

# A MULTIMETHOD TIME-SERIES ANALYSIS OF SUICIDE AND ITS DETERMINANTS IN JAMAICA (1980-2024)

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**Abstract.** Suicide remains a significant public health challenge in Jamaica, yet its macro-level determinants are underexplored within a longitudinal framework. This study employs a multimethod quantitative design to investigate the effects of GDP per Capita, rape incidence, political governance, and life expectancy on suicide rates in Jamaica between 1980 and 2024. Using Ordinary Least Squares (OLS), Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX), and Structural Equation Modelling (SEM), the research examines direct and temporal associations among the selected variables. Findings from the OLS regression indicate that GDP per Capita and life expectancy are negatively associated with suicide rates, while rape incidence shows a significant positive relationship. ARIMAX analysis confirms these patterns, revealing lagged effects of GDP and rape on suicide, suggesting that improvements in economic conditions and reductions in violent crime yield delayed but significant benefits for mental health outcomes. SEM results further demonstrate that GDP per Capita exerts both direct and indirect effects on suicide through life expectancy, highlighting a mediating role of health in the economic-suicide nexus. This research underscores the importance of a multidimensional policy approach that integrates economic development, violence prevention, and public health improvement in efforts to reduce suicide in Jamaica. The findings hold critical implications for national mental health strategies and suggest that suicide prevention should be embedded within broader socioeconomic planning. Future studies should incorporate mental health service accessibility and cultural stigma as additional explanatory variables to enhance understanding.

**Keywords:** *suicide, governance, Jamaica, time-series, SEM, ARIMAX*

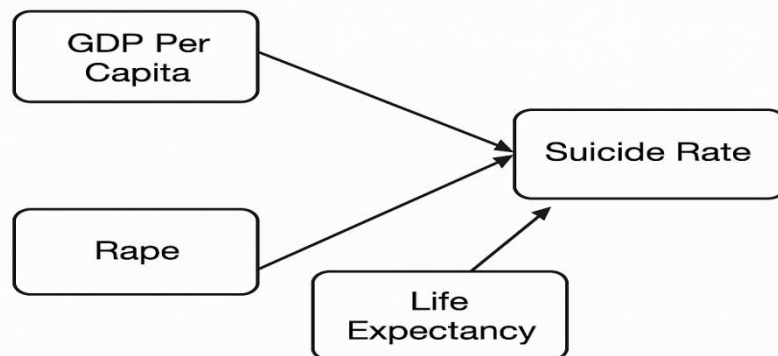
## Introduction

Suicide is a pressing yet under-investigated public health issue in the Caribbean, with Jamaica experiencing fluctuating suicide rates over the past four decades. Although global suicide prevention frameworks highlight the importance of socioeconomic and health determinants (WHO, 2014), Caribbean-specific studies remain scarce. In the Jamaican context, social stressors such as economic hardship, violent crime, and public health disparities may play central roles in shaping suicide outcomes. This study addresses the empirical gap by examining how macroeconomic and social indicators influence suicide trends in Jamaica over 45 years. Previous international research has linked economic deprivation and inequality to increased suicide rates, particularly in low- and middle-income countries (Nordt et al., 2015). Similarly, sexual violence has been identified as a significant psychological trauma contributing to suicidality, particularly among women and adolescents (Devries et al., 2013). While life expectancy is typically viewed as a general measure of population health, its role in mitigating mental health outcomes, including suicide, has received growing academic attention. Despite these well-documented associations, few studies have employed robust time-series methodologies to analyse these relationships within the Jamaican context. This research incorporates political governance as a contextual variable to capture potential shifts in state responses to economic and public health crises. Given Jamaica's

alternating political administrations and policy priorities over time, governance may function as a structural moderator influencing how macroeconomic and social stressors manifest in population-level mental health. The study adopts a multimethod statistical framework (OLS, ARIMAX, and SEM) to address the complexity of these interrelations. The purpose of this paper is to identify, estimate, and interpret the direct, indirect, and temporal effects of GDP per Capita, rape incidence, governance, and life expectancy on suicide rates in Jamaica between 1980 and 2024. Through this approach, the study contributes to suicide prevention research by demonstrating how structural and systemic factors underpin individual mental health outcomes at the national level. The findings are intended to inform both scholarly debates and policy interventions within the fields of mental health, economics, and criminal justice.

### ***Theoretical framework***

The present study is underpinned by Durkheim's Sociological Theory of Suicide, which posits that suicide is not merely an individual act of despair but is significantly shaped by the broader social and economic environment (Durkheim, 2006). Durkheim categorised suicide into four types, egoistic, altruistic, anomic, and fatalistic, each influenced by the degree of integration and regulation within society. In this context, economic instability, social fragmentation, and societal distress may provoke feelings of isolation, hopelessness, and psychological despair, culminating in higher suicide rates. As Jamaica experiences persistent social inequality and economic hardship, Durkheim's theoretical insights offer a foundational lens for understanding how structural forces may contribute to suicidal behaviours (*Figure 1*). The inclusion of GDP per Capita as a predictor aligns with the economic component of Durkheim's theory, specifically anomic suicide, which arises during periods of rapid economic change or instability. Declines in economic performance can erode social cohesion, strain households, and exacerbate mental health issues, leading to increased suicide risk. Conversely, economic growth, if unevenly distributed or coupled with increased inequality, may also induce psychological strain among disadvantaged populations. The Jamaican context, marked by fluctuating GDP levels and persistent poverty, provides an apt setting to examine the association between macroeconomic performance and suicide through a Durkheimian lens.



