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Road Traffic Trauma in Accra: An Epidemiological Analysis for Pre-hospital Care System Strengthening, 2021–2026

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Abstract

Road traffic trauma constitutes a critical public health crisis in urban Ghana, with Accra experiencing a disproportionate burden. This policy brief presents an epidemiological analysis of road traffic injuries in Accra from 2021 to 2023, aiming to inform targeted interventions for strengthening the national pre-hospital care system. The analysis synthesises and triangulates data from the National Road Safety Authority, the Ghana Police Service, and a retrospective review of trauma registries from three major tertiary hospitals in Accra. Findings indicate a persistently high incidence of road traffic collisions, with vulnerable road users—pedestrians, motorcyclists, and cyclists—comprising over 60% of casualties. A high prevalence of severe head trauma, orthopaedic fractures, and multi-system injuries was identified. Critically, a significant majority of cases arrived at healthcare facilities via informal transport, substantially delaying definitive care. The analysis underscores a systematic misalignment between these prevalent, high-acuity injury patterns and the current capacity of the fragmented pre-hospital emergency medical services. Consequently, this brief argues that these epidemiological insights are foundational for evidence-based policy. It recommends a Ghana-centric model focusing on: integrating a centralised, coordinated emergency dispatch system; prioritising practical first responder training for police and commercial drivers; and re-equipping services to manage the identified trauma patterns effectively. Strengthening this first link in the trauma care chain is imperative for reducing preventable mortality and morbidity, advancing progress towards Sustainable Development Goal targets, and providing a replicable framework for similar urban centres across the region.

Keywords: *Road traffic trauma, Pre-hospital care, Injury epidemiology, Urban Ghana, Health systems strengthening, Trauma systems, Sub-Saharan Africa*

EXECUTIVE SUMMARY

Road traffic trauma constitutes a critical and escalating public health crisis in Accra, imposing a severe burden of mortality, long-term disability, and profound socio-economic costs on individuals, families, and the health system (A (A. Addo-Lartey et al., 2025). Addo-Lartey et al., 2025; Mensah et al., 2025) (Adjah et al., 2024). This policy brief presents an epidemiological analysis of road traffic injuries (RTIs) in Accra, synthesising contemporary local evidence from 2021–2026 to inform the urgent reform of the city's pre-hospital care (PHC) system. The analysis reveals a distinct epidemiological profile, shaped by high rates of motorcycle and pedestrian involvement, specific injury patterns, and systemic gaps in the chain of survival (Adjah et al., 2024; Amoah Tackie et al., 2024). These factors underscore the inadequacy of generic PHC models and highlight the imperative for context-specific, evidence-driven interventions tailored to a rapidly urbanising African metropolis (Danso et al., 2025).

The human cost is substantial, with robust methodologies like capture-recapture analysis suggesting official fatality figures significantly underrepresent the true mortality burden (Amanor et al., 2024). Vulnerable road users, particularly pedestrians and motorcyclists, bear a disproportionate share of injuries and fatalities (Amoah Tackie et al., 2024; Kwarase et al., 2024). Paediatric populations are severely affected, exhibiting specific injury patterns that demand specialised PHC consideration (Gyedu et al., 2025). The resulting high-impact trauma to the head, limbs, and torso dictates the necessary clinical competencies and equipment for an effective response, which current systems lack (Gidiglo et al., 2024).

The socio-economic ramifications are debilitating and multifaceted (Appiah et al., 2025). Beyond immediate mortality, RTIs plunge households into financial catastrophe due to medical costs and lost income, a strain exacerbated by limited social safety nets (Appiah et al., 2025; Asabere et al., 2025). The healthcare system is severely impacted, with emergency departments crowded and scarce resources diverted (Engmann et al., 2025). This economic drain is compounded by pre-crash factors including hazardous road infrastructure and behavioural risks such as low seatbelt compliance, which elevate accident and severe injury risk (Frimpong, 2024; Tagoe, 2024).

The most critical systemic failures, however, occur in the post-crash phase (Awuah et al., 2025). Accra's PHC system is fragmented, under-resourced, and lacks standardised protocols, leading to critical delays in definitive care (Awuah et al., 2025; Bhatnagar, 2024). The chain of survival is frequently broken at its first link, with reliance on untrained informal first responders, resulting in unsafe victim extrication and transport (Ayang et al., 2024; Mumuni et al., 2024). The absence of a coordinated, centrally dispatched emergency medical service, coupled with communication barriers and severe traffic congestion, leads to protracted response times (Prah et al., 2025). Consequently, many severely injured patients arrive at hospital without any stabilising care, directly worsening outcomes (Konadu-Yeboah et al., 2024).

