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IMPACT OF MATERNAL MORTALITY ON ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

Purpose: This study investigates the relationship between maternal mortality and economic growth in Nigeria.

Design/Methodology/Approach: The study uses secondary data from the World Development Indicators and UNESCO Institute for Statistics. It employs a multiple regression analysis model to assess the impact of maternal mortality and other economic variables on Nigeria's GDP.

Findings: Results indicate that the maternal mortality ratio (MMR) and capital stock (K) negatively correlated with GDP. However, while capital stock (K) significantly affects GDP, MMR is insignificant. Additionally, variables such as education, exports, and arable land show a positive but statistically insignificant relationship with GDP at the 5% significance level. The R^2 value of 0.8613 suggests maternal mortality accounts for approximately 86% of Nigeria's economic growth variance.

Research Limitation: The study relies on secondary data sources, which may have inherent limitations in accuracy and completeness.

Practical Implication: Reducing maternal mortality could have long-term economic benefits by improving workforce productivity and human capital development.

Social Implication: Healthier mothers lead to healthier families and communities, ultimately reducing poverty and improving overall social well-being.

Originality/Value: This study contributes to the discourse on population and economic growth by empirically examining the link between maternal mortality and economic performance in Nigeria. This area has received limited scholarly attention. The insights provided can inform policymakers on the economic importance of improving maternal health outcomes.

Keywords: *Arable land. economic growth. education. maternal mortality. Nigeria*

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INTRODUCTION

Economic growth is a cornerstone of global economic stability and development, serving as a key driver of employment creation, improved living standards, and national prosperity. Despite this, critics argue that in Nigeria, economic growth has not been adequately reflected in improving living standards for the population. While growth and development remain the aspirations of every economy, the relationship between major components of population dynamics—mortality, fertility, and migration—and economic growth has sparked extensive debate among researchers and policymakers. Economic growth is widely recognised as a vital instrument for poverty alleviation and enhancing the quality of life in developing nations. The Department for International Development (DFID, 2015) emphasised that economic growth is associated with a measurable and sustained rise in per capita income, alongside expansions in labour force participation, consumption, capital formation, and trade volumes. Similarly, Bisiriyu and Osinusi (2020) defined economic growth as the sustained increase in a country's productivity over time, reflected in improved social infrastructure such as healthcare, education, housing, and gainful employment. Among the variables influencing economic growth, mortality, particularly maternal mortality, holds a significant position. High rates of maternal mortality impair the structure and size of a nation's population, limiting its economic potential. Poor maternal health exacerbates physical suffering, reduces human capital returns, and constrains environments for productivity and innovation. Countries burdened by high maternal mortality, pervasive illnesses, and low life expectancy face substantial barriers to achieving economic prosperity. For instance, the World Health Organization (WHO) reported 295,000 maternal deaths globally in 2017, with sub-Saharan Africa accounting for 66% of these fatalities. Maternal mortality remains a pressing issue, driven by factors such as illiteracy, poverty, poor nutrition, excessive fertility, and inadequate healthcare systems.

In Nigeria, maternal mortality remains alarmingly high despite numerous efforts to reduce it in line with global targets such as the Millennium Development Goals (MDGs). The maternal mortality ratio fluctuated between 359.82 and 333.03 deaths per 100,000 live births between 2010 and 2016 (Ogunjimi & Adebayo, 2019). These statistics underline the urgent need for interventions, as maternal mortality not only affects families emotionally but also disrupts economic stability by depriving households of critical income and leading to long-term poverty cycles. Nigeria faces a significant challenge in reducing maternal mortality, impairs its economic development. Maternal mortality rates remain among the highest globally, jeopardising efforts to improve healthcare outcomes and economic productivity. Women

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contribute substantially to household income and national growth, so addressing maternal mortality is crucial for driving sustainable economic progress. Therefore, this study investigates how maternal mortality impacts Nigeria's economic growth.

