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Theme: Building sustainable road safety systems for Africa: from data to implementation and ownership

Title: Equity Dimensions of Road Traffic Injuries and Fatalities among Vulnerable Road Users in Zambia

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Background

Road traffic injuries remain one of Zambia's leading causes of premature mortality, disproportionately affecting pedestrians, cyclists, and motorcyclists, collectively referred to as vulnerable road users (VRUs). In low-income settings, these groups often depend on unsafe transport environments lacking designated walkways, cycling lanes, or adequate enforcement of protective measures such as helmet and speed regulations. While road safety analyses have focused primarily on national aggregates, there has been limited examination of *equity dimensions*, including disparities by user type, age group, and geography, that underpin persistent injury risks.

This study provides the first nationwide assessment of Zambia's VRU burden from an equity perspective. It quantifies temporal trends and spatial inequalities in fatalities and injuries, highlights child vulnerability, and identifies provinces where VRUs face the greatest risk.

Aim

To examine temporal, demographic, and spatial equity dimensions of road traffic injuries among vulnerable road users in Zambia from 2016 to 2024, with a focus on disparities by user group, age, and province.

Method

This retrospective study analysed national road crash data from the Road Transport and Safety Agency (RTSA) for 2017–2024, covering over 140,000 crashes and approximately 90,000 injuries. Records were linked with population data from the Zambia Statistics Agency and classified by road user type, injury severity, age group, province, and year.

We estimated VRU fatality and serious injury proportions by province and over time. Temporal trends were assessed using binomial logistic regression to derive year-on-year odds ratios. Spatial inequality in VRU burden was measured using the Gini and Theil indices, with geographic patterns visualised through choropleth maps in R.

Results

In 2024, vulnerable road users (VRUs) accounted for 66.3% (95% CI: 64.3–68.3%) of fatalities and 54.7% (95% CI: 53.4–56.0%) of serious injuries in Zambia. From 2017 to 2024, the share of VRU fatalities increased modestly but significantly (OR = 1.02 per year, $p = 0.025$), while non-VRU fatalities declined.

Children represented 9.1% (95% CI: 8.0–10.4%) of fatalities, with a significant decline in minor injuries (OR = 0.95, $p < 0.001$). Spatial disparities were marked: Luapula recorded the highest VRU share (86.9%), followed by Eastern (69.0%) and North-Western (65.1%), while Copperbelt had the lowest (43.3%); inequality was significant (Gini = 0.122).

Urban areas accounted for 58% of casualties, but VRU proportions were similar in urban and rural settings. Motorcycle involvement more than doubled over the study period (2.6% to 5.7%), particularly in rural and peri-urban areas. Excessive speed remained the leading crash cause, followed by failure to keep near side and pedestrian inattention. Overall, per-capita VRU fatality rates declined slightly but not significantly.

Conclusions

VRUs continue to bear a growing share of road traffic fatalities, reflecting persistent structural and geographic inequities. Provinces such as Luapula, Northern, and Eastern face disproportionately high risk, underscoring the need for targeted infrastructure and speed management. The observed decline in minor injuries among children warrants further investigation to distinguish real gains from underreporting. The rapid rise in motorcycle crashes signals an urgent need for strengthened helmet use, licensing, and rider education.

Policy implications

- Prioritise VRU protection within Zambia's National Road Safety Strategy.
- Integrate spatial equity mapping into annual monitoring frameworks.
- Strengthen intersectoral coordination between transport, education, and health sectors to address behavioural and environmental risk factors.
- Develop a VRU Equity Index for Zambia to routinely measure and report progress on injury reduction by user group and province.

In conclusion, Zambia's road safety challenge is fundamentally one of equity. National safety gains must prioritise pedestrians, cyclists, motorcyclists, and children to achieve

the goals of the Decade of Action for Road Safety and the Sustainable Development Agenda.

Keywords: vulnerable road users, health equity, road safety, spatial disparities, child injuries, Zambia