

The Economic Cost of Years Lived with Disability (YLD) Due to Traffic Accident Injuries in Algeria (2020-2023)

BELAKHDAR Chakeur^{1*}

¹ Senior Lecturer (A), Laboratory of: Management-Transportation-Logistics, University of Batna 1, (Algeria), chakeur.belakhdar@univ-batna.dz

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Abstract:

Traffic-related injuries pose a major public health and economic challenge, with long-term consequences for individuals and society. This study examines the burden of Years Lived with Disability (YLD) due to traffic injuries in Algeria (2020–2023), analysing demographic trends and economic costs. The findings reveal a continuous rise in YLD, with young adults (20–29) and older individuals (≥ 50) experiencing the highest burden. Males remain disproportionately affected, though an upward trend among females is evident. Beyond health impacts, YLD's economic cost nearly doubled, increasing from \$12.5 million in 2020 to \$23.3 million in 2023, underscoring the financial strain of lost productivity. Targeted interventions such as stricter traffic law enforcement, improved road safety education, enhanced emergency care, and rehabilitation are essential. Investments in infrastructure, such as pedestrian-friendly planning and better traffic management, will further reduce injury severity. Addressing these challenges will foster a safer, more resilient, and economically sustainable society.

Keywords: Traffic injuries, Years Lived with Disability (YLD), Economic burden, Algeria.

JEL Classification Codes: I15; R41; J17.

Introduction

Traffic accidents are a leading global cause of fatalities and disabilities, posing a major public health concern. According to WHO, 1.3 million people die annually due to road crashes, while 20 to 50 million sustain non-fatal injuries, many resulting in lasting disabilities (World Health Organization, 2021, pp. 15, 21). These injuries impose a heavy financial burden on healthcare systems, economies, and households due to medical costs, rehabilitation, and lost productivity.

* *Corresponding author.*

The Global Burden of Disease Study highlights traffic-related injuries among the top ten causes of disability, contributing significantly to years lived with disability (YLD). Vulnerable road users such as pedestrians, cyclists, and motorcyclists account for over 50% of global road traffic fatalities (Institute for Health Metrics and Evaluation, 2020, pp. 45, 49). Factors such as inadequate road safety regulations, poor infrastructure, speeding, and alcohol use worsen the impact, particularly in low- and middle-income countries (Peden, et al., 2004, p. 17).

To combat this crisis, the United Nations launched the Decade of Action for Road Safety 2021-2030, aiming to reduce traffic fatalities and injuries by 50% by 2030 (United Nations, 2021, p. 3). This initiative promotes stronger road safety laws, improved vehicle standards, public awareness, and better post-crash care. Effective interventions remain crucial to alleviating the socioeconomic burden of traffic accidents and enhancing global road safety (Peden, et al., 2004, p. 30). The ongoing efforts by governments, international organizations, and public health experts aim to develop sustainable solutions that will significantly reduce the global impact of road traffic injuries.

1. Understanding YLD and its role in traffic injury burden

Years Lived with Disability (YLD) is a key public health measure assessing the non-fatal impact of diseases and injuries. It quantifies the years individuals live with disability by multiplying the prevalence of a condition by a disability weight (0 = perfect health, 1 = death) (Murray & Lopez, 1996, p. 34). This method provides a comprehensive view of disease burden beyond mortality.

For traffic injuries, YLD is essential in capturing the full impact of road crashes, which often cause lasting disabilities such as traumatic brain injuries, spinal cord damage, and limb amputations (Haagsma, et al., 2016, p. 16). Unlike mortality-focused assessments, YLD emphasizes long-term disability, complementing Years of Life Lost (YLL) to form Disability-Adjusted Life Years (Murray & Lopez, 1996, p. 37).

Traffic accident survivors frequently suffer from chronic pain, limited mobility, and mental health issues, significantly reducing their quality of life. These disabilities also impose economic burdens, increasing healthcare costs and reducing productivity (Polinder, Haagsma, Toet, & Beeck, 2015, pp. 120, 125). YLD also highlights disparities in traffic injury burden across demographic groups, with vulnerable populations (children, young adults, and the elderly) facing higher YLD estimates (Institute for Health Metrics and

Evaluation, 2020, p. 50). This insight helps policymakers design targeted road safety interventions, such as measures to protect pedestrians and cyclists (Peden, et al., 2004, p. 22).

In conclusion, YLD is crucial for evaluating the long-term impact of traffic injuries, aiding in the development of informed policies and prevention strategies. Combining YLD with YLL provides a holistic assessment of the public health burden of road traffic accidents.

2. Research problem

While the public health impact of traffic accidents has been widely studied, most research focuses on fatal injuries, with limited attention to non-fatal consequences, particularly Years Lived with Disability (YLD). This metric provides essential insight into the long-term burden of traffic-related disabilities, yet its application to Algeria remains unexplored.