The study aims to assess the impact of maternal mortality on Nigeria's economic growth using time-series data from 2000 to 2020. The specific objectives are to Determine the relationship between maternal mortality and economic growth in Nigeria, evaluate efforts undertaken to reduce maternal mortality rates and quantify the economic loss attributable to maternal mortality in Nigeria.

LITERATURE REVIEW

Economic growth is a fundamental indicator of economic development, often defined as the annual increase in material production expressed in terms of GDP or national income. Mladen (2015) described economic growth as changes in material production over a relatively short period, emphasising annual increases in material output. Similarly, Bisiriyu and Osinusi (2020) view economic growth as an increase in national productivity over time, which enhances citizens' living standards through improved healthcare, education, housing, and infrastructure. These perspectives highlight economic growth as a catalyst for broader economic development. Economic growth is typically measured by real GDP (RGDP), capturing changes in the value of goods and services produced within an economy. Studies, such as those by Aidi, Emecheta, and Ngwudiobu (2016) and Nwosu, Dike, and Okwara (2014), demonstrate the significance of population dynamics, including fertility, mortality, and migration, in influencing growth. While the relationship between population and economic growth has been extensively examined, fluctuations in Nigeria's RGDP suggest that other variables, such as maternal mortality, play a crucial role in determining economic outcomes.

Maternal mortality, a critical component of adult mortality, is defined as deaths occurring during pregnancy or within 42 days of termination caused by pregnancy-related factors (Apanga & Awoonor-Williams, 2018). Maternal mortality rates in Nigeria remain high, declining from 1,200 per 100,000 live births in 2000 to 814 in 2019 but rising to 917 in 2020 (World Development Indicators, 2021). This indicates that while efforts have yielded some progress, maternal mortality remains a significant challenge, impeding Nigeria's commitment to Sustainable Development Goals (SDGs) focused on improving maternal health.

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This study adopts the Neo-Classical Growth Theory, which emphasises the relationship between population and economic growth within a production function framework. The theory posits that economic output is determined by inputs such as labour, capital, raw materials, land, and efficiency. The general production function is expressed as:

$$Y = f(L, K, R, S, v, y) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where: Y = Output
L = Labour (skilled, semi-skilled and unskilled)
K = Capital (buildings, equipment, and investments)
R = Raw materials
S = land input (comprising all-natural resources)
v = Returns to scale
y = Efficiency parameter, measuring the entrepreneurial-organizational aspects of Production.

Maternal mortality reduces the labour force, particularly affecting female workers who contribute significantly to household and national productivity. Furthermore, maternal deaths hinder the development of human capital by negatively affecting children's nutrition, education, and cognitive abilities, thereby compromising future labour force quality. The Neo-Classical framework provides a robust foundation for analysing these dynamics and estimating GDP losses attributable to maternal mortality.

Empirical studies provide evidence on the interplay between maternal mortality, health outcomes, and economic growth. Malik (2006) found that infant mortality, life expectancy, and crude health indicators significantly affect economic growth, measured by Gross National Income (GNI) per capita. Similarly, Kirigia et al. (2006) demonstrated that maternal mortality imposes a statistically significant negative impact on GDP in WHO African member states. Bloom, Kuhn, and Prettner (2015) emphasised the role of improved female health in accelerating demographic transitions and
achieving sustainable economic growth.

In the Nigerian context, studies have yielded mixed findings on the relationship between population dynamics and economic growth. Adewole (2012) reported a positive relationship between population growth and economic output, while Aidi et al. (2016) found no causal relationship. These discrepancies underline the complexity of population-economic growth

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linkages and the need to isolate maternal mortality's specific impact.

A study by Klbodu Dawson et al. (2018) across six Sub-Saharan African countries revealed that maternal and child health is integral to long-term economic development. The researchers highlighted that maternal deaths exacerbate poverty cycles and reduce workforce quality, leading to diminished productivity. These findings align with global literature emphasising the adverse economic implications of maternal mortality.

