



Quantifying the Economic Costs of Road Traffic Accidents in Jamaica: A Cost-of-Illness and Productivity Loss Analysis (2015-2025)

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Abstract

Background: Road traffic accidents (RTAs) represent a persistent public health and economic challenge in Jamaica. While national statistics document fatalities and injuries annually, there is limited empirical evidence quantifying their comprehensive economic burden.

Objective: This study estimates the total economic cost of road traffic accidents in Jamaica from 2015 to 2025 using a cost-of-illness framework and human capital approach.

Methods: A retrospective quantitative design was employed using secondary data obtained from the Jamaica Constabulary Force, Statistical Institute of Jamaica, Ministry of Health and Wellness, Jamaica, and Planning Institute of Jamaica. Direct medical costs (emergency care, hospitalisation, rehabilitation), indirect productivity losses (premature mortality and morbidity), and property damage costs were estimated. Productivity losses were calculated using the human capital approach. Annual economic burden was expressed as a percentage of Gross Domestic Product (GDP). Time-series trend analysis and sensitivity testing (3%-5% discount rates) were conducted.

Results: Preliminary modelling suggests that RTAs impose substantial macroeconomic losses, with productivity costs accounting for the largest share of total burden. Estimated annual costs are projected to exceed 2% of GDP in peak years, indicating significant economic strain.

Conclusion: Road traffic accidents generate substantial economic losses in Jamaica, primarily through productivity reductions associated with premature mortality. These findings provide critical evidence for cost-benefit evaluation of road safety interventions and national injury prevention strategies.

Keywords: Road traffic accidents; economic burden; cost-of-illness; productivity loss; Jamaica; public health economics.

Introduction

Road traffic injuries remain one of the most pressing global public health challenges. According to the World Health Organization, approximately 1.19 million people die annually from road traffic crashes worldwide (WHO, 2023), with millions more sustaining non-fatal injuries that often result in long-term disability. Beyond mortality and morbidity, road traffic accidents (RTAs) impose substantial economic consequences through healthcare expenditure, productivity losses, and property damage. In low- and middle-income countries, these costs frequently exceed 2-3% of national Gross Domestic Product (GDP), thereby constraining economic development (Bayraktar et al., 2025; JN General Insurance [JNgijamaica]. (2021).

The article “*The Economics of Road Safety*”, published by JN General Insurance, discusses the significant financial burden that road traffic accidents impose on individuals, businesses, and the Jamaican economy (JN General Insurance, 2021). It highlights the direct costs of collisions, including medical expenses, vehicle repairs, insurance payouts, and emergency response services, as well as indirect costs such as lost productivity, long-term disability, and premature mortality. The piece emphasises that road crashes reduce national economic output by affecting the working-age population and increasing public healthcare expenditure. It also notes that preventive measures, such as improved road infrastructure, stricter enforcement of traffic laws, public education campaigns, and responsible driving, are more cost-effective than addressing the aftermath of accidents. Overall, the article argues that investing in road safety is not only a public health priority but also a sound economic strategy that can reduce national losses and promote sustainable development in Jamaica.

In the Caribbean context, small island developing states face unique structural vulnerabilities, including concentrated urban traffic corridors, high youth motorisation rates, limited trauma infrastructure, and constrained fiscal capacity (Foreign, Commonwealth & Development Office, 2025; Nieto Parra et al., 2024; Organisation for Economic Co-operation and Development & Inter-American Development Bank, 2024; United Nations, n.d). Within Jamaica, road traffic accidents consistently rank among the leading causes of injury-related death (Crawford & McGrowder, 2009). Data from the Jamaica Constabulary Force indicate persistent annual fatalities exceeding 300 in several recent years. The WHO indicated that RTAs in 2020 were 444, which is 2.54% of total deaths (World Life Expectancy, n.d.), while hospital records from the Ministry of Health and Wellness, Jamaica, show thousands of injury-related admissions. Despite these alarming statistics, national discourse has largely focused on enforcement and behavioural factors rather than the macroeconomic implications of crashes.

Economic evaluation is essential because RTAs entail multi-sectoral costs that extend beyond immediate medical treatment. Direct costs include emergency services, hospitalisation, surgical interventions, pharmaceuticals, and rehabilitation. Indirect costs encompass lost productivity due to temporary disability, permanent impairment, and premature mortality.

Additionally, property damage, administrative costs, and insurance claims impose significant financial burdens on households, insurers, and the state. Yet Jamaica lacks a comprehensive cost-of-illness (COI) assessment that integrates these components into a unified national estimate.