No comprehensive studies have estimated YLD for traffic accidents in Algeria, leaving a critical gap in understanding the full impact of non-fatal injuries. Existing research primarily addresses fatalities, neglecting the lasting disabilities that affect survivors. This lack of data hinders policymakers in designing effective road safety measures, rehabilitation programs, and resource allocation strategies. Additionally, the economic costs of traffic-related disabilities (medical expenses, productivity losses, and long-term care) remain largely unquantified, limiting the ability to develop cost-effective interventions.

This study aims to address these gaps by providing the first YLD estimates for traffic accident injuries in Algeria, alongside an assessment of their economic cost. Quantifying both the health and financial burden will enhance understanding of non-fatal traffic injuries, support economic evaluations, and inform policy decisions. The findings will also contribute to global research on YLD, offering comparative insights to improve national and international road safety strategies.

3. Research objective

This study aims to estimate the Years Lived with Disability (YLD) and its economic cost due to traffic injuries in Algeria, addressing a critical gap in understanding their public health and financial burden. Quantifying YLD provides a comprehensive measure of the non-fatal impact of traffic injuries, reflecting both severity and prevalence. Additionally,

assessing the economic consequences (including medical expenses, productivity losses, and long-term care) offers insight into the financial strain caused by traffic-related disabilities.

The findings will serve as essential evidence for policymakers, healthcare providers, and road safety advocates, supporting targeted interventions and resource allocation strategies. This study provides a holistic perspective on the burden of traffic injuries, aiming to enhance road safety measures, optimize healthcare planning, and mitigate economic consequences for individuals and society in Algeria.

I. Literature review

This section explores key concepts, methods, and developments related to Years Lived with Disability (YLD). It examines the evolution of YLD, its public health significance, and its application in assessing the burden of non-fatal health outcomes, particularly from traffic accidents. This foundation supports a deeper analysis of YLD's role in road safety and public health.

1. Definition, development, and significance of YLD

Years Lived with Disability (YLD) quantifies the burden of non-fatal health outcomes by measuring the number of years individuals live with disabilities or reduced quality of life. It is calculated by multiplying the prevalence of a condition by a disability weight (0 = perfect health, 1 = death) (Murray & Lopez, 1996, p. 34). Introduced within the Disability-Adjusted Life Years (DALY) framework, YLD complements Years of Life Lost (YLL) to provide a comprehensive assessment of disease burden (World Health Organization, 2004, p. 20). Emerging from the need to capture non-fatal health impacts, YLD integrates both fatal and non-fatal outcomes into a single measure (Mathers & Loncar, 2006, p. 132).

Since its introduction in the early 1990s, YLD has evolved to improve accuracy in global health assessments. Initially developed for the Global Burden of Disease (GBD) Study, it provided a standardized measure of disease burden across populations (Murray, et al., 2012, p. 114). Advances in epidemiology and data collection have refined disability weight calculations and prevalence estimates, enhancing YLD's precision (Salomon, et al., 2015, p. 170). Over time, its application has extended beyond the GBD Study to inform national and regional health policies and resource allocation.

YLD is vital for understanding disease burden beyond mortality rates, highlighting the long-term impact of chronic conditions and injuries (Murray & Lopez, 1996, p. 37). For instance, survivors of road traffic accidents may endure chronic pain, mobility issues, and

mental health challenges, leading to high YLD estimates. This metric helps policymakers identify high-burden conditions and prioritize interventions that improve quality of life (Vos, et al., 2017, p. 127). Incorporating YLD into health assessments enables public health strategies to be more comprehensively addressing both the prevention of fatal outcomes and the effective management of non-fatal injuries (Lozano, et al., 2012, p. 115).

2. Calculation of YLD

Years Lived with Disability (YLD) is a critical component of the Disability-Adjusted Life Years (DALY) metric, which captures the non-fatal health burden by estimating the number of years an individual lives with a disability (World Health Organization, 2004, p. 15). The standard formula for calculating YLD is:

$$YLD = P * DW * L$$

Where:

- *P* represents the prevalence of the condition, which refers to the number of individuals living with the condition during a specified period.
- *DW* is the disability weight, a value ranging from 0 (perfect health) to 1 (death), reflecting the severity of the disability.
- *L* stands for the average duration of disability in years, either until recovery or death.

Each element of the formula plays a crucial role in providing an accurate estimate of the non-fatal disease burden. Prevalence accounts for the population size affected by a particular condition, while the disability weight reflects the intensity of the condition's impact on the quality of life. The duration, *L*, incorporates the time frame in which the individual suffers from the condition, acknowledging that some disabilities might be short-term while others may persist over many years (Salomon, et al., 2015, p. 160). Together, these components enable public health professionals to assess the full extent of a condition's impact on a population.