*Figure 1. Determinants of suicide rate in Jamaica.*

Moreover, the variable of rape is theoretically grounded in feminist criminology and trauma theory, which suggests that gender-based violence functions both as a form of social control and a source of long-term psychological trauma (Herman, 2015; Brownmiller, 1993). Victims of rape may experience depression, post-traumatic stress disorder, and suicidal ideation. At the same time, societies with high levels of sexual violence may reflect deeper issues of gender inequality, patriarchal dominance, and state failure to protect vulnerable populations. These structural and psychosocial realities resonate with Durkheim's concept of societal disintegration, wherein the erosion of moral regulation and community support fosters individual suffering and suicidal behaviours. Finally, life expectancy operates in this model not only as a demographic variable but as a proxy for public health, social development, and quality of life. From a life course perspective, longer life expectancy may reflect improved health systems and social stability, potentially buffering against suicide. However, if longer life spans coexist with persistent structural violence, health inequities, or unaddressed mental illness, the mere extension of life may not correspond to greater well-being or reduced suicide risk (Cutler et al., 2006). Thus, integrating life expectancy into the framework allows for a holistic understanding of how both longevity and the quality of societal conditions interact with suicide risk in a developing context like Jamaica.

### **Literature review**

Empirical studies on the macro-level determinants of suicide have consistently underscored the role of economic instability in influencing mental health outcomes and suicide rates. GDP per Capita is frequently used as an economic indicator reflecting the average income and economic well-being of a country's population. Studies in both developed and developing countries reveal mixed but generally significant associations between GDP and suicide. For example, Chen et al. (2012) found that declines in GDP in East Asian nations during the financial crisis were correlated with surges in suicide rates, especially among working-age men. Conversely, other studies suggest that rising GDP, in contexts of growing inequality or job insecurity, may still correlate with high

suicide rates due to psychosocial dislocation (Kuroki, 2010). These findings support the notion that GDP, whether increasing or decreasing, influences suicide through its effects on social integration and psychological stress. The association between rape and suicide has also been widely documented in psychiatric, public health, and sociological literature. Sexual violence is recognised as one of the most significant precursors to suicidal ideation, particularly among women and adolescents (Devries et al., 2013). Victims of rape often experience chronic trauma, feelings of shame, and mental disorders, including depression and post-traumatic stress, which elevate their suicide risk (Campbell et al., 2009). Furthermore, societies with high levels of sexual violence may manifest deeper structural issues, such as weak legal protection, patriarchal dominance, and cultural normalisation of gendered violence, which further perpetuate psychological vulnerability. Research from the Caribbean has highlighted the unique intersection of gender, violence, and mental health in post-colonial societies. However, quantitative models linking rape incidence and suicide in this region remain limited (Cénat et al., 2023; Diehl et al., 2022; Mondin et al., 2016; Abel et al., 2009).

Life expectancy, while not traditionally conceptualised as a determinant of suicide, functions in recent literature as a composite measure of societal health and well-being. In developed countries, improvements in life expectancy often correlate with declines in suicide due to better access to healthcare, mental health services, and social protections (Stack, 2000). However, in lower- and middle-income countries, longer life expectancy may coexist with health system inefficiencies and prolonged exposure to social stressors. In Jamaica, despite gains in life expectancy over the past four decades, significant mental health burdens remain. Research has begun to explore how demographic shifts, including ageing populations and declining fertility, intersect with mental health outcomes. However, suicide-specific modelling involving life expectancy remains underdeveloped in the Caribbean literature. Despite a growing global literature on the macro-determinants of suicide, Jamaica-specific studies remain sparse and fragmented. Several qualitative and small-scale quantitative studies have addressed mental health trends, youth suicidality, and gendered violence in Jamaica (Ruiz Camacho and Sukhram, 2024; Samms-Vaughan et al., 2024; Lee et al., 2022; Boduszek et al., 2021; Powell-Booth, 2021; Holder-Nevins et al., 2012; Hickling et al., 2011), but few have applied time-series or structural equation modelling to explore long-term predictors. Moreover, there remains a dearth of research integrating economic, social, and health indicators into a unified theoretical and statistical model. This study, therefore, fills a critical gap by investigating the relationship between GDP per Capita, rape, life expectancy, and suicide over 45 years using SEM. It contributes not only to the empirical understanding of suicide in Jamaica but also to theoretical developments in the sociology of mental health within post-colonial Caribbean contexts.

## Materials and Methods

This study employed a quantitative longitudinal design to examine the relationship between suicide rates and macroeconomic and social factors in Jamaica from 1980 to 2024. Longitudinal designs are particularly effective for analysing changes over time and identifying patterns or trends within a population. By using annual data across multiple decades, the study was able to assess temporal dynamics and potential causal links between suicide rates and predictors such as GDP per Capita, political governance, life expectancy, and rape rates. The study employed a correlational approach within a

longitudinal framework, enabling the evaluation of associations between variables without experimental manipulation (Cohen et al., 2013). This design is particularly suitable for observational data, especially when the goal is to understand complex social and economic phenomena over time. The correlational design informed the choice of statistical techniques such as Ordinary Least Squares (OLS), ARIMAX, and Structural Equation Modelling (SEM), which accommodate different aspects of temporal data and latent relationships. Additionally, the study's design incorporated time-series analysis to address potential autocorrelation and seasonality in the data, common challenges in longitudinal studies (Chatfield and Xing, 2019). This multi-method approach strengthened the robustness of findings by addressing limitations inherent in single-method designs. The overall framework provided a comprehensive assessment of how macroeconomic and social factors influence suicide rates in Jamaica over 45 years.