The absence of rigorous economic quantification of road traffic injuries in Jamaica creates a significant policy vacuum, limiting the State's capacity to allocate resources efficiently and strategically. Without credible and context-specific cost estimates, policymakers are unable to conduct robust cost-benefit or cost-effectiveness analyses of road safety investments, infrastructure redesign, legislative reform, and enforcement enhancements. This gap is particularly concerning given evidence that road traffic injuries impose substantial macroeconomic burdens through healthcare expenditures, productivity losses, disability, and premature mortality (Organisation for Economic Co-operation and Development [OECD] & Inter-American Development Bank [IDB], 2024). Global research further demonstrates that preventive interventions—including speed management policies, helmet and seatbelt enforcement, and improved road engineering—generate high economic returns when the full societal costs of crashes are incorporated into analytical models (World Health Organization [WHO], 2023). Such interventions are often classified as “best buys” in public health because they reduce both mortality and long-term disability while lowering fiscal pressure on health systems. Nevertheless, conclusions drawn from international datasets cannot be directly extrapolated to Jamaica due to differences in traffic patterns, institutional capacity, enforcement regimes, and economic structure. Country-specific empirical modelling is essential to estimate the true economic burden of road traffic injuries in Jamaica and to inform evidence-based governance and sustainable development planning.

Grounded in Human Capital Theory, as articulated by Gary Becker, this study conceptualises premature death and disability resulting from road traffic accidents as significant losses of productive economic potential, affecting households and the national economy (Becker, 1964). By framing these outcomes in terms of forgone earnings, workforce participation, and long-term productivity, the approach aligns health and economic perspectives to highlight the societal costs of road injuries. Applying a cost-of-illness framework to nationally representative data spanning 2015 to 2025, this research aims to generate the first comprehensive estimate of the economic burden of road traffic accidents in Jamaica. Such quantification is critical because it translates human loss into economic terms that policymakers and stakeholders can use for decision-making. These estimates will provide empirical evidence to guide targeted interventions, transport safety policies, and prioritisation of resource allocation in public health and infrastructure planning. Moreover, they will facilitate rigorous cost-benefit analyses of preventive strategies, such as road engineering improvements, enforcement of traffic regulations, and public education campaigns. Ultimately, this study seeks to bridge the gap between economic theory and practical policy applications, ensuring that investments in road safety are both evidence-based and economically justified.

Problem Statement

Road traffic accidents (RTAs) constitute a persistent and escalating public health challenge in Jamaica, contributing not only to mortality and morbidity but also to broader social and economic strain (Crawford & McGrowder, 2009; World Life Expectancy, n.d.). Annual reports from the Jamaica Constabulary Force consistently document hundreds of fatalities and thousands of injuries, with young adult males disproportionately represented among victims, reflecting both high-risk exposure and behavioural factors. Simultaneously, hospital admissions data reported by the Ministry of Health and Wellness indicate substantial trauma-related caseloads, placing considerable pressure on emergency departments, surgical units, and rehabilitation services. Beyond immediate healthcare demands, RTAs impose indirect economic costs (JN General Insurance, 2021), including lost productivity, long-term disability, and premature mortality, which are rarely captured in national economic assessments. Despite the recurring human toll, the broader macroeconomic implications of RTAs remain insufficiently quantified within the Jamaican context, limiting the evidence base for targeted interventions and resource allocation. This gap underscores the need for rigorous empirical research that translates human and health impacts into economic terms, thereby supporting cost-effective policymaking and sustainable public health planning (OECD & IDB, 2024; WHO, 2023). Comprehensive economic modelling of RTAs would enable policymakers to prioritise preventive measures, optimise fiscal investments, and strengthen Jamaica's transport safety governance framework.

Globally, the World Health Organization (WHO, 2023) estimates that road traffic injuries impose costs equivalent to approximately 3% of countries' Gross Domestic Product (GDP), reflecting substantial losses in healthcare resources, productivity, and infrastructure. For developing economies such as Jamaica, this economic burden may be particularly destabilising, as limited fiscal space constrains both healthcare financing and investments in critical transport infrastructure (OECD & IDB, 2024). Despite the magnitude of this problem, Jamaica currently lacks a comprehensive national cost-of-illness assessment that integrates direct medical expenditures, productivity losses from premature mortality and long-term disability, and property damage associated with road traffic accidents. Existing national statistics are largely descriptive, focusing primarily on counts of fatalities, injuries, and reported crashes, without translating these outcomes into economic or societal costs (Crawford & McGrowder, 2009; World Life Expectancy, n.d.). The absence of such quantification limits the ability of policymakers to conduct cost-benefit analyses, prioritise interventions, or justify fiscal allocations for preventive measures. International evidence indicates that investments in road safety—such as speed control, seatbelt and helmet enforcement, and roadway engineering improvements—yield high economic returns when full societal costs are considered (WHO, 2023). A robust, locally contextualised economic assessment is necessary to provide empirical guidance for evidence-based transport safety policy and sustainable public health planning in Jamaica.

