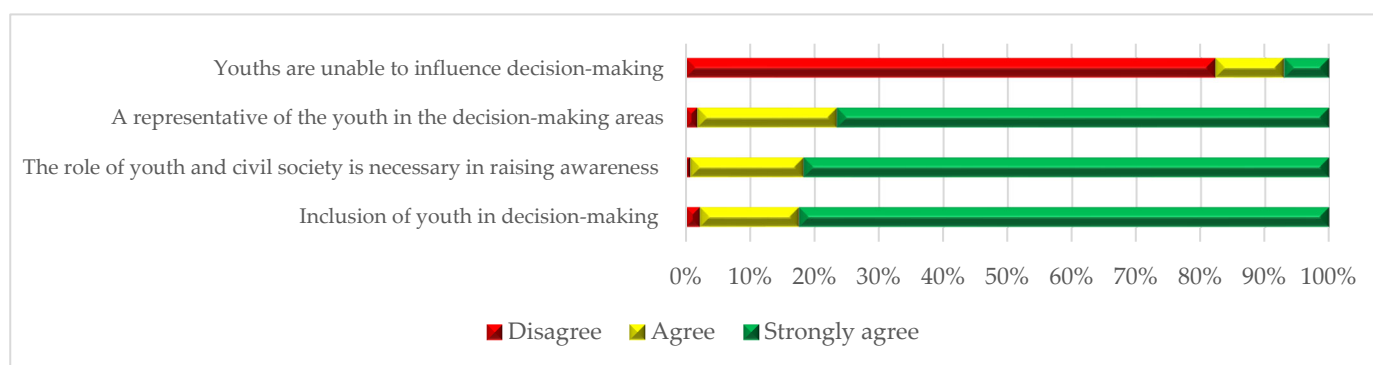
Road safety is a personal responsibility. This is believed by more than 58% of respondents, with 15% believing it is the responsibility of the NARSA within the Ministry, 8% attributing the onus to driving schools and Training for Transportation Professionals, and 6% assuming it is the responsibility of NGOs (Table 3).

Table 3. Perceived responsibility for decreasing road accidents evident in the survey.

	Frequency	Percent	Valid Percent	Cumulative Percent
NARSA	43	15.8	15.8	15.8
Personal responsibility	158	58.1	58.1	73.9
NGOs	18	6.6	6.6	80.5
Driving schools and Training for Transportation Professionals	23	8.5	8.5	89.0
Ministry of Transport and Equipment	30	11.0	11.0	100.0
Total	272	100.0	100.0	

4.3. Involvement of Youths

Four attitudinal items, presented on a three-point Likert scale, were used to evaluate youth engagement interest. Figure 5 shows the results from 272 respondents. In general, the three major issues that the Moroccan youths agreed upon the most concern road safety: (1) the inclusion of youth in decision-making (2), the role of youth and NGOs in raising awareness, and (3) representation of youth in decision-making areas.

**Figure 5.** Youth's perceptions of involvement tools in road safety decision-making.

According to Figure 5, youths agree on the importance of being active in decision-making, are aware of their potential to influence, and believe that they play an important role in raising awareness in society. These observations illuminate the proactive and engaged nature of the youth cohort, emphasizing their dedication to instigating positive societal transformations.

Figure 6 further presents the tools of involvement in decision-making. Youths were asked to choose the best method for involving them in decision-making from five options: regional meetings under the direction of the NARSA, nomination of a youth representative in the concerned organization (road safety ambassador), integration with the House of Parliament and the legislature, as well as youth councils and NGOs.

The survey found that 27.6% of respondents believe that regional meetings under the direction of NARSA can ensure youth inclusion in road safety decision-making. Additionally, 24.3% of respondents consider the appointment of a youth representative in the concerned organization (road safety ambassador) as crucial for inclusion. Furthermore, 18.4% of participants prefer direct engagement with parliament and the legislature. Meanwhile, 12.9% of those surveyed think that NGOs could play a role in facilitating youth involvement. Lastly, 10.7% of respondents feel that youths should take the initiative themselves by creating their own councils to be involved in road safety decisions.