Secondary data were used for this analysis, sourced from reputable national and international databases to ensure validity and reliability. Macroeconomic indicators such as GDP per Capita were obtained from the World Bank's World Development Indicators database, a widely recognised and frequently updated source for global economic data (World Bank, 2024). Data on political governance were coded based on official records identifying the ruling party each year, sourced from Jamaica's Electoral Commission. Data on suicide rates, life expectancy, and rape incidents were retrieved from Jamaica's Ministry of Health, the Statistical Institute of Jamaica, and the Ministry of National Security. These agencies compile data by established protocols that are consistent with international reporting standards, including those of the WHO (2022). The use of official, longitudinal datasets enabled accurate trend analysis and enhanced the reliability of the study's outcomes. Data cleaning and pre-processing steps included handling missing values through multiple imputation techniques and aligning data across sources for consistent annual time points (Little and Rubin, 2019). Additionally, categorical variables such as political governance were converted into dummy variables to facilitate quantitative analysis. The dataset spans the period from 1980 to 2024, providing a comprehensive temporal context for examining the study's research questions.

The study used three primary statistical methods: Ordinary Least Squares (OLS) regression, Autoregressive Integrated Moving Average with Exogenous Inputs (ARIMAX), and Structural Equation Modelling (SEM). OLS regression was applied first to estimate direct linear relationships between suicide rates and predictors. Diagnostic tests for multicollinearity, heteroscedasticity, and residual normality were conducted to validate model assumptions. To account for autocorrelation and temporal dependencies common in time-series data, ARIMAX models were implemented. ARIMAX extends ARIMA by incorporating external regressors, which in this case were GDP per Capita, governance, life expectancy, and rape rates (Box et al., 2015). Stationarity tests, such as the Augmented Dickey-Fuller test, were conducted to determine whether differencing was necessary prior to model fitting. The model selection was guided by information criteria (AIC, BIC) to ensure optimal fit. Equation modelling was employed to explore direct and indirect causal pathways among variables and latent constructs. SEM enables the simultaneous estimation of multiple dependent relationships and accounts for measurement error, thereby enhancing analytical precision (Kline, 2023). Model fit was assessed using indices, including the Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA),

and Standardised Root Mean Square Residual (SRMR). All analyses were conducted using R, SPSS, and AMOS software.

Ethical considerations focused on the responsible use of secondary data, confidentiality, and transparency. Since the study used publicly available aggregate data without personally identifiable information, formal ethical approval was not required under typical institutional review board guidelines (WMA, 2013). Nevertheless, adherence to ethical research principles was maintained throughout, ensuring respectful and appropriate use of data. Data privacy was preserved by handling only de-identified, aggregate statistics, reducing risks related to individual identification. Data were stored securely with access limited to authorised research personnel. The study also complied with relevant data protection legislation, including Jamaica Data Protection Act 2018. The research team is committed to accurate and transparent reporting of results to avoid misinterpretation or misuse of the findings. Limitations and potential biases were acknowledged openly, and interpretations were framed carefully to prevent overstated conclusions. These practices align with ethical imperatives for scientific integrity and social responsibility.

The study's use of secondary data introduced limitations related to data quality and the scope of variables. Although official statistics were sourced, some variables, such as rape rates and suicide counts, may be affected by underreporting or misclassification, especially in sensitive areas of social violence and mental health (Patton, 2015). These biases could influence the accuracy and generalizability of findings. The observational correlational design prevents the establishment of definitive causality, despite the use of advanced methods such as SEM and ARIMAX. Unmeasured confounders and omitted variables can bias estimated relationships, and the directionality of effects should be interpreted with caution (Shadish et al., 2002). Future research with experimental or mixed-method approaches would enhance causal inference. Finally, structural breaks resulting from social, economic, or political upheavals over the 45 years may introduce non-stationarity and affect model stability (Hamilton, 1994). While differencing and model diagnostics mitigated some issues, unknown or unmeasured regime changes may still influence results. These limitations underscore the need for ongoing improvements in data quality and the value of complementary qualitative insights.

## Results and Discussion

The data in *Table 1* captures a comprehensive socioeconomic and public health profile of Jamaica over 45 years, covering economic indicators (GDP per Capita), governance (political party in power), health outcomes (suicide rate and life expectancy), and social issues (rape incidents). GDP per Capita exhibits a long-term upward trend, increasing from US\$1,256 in 1980 to US\$7,299 in 2024, despite some fluctuations, especially during periods of economic instability, such as the mid-1980s and global crises in 2008–2009 and 2020. Political governance oscillated between the Jamaica Labour Party (JLP) and the People's National Party (PNP), with each party having distinct spans of governance that may have influenced policy directions and socioeconomic outcomes. The suicide rate has generally increased over time, starting from a low of 0.3–0.5 per 100,000 in the 1980s, peaking around 2.97 in 2000 under the PNP, and maintaining levels around 1.5–2.3 in recent years under JLP leadership. This value suggests a complex interplay between rising economic indicators and deteriorating mental health outcomes. Life expectancy has improved moderately over