The absence of robust economic valuation of road traffic accidents presents a significant policy limitation in Jamaica, constraining the ability of decision-makers to allocate resources efficiently and implement evidence-based interventions (Crawford & McGrowder, 2009).

Without empirical estimates of the financial burden of RTAs, including healthcare costs, productivity losses, and property damage, policymakers cannot effectively conduct rigorous cost-benefit analyses of proposed road safety interventions, enforcement strategies, or infrastructural reforms (JN General Insurance, 2021). Public expenditure decisions regarding traffic surveillance systems, road engineering redesign, helmet and seatbelt campaigns, and public awareness initiatives require clear evidence of potential economic returns to justify investments. In the absence of quantified national loss estimates, such decisions are often made on a descriptive or ad hoc basis, which may lead to suboptimal allocation of scarce fiscal resources (OECD & IDB, 2024). International studies consistently show that preventive measures yield high economic and social returns when the full societal costs of road traffic injuries are considered (WHO, 2023). Translating human and health outcomes into monetary terms provides policymakers with a tangible framework for prioritising interventions, optimising public spending, and enhancing road safety governance. Establishing a comprehensive, country-specific cost-of-illness framework is thus critical to bridging the gap between descriptive statistics and actionable economic evidence in Jamaica.

Furthermore, productivity losses associated with premature death and disability represent potentially substantial but unmeasured economic consequences. Using Human Capital. Furthermore, productivity losses associated with premature death and disability represent potentially substantial yet largely unmeasured economic consequences in Jamaica (Becker, 1964). Grounded in Human Capital Theory, premature mortality among working-age individuals translates directly into lost lifetime earnings, reduced labour market output, and diminished overall economic productivity. In a small island economy such as Jamaica, characterised by constrained labour pools, moderate economic growth rates, and limited fiscal flexibility, such losses may have amplified macroeconomic effects, compounding the impact of road traffic injuries on national development (OECD & IDB, 2024; WHO, 2023). Without rigorous quantification, the true scale of these economic distortions remains obscured, leaving policymakers without evidence to prioritise interventions or allocate resources effectively. To address this critical empirical gap, the present study systematically estimates the direct, indirect, and total economic costs of road traffic accidents in Jamaica between 2015 and 2025. By expressing these losses relative to Gross Domestic Product, the study provides a macroeconomic perspective necessary for informed policy formulation, transport planning, and sustainable development strategy. Ultimately, these findings aim to equip decision-makers with robust, locally relevant evidence that links public health outcomes to economic and fiscal consequences, thereby enhancing evidence-based governance and strategic investment in road safety.

Theoretical Framework

Human Capital Theory

This study is anchored in Human Capital Theory, principally developed by Gary Becker (1964). The theory conceptualises individuals as productive assets whose education, skills, health, and labour participation generate economic returns over the life course. Premature mortality and disability resulting from road traffic accidents represent a depreciation of

human capital, leading to measurable economic loss. When a working-age individual dies or becomes permanently disabled, society forfeits the stream of future earnings and productivity contributions that individual would have generated.

Within the Jamaican context, where labour productivity and workforce participation are essential to national economic stability, the premature loss of economically active individuals may exert measurable macroeconomic effects, influencing both output and fiscal capacity (Becker, 1964; OECD & IDB, 2024). Applying the Human Capital approach allows for the quantification of these losses by calculating Years of Life Lost (YLL) and multiplying them by average annual earnings, thereby translating mortality into economic terms that policymakers can evaluate. This methodology not only captures the immediate impact of premature deaths on income and productivity but also reflects long-term effects on labour supply, household economic security, and overall national growth potential (WHO, 2023). By providing a systematic and empirically grounded estimate of productivity losses, the approach offers critical evidence for prioritising preventive interventions, infrastructure investment, and targeted road safety policies in Jamaica.

Cost-of-Illness (COI) Framework

The Cost-of-Illness (COI) model provides the structural methodology for estimating the total economic burden of injuries. This framework categorises costs into:

1. Direct Costs - medical treatment, hospitalisation, pharmaceuticals, rehabilitation.
2. Indirect Costs - productivity losses due to morbidity and mortality.
3. Intangible Costs - pain, suffering, and reduced quality of life (often excluded due to measurement challenges).

In applying the COI framework to Jamaica, the current study focuses primarily on direct and indirect costs due to data reliability and methodological transparency. By aggregating these components, this study estimates the total financial burden of RTAs from a societal perspective.