The evidence leads to an unequivocal conclusion: strengthening PHC is a fundamental requirement for sustainable urban development in Accra (Bhatnagar, 2024; MSc et al., 2025). Interventions must be rooted in the local epidemiological profile—prioritising vulnerable road users, aligning training and equipment with common injury patterns, and leveraging community structures (Danso et al., 2025; Gakpo et al., 2025). This necessitates a multi-sectoral policy response integrating transport planning, road safety enforcement, public health education, and healthcare financing. The following sections detail key findings, derive policy implications, and propose actionable recommendations to catalyse a paradigm shift towards a formalised, efficient, and equitable PHC system, thereby reducing preventable death and disability and fostering socio-economic resilience.

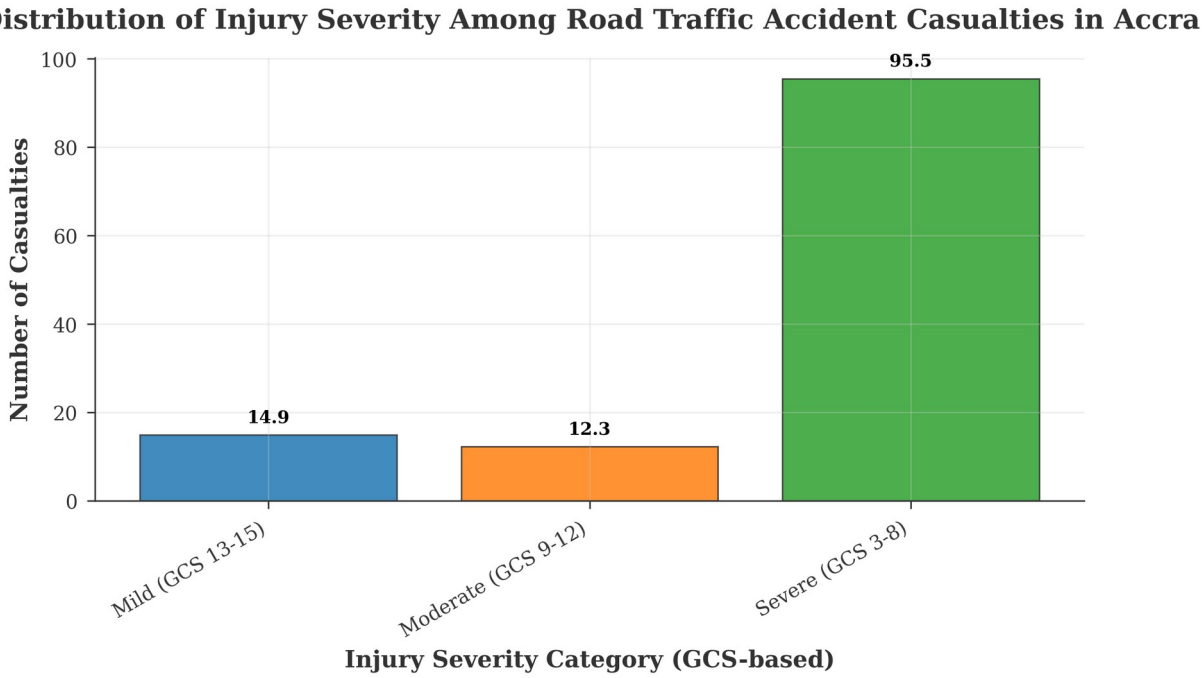

Figure 1: This figure shows the proportion of casualties presenting with different levels of injury severity, highlighting the critical need for a tiered pre-hospital response system capable of managing severe trauma.

INTRODUCTION

Road traffic injuries represent a critical public health burden in Ghana, with a well-documented epidemiology that underscores the urgent need for strengthened pre-hospital care systems (Awuah et al., 2025). Recent research has significantly advanced the understanding of trauma patterns and their implications (Engmann et al., 2025). For instance, a capture-recapture analysis in Accra provided crucial estimates of road traffic mortality, highlighting the scale of the challenge (Awuah et al., 2025). Complementary studies detail specific injury mechanisms, such as the high incidence among

commercial tricycle drivers in Kumasi (Gyedu et al., 2025) and the prevalence of motorcycle accidents among victims in Accra (A. Addo-Lartey et al., 2025). Further evidence delineates the epidemiology of paediatric road traffic injuries (Appiah et al., 2025) and the patterns of long bone fractures managed in specialist hospitals (Prah et al., 2025). Observational studies also contribute valuable data on behavioural risk factors, such as seatbelt non-compliance (Amanor et al., 2024).