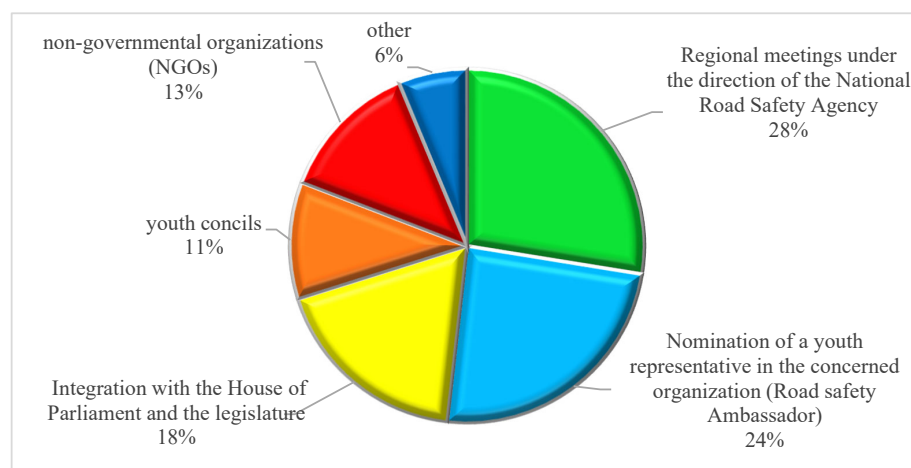


Figure 6. Mechanisms to ensure youth inclusion.

4.4. Open-Ended Question Outcome

In our survey, we inquired, “If the respondents were given the opportunity to participate in the road safety decision-making process, what critical suggestions would they make to reduce the number of fatalities and injuries caused by traffic accidents?” We carefully evaluated their replies and grouped them into different sections, as shown in Table 4, to provide important proposals from youths aimed at preventing road accidents. These sections include proposals for traffic law improvements, traffic signals and infrastructure, driving licenses and professional driving, the educational system, public awareness, drugs and corruption, and promoting sustainability through environmental conservation and car maintenance.

Table 4. Proposals and recommendations from Moroccan youth to decision makers.

Sections	Youth’s Recommendations
Traffic law	- Strictly enforce traffic laws for everyone, without exceptions, and consider increasing penalties to deter violators. - Enhance police and gendarmerie patrols to ensure continuous monitoring by security services for effective enforcement of traffic regulations. - Increase the number of radars and install cameras in critical areas to improve road safety. - Modify the penalties for certain violations, implementing relevant training programs for violators and financial fines. - Address the recurring issue of speeding, acknowledging its significant threat to life, by imposing stricter penalties for exceeding speed limits in each area. - Suggest reducing the maximum speed within cities from 60 to 50 km/h for enhanced safety.
Traffic signals and infrastructure	Conducting a comprehensive study to evaluate the condition of road infrastructure in Morocco, with particular attention to identifying black spots and areas with a high frequency of traffic accidents.
Driving licenses and professional driving	- Tighten the training procedures and the theoretical and practical exams for obtaining driving licenses (a suggestion that emerged repeatedly in the survey results). - Modernize training methods and introduce innovative approaches to driver education. - Renew the driving license exams and their management. - One proposal was to renew a license every seven years with a thorough evaluation of the driver, including psychological and mental health assessments. - The focus extended to professional drivers, such as taxi drivers, bus drivers, and operators of heavy vehicles, with calls to closely monitor their actions and conduct road ethics training courses. - Emphasize driver responsibility and impose stringent monitoring on training institutions.

Table 4. *Cont.*

Sections	Youth's Recommendations
Educational system	• Inclusion of road safety in the education system. • Implement innovative approaches to enhance children's and society's understanding of road safety. • Organize creative workshops, competitions, and cultural events where students can showcase their creations and educational plays.
Public awareness	• Educating about road risks. • Emphasizing the value of life. • Highlighting the importance of communication between pedestrians and drivers. • Encouraging adherence to traffic rules and laws. • Promoting road ethics. • Demonstrating the impact of accidents on individual productivity. Methods to spread awareness: • Conducting awareness campaigns. • Organizing plays and workshops. • Utilizing social networking sites for outreach. • Leveraging technological means to enhance awareness. • Ensuring customization of approaches for different segments of society to encourage creativity and flexibility in awareness strategies.
Drugs and corruption	• Implement a dedicated reporting mechanism, such as a designated hotline, to report incidents of bribery among road users. • Advocate for the utilization of automated traffic monitoring systems to detect violations. • Require repeat offenders to undergo mandatory re-education. • Equip vehicles with alcohol-level sensors for breath analysis to detect alcohol or other substances; these sensors should trigger an internal alert system to notify the driver and passengers. Integrate these sensors with external surveillance cameras for comprehensive monitoring. • Notify the police and the royal gendarmerie for prompt intervention in case of potential violations.
Promoting sustainability: environmental conservation and car maintenance	• Young Moroccans advocate for incorporating ecological training as a prerequisite for obtaining driving licenses to reduce carbon dioxide emissions and combat environmental pollution. • The "zero deaths" initiative promotes sustainable development and prioritizes public health protection. • Utilizing solar and wind energy to illuminate public roads. • Calling on relevant authorities to implement renewable energy solutions as an alternative to conventional electricity, leading to reduced overall energy consumption.