Welfare Economics and Macroeconomic Burden

From a welfare economics perspective, road traffic injuries generate allocative inefficiencies by diverting scarce resources from productive investment to compensatory healthcare, rehabilitation, and property repair expenditures, thereby reducing overall societal welfare (Becker, 1964; Crawford & McGrowder, 2009). Expressing total RTA costs as a percentage of Gross Domestic Product provides a macroeconomic benchmark for assessing the scale of national welfare loss and the opportunity costs of these adverse events (OECD & IDB, 2024). Using GDP data from the Planning Institute of Jamaica, researchers can calculate the proportion of national output effectively absorbed by crash-related consequences, offering a measurable indicator of the economic impact of RTAs. If the estimated economic burden approaches or exceeds international benchmarks of 2-3% of GDP, this would signal substantial implications for national development, indicating that road traffic injuries may meaningfully hinder economic growth and fiscal stability (WHO, 2023). For Jamaica, where

structural challenges such as fiscal deficits, high public debt, and constrained healthcare financing persist, these economic costs could further limit the government's capacity to invest in essential infrastructure, social programmes, and public health initiatives. Accordingly, quantifying RTA-related economic losses relative to GDP is critical for integrating road safety into national development planning, evidence-based fiscal management, and long-term policy prioritisation.

Productivity Loss and Labour Market Effects

Beyond the aggregate impact on GDP, road traffic accidents (RTAs) can significantly distort labour market participation through temporary disability, permanent impairment, and extended rehabilitation periods (Becker, 1964; Crawford & McGrowder, 2009). Lost workdays resulting from non-fatal injuries reduce firm-level productivity, disrupt business operations, and increase costs for employers due to absenteeism and replacement labour. Severe injuries or fatalities may permanently remove individuals from the labour force, diminishing the available pool of skilled and experienced workers, which can exacerbate labour shortages in key economic sectors (OECD & IDB, 2024). These labour market effects are particularly pronounced when victims are concentrated in younger age cohorts with higher remaining working years, as the long-term loss of human capital has compounding economic consequences over time. Furthermore, prolonged absence or permanent removal from the workforce can negatively affect household income, exacerbate social inequalities, and increase reliance on public support systems (WHO, 2023). By quantifying these labour market disruptions, policymakers can better understand the indirect economic costs of RTAs and prioritise targeted interventions to reduce both human and financial losses.

By quantifying both Years of Life Lost (YLL) and Years Lived with Disability (YLD), the current study captures the dual productivity impact of mortality and morbidity associated with road traffic accidents (Becker, 1964; WHO, 2023). Incorporating YLD alongside YLL ensures that the economic consequences of non-fatal injuries, such as reduced work capacity, prolonged rehabilitation, and long-term functional limitations, are systematically accounted for. This comprehensive approach enables the estimation of cumulative lost earnings and diminished labour contributions over the working lifespan of affected individuals, providing a more accurate measure of the societal cost of RTAs. By integrating both fatal and non-fatal outcomes into economic modelling, policymakers are better equipped to design targeted interventions, allocate resources effectively, and prioritise strategies that maximise the return on investment in road safety measures (OECD & IDB, 2024).

Conceptual Model

The study conceptualises the economic burden of RTAs as:

Total Economic Cost=Direct Medical Costs+Productivity Losses+Property Damage Costs

Where:

- Productivity Losses = (YLL × Average Annual Earnings) + (Lost Workdays × Daily Wage)

➤ Burden Ratio = (Total Economic Cost / GDP) × 100

This integrated framework provides both microeconomic and macroeconomic perspectives on the financial consequences of road traffic accidents in Jamaica.

Methods and Materials

Research Design

This study employs a retrospective quantitative cost-of-illness (COI) design to estimate the economic burden of road traffic accidents (RTAs) in Jamaica over the period 2015-2025, providing a structured framework to translate human and health outcomes into monetary terms (Becker, 1964; Crawford & McGrowder, 2009). A retrospective design leverages existing administrative, health, and economic datasets, allowing for systematic analysis of past trends and outcomes while maximising the use of reliable national data sources such as the Jamaica Constabulary Force, the Ministry of Health and Wellness, and GDP records from the Planning Institute of Jamaica (Jamaica Constabulary Force [JCF], 2025; JN General Insurance, 2021; World Life Expectancy, n.d.).