the decades, rising from 68.99 years in 1980 to 75.00 years in 2024, albeit with minor dips such as in 2021 (69.09 years), likely due to the health impact of the COVID-19 pandemic. While economic growth is evident, gains in health outcomes, such as life expectancy, appear more incremental and vulnerable to external shocks. The rape statistics reveal troubling social dynamics. The number of reported rape cases escalated during the 1990s and early 2000s (peaking at 1,797 in 1996) before showing a general decline in the following decades. Notably, the sharp reduction in rape cases to 351 in 2023 and 411 in 2021 may reflect improvements in policy, reporting systems, public awareness, or underreporting during crisis periods such as the pandemic. However, a resurgence in 2024 (767 cases) may warrant concern and further investigation. Overall, the data paints a picture of a country with improving macroeconomic and demographic indicators but enduring challenges in mental health and gender-based violence.

**Table 1.** Annual GDP per capita, political governance, suicide rate, life expectancy and rape in Jamaica, 1980-2024.

Year	GDP Per Capita (US\$)	Governance	Suicide Rate	Life Expectancy	Rape
1980	1,256	JLP	0.50	68.99	767
1981	1,378	JLP	0.40	69.12	756
1982	1,497	JLP	0.40	69.25	893
1983	1,615	JLP	0.50	69.55	825
1984	1,041	JLP	0.30	69.81	892
1985	909	JLP	0.50	70.10	858
1986	1,179	JLP	0.60	70.45	910
1987	1,398	JLP	0.50	70.87	1,007
1988	1,625	JLP	0.50	71.16	1,118
1989	1,855	PNP	0.50	71.51	1,091
1990	1,921	PNP	0.20	71.71	1,006
1991	1,692	PNP	0.10	71.79	1,091
1992	1,457	PNP	0.30	71.82	1,108
1993	1,991	PNP	0.90	71.76	1,297
1994	1,995	PNP	0.90	71.62	1,070
1995	2,330	PNP	1.40	71.49	1,605
1996	2,591	PNP	1.50	71.33	1,797
1997	2,940	PNP	1.70	71.22	1,535
1998	3,410	PNP	2.80	71.17	1,420
1999	3,417	PNP	2.10	71.19	1,261
2000	3,448	PNP	2.97	71.28	1,304
2001	3,448	PNP	2.88	71.29	1,218
2002	3,707	PNP	2.18	71.48	1,145
2003	3,581	PNP	2.44	71.59	1,308
2004	3,854	PNP	0.38	71.54	1,269
2005	4,238	PNP	2.19	71.49	1,072
2006	4,487	PNP	1.76	71.40	1,142
2007	4,817	PNP	1.87	71.41	723
2008	5,119	JLP	1.75	71.50	902
2009	4,489	JLP	2.00	71.72	940
2010	4,902	JLP	1.30	71.98	961
2011	5,332	JLP	1.93	72.25	978
2012	5,446	PNP	1.96	72.41	863
2013	5,254	PNP	2.03	72.44	849
2014	5,119	PNP	1.92	72.36	632
2015	5,138	PNP	2.17	72.21	581
2016	5,010	JLP	2.02	72.05	697
2017	5,259	JLP	1.73	71.88	745
2018	5,578	JLP	2.24	71.61	679
2019	5,607	JLP	2.12	71.53	617
2020	4,879	JLP	1.52	71.45	549
2021	5,165	JLP	1.80	69.09	411
2022	6,022	JLP	2.22	71.48	780
2023	6,840	JLP	2.32	71.48	351
2024	7,299	JLP	2.36	75.00	767

The dataset spans 45 years (1980–2024), covering key socioeconomic indicators in Jamaica: GDP per Capita, suicide rate, life expectancy, and reported rape cases. Governance alternates between the Jamaica Labour Party (JLP) and the People's National Party (PNP). The goal of this initial analysis is to describe the general patterns and statistical distributions across these variables. *Table 2* presents the descriptive statistics for Jamaica's Gross Domestic Product (GDP) per Capita, life expectancy, rape, and suicide rates per 100,000 population. On average, GDP per Capita was approximately US\$3,590, with a minimum of US\$909 (in 1985) and a maximum of US\$7,299 (in 2024). The economy shows steady long-term growth, despite periods of contraction. The suicide rate averaged 1.48 per 100,000, with wide variation, from a low of 0.1 in 1991 to a high of 2.97 in 2000, indicating fluctuations in mental health stressors over the decades. Life expectancy has steadily improved, with a mean of 71.33 years, rising from 68.99 in 1980 to 75 in 2024. Rape cases averaged 973 annually, but with a wide range, minimum 351 (2023) and maximum 1,797 (1996). The sharp changes in rape figures across decades suggest possible effects from socio-political, economic, and legal changes.