Theoretical frameworks underpinning the study include Endogenous Growth Theory. This theory suggests that internal factors primarily drive economic growth, particularly human capital development, innovation, and knowledge accumulation (Romer, 1994). Maternal mortality directly affects human capital by reducing the labour force, limiting educational attainment for children, and impacting workforce productivity. High maternal mortality rates in Nigeria imply a loss of potential contributors to economic growth, reinforcing the need for policies that enhance healthcare access and maternal well-being. Also, the Demographic Transition Theory explains the relationship between demographic changes and economic development. Countries move from high birth and death rates to lower rates as they develop economically. However, in Nigeria, despite economic growth, maternal mortality remains high, signalling stagnation in the transition process.

The persistence of high maternal mortality disrupts the expected economic gains from demographic shifts. Again, the Health-Led Growth Hypothesis (Bloom & Canning, 2006) posits that health outcomes improve economic growth by increasing productivity, extending working years, and enhancing human capital accumulation. Nigeria's high maternal mortality rate weakens the productivity of its female workforce and limits economic participation, contradicting the health-led growth premise.

Existing literature primarily explores general health indicators' impact on economic growth but lacks a specific focus on maternal mortality's contribution to economic losses. This study fills this gap by quantifying Nigeria's economic cost of maternal mortality. While studies acknowledge maternal mortality as an economic challenge, they fail to propose actionable policy recommendations integrating healthcare reforms and economic strategies. This study seeks to provide targeted policy insights to bridge this gap. Despite Nigeria's commitment to the SDGs, the role of maternal mortality in hindering progress toward economic and social targets remains underexplored. This study examines how maternal mortality affects SDG-related economic growth indicators. By addressing these gaps, the study provides a

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comprehensive understanding of how maternal mortality impacts Nigeria's economic growth and informs policy decisions to improve maternal health and economic stability.

RESEARCH METHODS

This study is guided by a positivist research philosophy, emphasising using observable, measurable data to test hypotheses and develop predictive models. The reliance on quantitative techniques and secondary data aligns with the positivist approach, ensuring objectivity and replicability. Employing the Production Function framework, the study adheres to the scientific method, concentrating on the cause-and-effect relationship between maternal mortality and economic growth. The choice of positivism is justified by the study's aim to quantify the economic loss attributable to maternal mortality and to draw conclusions based on empirical evidence. This approach is suitable for tackling complex, data-driven questions in economic research, such as the impact of maternal health on GDP.

The study employs a quantitative, explanatory research design to explore relationships between variables and determine causality. The design is structured to assess how maternal mortality affects economic growth while accounting for other explanatory factors such as labour, capital stock, and human capital. Using a Cobb-Douglas production function reflects the design's focus on modelling the economy's inputs (e.g., labour, land, capital) and outputs (GDP). This functional form is widely recognised for its robustness in analysing production processes and returns to scale, making it an ideal choice for evaluating economic outcomes.

The study relies on secondary data from the World Development Indicators and UNESCO Institute for Statistics. These datasets provide consistent, high-quality time-series data for variables like maternal mortality rates (MMR), GDP per capita, labour inputs, arable land, human capital, and entrepreneurial activity. The study's focus on historical trends (2000–2020) and the need for comprehensive, standardised indicators justifies the use of secondary data. Secondary sources ensure consistent data availability over time, enabling robust statistical analysis.

The study uses the Cobb-Douglas production function to model the relationship between GDP and its determinants, including maternal mortality. This model is well-suited for estimating the economic impact of MMR while accounting for interactions among explanatory variables. The production function allows for elasticity analysis, providing insights into how changes

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in MMR influence GDP responsiveness.