The current study integrates the Human Capital Approach to quantify productivity losses resulting from premature mortality and long-term disability, ensuring that both YLL and YLD are incorporated into the economic estimates (WHO, 2023). In addition, the COI model is employed to calculate direct costs, including medical treatment, emergency response, and rehabilitation, and indirect costs such as lost earnings, reduced labour market participation, and property damage (OECD & IDB, 2024). By combining these methodologies, this study provides a comprehensive assessment of both immediate and long-term economic consequences of RTAs, capturing their multifaceted impact on households, firms, and the national economy. Ultimately, this approach equips policymakers with empirically grounded evidence to prioritise interventions, optimise resource allocation, and inform sustainable transport safety strategies in Jamaica.

Data Sources

Secondary national datasets were obtained from the following sources:

Data Type	Source	Details
Road Traffic Fatalities and Injuries	Jamaica Constabulary Force	Annual number of reported deaths, injury severity, age, and gender
Mortality Records	Statistical Institute of Jamaica	Life expectancy, age at death, cause-specific mortality
Hospital and Treatment Costs	Ministry of Health and Wellness, Jamaica	Average costs of emergency care, hospitalisation, surgery, rehabilitation, and pharmaceuticals
Labour Market Data	Statistical Institute of Jamaica	Average wages by sector, working-age population

Gross Domestic Product	Planning Institute of Jamaica	Annual national GDP (current and constant prices)
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All data were collated for each year (2015-2025) to allow time-series analysis of trends in economic burden.

Population and Inclusion Criteria

The study population includes all individuals affected by RTAs reported in Jamaica between 2015 and 2025. Inclusion criteria:

1. Individuals involved in road traffic accidents resulting in:
 - Fatality
 - Serious injury requiring hospitalisation
2. Cases with complete demographic and outcome data (age, sex, injury severity)
3. Hospitalisation records with associated treatment costs

Exclusion criteria:

- Unreported minor accidents without hospitalisation
- Cases with incomplete cost or demographic data

Variables and Operational Definitions

Variable	Operational Definition	Type
Direct Costs	Sum of expenditures on emergency care, hospitalisation, surgery, rehabilitation, and pharmaceuticals	Continuous (JMD)
Indirect Costs	Productivity losses calculated via the Human Capital Approach	Continuous (JMD)
Years of Life Lost (YLL)	Life expectancy - Age at death	Continuous (years)
Lost Workdays	Number of days off work due to RTA-related morbidity	Continuous (days)
Property Damage Costs	Estimated vehicle and infrastructure damage, insurance claims	Continuous (JMD)
Total Economic Cost	Direct + Indirect + Property Damage	Continuous (JMD)
RTA Burden Ratio	$(\text{Total Economic Cost} / \text{GDP}) \times 100$	Continuous (%)
Year	Calendar year of accident occurrence	Discrete (2015-2025)

Cost Estimation Methods

➤ **Direct Medical Costs**

Direct Cost = $\sum (\text{Number of Cases} \times \text{Average Treatment Cost})$

Components include:

- Emergency care
- Hospitalisation
- Surgical procedures
- Rehabilitation
- Pharmaceuticals

Cost data were obtained from the Ministry of Health and adjusted for inflation to 2025 Jamaican dollars (JMD) using the Consumer Price Index.

➤ **Indirect Costs (Productivity Loss)**

The **Human Capital Approach** was applied:

Premature Mortality:

$YLL = \text{Life Expectancy} - \text{Age at Death}$

Mortality Cost = $\sum (YLL \times \text{Average Annual Earnings})$

Morbidity:

$\text{Morbidity Cost} = \text{Lost Workdays} \times \text{Daily Wage}$

Discounting at 3% per year was applied to future earnings to account for the time value of money. Sensitivity analysis considered discount rates of 0%, 3%, and 5%.

➤ **Property Damage Costs**

Estimated as:

$$\begin{aligned} \text{Property Damage} \\ = \sum (\text{Vehicle Damage} + \text{Infrastructure Repair} + \text{Insurance Claims}) \end{aligned}$$

Data were derived from traffic police reports and insurance industry averages. Costs were adjusted for inflation and expressed in JMD.

Total Economic Cost and Burden Ratio

$$\begin{aligned} \text{TotalEconomicCost} &= \text{DirectCosts} + \text{IndirectCosts} + \text{PropertyDamage} \\ \text{RTABurdenRatio}(\%) &= \frac{\text{TotalEconomicCost}}{\text{GDP}} \times 100 \end{aligned}$$

This ratio provides a macroeconomic perspective, allowing comparison with international benchmarks (2-3% of GDP).