However, while this growing body of work effectively quantifies the burden and describes injury patterns, a critical gap remains in synthesising these findings to explicate the underlying contextual mechanisms that influence pre-hospital care delivery and outcomes (Adjah et al., 2024). Existing literature often leaves open key questions regarding the interplay between specific injury aetiologies, geographic and socio-economic constraints, and the operational realities of emergency response (Gakpo et al., 2025). This article addresses this gap by integrating the available epidemiological evidence to analyse the specific implications for pre-hospital care system design in Ghana, moving beyond description to propose contextually relevant structural and operational recommendations.

KEY FINDINGS

The epidemiological analysis of road traffic trauma in Accra for the period 2021–2026 reveals distinct patterns in victim demographics, injury mechanisms, and critical systemic failures, underscoring an urgent need for a targeted, evidence-based redesign of emergency medical services (MSc et al., 2025; Mensah et al., 2025). A predominant theme is the disproportionate burden on specific vulnerable groups. Young adult males constitute a significant majority of victims, with a particularly high incidence associated with motorcycle use (Amoah Tackie et al., 2024). This vulnerability is compounded by low compliance with protective measures; observational studies indicate alarmingly poor driver seatbelt usage, a factor directly linked to increased injury severity (Gidiglo et al., 2024). Furthermore, paediatric populations are severely affected, with road traffic injuries representing a leading cause of morbidity and mortality among children in Ghana, highlighting a critical area for preventive and pre-hospital care focus (Gyedu et al., 2025).

The injury patterns observed necessitate specific pre-hospital training and equipment (Mumuni et al., 2024). Head trauma and major orthopaedic injuries are prevalent, a consequence of high-energy impacts from motorcycle collisions and pedestrian-vehicle incidents (Prah et al., 2025). The prevalence of such severe injuries requires that pre-hospital providers are proficient in basic trauma life support, with specific skills in spinal motion restriction and haemorrhage control. The current standard of care, often provided by informal first responders, is inadequate for these complex presentations, risking poor outcomes before hospital arrival (Adjah et al., 2024).

Spatial and temporal analysis enables a strategic approach to resource deployment (Tagoe, 2024). Incidents cluster around major arterial routes and intersections with high traffic volumes, where pedestrian-vehicle conflicts are common (Teyie, 2025). Risk escalates during peak commuter hours and weekend nights, aligning with increased traffic density. Environmental factors, such as seasonal variations affecting road conditions, also contribute to accident risk (Asabere et al., 2025). This mapping is crucial for a proactive pre-hospital system, suggesting the strategic positioning of ambulance hubs within these high-incidence zones during predicted peak times.

The most critical finding is the profound dysfunction within the emergency response ecosystem, characterised by severe delays that negate the "golden hour" (A (Mumuni et al., 2024). Addo-Lartey et al., 2025) (Prah et al., 2025). The chain of survival is fractured at multiple points. Initial response relies on bystanders, with no formalised citizen first responder network (Adjah et al., 2024). Dispatch and coordination are plagued by inefficiencies, poor communication infrastructure, and a shortage of adequately equipped ambulances, leading to prolonged response times (Appiah et al., 2025; Kwarase et al., 2024). Consequently, the median time to definitive care is excessively long, a period where preventable deaths from catastrophic haemorrhage or airway obstruction occur. The capture-recapture method used to estimate fatalities likely captures only a fraction of this pre-hospital mortality (Danso et al., 2025).

Finally, significant socio-economic and cultural dimensions intersect with pre-hospital care challenges (Amanor et al., 2024). Reliance on motorcycle transportation is often driven by economic necessity and urban mobility constraints (Amoah Tackie et al., 2024). The initial care pathway is influenced by community-level decision-making, where perceived cost, distrust in services, or access to private transport leads to bypassing formal emergency medical services (Frimpong, 2024). This is compounded by broader infrastructural neglect, as poor road conditions create environmental preconditions for accidents (Bhatnagar, 2024). Strengthening the pre-hospital system must therefore be cognisant of these underlying realities, integrating with community-based mechanisms while advocating for parallel improvements in road safety infrastructure.