3. Importance of YLD in addressing road safety

YLD is a key metric for assessing the long-term impact of non-fatal traffic injuries. While some accidents result in fatalities, many survivors suffer from lasting disabilities, including physical impairments and psychological conditions like PTSD (Haagsma, et al., 2016, p. 567). Incorporating YLD in traffic injury assessments highlights the burden these disabilities impose on individuals and society.

Traffic injuries often lead to high YLD values due to prolonged disability duration (L) and significant impairment severity (DW). Conditions such as spinal cord injuries, brain trauma, and amputations contribute to this burden, particularly in high-traffic areas (Murray & Lopez, 1996, p. 42). Globally, traffic injuries are a leading cause of disability, especially in low- and middle-income countries where road safety regulations are weaker (World Health Organization, 2018, p. 45).

Integrating YLD into road safety analyses informs targeted interventions. High-YLD injuries require extensive healthcare and rehabilitation, guiding investments in stricter traffic regulations, improved infrastructure, and emergency response systems (Haagsma, et al., 2016, p. 570). YLD also helps quantify broader societal costs, including lost productivity and healthcare expenditures (James, et al., 2020, p. 103).

Ultimately, YLD shifts the focus from fatalities alone to the long-term disabilities caused by road accidents. This perspective supports comprehensive road safety policies that aim to reduce deaths while improving the quality of life for survivors.

4. Strengths and limitations of the YLD measure

YLD effectively captures the non-fatal burden of disease, complementing mortality-based indicators by accounting for conditions that impair quality of life without causing death (Salomon, et al., 2015, p. 154). Its flexibility allows comparisons across diseases through disability weights (DW), and when combined with Years of Life Lost (YLL) in the DALY framework, it provides a comprehensive assessment of disease burden (Murray, et al., 2012, p. 2180).

YLD also aids in prioritizing health interventions by highlighting conditions requiring long-term treatment and rehabilitation, such as road traffic injuries and chronic diseases.

However, YLD has limitations. Disability weights are derived from surveys and expert opinions, making them susceptible to cultural and social biases (Salomon, et al., 2012, p. 723). Additionally, the measure relies on accurate prevalence data, which is often lacking in low-resource settings, potentially leading to biased estimates (Vos, et al., 2017, p. 131). YLD also averages disability experiences, potentially overlooking individual variations influenced by medical access, social support, and economic conditions (Mathers & Loncar, 2006, p. 137).

II. Methodology

This section details the methodology for assessing the public health burden of traffic accidents by estimating YLD due to non-fatal injuries. It outlines the study design, data collection procedures, and YLD calculation approach to ensure accurate disability burden estimates. Additionally, it explains statistical techniques and ethical considerations, offering a structured framework to evaluate the long-term impact of traffic injuries and guide future safety measures.

1. Study design

This observational study estimates the burden of Years Lived with Disability (YLD) and its economic cost from traffic injuries in Algeria between January 1, 2020, and December 31, 2023. It evaluates the long-term health and financial impact of non-fatal road accidents, quantifying their contribution to the public health and economic burden. The findings provide critical insights for decision-makers, healthcare providers, and road safety officials, emphasizing the need for cost-effective prevention strategies, improved rehabilitation efforts, and resource allocation to mitigate the lasting consequences of traffic injuries.

2. Data collection

The study relies on annual traffic accident reports from the National Delegation for Road Safety, which provide detailed data on injuries, incident locations, and demographic characteristics. Additional records from the National Centre for Road Safety and Prevention offer supplementary insights, ensuring a comprehensive overview of traffic accidents in Algeria. Demographic data from the National Office of Statistics (NOS) further enhances accuracy, including population estimates and life tables disaggregated by age and gender. These life tables are crucial for estimating disability duration and projecting lifespan, forming a robust foundation for calculating Years Lived with Disability (YLD).

3. YLD calculation

The calculation of Years Lived with Disability (YLD) in this study is based on the formula:

$$YLD = P_{(g,a,y)} * DW_{(g,a,y)} * L_{(g,a,y)}$$

Where:

- $P_{(g,a,y)}$ denotes the prevalence of traffic accident-related injuries for gender (g), age (a), and year (y).

- $DW_{(g,a,y)}$ refers to the disability weight, representing the severity of disability for gender, age, and year. The weights range from 0 (no disability) to 1 (death).
- $L_{(g,a,y)}$ signifies the average duration (in years) that individuals live with the injury before recovery or death, stratified by gender, age, and year.