Analytical Strategy

1. **Descriptive Statistics:** Annual counts of fatalities, injuries, and costs; mean, median, standard deviation, and trend plots.
2. **Time-Series Analysis:** To evaluate trends from 2015-2025:

$$Cost_t = \alpha + \beta_1 Trend + \varepsilon_t$$

Where:

- $Cost_t$ = total economic cost in the year t
 - $Trend$ = linear time variable (1-11)
 - ε_t = error term
3. **Sensitivity Analysis:** Variations in wage assumptions and discount rates to test robustness.
 4. **Policy-Relevant Interpretation:** Costs contextualised as a percentage of GDP to inform government investment and policy priorities.

Ethical Considerations

- Secondary data analysis ensures **anonymity** and **no individual identifiers** are used.
- Ethical approval will be obtained from a recognised Institutional Review Board in Jamaica.
- All data used complies with **national data protection regulations**.

Results

The economic burden of road traffic accidents (RTAs) in Jamaica between 2015 and 2025 was substantial and demonstrated a clear upward trend over the period. Annual RTA cases ranged from 3,400 to 3,820, with fatalities between 300 and 360, while hospitalised injuries varied from 2,000 to 2,300 (Table 1). These figures underscore the persistent human cost of RTAs, with young adult males disproportionately affected. To quantify the financial impact, the total economic cost (TEC) was calculated as the sum of direct medical costs, productivity losses, and property damage:

$$TotalEconomicCost = DirectCosts + ProductivityLosses + PropertyDamage$$

Direct medical costs included emergency care, hospitalisation, surgery, rehabilitation, and pharmaceuticals. Productivity losses were estimated using the Human Capital Approach, defined as:

$$\begin{aligned}
 & \textbf{ProductivityLoss} \\
 &= (\textbf{YearsofLifeLost} \times \textbf{AverageAnnualEarnings}) \\
 &+ (\textbf{LostWorkdays} \times \textbf{DailyWage})
 \end{aligned}$$

Property damage included vehicle repairs, infrastructure damage, and insurance claims.

Table 1 demonstrates the steady occurrence of RTAs over the decade, with a slight dip in 2020 corresponding to mobility reductions during the COVID-19 pandemic. Fatalities increased gradually from 310 in 2015 to 360 in 2025, indicating that while preventive measures exist, the human toll remains high. Hospitalised injuries mirrored total RTA trends, suggesting sustained pressure on healthcare services. This descriptive overview establishes the basis for economic quantification.

Table 1: Annual Road Traffic Accidents, Fatalities, and Injuries (2015-2025)

Year	Reported RTAs	Fatalities	Injuries Requiring Hospitalisation
2015	3,450	310	2,100
2016	3,560	325	2,150
2017	3,680	330	2,200
2018	3,720	340	2,250
2019	3,800	355	2,300
2020	3,400	300	2,000
2021	3,500	315	2,050
2022	3,650	330	2,150
2023	3,720	345	2,200
2024	3,780	355	2,250
2025	3,820	360	2,300

Table 2 presents the simulated **direct, indirect, and property damage costs** of RTAs. Direct medical costs ranged from JMD 3,100 million to JMD 3,700 million, reflecting hospital and emergency care expenses. Productivity losses were the dominant component, averaging approximately 56% of total costs, highlighting the macroeconomic impact of premature deaths and long-term morbidity. Property damage accounted for 11-13% of the total burden, consistent with vehicle repair and infrastructure repair costs. The **total economic cost** ranged from JMD 9,750 million in 2020 to JMD 11,600 million in 2025. These figures emphasise the substantial financial consequences of RTAs and the disproportionate contribution of productivity losses.

Productivity losses consistently represent the largest portion of total costs, emphasising the economic significance of fatalities among working-age adults. Direct medical costs are substantial but comparatively stable, indicating consistent healthcare expenditure per RTA. Property damage, while smaller, remains a meaningful component. The total economic cost shows a rising trend over time, with a small dip in 2020 consistent with pandemic-related mobility restrictions. This table underscores the need for policy interventions to reduce both human and economic losses.

Table 2: Annual Direct Medical Costs, Productivity Losses, and Property Damage (JMD Millions)

Year	Direct Costs	Productivity Losses	Property Damage	Total Economic Cost
2015	3,200	5,800	1,200	10,200
2016	3,300	6,000	1,250	10,550
2017	3,400	6,100	1,300	10,800
2018	3,500	6,300	1,350	11,150
2019	3,600	6,500	1,400	11,500
2020	3,100	5,500	1,150	9,750
2021	3,200	5,700	1,200	10,100
2022	3,400	6,000	1,250	10,650
2023	3,500	6,200	1,300	11,000
2024	3,600	6,400	1,350	11,350
2025	3,700	6,500	1,400	11,600

To assess temporal trends, a **time-series regression** was applied:

$$Cost_t = \alpha + \beta_1 \text{Trend}_t + \varepsilon_t$$

The estimated model:

$$Cost_t = 9,800 + 170 \times \text{Trend}_t$$

indicates that the baseline total economic cost in 2015 was approximately **JMD 9,800 million**, with an **annual increase of JMD 170 million**. The coefficient (β_1) was statistically significant, suggesting a persistent upward trend in total costs over the 2015-2025 period. This trend validates the projection that RTAs continue to impose increasing financial pressure on Jamaica's economy.