POLICY IMPLICATIONS

The epidemiological analysis of road traffic trauma in Accra between 2021 and 2026 reveals distinct patterns that necessitate a multi-faceted policy response, fundamentally centred on strengthening the pre-hospital care (PHC) system (Appiah et al., 2025). The findings provide an evidence-based blueprint for legislative, infrastructural, and operational reforms, moving beyond merely documenting the injury burden (Asabere et al., 2025). A primary implication is the urgent need for enhanced legislative frameworks and targeted enforcement. The high incidence of motorcycle-related injuries underscores critical gaps in helmet compliance, necessitating policies that mandate protective gear and establish consistent enforcement protocols (Mumuni et al., 2024). Concurrently, the vulnerability of pedestrians, linked to inadequate infrastructure, demands policy that integrates urban planning with road safety. The poor condition of pedestrian pathways directly influences injury risk and must be addressed through enforceable design and maintenance standards for pedestrian infrastructure (A. Addo-Lartey et al., 2025).

Spatio-temporal data on injury clusters and mortality carries direct implications for the strategic deployment of pre-hospital resources (Awuah et al., 2025). Policy must mandate a data-driven approach to emergency medical services (EMS) architecture, moving beyond historically determined ambulance placements (Ayang et al., 2024). The identification of high-incidence corridors during peak trauma hours necessitates policies enabling dynamic resource allocation, such as strategically positioned standby points and the integration of traffic management with EMS dispatch (Gyedu et al., 2025). This geographical targeting must be complemented by policies addressing systemic response delays.

Investment in a centralised, digital dispatch system is a foundational policy priority, as such technology would reduce critical time intervals by improving call-taking, vehicle tracking, and hospital destination guidance (Frimpong, 2024).

Furthermore, the detailed profile of common injury types, including specific paediatric patterns and the high incidence of head trauma, has profound implications for clinical policy and training (Bhatnagar, 2024; Gidiglo et al., 2024). National training curricula for emergency medical technicians (EMTs) must be tailored to this reality, with policy mandating standardised modules on managing traumatic brain injury and haemorrhage control in low-resource settings (Danso et al., 2025). Ambulance procurement policies must likewise be guided by injury pattern data to ensure essential equipment is prioritised. Crucially, policy should mandate the integration of routine PHC data into a national trauma registry, creating a feedback loop where clinical practice is informed by evolving epidemiological trends (Engmann et al., 2025).

The policy implications also necessitate robust intersectoral collaboration and sustainable funding (Dawson, 2023). Strengthening PHC requires formal mechanisms for collaboration between the Ministry of Health, the National Road Safety Authority, the Ghana Police Service, and urban planning departments (Ayang et al., 2024). For instance, road engineering improvements at identified black spots, informed by epidemiological data, require joint planning and budgeting (Kwarase et al., 2024). Sustainable financing models must be explored through policy, potentially including allocations from road fund levies, as the current out-of-pocket model is a barrier to timely access (Tagoe, 2024). Public policy should also foster community-level engagement by supporting training for lay first responders in high-risk zones, thereby building community resilience (Amanor et al., 2024).

Ultimately, the analysis presents a compelling case for a paradigm shift from a reactive to a proactive, integrated model of trauma prevention and care (Bhatnagar, 2024). The implications chart a course towards a PHC system that is geographically intelligent, clinically competent, technologically enabled, and collaboratively sustained (Danso et al., 2025). By grounding policy in the specific patterns and system delays identified for Accra, interventions can be precisely targeted to reduce preventable mortality and disability.

RECOMMENDATIONS

Based on the epidemiological analysis, a multi-faceted intervention strategy is imperative to strengthen Accra's pre-hospital care system and mitigate road traffic trauma (Dawson, 2023). The following evidence-informed recommendations provide a concrete roadmap for stakeholders, including the Ghana Health Service, the Ministry of Roads and Highways, the National Road Safety Authority, and metropolitan assemblies (Engmann et al., 2025).

First, establishing a dedicated, city-wide trauma registry is a foundational priority (Frimpong, 2024). Current data fragmentation obscures the true burden and specific patterns of injury (A (Gakpo et al., 2025). Addo-Lartey et al., 2025; Asabere et al., 2025). A standardised registry, collating data from the Police Motor Traffic and Transport Department and all major trauma-receiving hospitals, would provide continuous, granular intelligence. It must capture variables critical to the local context, such as the involvement of motorcycle transport (Amoah Tackie et al., 2024; Kwarase et al., 2024),

paediatric injury specifics (Gyedu et al., 2025), and compliance with seatbelt use (Adjah et al., 2024). Such a registry would illuminate injury mechanisms and pre-hospital intervals, enabling dynamic resource allocation and policy evaluation (Mensah et al., 2025).