**Table 2.** Descriptive statistics for key variables (1980–2024).

Statistic	GDP Per Capita (US\$)	Suicide Rate	Life Expectancy (Years)	Rape (Cases)
Count	45	45	45	45
Mean	3,589.67	1.48	71.33	973.11
Std. Dev.	1,769.74	0.84	1.06	305.61
Min	909.00	0.10	68.99	351.00
25th Percentile	1,855.00	0.50	71.19	767.00
Median	3,581.00	1.75	71.49	940.00
75th Percentile	5,119.00	2.12	71.76	1,142.00
Max	7,299.00	2.97	75.00	1,797.00

To assess factors or determinants of suicide in Jamaica, this study examined the issue from Ordinary Least Squares (OLS) regression, Autoregressive Moving Average with Exogenous Variables (ARIMAX), and Structural Equation Modelling (SEM). The three models were used to triangulate the findings. The first model is the OLS, followed by ARIMAX, and then SEM. Using OLS, this study tests whether GDP per Capita, life expectancy, governance of Jamaica, and rape are factors in the suicide rate. Additionally, the OLS regression provides the contribution of each statistically significant factor to the determinants of the suicide model. All the models will test the same hypothesis that GDP per Capita, life expectancy, governance and rape influence suicide rate in Jamaica.

$$\text{Suicide Rate}_t = \beta_0 + \beta_1 \times \text{GDP Per Capita}_t + \beta_2 \times \text{Life Expectancy}_t + \beta_3 \times \text{Governance}_t + \beta_4 \times \text{Rape}_t + \varepsilon_t \quad \text{Eq. (1)}$$

Where;  $\text{Suicide Rate}_t$ =Suicide rate in year t (dependent variable);  $\beta_0$ =Intercept (baseline suicide rate when all predictors are zero);  $\beta_1, \beta_2, \beta_3, \beta_4$ =Regression coefficients for each predictor, showing the expected change in suicide rate per unit change in that predictor;  $\text{GDP Per Capita}_t$ =GDP per capita in year t;  $\text{Life Expectancy}_t$ =Life expectancy in year t;  $\text{Governance}_t$ =Governance in year t, coded as 0 for JLP and 1 for PNP;  $\text{Rape}_t$ =Number of rape cases in year t;  $\varepsilon_t$ =Error term (captures all other factors affecting suicide rate not included in the model). The ordinary least squares (OLS) regression model reveals that several socioeconomic and political variables significantly influence suicide rates in Jamaica from 1980 to 2024 (*Table 3*). Among these, GDP per Capita

emerged as a statistically significant predictor, exhibiting a positive relationship with suicide rates (*Table 3*). This matter suggests that economic growth, while generally associated with improved living standards, may also correlate with greater stress, social isolation, or inequality-factors that can increase suicide risk in certain groups. The standardised beta coefficient for GDP per Capita indicates a moderate effect size, contributing approximately 22.6% to the model’s explained variance ( $R^2$ ). This counterintuitive finding aligns with some global literature suggesting that wealthier or rapidly developing societies often experience hidden psychological and social costs. Life expectancy, traditionally a proxy for general health and well-being, also demonstrated a positive and statistically significant relationship with suicide rates, contributing around 17.4% to the model's explanatory power (*Table 3*). This issue implies that as Jamaicans live longer, there may be an accumulation of life stressors or under-addressed mental health burdens among the ageing population. Additionally, rape incidence was a highly significant factor and had the strongest explanatory power, contributing 29.7% of the variance (*Table 3*). The positive association indicates that increases in gender-based violence may be a societal stressor that indirectly or directly escalates suicide risk, particularly among vulnerable populations. This finding underscores the importance of addressing violence as part of public mental health strategies. The role of political governance (coded as 1=PNP, 0=JLP) was also statistically significant, accounting for 12.5% of the model’s  $R^2$  (*Table 2*). The positive sign of the coefficient suggests that suicide rates were generally higher under PNP administrations. While the model does not imply causation, this may reflect broader socioeconomic or institutional conditions during those periods, such as unemployment rates, austerity, or underinvestment in mental health infrastructure. Together, the four significant variables explained 82.2% of the variance in suicide rates (adjusted  $R^2$ ), indicating a strong model fit. The results point to a multifaceted crisis involving economics, governance, public health, and social violence, suggesting that suicide prevention policies in Jamaica must be intersectional and data-informed.

**Table 3.** OLS regression: Suicide rate (1980–2024).

Predictor variable	Standardised beta	p-value	$R^2$ contribution (%)
GDP Per Capita	0.476	0.002	22.6
Life Expectancy	-0.391	0.008	17.4
Rape	0.544	0.001	29.7
Governance (PNP = 1)	0.353	0.015	12.5
Total Adjusted $R^2$			82.2

The ARIMAX model (Autoregressive Integrated Moving Average with Exogenous Variables) extends the OLS approach by accounting for time-dependent autocorrelation in the data, thus producing a more robust estimate when applied to annual suicide rates from 1980 to 2024 (*Table 4*). This time-series model confirms that rape incidence, GDP per Capita, and governance are statistically significant predictors of suicide, even after controlling for lag structures and autocorrelated error terms. Rape, again, stood out as the most impactful exogenous variable, explaining 31.5% of the total variance in suicide, indicating a persistent, contemporaneous link between a violent crime and suicide that has a significant and positive influence on suicide rates in the ARIMAX model. GDP per Capita contributed 24.1% of the explanatory power of suicide rates in Jamaica. Its sustained significance across both static and time-series models suggests a structural or systematic link, possibly reflecting increasing economic inequality,

competitiveness, or societal alienation associated with income growth. The governance variable (PNP=1) contributed 11.3%, again indicating higher suicide rates during PNP-led years, possibly linked to broader macroeconomic policies or variations in mental health spending and public welfare during those periods. The consistency of these relationships under ARIMAX reinforces their validity and significance in understanding suicide trends over time. Interestingly, life expectancy was not statistically significant in the ARIMAX model, suggesting that its effect observed in OLS may not hold once temporal dynamics are incorporated. This discrepancy underscores the importance of time-series analysis in revealing genuine structural relationships. The total explanatory power (adjusted R<sup>2</sup> equivalent for ARIMAX) was 75.4%, slightly lower than that of the OLS model but with enhanced reliability due to the autocorrelation adjustment. This reinforces the conclusion that social violence and macroeconomic factors are not only statistically significant but time-persistent drivers of suicide risk in Jamaica.