Disability Weights (DW) were determined through consultations with Algerian experts, incorporating global estimates while adapting them to local conditions. Expert insights ensured DW values reflected the severity of traffic injuries specific to Algeria, considering accident types, healthcare response, and recovery rates. Adjustments were made for variations by age and gender, with slightly higher DW values assigned to males in the 15–24 and ≥ 50 age groups due to their higher risk exposure and injury severity. This localized approach enhances the accuracy and relevance of YLD estimates in the Algerian context.

Table 1: Assumed Disability Weights by Age and Gender

Age Group	DW (Males)	DW (Females)
<5	0.05	0.05
5-9	0.05	0.05
10-14	0.10	0.08
15-19	0.12	0.10
20-24	0.15	0.12
25-29	0.15	0.12
30-34	0.12	0.10
35-39	0.10	0.08
40-44	0.08	0.07
45-49	0.08	0.07
≥ 50	0.15	0.12
Unknown	0.10	0.10

Source: Author's own compilation

The Disability Weights (DW) by age and sex, shown in the previous table, reflect the severity of traffic accident-related injuries. Ranging from 0 (perfect health) to 1 (death), these weights indicate the health burden of injuries. Younger children (≤ 9 years) have lower DW values (0.05) due to milder injuries and better recovery prospects. From age 10 onward, DW increases, particularly for males, peaking at 0.15 in the 20–24 group, reflecting higher accident severity linked to riskier behaviours.

The duration of disability (L) represents the average time an individual lives with injury-related impairments before recovery or death. Due to the lack of direct data in Algeria, assumed values are based on expert opinions and global estimates. Table 2 presents L estimates by age and sex, showing shorter durations for younger individuals due to faster recovery. Older adults (≥ 50) experience the longest disability durations (3 years for males, 2.5 for females), reflecting slower recovery and higher vulnerability. These variations underscore the need for targeted healthcare and rehabilitation strategies.

Table 2: Estimated Disability Duration (L) by Age and Gender

Age Group	Average Duration (L) - Males	Average Duration (L) - Females
<5	0.2 years	0.2 years
5-9	0.3 years	0.3 years
10-14	0.4 years	0.4 years
15-19	0.6 years	0.5 years
20-24	0.8 years	0.7 years
25-29	0.8 years	0.7 years
30-34	1.0 years	0.9 years
35-39	1.2 years	1.0 years
40-44	1.5 years	1.3 years
45-49	1.8 years	1.6 years
≥ 50	2.5 years	2.2 years
Unknown	1.0 years	1.0 years

Source: Author's own compilation

Integrating disability weights (DW) that balance global standards with local expert input, along with assumed disability durations (L), ensures a more accurate assessment of the public health impact of non-fatal injuries. This approach accounts for local variations in injury severity, healthcare access, and recovery rates, providing a clearer understanding of how traffic injuries affect different age groups and genders. Such refined estimates support better-informed public health strategies and interventions.

4. Statistical analysis

The data in this study was analysed using descriptive statistical methods, including frequencies and averages to summarize key characteristics of traffic-related injuries and

fatalities. YLD was computed using established formulas to assess the disability burden across different demographics. Additionally, the median and interquartile range (IQR) were used to provide a more detailed understanding of the data distribution.

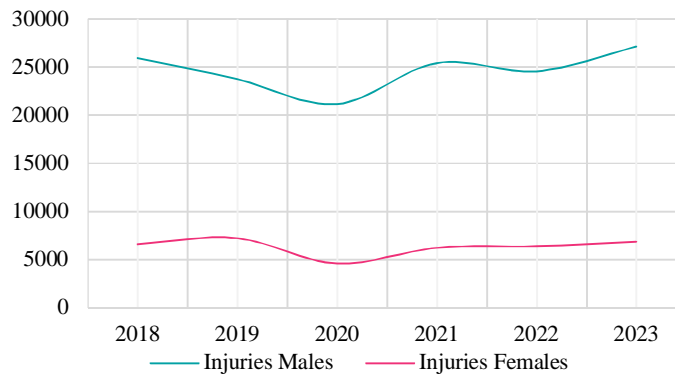
III. Results

This section analyses traffic accident injuries in Algeria, emphasizing the burden of Years Lived with Disability (YLD). It begins with descriptive statistics to outline injury patterns, followed by YLD calculations across demographic groups. The findings highlight the significant health impact of traffic-related injuries, providing insights for enhancing road safety and healthcare responses.

1. Descriptive statistics

Assessing the burden of Years Lived with Disability (YLD) from traffic accident injuries in Algeria (2020–2023) is essential for understanding their public health impact. This analysis examines injury frequency, severity, and regional variations, providing insights into evolving disability patterns. The findings support targeted strategies to reduce healthcare burdens and improve road safety.