5. Discussion

5.1. General Discussion

Road safety is a critical concern worldwide, and Morocco is no exception. To effectively tackle the issue of road accidents and fatalities, it is essential to understand the attitudes of the youth toward road safety and their readiness to contribute to the development and implementation of road safety strategies.

The findings from the analysis of youth suggestions demonstrate that young individuals possess a wealth of innovative ideas that can help improve road safety situations. However, to fully harness this potential, they need encouragement from policymakers and a belief in their capabilities to achieve the proposed recommendations.

This discussion emphasizes the significance of youth engagement in decision-making processes related to road safety in Morocco, based on an analysis of almost 300 youth suggestions. By integrating the perspectives and insights of young individuals, policymakers can develop more contextually relevant and effective measures to address the pressing issue of road accidents.

Recognizing the importance of youth participation in decision-making related to road safety, it becomes evident that integrating the youth's opinions and experiences in crafting road safety strategies may lead to increased compliance with traffic regulations, safer road behaviors, and ultimately a decline in road fatalities.

One prominent recommendation that emerged from the youth's suggestions is the appointment of a youth representative to the administrative board of NARSA. This proposal highlights the growing recognition of the significance of involving young individuals in decision-making processes related to road safety in Morocco. By including the perspectives and insights of youth alongside decision-makers, progress can be made towards achieving the ambitious goal of "zero deaths" on the roads in the future. This step not only acknowledges the unique perspective and contributions of the younger generation but also fosters a collaborative approach toward enhancing road safety initiatives in the country.

The youth population represents the driving force of Morocco's population pyramid and plays a pivotal role in shaping the country's future development. The current road safety measures and action plans have not yielded the desired results, indicating that the lack of youth integration might be one of the reasons for the skepticism surrounding the expected outcomes.

Engaging the youth in decision-making processes will inject new energy into the development, establishment, and implementation of road safety goals. Their involvement can be particularly instrumental in raising community awareness and enhancing government efficiency in road safety. Furthermore, incorporating the youth's perspectives will lead to the modernization of road infrastructure management and the reduction of accidents.

Moreover, integrating the youth into the National Road Safety Strategy will not only have a significant impact at the regional (North Africa, Mediterranean) and global levels but will also position Morocco as a country that values and empowers its youth to achieve the vision of zero road accidents in the coming years.

Granting decision-making powers to the youth, with a mandatory nature, stems from the belief that this demographic represents the most vital and active group, embodying Morocco's future. This approach will also instill a sense of responsibility, patriotism, and hope in the hearts of future generations, which is essential to mitigate the issue of youth migration.

Updating Morocco's National Road Safety Strategy to include youth engagement is crucial. This update should consider the psychological and environmental problems and consequences of roads, as well as the social and economic costs associated with road accidents. Engaging the youth in decision-making will enable the formulation of comprehensive strategies that address the specific needs and concerns of young road users, ultimately leading to a safer road environment for all.

5.2. Linking Youth Suggestions to Established Road Safety Studies and Strategy

Building on our prior discussions and the research findings, the suggestions provided by the youth in our survey may initially appear vague, since the questions were left open, allowing respondents to freely express themselves, the suggestions provided by the youth in our survey may initially appear vague. However, upon comparing these suggestions with existing studies, it becomes evident that the survey results hold considerable value for policymakers.

In line with the recommendations put forth by Ray Shuey et al. [54], our study highlights the significance of community engagement in augmenting the effectiveness of environmental conservation initiatives. The youth's suggestions align with this perspective, particularly in their emphasis on enhancing public awareness.

Drawing parallels with the work of Naimul Razzaque et al. [55], our participants' suggestions concerning the enforcement of traffic laws reveal a noteworthy correlation. Similar to the findings in Razzaque's study, our participants note the lack of effective enforcement mechanisms in existing traffic laws. This aligns with the objectives outlined in

Morocco's 2017–2026 action plan, emphasizing the need to strengthen control over drivers through enhanced monitoring and law enforcement.

