

3<sup>rd</sup> AfroSAFE conference | 8–12 June 2026, Lusaka, Zambia

# Investigating Risk Factors for Pedestrian Fatalities in Tanzania using standard logistic and mix-logit model

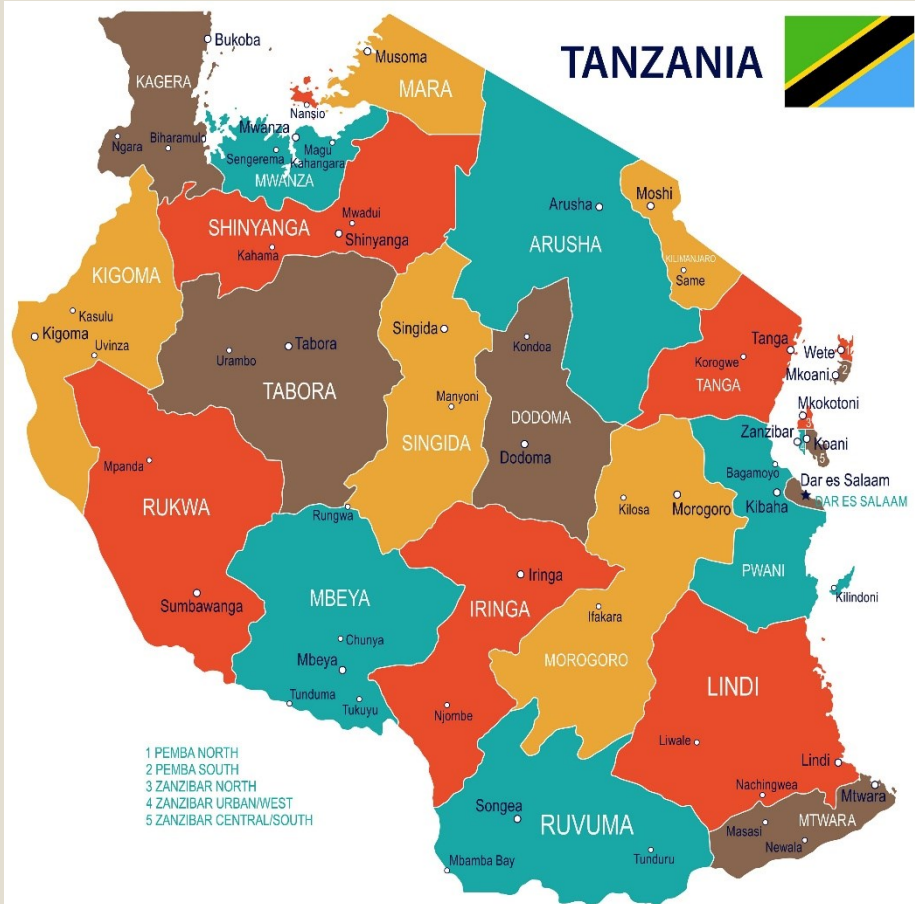
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## Background

- Africa bears the highest pedestrian fatality burden globally of 19 per 100,000 population, highlighting the need for evidence-based interventions.
- Road traffic injuries are a major public health concern. Pedestrians account for approximately 26% of road traffic fatalities in Tanzania.