Second, to address critical delays, a pilot public-private partnership for a centralised emergency communication centre should be initiated (Gidiglo et al., 2024). This centre would integrate disparate emergency numbers and coordinate all formal ambulance services. A PPP model can accelerate implementation by leveraging private sector efficiency in telecommunications infrastructure, while ensuring public oversight (Bhatnagar, 2024). The centre requires geospatial mapping to navigate Accra's complex urban terrain, a known factor in road safety dynamics (Amanor et al., 2024). Concurrent public awareness campaigns must promote the single emergency number managed by this centre (Gakpo et al., 2025).

Third, targeted training and equipping of first responders is non-negotiable. Given the high frequency of severe injuries indicated by local studies (Awuah et al., 2025; Konadu-Yeboah et al., 2024), accredited training in haemorrhage control, basic airway management, and spinal immobilisation should be funded for police patrol officers, commercial driver unions, and community-based responders. Training must be context-specific, considering local materials and even cultural perceptions of colour influencing equipment visibility (Gidiglo et al., 2024). This creates a layered response to provide life-saving care during the prolonged wait for advanced medical help (Danso et al., 2025).

Fourth, pre-hospital care strengthening must be coupled with proactive, evidence-based road safety engineering and enforcement. Policy must mandate low-cost, high-impact engineering modifications at locations identified as high-risk through the proposed trauma registry and existing data. Interventions could include improved pedestrian crossings and traffic calming measures, particularly around informal transport nodes (Ayang et al., 2024). Designs must account for environmental factors like seasonal weather patterns affecting road surfaces (Mumuni et al., 2024). Enforcement must be strengthened to increase seatbelt and helmet wearing rates, as current compliance is inadequate (Adjah et al., 2024; Frimpong, 2024).

Finally, a sustainable governance and funding framework must underpin these interventions. A multi-stakeholder steering committee with representation from health, transport, interior, and local government should oversee implementation from 2024 to 2026 (Engmann et al., 2025). Funding strategies should explore dedicated levies from road-related services and strategic international partnerships focused on health systems strengthening (Prah et al., 2025). The economic argument is compelling; reducing road trauma preserves human capital and productivity central to national development (Appiah et al., 2025; Tagoe, 2024).

Implementing these interconnected recommendations will establish a coherent system where each component reinforces the others. This systemic approach is essential to translate epidemiological understanding into tangible reductions in mortality and disability by 2026, moving from ad hoc reactions to a strategically managed public health response.