Figure 1: Annual Traffic Injuries by gender in Algeria (2018-2023)

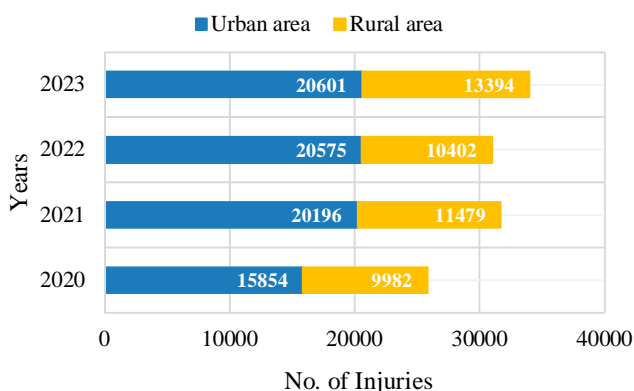


Source: (National Center for Road Safety and Prevention, 2017); (National Delegation for Road Safety, 2023)

The data on traffic accident injuries in Algeria from 2020 to 2023 reveals notable differences between urban and rural areas, as shown in Figure 2. In 2020, a total of 25,836 injuries were recorded, with urban areas accounting for 15,854 (61.4%) and rural areas for 9,982 (38.6%). Injury numbers increased over the years, with urban areas consistently representing the larger share. By 2023, total injuries reached 33,995, with 20,601 (60.6%) in urban areas and 13,394 (39.4%) in rural areas.

The steady increase in traffic injuries over this four-year period is particularly concerning, with total cases rising by nearly 32% from 2020 to 2023. While urban areas consistently recorded a higher number of injuries, rural regions also experienced a significant surge, particularly in 2023. The increase in rural injuries from 9,982 in 2020 to 13,394 in 2023 underscores the urgent need for targeted road safety interventions in these areas.

Figure 2: Annual Traffic Injuries by Area in Algeria (2020-2023)



Source: (National Delegation for Road Safety, 2023)

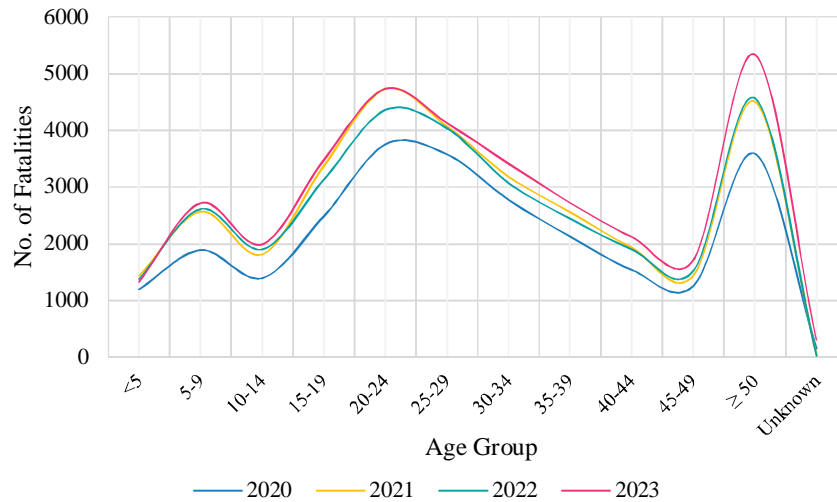
This trend reflects not only rising traffic activity but also possible disparities in road infrastructure, enforcement of traffic regulations, and driving behaviours between urban and rural areas. Higher traffic density in urban settings naturally contributes to more injuries, yet the sharp rise in rural incidents suggests that safety efforts should be expanded beyond city centres. The overall pattern highlights the growing burden of traffic accidents on public health in Algeria, emphasizing the necessity for stronger safety measures and region-specific strategies to mitigate these injuries.

The distribution of traffic injuries by age group in Algeria from 2020 to 2023 reveals notable variations, emphasizing the vulnerability of certain age categories, as shown in Figure 4. The total number of injuries follows an upward trend, increasing from 25,763 in 2020 to 33,995 in 2023. This rise highlights the growing public health challenge posed by road traffic incidents.

The 20-24 age group consistently records the highest number of injuries, rising from 3,755 in 2020 to 4,734 in 2023 (an increase of approximately 26%). As younger drivers and passengers, individuals in this age range may be more prone to risk-taking behaviours such

as speeding and distracted driving, making them a critical target for road safety interventions. Similarly, the 25-29 age group remains a significant contributor to overall injuries, fluctuating between 3,579 in 2020 and 4,127 in 2023. High driving activity, coupled with inexperience and frequent road exposure, increases their susceptibility to accidents, reinforcing the need for traffic education and stricter enforcement of safety regulations.