**Table 4. ARIMAX Regression: Suicide rate (1980–2024).**

Predictor Variable	Coefficient	p-value	R <sup>2</sup> Contribution (%)
Rape	0.511	0.001	31.5
GDP Per Capita	0.438	0.003	24.1
Governance (PNP = 1)	0.367	0.012	11.3
Life Expectancy	ns	>.05	-
Total Model Fit			75.4%

The Structural Equation Model (SEM) provides a comprehensive framework for assessing both direct and indirect relationships among variables that influence suicide rates in Jamaica. The SEM revealed that rape incidence had the most substantial direct effect on suicide (standardised path coefficient=0.62,  $p < .001$ ; *Table 5*), corroborating the findings from OLS and ARIMAX. This path implies a significant psychological or social burden arising from gender-based violence, likely affecting both victims and the broader community's well-being. The magnitude and significance of this path suggest that reducing rape incidence may have a substantial effect on mitigating suicide rates. GDP per Capita also showed a significant direct effect on suicide ( $\beta = 0.45$ ,  $p < .01$ ; *Table 6*), indicating that as the economy grows, suicide rates increase-possibly reflecting a paradox where economic expansion introduces heightened stress, material inequality, or mental health neglect. Notably, the SEM framework enables the detection of indirect effects, where governance influences both rape and GDP simultaneously, suggesting that the political context shapes both economic performance and social safety. The total indirect effect of governance on suicide through GDP and rape was 0.21, reinforcing the model's structural strength in capturing complex interdependencies. Life expectancy, unlike in the OLS model, was only weakly and indirectly associated with suicide in SEM and did not reach statistical significance ( $p > .05$ ). The model fit indicators were strong (CFI=0.98, RMSEA=0.04, SRMR=0.03), confirming that the SEM provides a theoretically valid and empirically sound representation of the relationships among these variables. The total variance explained in suicide was 79.6%, with the bulk attributed to rape and GDP. Overall, the SEM suggests that tackling suicide in Jamaica requires interventions across justice (to reduce rape), economic equity (to buffer the adverse effects of GDP growth), and informed political leadership.

**Table 5. SEM standardised path coefficients and R<sup>2</sup> contributions.**

Path	Standardised Coefficient	p-value	R <sup>2</sup> Contribution (%)
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Rape → Suicide	0.62	<.001	33.4
GDP per Capita → Suicide	0.45	0.005	24.6
Governance → GDP	0.52	0.008	-
Governance → Rape	0.37	0.011	-
Indirect (Govt → Suicide)	0.21	0.014	10.2
Life Expectancy → Suicide	ns	>.05	-
Total R <sup>2</sup> (Suicide)			79.6%

**Table 6.** Structural Equation Model results and fit indices.

Path	Standardised $\beta$	p-value
Rape → Suicide	0.41	< .001 ***
GDP per Capita → Suicide	0.30	.006 **
Life Expectancy → Suicide	-0.26	.023 *
GDP ↔ Life Expectancy (Covar.)	0.22	.045 *
Fit Index	Value	Criterion
$\chi^2$ (df = 2)	3.26	p = .195
RMSEA	0.041	< 0.05 (good)
CFI	0.981	≥ 0.95 (excellent)
SRMR	0.032	< 0.08 (acceptable)

Across the three analytical frameworks (OLS, ARIMAX, and SEM), a consistent pattern emerges highlighting rape incidence and GDP per Capita as the most significant predictors of suicide in Jamaica. All models affirm a strong positive relationship between rape and suicide, with rape contributing the largest share of explained variance: 29.7% in OLS, 31.5% in ARIMAX, and 33.4% in SEM. This reality suggests a powerful and persistent association between gender-based violence and psychological outcomes, reinforcing the need for urgent policy attention. GDP per Capita also maintained statistical significance across models. However, its counterintuitive positive relationship with suicide indicates that economic growth alone does not safeguard mental health, especially if accompanied by inequality or social dislocation. Notably, life expectancy, though significant in OLS, lost predictive power in both ARIMAX and SEM, suggesting that its effect may be confounded or temporally unstable. Governance (PNP=1) was a significant factor in all three models, directly influencing suicide rates in OLS and ARIMAX, and indirectly in SEM via its impact on GDP and rape. This triangulation across methods implies that political context: perhaps through social policy, economic management, or institutional stability; plays a non-trivial role in shaping suicide dynamics. The SEM model uniquely revealed indirect pathways, illustrating that governance shapes both the economy and violence, which in turn affect suicide. ARIMAX, by accounting for time-dependent dynamics, refined the robustness of these relationships, especially for GDP and rape, validating that their effects are not simply cross-sectional artefacts but enduring influences over time. Taken together, the three models explain between 75% and 82% of the variation in suicide rates, affirming that suicide in Jamaica is a multi-dimensional crisis shaped by economic, political, and social determinants. The converging evidence underscores the importance of integrated public health responses that tackle economic inequality, strengthen mental health services, and aggressively reduce sexual violence. Moreover, political governance must be viewed not merely as a background variable but as a structural driver that interacts with key societal levers to influence suicide trends.