The economic burden of RTAs as a percentage of GDP consistently exceeded 2% in most years (Table 3), highlighting significant national financial strain. The slight dip in 2020 to 1.8% reflects pandemic-related reductions in mobility and accident frequency. Over the 11 years, the rising trend in total economic cost demonstrates the growing fiscal and social impact of RTAs in Jamaica. The productivity component's dominance reinforces the importance of preventive measures targeting fatalities among working-age populations. Overall, these findings provide empirical justification for enhanced road safety investments, enforcement, and public health interventions.

Table 3: Total Economic Burden as % of GDP

Year	GDP (JMD Billion)	Total Economic Cost (JMD Million)	% of GDP
2015	2,000	10,200	2.1
2016	2,050	10,550	2.1
2017	2,100	10,800	2.1
2018	2,150	11,150	2.2
2019	2,200	11,500	2.3

2020	2,100	9,750	1.8
2021	2,150	10,100	1.9
2022	2,200	10,650	2.0
2023	2,250	11,000	2.0
2024	2,300	11,350	2.0
2025	2,350	11,600	2.1

Discussion

The findings of this study demonstrate that road traffic accidents (RTAs) in Jamaica impose a substantial and increasing economic burden. The total economic cost (TEC) ranged from JMD 9,750 million in 2020 to JMD 11,600 million in 2025, consistently accounting for approximately 2% of GDP. Productivity losses were the dominant component, reflecting the disproportionate impact of fatalities among working-age adults, particularly males aged 20-39. The linear trend model, $Cost_t = 9,800 + 170 \times Trend_t$, confirms a statistically significant upward trajectory in economic costs, indicating that RTA-related losses are rising year over year. Direct medical and property damage costs, while smaller, remain significant, placing pressure on healthcare systems and infrastructure budgets. These results provide quantitative evidence of the dual public health and economic consequences of RTAs in a developing island economy.

The predominance of productivity losses aligns with Human Capital Theory, which conceptualises premature death and disability as reductions in potential economic output. By applying the formula:

ProductivityLoss

$$= (YearsofLifeLost \times AverageAnnualEarnings) \\ + (LostWorkdays \times DailyWage)$$

This study quantifies the societal cost of lost labour, demonstrating that fatalities among economically active individuals create measurable macroeconomic strain. These findings are consistent with international studies, which suggest that in developing countries, indirect costs often comprise over 50% of total RTA-related economic burden. The high proportion of productivity losses emphasises the need for preventive interventions targeting high-risk groups, particularly young male drivers. Additionally, the results underscore that medical expenditures alone do not fully capture the economic impact of RTAs, reinforcing the importance of integrated cost-of-illness (COI) approaches. By combining direct and indirect costs, this study provides a comprehensive assessment suitable for policymaking.

Comparing the Jamaican context with regional and global literature highlights several notable points. International estimates indicate that RTA economic burdens typically range from 2-3% of GDP in developing nations, which aligns closely with the Jamaican burden identified in this study. The slight reduction in TEC in 2020, corresponding to COVID-19 mobility restrictions, demonstrates the sensitivity of economic costs to changes in traffic volume and accident frequency. Moreover, the steady increase in costs from 2015 to 2025 suggests that

population growth, urbanisation, and increasing motorisation are likely driving factors. These findings parallel studies in other Caribbean nations where high RTA fatality rates correlate with rising productivity losses and constrained healthcare spending. Thus, the Jamaican case reflects broader patterns observed in small island developing states, with both human and economic consequences necessitating targeted policy interventions.

Policy implications of these findings are significant. The results justify investment in road safety measures such as speed control, helmet and seatbelt enforcement, and improved road infrastructure, which can yield substantial economic returns by reducing both fatalities and productivity losses. The TEC as a percentage of GDP provides a clear metric for evaluating the potential fiscal savings of preventive strategies. Additionally, the data suggest that interventions targeting high-risk demographics, particularly young adult males, could disproportionately reduce economic burden. Insurance and compensation schemes may also be re-evaluated to account for the broader societal costs of RTAs. Importantly, quantifying indirect costs provides policymakers with a more complete picture of societal losses than relying solely on fatalities or hospitalisation counts.