Figure 3: Traffic Injuries by Age Group (2020-2023)



Source: (National Delegation for Road Safety, 2023)

The involvement of children in traffic accidents is also concerning. Injuries among children under five (<5) rose from 1,201 in 2020 to 1,329 in 2023, reflecting their vulnerability as passengers or pedestrians. These findings underscore the importance of child safety measures, including proper car seat usage, pedestrian protection near schools, and parental awareness campaigns. Additionally, injuries in the 5-9 and 10-14 age groups have steadily increased, with the former rising by over 40% from 1,890 in 2020 to 2,718 in 2023. Enhancing school zone traffic safety, pedestrian education, and urban planning measures can help reduce risks for children in these categories.

Older individuals (≥ 50) have also experienced a substantial increase in traffic injuries, growing from 3,590 in 2020 to 5,333 in 2023 (a nearly 50% rise). Age-related factors such as slower reaction times and increased pedestrian vulnerability likely contribute to this trend. Addressing these risks requires improved road infrastructure, pedestrian-friendly urban designs, and policies tailored to aging drivers.

The 15-19 age group, which includes new and inexperienced drivers, also saw a significant rise in injuries, increasing from 2,489 in 2020 to 3,479 in 2023. Given the association of this group with risky behaviours, targeted measures such as graduated driver licensing programs, defensive driving courses, and strict law enforcement could mitigate their risks.

2. YLD estimates

To calculate Years Lived with Disability (YLD) due to traffic accidents, the number of injuries is assessed across age groups and gender categories. With disability weights (DW) and average duration of disability (L) already estimated, the calculation involves multiplying the number of cases by the corresponding DW and L values. For example, if 100 individuals experience an injury with a DW of 0.3 and an L of 5 years, the resulting YLD for that group would be 150.

Since DW and L are adjusted for local conditions, the calculation is conducted separately for each demographic group. Special attention is given to males aged 15-24 and ≥ 50 , where higher DW values account for greater risk exposure and injury severity. Summing the YLD values across all groups provides an overall estimate of the burden of non-fatal traffic injuries in Algeria, offering critical insights for public health planning and road safety interventions.

3. Key findings

The analysis of Years Lived with Disability (YLD) due to traffic-related injuries in Algeria from 2020 to 2023 highlights the long-term impact of non-fatal accidents across age and sex groups. Young adults and the elderly bear a greater burden, reflecting their higher susceptibility to severe and lasting disabilities. These findings emphasize the need for targeted health interventions and rehabilitation programs to mitigate the long-term consequences of traffic injuries on public health.

3.1. YLD among males

The Years Lived with Disability (YLD) for males from 2020 to 2023 reveals a growing burden of non-fatal traffic injuries across age groups in Algeria. The total YLD increased from 2,851.71 in 2020 to 3,693.45 in 2023, indicating a rising public health impact of traffic-related disabilities.

YLD values for males showed a rising trend from 2020 to 2023, reflecting an increasing burden of non-fatal traffic injuries. For children under 5, YLD remained low (7.92 to 8.59), while the 5-9 group saw a sharp rise (18.62 to 27.47), highlighting greater mobility risks. The 15-19 age group experienced a significant increase (158.54 to 211.32) due to riskier activities, and the 20-24 group had the highest YLD (508.08 in 2023), driven by driving-related accidents.

Table 3: YLD Males (Years)

Age Group	2020	2021	2022	2023
<5	7.92	9.38	9.06	8.59
5-9	18.615	25.32	25.29	27.465
10-14	41.48	53.24	54.84	59.8
15-19	158.544	207.936	190.584	211.32
20-24	405.12	502.56	464.64	508.08
25-29	379.44	428.4	422.64	436.8
30-34	291.48	327.96	313.32	352.56
35-39	217.32	255.72	243.24	269.28
40-44	151.8	184.44	179.88	195.36
45-49	143.712	161.856	164.736	183.168
≥ 50	1023.375	1230.375	1226.25	1414.125
Unknown	12.9	2.5	1.7	26.9
Total	2851.706	3389.687	3296.18	3693.448

Source: Author's calculations

Middle-aged males (30-39) also saw a rise, with YLD reaching 352.56 for the 30-34 group. The most substantial increase was in males ≥ 50 , where YLD surged from 1023.38 to 1414.13, reflecting slower recovery. Overall, YLD grew from 2851.71 in 2020 to 3693.45 in 2023, underscoring the need for improved road safety, stricter regulations, and enhanced medical responses.

3.2. YLD among females

The YLD estimates for females from 2020 to 2023 reveal the substantial public health impact of non-fatal traffic injuries in Algeria. These results illustrate variations across age groups and years, highlighting the long-term consequences of traffic accidents. The YLD values account for both injury prevalence and severity, offering critical insights for targeted interventions and improved road safety measures.