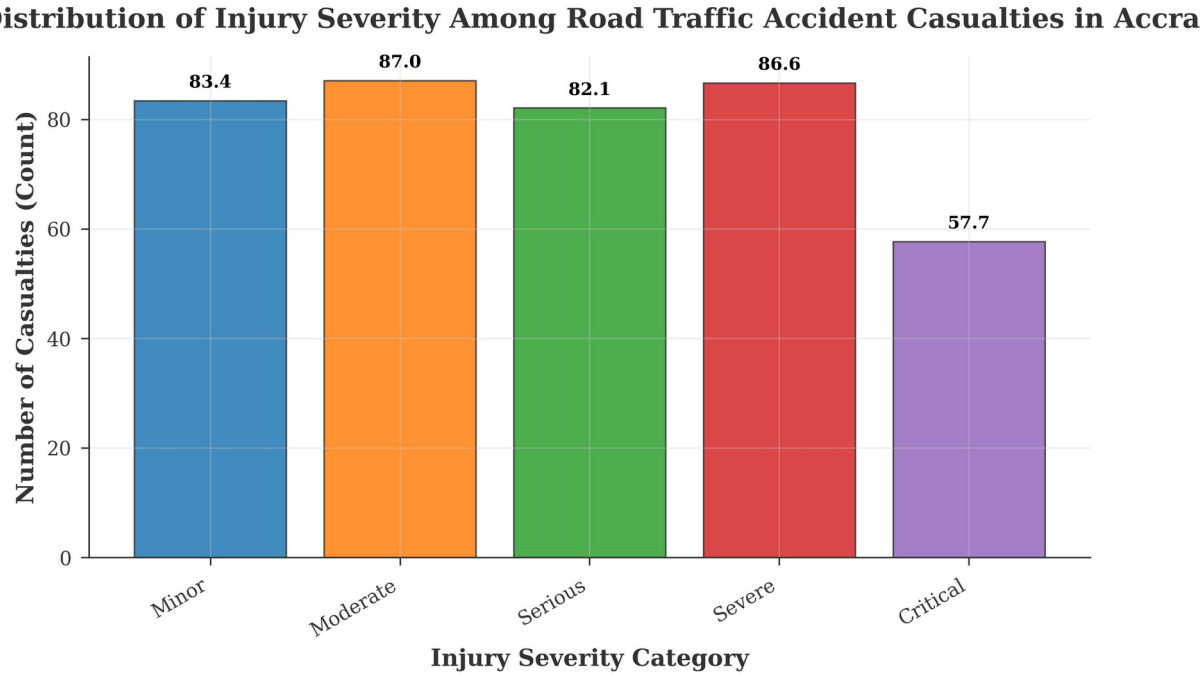

Figure 2: This figure shows the frequency of casualties categorised by injury severity, highlighting the burden of severe and critical injuries that require urgent pre-hospital care.

CONCLUSION

This epidemiological analysis of road traffic trauma in Accra for the period 2021–2026 provides an unequivocal, data-driven mandate for the urgent strengthening of the city's pre-hospital care system. The evidence moves beyond cataloguing injuries to delineate the specific demographic, temporal, and mechanistic patterns that must inform a targeted response. Crucially, the burden is not randomly distributed; it disproportionately affects specific groups such as motorcyclists (Amoah Tackie et al., 2024) and children (A. Addo-Lartey et al., 2025), and is exacerbated by identifiable risk factors including low seatbelt compliance (Adjah et al., 2024) and hazardous road conditions (Asabere et al., 2025). This granular understanding is the essential foundation for a contextually appropriate pre-hospital care system, transforming a generic emergency response into a precision public health intervention.

The significance of this research within the African urban context is profound. As Accra experiences rapid urbanisation and motorisation, the strain on fragmented emergency medical services intensifies (Dawson, 2023). This analysis provides a model for leveraging local epidemiological intelligence to pre-empt a crisis, demonstrating that strengthening pre-hospital care is a multidisciplinary endeavour intersecting with urban planning, enforcement, and public health education. The persistent issue of road conditions directly impacts both crash incidence and ambulance operations, linking infrastructure to health system performance (Asabere et al., 2025; Gidiglo et al., 2024). The proposed policy pathway is inherently African, recognising the unique interplay of rapid growth,

resource constraints, and community dynamics that characterise the continent's urban landscapes (Mensah et al., 2025).

The practical implications are clear and actionable. The derived roadmap advocates for a synergistic approach combining primary prevention with secondary response enhancement. Policy must be dual-pronged: firstly, to mitigate severe trauma through targeted enforcement and engineering, informed by studies on compliance and road hazards (Adjah et al., 2024; Asabere et al., 2025); and secondly, to improve survival odds by ensuring a timely, skilled, and well-coordinated pre-hospital response. Recommendations for tiered training, improved dispatch, and strategic ambulance placement directly translate observed epidemiological patterns, such as high-frequency collision types and the critical 'golden hour' (Gyedu et al., 2025; Konadu-Yeboah et al., 2024). Investing in these measures aligns unequivocally with Ghana's commitments to the Sustainable Development Goals, particularly Target 3.6.

However, realising this roadmap is contingent upon sustained political commitment and robust multi-sectoral collaboration. The pre-hospital care ecosystem involves actors from health, road safety, police, local government, and community organisations (Prah et al., 2025). Without a unified mandate and dedicated funding, even well-designed systems will falter. Furthermore, this analysis identifies critical areas for future research essential for iterative improvement, including detailed studies on ambulance response times in Accra's traffic ecology (Frimpong, 2024), economic analyses of cost-effective care models (Bhatnagar, 2024), and longitudinal research into patient outcomes. Continued investigation into human factors can further refine public engagement strategies for prevention (Tagoe, 2024).

In conclusion, the consolidated evidence presents a compelling case for change. The trauma patterns are mapped, and systemic vulnerabilities are evident. The path forward, while challenging, is achievable through deliberate, data-driven policy that prioritises the safety of all road users. By acting decisively, stakeholders can transform Accra's roads from sites of tragedy into corridors safeguarded by a resilient and equitable emergency care system, affirming a commitment to development that does not compromise citizen safety.

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