Building upon the theoretical framework established by the World Health Organization (WHO) in its latest manual on road safety [56], which emphasizes the importance of enhancing safety awareness and behaviors through education and training, the results of the survey delve deeper into road safety improvement based on the youth's suggestions. One recurrent suggestion from youth participants pertained to the impact of various education and training methodologies on future road safety effectiveness.

The link between the National Road Safety Strategy and the recommendations provided by survey participants is presented in Table 5. The strategy delineates actionable directives. To date, several actions have been deliberated and effectively implemented, such as the creation of NARSA. The strategy endeavors to address five pivotal concerns: pedestrians, motorized two- and three-wheel vehicles, single-vehicle accidents, children under 14 years old, and professional transportation. While some of the participants' suggestions have already been incorporated into the strategy, novel recommendations have emerged, as clarified by the analysis of questionnaire responses conducted in this study.

Table 5. Action guidelines from the National Road Safety Strategy and youth recommendations for implementation.

Strategic Issues - The National Road Safety Strategy	Action Guidelines	Survey Finding - Recommendations for Action
1 Pedestrians	- Adaptation of urban infrastructure. - Encouragement for consideration of them by other users. - Protection of pedestrian pathways.	* Engage youth in decision-making processes. '1,2,3,4,5' Conduct an in-depth study on tailoring awareness campaigns according to regional dynamics and avoiding normalization.
2 Motorized two- and three-wheelers	- Wearing helmets. - Speed control. - Attention from other vehicles. - Updating homologation rules.	'2,3,5' Mandate re-education programs for repeat offenders. '2,3' Introduce ecological training as a prerequisite for obtaining driving licenses to mitigate carbon emissions and combat environmental pollution.
3 Single-vehicle accident	- Wearing seat belts. - Adherence to traffic rules: speed, priorities, etc. - Treatment of road shoulders. - Introduction of defensive and safe driving.	'1,2,3' Implement solar and wind energy solutions for street lighting. - Highlight the impact of accidents on individual productivity. * Undertake a comprehensive study to assess the state of road infrastructure, with a focus on identifying high-risk areas and black spots.
4 Children under 14 years old	- Arrangement of the surroundings of frequented places. - Encouragement of speed reduction. - Calm driving and the creation of protected crossings in front of schools and residential areas. - Integration of road education in the school environment. - Sensitization in schools to road risks.	'1,2,3' Revise penalties for specific violations (such as alcohol consumption and high speed), coupled with training programs for offenders in addition to financial fines. '1,2,3,4,5' Customize awareness strategies for different societal segments and regions to foster creativity and adaptability. * Advocate for the adoption of renewable energy solutions by relevant authorities as an alternative to traditional electricity, leading to reduced energy consumption.
5 Professional transportation	- Driver training. - Vehicle technical inspection. - Enforcement of traffic rules compliance: speed, etc. - Fleet safety management in companies: road risk prevention, compliance with driving time, etc. - Introduction of defensive and safe driving.	'2,3,5' Install alcohol level sensors in vehicles for breath analysis to detect alcohol or other substances, with integrated alert systems to notify drivers and passengers, and integrate these sensors with external surveillance cameras for comprehensive monitoring. - Other

* Recommendations unrelated to any specific strategic issues.

5.3. Aligning the Study's Perspectives with Prior Research

In the context of the ongoing discourse, as highlighted in the discussion, it becomes apparent that the innovative insights possessed by young individuals hold significant

potential to enhance road safety conditions. Our study underscores the importance of not only gaining policy authorities' endorsement for these ideas but also fostering a sense of self-efficacy within young individuals, enabling them to effectively translate their recommendations into reality. Our findings emphasize the crucial need to integrate youth perspectives into decision-making processes regarding road safety.

Our research aligns with the conclusions drawn by Macauley et al. [22], Horwath et al. [24], and Charles et al. [24], as it provides a more nuanced understanding of how involving young individuals in the formulation of road safety strategies can contribute to increased adherence to traffic regulations, the cultivation of safer road behaviors, and ultimately a reduction in road fatalities. Specifically, our study delves into the specific mechanisms through which youth engagement influences road safety, building upon and expanding the insights presented by these prior researchers. By judiciously bridging gaps between our findings and the existing body of research, we elevate the discourse about youth engagement in road safety initiatives to a level that is not only empirically grounded but also influential in guiding future policy and research endeavors.