# Study Population and Data Source



## Data summary

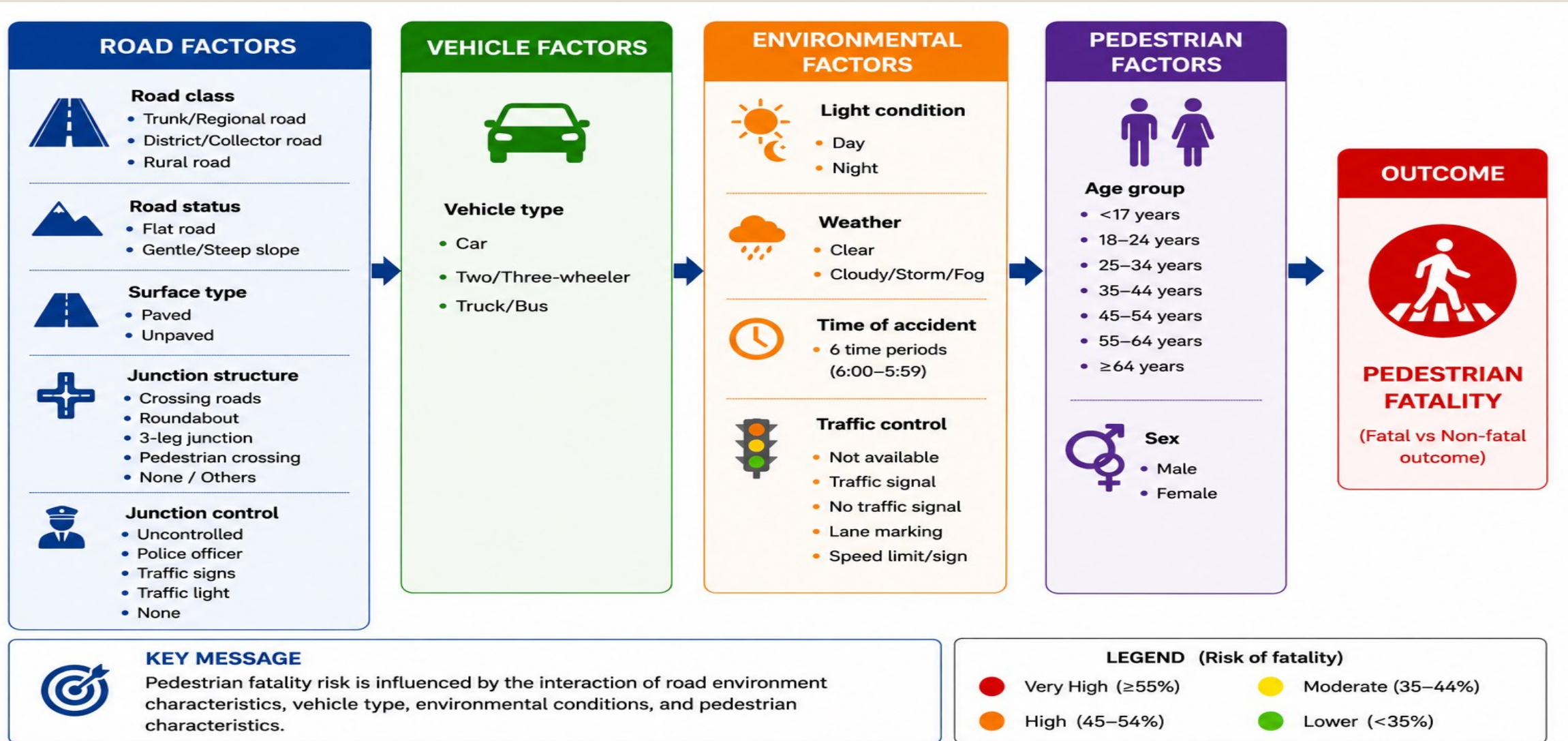
Total crashes 21,952  
Pedestrian crashes 3,080.  
injured pedestrians 3,351  
Pedestrian fatalities 1,232

## Key findings:

36.8% among injured pedestrians

Source: Tanzania Police Road Crash Database (2015–2017)

# Conceptual framework for factors associated with Pedestrian Fatalities



**Figure.** Conceptual framework of factors associated with pedestrian fatality risk in Tanzania (2015–2017)

# Methodology

- Standard Logistic Regression was used to estimate risk factors for pedestrian fatalities.
- Mixed-Effects Logistic regression accounted for regional clustering and unobserved heterogeneity.
- The clustering effect was assessed using the intraclass correlation coefficient (ICC).
- Model fits were compared using Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC)

## Distribution of Pedestrian Fatalities by Key Characteristics

Characteristic	Fatal (%)	Risk
Age ≥64 years	60.8	Very High
Male	39.9	Moderate
Age ≤17 years	37.0	Moderate
Trucks/Buses	58.5	Very High
Gentle/Steep Slope	55.2	Very High
Rural Roads	54.2	High
Vehicle Manoeuvre	52.5	High
Unpaved Roads	51.7	High
Hit-and-Run	50.8	High
Cloudy/Storm/Fog	46.8	High
Night-time	41.4	Moderate