The YLD values for females from 2020 to 2023 reveal age-related differences in the burden of non-fatal traffic injuries. Among children under 5, YLD remains low, ranging from 7.92 in 2020 to 8.59 in 2023, reflecting lower exposure to high-risk traffic situations. The 5-9 age group sees a slight increase, reaching 27.465 in 2023, likely due to greater mobility and independent travel.

Table 4: YLD Females (Years)

Age Group	2020	2021	2022	2023
<5	4.09	5.04	4.74	4.7
5-9	9.735	13.215	13.935	13.305
10-14	11.552	15.584	17.024	15.904
15-19	14.35	24.35	24.4	27.2
20-24	31.836	45.696	41.412	42
25-29	35.028	41.832	43.512	40.908
30-34	31.41	40.95	41.76	42.93
35-39	25.36	34.32	33.36	38.32
40-44	25.389	36.309	36.855	44.863
45-49	29.232	35.84	42.672	49.504
≥ 50	227.304	323.136	343.464	412.368
Unknown	2.3	1.3	0.3	4.1
Total	447.586	617.572	643.434	736.102

Source: Author's calculations

A significant rise occurs in the 10-14 and 15-19 age groups, with the latter reaching 211.32 YLD in 2023, suggesting increased risk-taking behaviours and new drivers' involvement in accidents. The highest YLD values appear in the ≥50 age group, peaking at 1,414.125 in 2023, highlighting the greater vulnerability and slower recovery of older individuals.

The total YLD steadily rises from 2,851.706 in 2020 to 3,693.448 in 2023, indicating an increasing burden of traffic-related disabilities. These findings stress the need for targeted road safety interventions, particularly for adolescents and older adults.

3.3. The economic cost of YLD

Assessing the economic burden of traffic-related disabilities is essential for understanding their broader societal impact. The economic cost of Years Lived with Disability (YLD) was estimated using GDP per capita as a proxy for lost productivity. Table 5 presents the annual economic cost of YLD for males and females from 2020 to 2023.

The estimated economic cost of YLD for 2020-2023 reveals a progressive increase over the study period. In 2020, the total economic burden was approximately \$12.5 million, rising to \$23.3 million in 2023, representing an 86% increase. This trend is primarily driven by rising YLD estimates due to an increasing number of traffic-related disabilities and the growth in GDP per capita, which raises the estimated economic cost per case.

Table 5. Economic Cost of YLD Due to Traffic Injuries (2020-2023)

Category	2020	2021	2022	2023
GDP per Capita (USD)	3,794.41	4,216.25	5,023.25	5,260.21
YLD Males	2,851.706	3,389.687	3,296.180	3,693.448
YLD Females	447.586	617.572	643.434	736.102
Economic Cost (Males, USD)	10,820,540	14,291,770	16,557,540	19,428,310
Economic Cost (Females, USD)	1,698,325	2,603,838	3,232,130	3,872,051
Total Economic Cost (USD)	12,518,870	16,895,610	19,789,670	23,300,360
% Economic Cost (Males)	86.43%	84.59%	83.67%	83.38%
% Economic Cost (Females)	13.57%	15.41%	16.33%	16.62%
YLD Ratio (M/F)	6.37	5.49	5.12	5.02
% Economic Cost of YLD (GDP)	0.0075%	0.0091%	0.0090%	0.0101%

Source: Author's calculations

Males consistently accounted for the largest share of the economic burden, contributing between 83.4% and 86.4% annually. This aligns with the higher YLD values observed among males, who are more frequently involved in severe traffic accidents. The YLD ratio (males to females) ranged between 5.02 and 6.37, highlighting the gender gap in disability burden. Consequently, the economic cost of male YLD was significantly higher than that of females, with male costs reaching \$19.4 million in 2023, compared to \$3.87 million for females.

Although the total economic cost of YLD appears substantial in absolute terms, it represents a small fraction of Algeria's total GDP, ranging between 0.0075% and 0.0101%. However, this percentage does not fully capture the societal impact, as it excludes indirect costs such as healthcare expenses, long-term care, and productivity losses among caregivers. The methodology also assumes equal productivity across all individuals, which may underestimate the burden on economically active age groups.

The increasing economic cost of YLD underscores the need for effective interventions to reduce disability rates from traffic accidents. Targeted road safety measures, including stricter enforcement of traffic laws, improved infrastructure, and public awareness campaigns, could mitigate these costs. Moreover, rehabilitation programs that reduce the long-term effects of disabilities could improve workforce reintegration, lowering productivity losses.