5.4. Key Policymaker Considerations

The findings and conclusions of this study have significant implications for informing policymakers in devising strategies to enhance road safety within our extensive transportation system. By incorporating these scientifically backed key points into their policymaking considerations, relevant authorities can develop evidence-based and inclusive approaches to improve road safety and create a safer transportation system for all stakeholders.

The following key points, derived from the research, present crucial factors to be considered in formulating effective policies:

- Integrating the perspectives and insights of young individuals can lead to the development of more comprehensive and contextually relevant road safety measures.
- Organizing periodic meetings with young individuals enables continuous feedback and updates, fostering their engagement and ownership in road safety initiatives.
- Empowering youth ambassadors involves designating youth representatives as envoys in policymaking and implementation processes to ensure a more effective representation of youth interests and concerns in road safety strategies.
- Utilizing renewable energy sources, such as solar and wind power, in the transportation infrastructure can contribute to sustainability goals while minimizing the environmental impact.

By addressing these key points, policymakers can create a road safety framework that not only addresses the specific needs and concerns of the youth but also promotes a sustainable and environmentally friendly transportation system. Furthermore, involving young individuals in decision-making processes fosters a sense of ownership and responsibility, making them active contributors to the success of road safety initiatives.

5.5. Limitations and Further Research

This study explores the significance of youth engagement in road safety and its potential to enhance decision-making in countries striving to reduce road fatalities, particularly since road crashes remain a leading cause of death among young individuals. However, despite its valuable insights, certain limitations exist, opening avenues for future research.

One notable limitation of this study is related to the sample size. While efforts were made to maximize the sample within financial and time constraints, it remained confined to Morocco. To achieve a more comprehensive understanding of youth attitudes and behaviors toward road safety, future research could encompass a wider range of regions, including remote areas, to investigate the nuances and variations that may exist among different youth populations.

Another limitation is that the preliminary analysis did not specifically delve into whether youths adhere to traffic laws correctly or not. Exploring this aspect in future studies could provide crucial insights into the effectiveness of existing regulations and the

level of youth compliance with road safety measures. Understanding how well young individuals follow traffic laws can shed light on potential areas for improvement in road safety strategies and enforcement.

To address these limitations and build upon the findings of this study, future researchers should consider expanding the geographical scope of their investigations to include diverse regions and demographics. Conducting surveys and data collection in remote areas and other countries could offer a more comprehensive perspective on youth engagement and road safety. Additionally, researchers should design studies that focus on observing and evaluating youth adherence to traffic laws, which would contribute valuable data to enhance road safety strategies.

Despite these limitations, our study has notable strengths. We successfully shed light on the significance of youth engagement in road safety decision-making, emphasizing its potential impact on reducing road fatalities. Our research contributes a foundational understanding of this critical aspect, laying the groundwork for future investigations. To further strengthen the field, future researchers should consider expanding the geographical scope of their inquiries, encompassing diverse regions and demographics. Additionally, focusing on observing and evaluating youth adherence to traffic laws in subsequent studies would provide valuable data to inform and enhance road safety strategies.

6. Conclusions

The research impacts of this study extend across global, national, and local contexts, significantly contributing to the discourse on road safety and youth engagement. Globally, the study's insights underscore the universal importance of prioritizing road safety as a cross-cutting concern that affects not only individual countries but the international community as a whole. At a national level, the findings resonate particularly strongly in Morocco, shedding light on the pressing issue of traffic accidents and their far-reaching implications on economic stability, societal well-being, and sustainable development priorities.

Traffic accidents present a complex issue to society, with serious consequences across several areas, including the economic and social sectors. Furthermore, these accidents threaten a country's infrastructure for logistics and put at risk both societal and economic stability. Youths appear to be the most vulnerable demographic harmed by road accidents. As a consequence, this study was conducted to assess available data and shed light on this critical topic.

This study shows that youth engagement is a crucial component in enhancing road safety in Morocco. By involving young individuals in decision-making processes, policy-makers can tap into their innovative ideas and perspectives to create contextually relevant and effective road safety measures. Integrating the youth into the strategy will not only reduce road accidents but also empower the younger generation to take an active role in shaping their country's future, aiming for sustainability and fostering a safer road environment for all citizens.