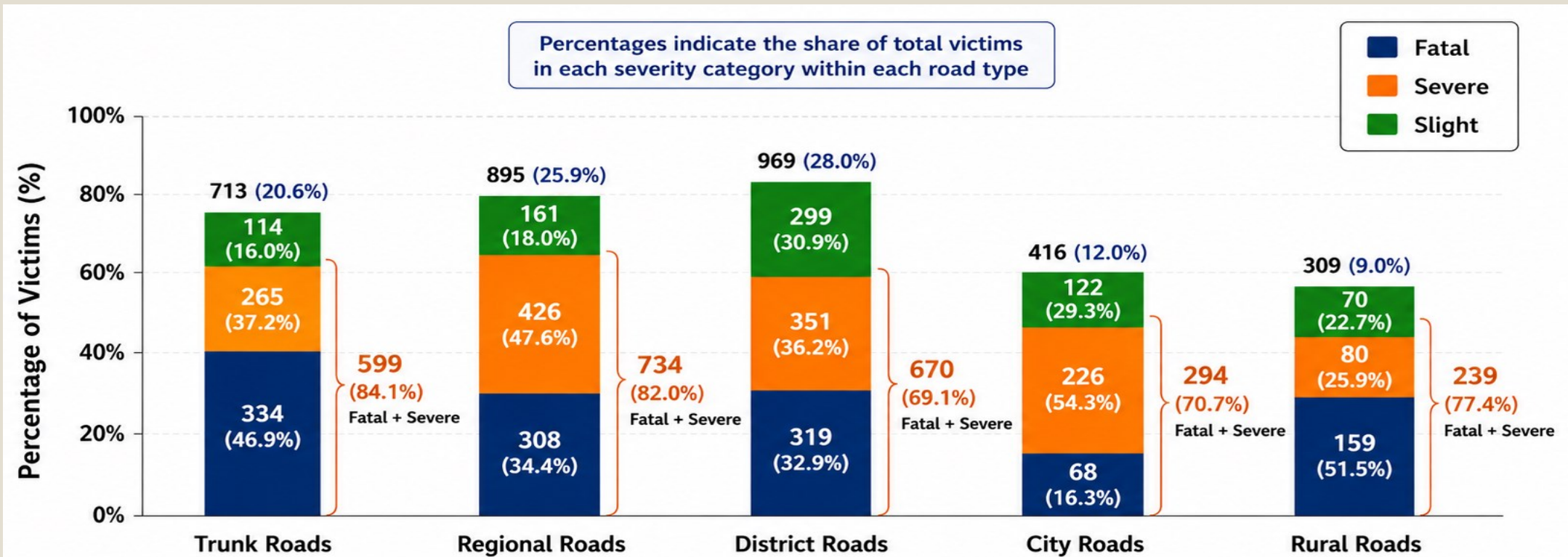
### RISK LEVEL

- Very High (≥55%)
- High (45–54%)
- Moderate (35–44%)
- Lower (<35%)

### KEY FINDINGS

- Older pedestrians (≥64 years) had the highest fatality burden (60.8%).
- Truck/bus crashes showed the highest vehicle-related fatality risk (58.5%).
- Rural, sloped and unpaved roads were associated with elevated mortality.
- Hit-and-run crashes and night-time conditions substantially increased fatalities.

# Pedestrian Injury Severity by Road Type



## KEY MESSAGE (Focus on Fatal and Severe Injuries):

- Trunk roads have the highest proportion of **fatal** (46.9%) and **severe** (37.2%) injuries.
- Regional roads report the highest number of **severe** injuries (47.6%).
- City roads have the highest proportion of **severe** injuries (54.3%).
- Rural roads have the highest proportion of **fatal** injuries (51.5%).