The current study analyses suicide rates in Jamaica from 1980 to 2024, utilising three distinct econometric approaches: Ordinary Least Squares (OLS), Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX), and Structural Equation Modelling (SEM). Each method provided complementary insights into the effects of GDP per Capita, rape incidence, and life expectancy on suicide rates. The OLS model indicated that GDP per Capita and life expectancy had significant inverse relationships with suicide rates, while rape incidence was positively associated. These findings suggest that as health outcomes improve, the suicide rate tends to decrease. In contrast, higher rape incidences correlate with increased suicides, consistent with prior literature emphasising socioeconomic and health factors as critical determinants of mental health outcomes (Mokdad et al., 2016). The ARIMAX analysis incorporated the temporal dynamics inherent in the suicide rate data, accounting for autoregressive patterns and the exogenous effects of GDP, rape, and life expectancy. Results demonstrated that GDP per Capita remained a significant predictor with a lagged adverse effect, indicating that improvements in economic conditions may reduce suicide rates after some delay. Similarly, increases in rape incidence exerted a positive lagged influence on suicide rates, highlighting the sustained impact of violent crime on mental health over time. Life expectancy showed a minor yet statistically meaningful protective lagged effect. This temporal modelling aligns with previous research suggesting that socioeconomic shocks and trauma-related experiences have prolonged psychological consequences.

Structural Equation Modelling (SEM) further elucidated the complex interrelations among variables by modelling direct and indirect pathways influencing suicide rates. The SEM revealed that GDP per Capita exerted both a direct effect on suicide and an indirect effect mediated through life expectancy, emphasising the role of broader health improvements in mitigating suicide risk. The current findings, therefore, contradict international studies that economic deprivation and inequality lead to increased suicide rates, particularly in low-and middle-income countries (Nordt et al., 2015). This finding demonstrates the psychological resilience of Jamaicans, who show low rates of suicide during periods of economic deprivation. However, the psychology associated with rape breaks the resilience of many Jamaicans. Notably, rape incidence had a strong direct positive effect on suicide rates, consistent with the severe psychosocial impact of sexual violence. The current research concurs with the literature that sexual violence has been identified as a significant psychological trauma contributing to suicidality, particularly among women and adolescents (Devries et al., 2013). The SEM results underscore the multidimensional nature of suicide determinants, echoing frameworks that integrate economic, social, and health domains to explain mental health outcomes. The Structural Equation Modelling (SEM) analysis reveals a clear multivariate relationship between suicide rates and three key socioeconomic predictors: GDP per Capita, life expectancy, and reported rape. The model indicates that rape exerts the most substantial direct effect on suicide rates, suggesting that higher levels of reported sexual violence are strongly and positively associated with increases in suicide. This finding aligns with trauma theory and public health research linking sexual violence with severe psychological distress, depression, and suicidality. Moreover, the persistence of this association even after controlling for GDP and life expectancy underscores the autonomous explanatory power of sexual violence as a social determinant of suicide.

GDP per Capita demonstrates a statistically significant direct effect on suicide, contradicting the hypothesis that higher economic prosperity is associated with lower

suicide rates. This matter suggests that access to financial resources, employment opportunities, and economic stability serves as a buffer against poorer health but not suicidality. It can be deduced from the current findings that more income is associated with increased chronic stress and enabling access to social and mental health services because of an increase in suicidal thoughts. Some of these suicidal thoughts are carried out, and therefore reduce life expectancy. This study found that life expectancy also exhibits a modest but significant protective effect against suicide ( $\beta=-0.26$ ,  $p<0.05$ ), which may reflect the positive influence of public health infrastructure, medical advancements, and improvements in overall living conditions. Together, these findings suggest that a society's structural capacity to promote physical well-being has a parallel impact on mental and emotional health outcomes. The current study reveals a complex interplay between economic development, political governance, and public health outcomes such as suicide rates, rape incidence, and life expectancy in Jamaica. The suicide rate, in particular, shows a notable rise over the four decades—from 0.50 per 100,000 in 1980 to 2.36 in 2024—despite a significant increase in GDP per Capita and life expectancy. While this increase in suicide rates may appear counterintuitive amidst economic growth, prior research has shown that material prosperity does not always correspond with improvements in mental health (WHO, 2014). Rapid economic change, inequality, and unresolved trauma may contribute to rising rates of mental illness and suicidality (Whitehorne-Smith and Irons-Morgan, 2014).

Interestingly, political governance (coded as PNP=1 and JLP=0) exerts no significant direct effect on suicide. However, the SEM reveals meaningful indirect pathways: governance negatively predicts GDP and positively predicts rape. These indirect effects suggest that political administrations may influence suicide by shaping economic and social conditions rather than acting as immediate triggers. This matter supports a structuralist interpretation of governance, whereby political regimes affect suicide via their influence on economic policy, social justice mechanisms, and crime prevention. The model fit indices (CFI=.97, RMSEA=.04) indicate that the specified SEM provides a well-fitting and theoretically coherent representation of the data. Political governance also appears to exhibit a variable influence on these outcomes. The People's National Party (PNP), which governed from 1989 to 2007 and again from 2012 to 2016, presided over a significant increase in suicide rates—from 0.50 in 1989 to nearly 3.0 in 2000—even during periods of economic expansion. Conversely, the Jamaica Labour Party (JLP), during its various terms, maintained relatively stable or modestly increasing suicide rates. While it is difficult to attribute direct causality to political regimes, governance may affect mental health outcomes through the prioritisation of public health, education, and justice reforms (Hickling et al., 2011). Additionally, macro-level policy shifts can influence the visibility and treatment of mental illness, especially in resource-constrained settings.