Prospects for future research include delving deeper into effective processes for incorporating youth participation into road safety policies. Furthermore, exploring the comparative efficacy of various methods for engagement and their subsequent effects might provide policymakers and practitioners with practical insights. Long-term research on the evolution of youth road safety attitudes and practices could provide useful data for guiding policy changes. These initiatives, taken as a whole, can stimulate long-term improvements in road safety, promoting a safer and more prosperous future.

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Appendix A

Part A. Background Information

A1. Are you:

- ☐ Male
☐ Female

E2. Age:

Mark one only

- ☐ 15–18
☐ 19–20
☐ 24–29
☐ 30–35

Part B: Transportation and Road Safety

B1. Do you currently possess a valid driver's license?

- ☐ Yes
☐ No

B2. What is your primary mode of transportation daily?

- | | |
|---------------------|--------------------------|
| a. Car | ☐ |
| b. bike/motorcycle | ☐ |
| c. public transport | ☐ |
| d. walking | ☐ |
| e. Other—specify: | ☐ |

B3. Have you or anyone in your immediate surroundings experienced a traffic collision before?

- ☐ Yes
☐ No

B4. Have you personally been involved in a traffic collision resulting in a fatality or serious injury?

- ☐ Yes
☐ No

B5. In your estimation, how many fatalities occur daily in Morocco due to road collisions?
Mark one only

- a. Less than 5 fatalities ☐
- b. 5 fatalities ☐
- c. 10 fatalities ☐
- d. 15 fatalities ☐
- e. No idea ☐

B6. What, in your opinion, are the main causes of road collisions?

- a. Speeding ☐
- b. Drivers' behaviors ☐
- c. Vehicles ☐
- d. Road infrastructure ☐
- e. Other—Specify: ☐

B7. In your view, who bears the responsibility for reducing the number of fatalities and injuries resulting from road collisions?

- a. Road safety is a personal responsibility ☐
- b. Driving schools/formation centers ☐
- c. Minister of equipment and transport ☐
- d. National Road Safety Agency (NARSA) ☐
- e. Other—Specify: ☐

1. Part C: Volunteer Work and Civic Engagement

C1. Are you currently engaged in volunteer work with a local community or civil society organizations (NGOs)?

- ☐ Yes
- ☐ No

C2. Based on your personal experience, how would you evaluate your involvement in volunteer work, considering contributions to community-building and NGOs?

- | Low | | | | | High |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------|
| 1 | 2 | 3 | 4 | 5 | |
| ☐ | ☐ | ☐ | ☐ | ☐ | |

C3. Have you participated in a project that influenced public policy or the decision-making process?

- ☐ Yes
- ☐ No
- ☐ If yes, kindly share your experience.

Part D: Youth Integration and Decision-Making

D1. Integrating young people into decision-making processes is a vital necessity.

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

D2. The role of youth and NGOs is crucial in raising awareness within the community.

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

D3. Consultations with young people alone are insufficient for their integration into decision-making.

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

D4. It is necessary to have a representative from the youth category in decision-making chambers.

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

D5. Young people are capable of influencing the decision-making process.

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

Part E: National Road Safety Awareness

E1. Are you aware of the role of NARSA?

☐ Yes
☐ No

E2. Are you familiar with the National Road Safety Plan?

☐ Yes
☐ No

E3. Do you believe road safety should be a top national priority, considering its critical and pressing nature?

☐ Yes
☐ No

E4. Would you be willing to participate in volunteer work to contribute to the implementation of the objectives of the National Road Safety Plan?

☐ Yes
☐ No

Part F: Youth Inclusion in Road Safety Policymaking

F1. Among the following options, what is the most effective mechanism for ensuring the inclusion of Moroccan youth in road safety and sustainable transport policymaking?

- a. Work with the House of Parliament and the legislature ☐
- b. NGOs ☐
- c. Holding regional consultations under the supervision of NARSA ☐
- d. Selecting a representative of the youth category in the concerned entity (Road Safety Ambassador) ☐
- e. Youth Councils ☐
- f. Other—Specify: ☐

F2. Share your opinion on how we can activate the role of youth in participating in the development and implementation of the National Road Safety Policy:

- a. Holding training courses ☐
- b. awareness campaigns ☐
- c. Periodic consultations ☐
- d. Financing youth projects and civil society institutions ☐
- e. Encouraging scientific research ☐
- f. Establishment of a National Youth Council for Road Safety ☐
- g. Working directly with decision-makers ☐
- h. Other—Specify ☐

F3. If you were integrated into road safety decision-making, what suggestions would you prioritize to reduce the number of deaths and injuries resulting from road crashes?

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