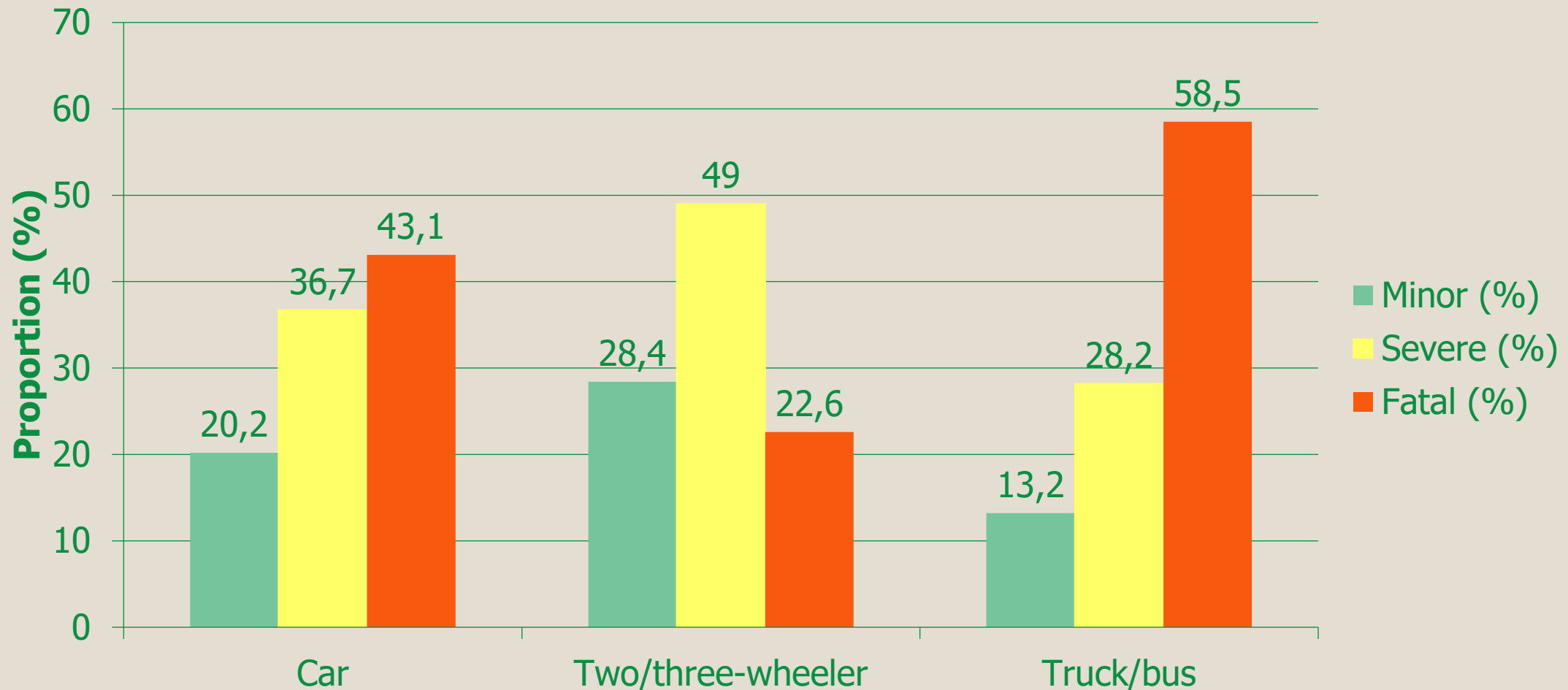


Across all road types, **severe injuries** constitute a substantial share of total victims, ranging from **25.9% to 54.3%**.



Priority interventions should target **high-fatality roads** (trunk & rural) and **severe injury reduction** (especially on city and regional roads).