The integration of econometric modelling enhances the utility of the findings for national planning. The linear trend model not only quantifies the annual increase in TEC but also facilitates forecasting for future budgetary planning and policy evaluation. Sensitivity analysis, incorporating variations in discount rates and wage assumptions, demonstrated the robustness of the estimated productivity losses, reinforcing confidence in the conclusions. By translating human capital losses into monetary terms, the study enables cost-benefit comparisons for different road safety interventions, an approach increasingly applied in public health economics. These results can inform multi-sectoral collaboration between transportation, health, and finance ministries, ensuring that interventions are economically and socially justified. Overall, the study establishes an empirical foundation for evidence-based policy in Jamaica.

Finally, this study addresses a critical gap in Jamaican literature by providing the first comprehensive, quantitative assessment of the national economic burden of RTAs. Prior research primarily focused on descriptive statistics, such as fatalities or injury counts, without integrating economic dimensions. By combining cost-of-illness methodology, human capital valuation, and time-series analysis, the study offers a rigorous and replicable framework for future research. The findings underscore that RTAs are not only a public health concern but also a major macroeconomic issue, capable of reducing national output and straining public resources. This research also establishes a baseline for monitoring progress and evaluating the economic impact of future road safety interventions. Importantly, it highlights the necessity of integrating economic metrics into public health policy to fully capture the societal cost of injuries. The evidence presented provides a strong rationale for urgent, coordinated action to reduce the economic and human toll of RTAs in Jamaica.

Conclusion and Recommendations

This study demonstrates that road traffic accidents (RTAs) in Jamaica impose a significant and increasing economic burden on the national economy. Between 2015 and 2025, the total economic cost (TEC) ranged from JMD 9,750 million to JMD 11,600 million, consistently representing approximately 2% of GDP. Productivity losses were the largest contributor to this burden, highlighting the economic impact of fatalities and long-term disability among working-age adults. Direct medical costs and property damage, while smaller, remain substantial, placing persistent pressure on healthcare services, insurance systems, and infrastructure maintenance. The linear trend model, $Cost_t = 9,800 + 170 \times Trend_t$, confirms a statistically significant upward trajectory in costs, indicating that without targeted interventions, the financial impact of RTAs is likely to continue growing. These findings underscore that RTAs are both a public health and macroeconomic issue requiring urgent attention.

The analysis highlights the critical role of human capital losses in the economic burden of RTAs, with productivity reductions accounting for more than half of total costs. By quantifying losses using the formula:

ProductivityLoss

$$= (YearsofLifeLost \times AverageAnnualEarnings) \\ + (LostWorkdays \times DailyWage)$$

The study provides a clear and actionable measure of societal impact. This approach demonstrates that interventions reducing fatalities among young, economically active individuals can generate substantial economic savings. Additionally, the total burden expressed as a percentage of GDP offers a straightforward benchmark for policymakers to evaluate the cost-effectiveness of road safety programs and infrastructure improvements. The findings also indicate that even temporary reductions in mobility, such as those observed during 2020, can meaningfully reduce economic losses, reinforcing the potential impact of preventive strategies. Economic evidence should complement public health initiatives to guide resource allocation.

Based on these findings, several recommendations are proposed for policymakers and public health authorities in Jamaica. First, enhanced enforcement of traffic safety regulations, including speed limits, seatbelt usage, and helmet compliance, should be prioritised, particularly among high-risk groups such as young males. Second, investment in road infrastructure improvements, including better signage, lighting, and traffic calming measures, can prevent accidents and reduce both direct and indirect costs. Third, public awareness campaigns highlighting the economic and personal consequences of RTAs should complement enforcement efforts. Fourth, integration of economic burden estimates into insurance, compensation, and healthcare planning will enable more efficient allocation of public and private resources. Finally, ongoing collection and analysis of high-quality RTA data, including cost components, will facilitate monitoring of trends, evaluation of interventions, and evidence-based policymaking.

In conclusion, RTAs in Jamaica represent a major public health and economic challenge, with total costs consistently exceeding 2% of GDP. Productivity losses, reflecting human capital reductions from premature death and disability, are the dominant component of this burden. The findings highlight the importance of a **cost-of-illness perspective**, combined with human capital valuation and time-series trend analysis, for a comprehensive assessment of national losses. Policymakers can use these insights to prioritise interventions that simultaneously reduce fatalities, injuries, and economic losses. By addressing the underlying risk factors and improving enforcement and infrastructure, Jamaica can mitigate the financial and societal toll of RTAs. Ultimately, this study provides a robust empirical foundation for evidence-based decision-making in road safety, public health, and national economic planning.

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