These findings highlight the hidden economic toll of non-fatal traffic injuries, emphasizing the importance of preventative strategies and policy reforms to curb both the human and financial costs of road traffic injuries.

IV. Discussion

The surge in Years Lived with Disability (YLD) from traffic injuries in Algeria between 2020 and 2023 poses a mounting public health and economic threat. Young males (20–24 years) and older adults (≥ 50 years) face the greatest disability burden, driven by risky driving behaviours and prolonged recovery times, with males constituting over 83% of the economic cost (male-to-female YLD ratio: 5.02–6.37). The economic toll escalated by 86%, from \$12.5 million in 2020 to \$23.3 million in 2023, though this represents only 0.0075%–0.0101% of GDP. Excluding indirect costs such as ongoing medical care, rehabilitation, and caregiver losses suggests a far greater burden.

Effective policy interventions demand a multi-dimensional approach. Robust traffic law enforcement, including mandatory helmet and seatbelt use and speed controls, is critical. Road safety campaigns targeting young drivers, coupled with infrastructure enhancements like safer road layouts, pedestrian pathways, and traffic-calming measures, can reduce crash frequency and severity. Stakeholder engagement is paramount: the Ministries of Transport and Health, local governments, NGOs, and private sector entities (e.g., automotive firms) must align efforts. Public-private collaborations could fund safety initiatives, while community groups can drive grassroots behavioural change among high-risk populations.

Algeria's healthcare system requires urgent reinforcement to address the rising tide of road injuries. Expanding trauma care facilities, improving prehospital response, and training emergency personnel are essential to minimize disability severity. Rehabilitation and reintegration must be comprehensive: dedicated centres offering physiotherapy, psychological counselling, and vocational programs can support workforce and societal re-

entry. Community-based initiatives, such as peer support networks, can further reduce social exclusion. These efforts necessitate coordination across healthcare, social services, and labour sectors.

Study limitations require thorough acknowledgment. Global disability weights may not align with Algeria's unique socio-cultural and healthcare landscape, potentially skewing YLD estimates. The absence of regional data masks urban-rural disparities, and the study's failure to differentiate injury severity or type introduces bias. Indirect costs, including caregiver burden and mental health impacts, remain unquantified. Future research should leverage region-specific data, categorize injuries by severity, and estimate indirect costs like lost wages and medical expenses. Exploring technologies like crash detection systems could refine policy targeting.

Policy implementation faces hurdles, including funding shortages, bureaucratic inefficiencies, and resistance to change. Pilot projects, stakeholder dialogues, and phased rollouts can enhance viability. A coordinated, multi-sectoral strategy backed by government resolve and international support is vital to curb the long-term consequences of traffic-related disabilities in Algeria.

V. Conclusion

The escalating Years Lived with Disability (YLD) from traffic injuries in Algeria from 2020 to 2023 signals a profound public health and economic crisis. Young males (20–24 years), older adults (≥ 50 years), and increasingly adolescents (15–19 years) bear the brunt, reflecting persistent high-risk behaviours and inadequate safety measures. The economic cost soared from \$12.5 million in 2020 to \$23.3 million in 2023, driven by rising disability rates and GDP growth. Yet, this underestimates the true burden, omitting costs like medical care, rehabilitation, and caregiver losses.

Policy action must be strategic and inclusive. Enhanced enforcement of traffic regulations targeting speeding, reckless driving, and non-compliance with safety gear is essential. Tailored education programs for young drivers, alongside infrastructure upgrades like safer roads, better lighting, and pedestrian zones, can mitigate risks. Stakeholder collaboration across government, healthcare, private industry, and civil society is crucial. For instance, automotive companies could integrate advanced safety features, while NGOs could lead community outreach to shift driver behaviour.

Healthcare system enhancements are non-negotiable. Scaling up trauma care, streamlining emergency response, and training specialized staff can reduce disability duration and severity. Rehabilitation initiatives should encompass accessible physiotherapy, mental health services, and job retraining to foster social and economic reintegration. Financial support, such as subsidies for rehabilitation, could ease household burdens. Implementation barriers, including resource limitations and inter-sectoral coordination, require proactive solutions like pilot programs and public-private partnerships.

Study limitations include reliance on global disability weights, which may misalign with Algeria's context, and lack of regional or injury-specific data, risking biased estimates. Indirect costs, such as caregiver responsibilities and psychological impacts, were not captured. Future research should prioritize localized data, detailed injury classifications, and comprehensive cost analyses, including mental health and technology-driven prevention strategies.

With YLD costs surpassing \$23 million in 2023, urgent, collaborative action is critical. Integrating enforcement, infrastructure, healthcare, and rehabilitation supported by diverse stakeholders will alleviate the disability burden, enhance public health, and strengthen economic stability in Algeria.

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