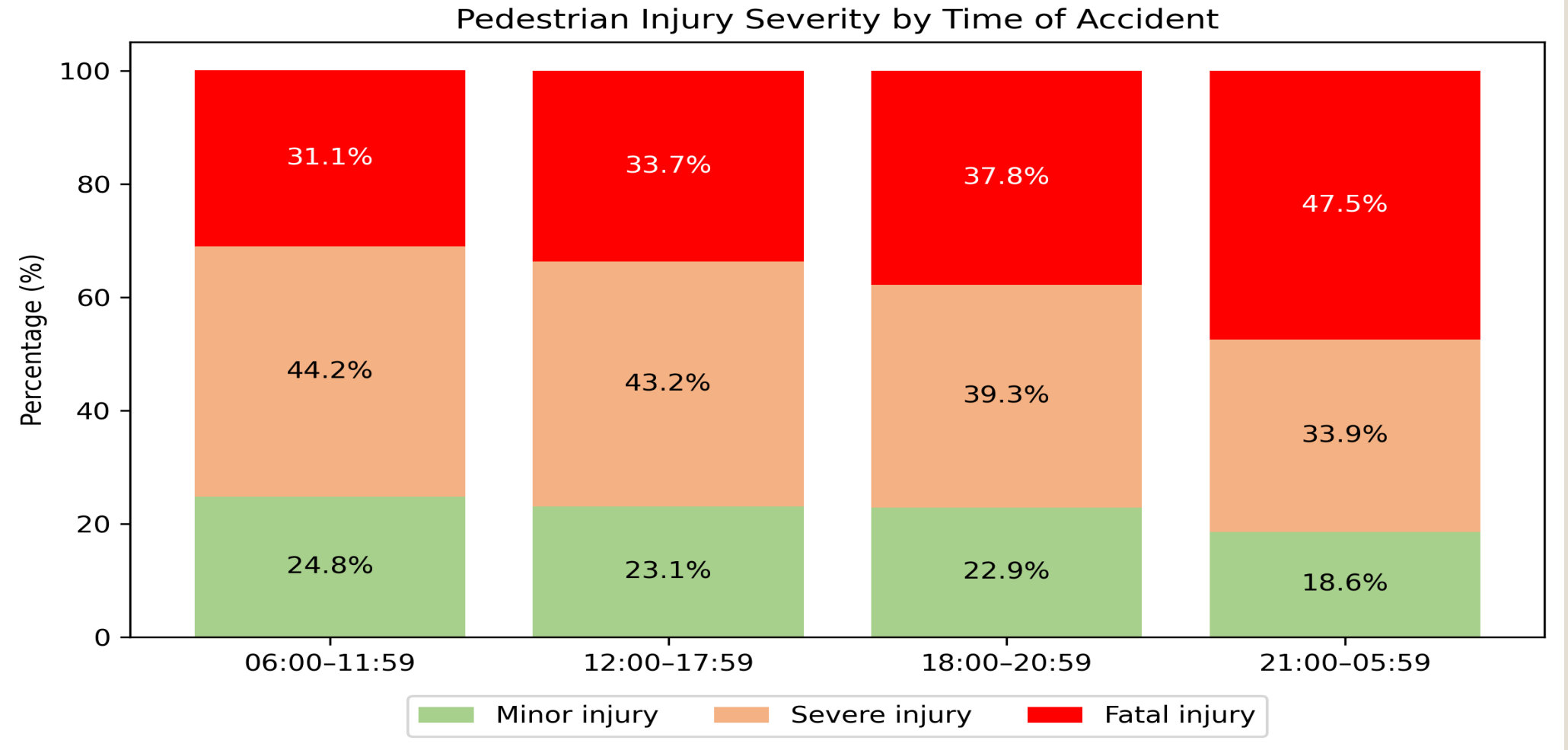
# Pedestrian Injury Severity by Vehicle Type



## Key Findings:

- Truck/bus crashes had the highest fatal injury proportion (58.5%).
- Two/three-wheelers had the highest severe injury proportion (49.0%).
- Car-related crashes resulted in substantial severe (36.7%) and fatal (43.1%) injuries.

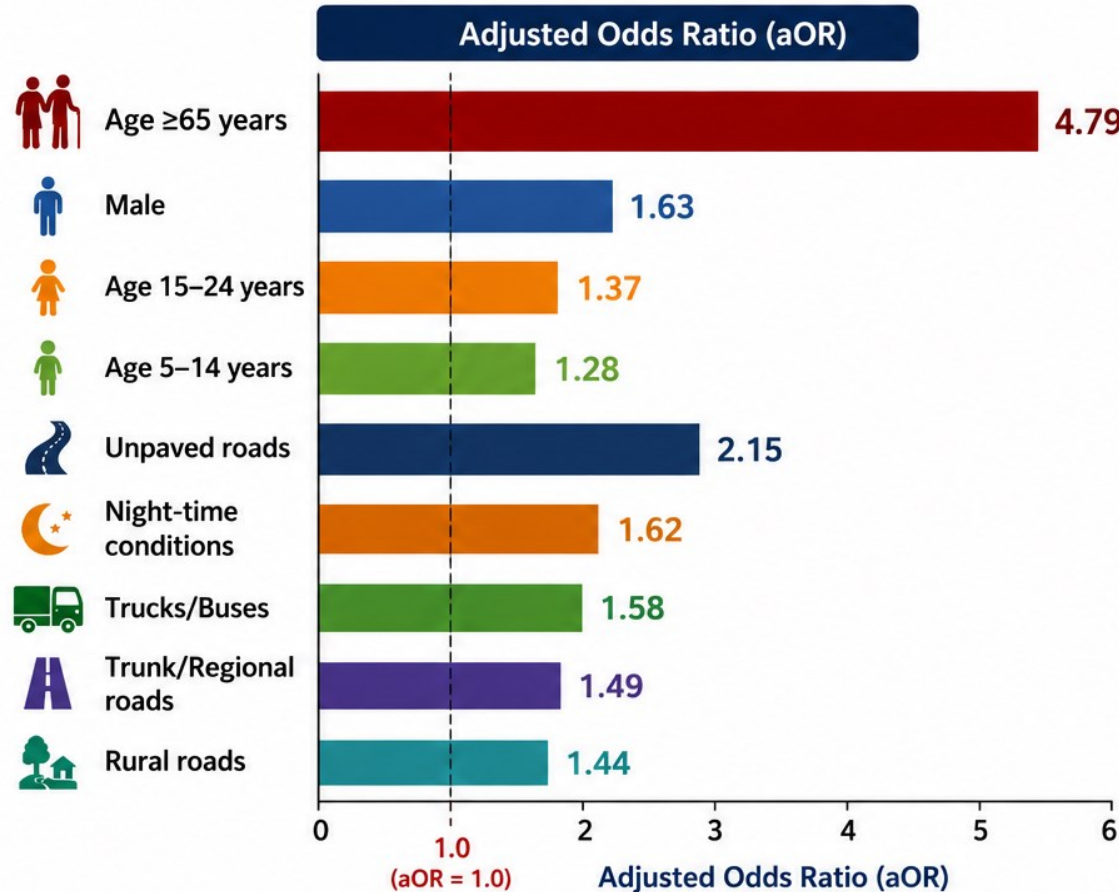
# Pedestrian Injury Severity by Time of Accident