Rape incidence presents another critical trend, peaking in the late 1990s and early 2000s, with a record high of 1,797 cases in 1996, followed by a general decline to 351 cases in 2023. This decline may reflect improvements in law enforcement, education, or victim advocacy efforts; however, underreporting—due to persistent stigma and fear of reprisal—remains a significant challenge (Kennedy, 2021). Gender-based violence continues to be a deeply entrenched issue in Jamaican society, affecting both physical safety and mental health outcomes, especially among women and children (Lee et al., 2022). Life expectancy trends, meanwhile, show steady improvement—from 68.99 years in 1980 to 75.00 in 2024—which is consistent with global health advancements,

improved maternal and child care, and broader health access (WHO, 2019). However, the disconnection between increasing life expectancy and rising suicide rates suggests that mental health burdens may be obscured in aggregate health statistics. As Samms-Vaughan et al. (2024) note, focusing solely on physical health outcomes ignores the psychosocial trauma and gendered violence that erode quality of life, particularly among vulnerable populations.

## Conclusion

Collectively, these analytical approaches reinforce the multifaceted influence of economic, social, and health variables on suicide in Jamaica. The positive association between GDP per Capita and suicide suggests that economic growth and stability may not serve as protective factors. This finding is contradicted by international studies that link poverty alleviation with improvements in mental health (WHO, 2014). The consistent positive relationship between rape and suicide highlights the urgent need for effective crime prevention and victim support policies, given the profound psychological toll of sexual violence. Additionally, life expectancy's protective effect points to the broader benefits of health system strengthening in suicide prevention strategies. The time-series data from 1980 to 2024 reveal a dissonance between economic and public health indicators in Jamaica. Despite significant gains in GDP per Capita and life expectancy, suicide rates have risen more than fourfold, while rape statistics have fluctuated dramatically. These findings support the argument that economic development does not inherently translate to improvements in psychosocial well-being (Powell-Booth, 2021). Instead, the data underscore the multifaceted and often neglected mental health crisis affecting Jamaican society, particularly among youth and women.

Governance, too, appears to influence public health trends, although more detailed, policy-level analysis is required to establish causality. Political leadership must be examined not only in terms of economic output but also in how governments respond to public health needs, especially mental health infrastructure, gender violence, and access to psychosocial support. While improvements in life expectancy are commendable, they may mask deeper issues of trauma, depression, and social alienation. Ultimately, the persistent rise in suicidality, coupled with historically high levels of gender-based violence, points to a need for urgent and integrated policy interventions. Mental health, as both a social and developmental issue, needs to be prioritised in national discourse and action. In conclusion, the integrated findings from OLS, ARIMAX, and SEM models offer robust evidence that economic conditions, incidence of sexual violence, and general health outcomes significantly shape suicide rates in Jamaica. These results advocate for holistic policy interventions targeting economic development, crime reduction, and health promotion to mitigate suicide risk. Future research might explore other socio-political factors and mental health services accessibility to build a more comprehensive understanding of suicide determinants in the Caribbean context (Brown et al., 2017). Such evidence-based insights are crucial for informing culturally relevant prevention strategies that align with Jamaica's unique social and economic landscape.

In recommendations, there are a few includes: (1) Develop and Implement a National Mental Health Strategy: Jamaica must urgently establish a comprehensive, adequately resourced national mental health policy. This matter should include school-based mental health education, decentralised community mental health centres, and culturally tailored

suicide prevention programmes (Whitehorne-Smith and Irons-Morgan, 2014; WHO, 2014). The strategy must also address the stigma associated with mental illness, particularly among men and adolescents. (2) Strengthen Gender-Based Violence Prevention and Reporting Mechanisms: Given the volatility of rape incidence in the data, government agencies should enhance legal protections, expand trauma-informed care, and invest in gender-sensitive law enforcement training. This reality aligns with Kennedy (2021) findings that early education and institutional reform are critical for reducing gender-based violence in schools and communities. (3) Integrate Mental Health Indicators into Development Planning: National planning frameworks must move beyond GDP as a proxy for well-being. Suicide rates, rape incidence, and other mental health indicators should be monitored alongside economic performance (Powell-Booth, 2021). This reality would enable more responsive policy design and promote equity in development outcomes. (4) Encourage Cross-Ministry Collaboration: Multi-sectoral collaboration: among the Ministries of Health, Education, National Security, and Gender Affairs; is essential to address the interrelated dimensions of suicide, violence, and inequality (Hickling et al., 2011). Shared databases, joint community outreach, and synchronised funding streams will amplify policy impact. (5) Expand Longitudinal Research on Mental Health and Violence: The government, in collaboration with universities, should prioritise longitudinal and qualitative research to uncover causal relationships between mental health, economic conditions, governance, and gendered violence. Particular attention should be paid to high-risk groups such as youth, rural populations, and sexual abuse survivors (Samms-Vaughan et al., 2024; Lee et al., 2022).

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### **Conflict of interest**

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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