Key findings: Fatal injuries peaked at night (47.5%); severe injuries were highest in the morning (44.2%); minor injuries were lowest at night (18.6%).

# Key Risk Factors Associated with Pedestrian Fatalities

Mixed-Effects Logistic Regression Results (Adjusted Odds Ratios)



Risk Factor	Adjusted Odds Ratio (aOR)
Age ≥65 years	4.79
Male	1.63
Age 15–24 years	1.37
Age 5–14 years	1.28
Unpaved roads	2.15
Night-time conditions	1.62
Trucks/Buses	1.58
Trunk/Regional roads	1.49
Rural roads	1.44



**Key Message:** Older pedestrians ( $\geq 65$  years) had the highest risk of fatal injury. Males and younger age groups (15–24 and 5–14 years) were also at increased risk. Road environment (unpaved, rural, and trunk roads), night-time conditions, and heavy vehicles (trucks/buses) significantly increased the risk of pedestrian fatalities.

# Model Comparison

Feature	Logistic Regression	Mixed-Effects Logistic Regression
Accounts for regional clustering	X	✓
Accounts for unobserved heterogeneity	X	✓
Includes random effects	X	✓
ICC estimation	Not available	0.26
AIC (Akaike Information criterion)	3868.6	3621.2
Overall model performance	Good	Better
Preferred model		✓

Key Finding: The mixed-effects model outperformed the standard logistic model. ICC = 0.26 indicates that 26% of the variation in pedestrian fatalities was attributable to differences between regions.

## Conclusions

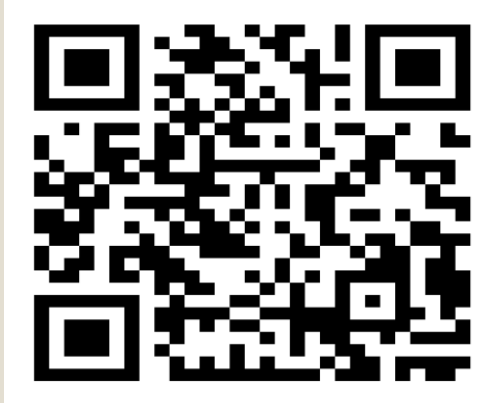
- Older pedestrians ( $\geq 65$  years), trucks/buses, rural roads, trunk/regional roads, unpaved roads, and night-time conditions were significant predictors of pedestrian fatalities.
- The mixed-effects model provided a better fit than the standard logistic model, indicating that regional factors play an important role in pedestrian fatality risk.
- Approximately **26% of the variation** in pedestrian fatalities was attributable to regional differences

# Recommendations

- Implement comprehensive pedestrian safety improvements on rural and trunk roads through sidewalks, safe crossing facilities, traffic calming measures, speed enforcement, and road safety awareness campaigns.
- Enhance night-time visibility through improved street lighting, reflective road markings, and illuminated pedestrian crossings.
- Strengthen heavy-vehicle safety regulations and protect vulnerable pedestrians through stricter enforcement, vehicle safety technologies, and safer road environments around pedestrian activity areas.

What to read the full paper ?

## Explaining Risk Factors for Pedestrian Fatalities in Tanzania Using a Mixed-Logit Analysis



Transportation Research Interdisciplinary Perspectives

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Thank you for listening.

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