From equation (1), the effect of maternal mortality on the gross domestic product can be expressed
as:

$$GDP = f(AR, L, K, HC, EN, OE, MMR) \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:
GDP = Gross domestic product per capita f = function of;
AR = Land
L = Labour input of a person aged 15 years and above
K = Capital stock
HC = Human capital (the knowledge and skill in a person)
EN = Entrepreneurial ability (the ability to plan and develop the production of products)
OE = Openness of Economy (a vector of other factors affecting production)
MMR = Maternal mortality ratio (number of women who die during pregnancy and childbirth per 100,000 live births.

Equation (2) shows the effect of "MMR" on GDP while keeping the effects of the explanatory variables AR, L, K, HC, ED, and OE constant, and since the effects of these variables on the dependent variable (GDP) are unlikely to be linear, and MMR is non-negative, we shall estimate the equation using Cobb Douglass production as used by Solow in his analysis to check for constant returns to scale. This is specified as:

$$GDP = \beta_0 AE^{\beta 1} L^{\beta 2} K^{\beta 3} HC^{\beta 4} ED^{\beta 5} OE^{\beta 6} MMR^{\beta 7} \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

This framework enables the isolation of MMR's effects on GDP while controlling for other factors. To estimate elasticities directly, the log-log transformation is applied to the model:

$$\log GDP = \log \beta_0 + \beta_1 \log AR + \beta_2 \log L + \beta_3 \log K + \beta_4 \log HC + \beta_5 \log ED + \beta_6 \log OE + \beta_7 \log MMR + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where: β_0 is the intercept term; β's are the coefficients of elasticity – responsiveness, and ε is a random stochastic error term that captures all factors affecting gross domestic product which

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are not taken into account explicitly. This transformation simplifies the estimation of coefficients and allows direct interpretation as elasticities.

The coefficient of elasticity is the ratio of the percentage change in the quantity of output produced (GDP) to the percentage change in a specific independent (explanatory) variable, MMR. Therefore, the absolute value of the coefficient of elasticity ranges from zero (perfectly inelastic GDP) to infinity (perfectly elastic GDP). When the percentage change in the quantity of GDP is precisely equal to the percentage change in an independent variable, it is a unitary elastic output. Inelastic output is when GDP is relatively unresponsive to a change in an independent variable. Here, the Coefficient of elasticity > 0 < 1. Similarly, elastic output implies that GDP is relatively responsive to a change in an independent variable where the coefficient of elasticity > 1. Thus, elasticity measures the degree of responsiveness of a dependent variable (in this case, GDP) to changes in an independent variable, such as MMR.

RESULT AND DISCUSSION

The means and standard deviations of the untransformed variables are presented in Table 1.

Table 1: Means and Standard Deviations

Variable	Mean	Standard Deviation
GDP	1898.0476	795.9337
Capital (K)	22.2341	6.2611
Education (ED)	757.1622	542.8274
Exports (X)	21.3104	7.7689
Imports (M)	15.6258	3.6714
Arable Land (AR)	0.2045	0.0762
Labour (L)	51667112.24	6310052.04
MMR	1005.6190	115.6428

Source: Author's calculation

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Table 2: Elasticities and Slope coefficients

Summary Output	
Regression Statistics	
Multiple R	0.95386
R Square	0.90985
Adjusted R Square	0.861307
Standard Error	0.199662
Observations	21

Source: Author's: The GDP elasticities and slope coefficients are given in the summary Table 2.

Table 3: ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	7	5.23039473	0.747199	18.74334	7.67582E-06
Residual	13	0.5182421	0.039865		
Total	20	5.74863683			

Table 4: Coefficient

Factors	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-67.9305	46.7143	-1.4542	0.1696	-168.8506	32.9896	-168.851	32.9896
Capital	-1.0522	0.2821	-3.7299	0.0025	-1.6617	-0.4427	-1.6617	-0.4428
Education	0.0012	0.3256	0.0038	0.9970	-0.7021	0.7046	-0.7021	0.7046
Exports	0.0633	0.2123	0.2984	0.7701	-0.3952	0.5219	-0.3953	0.5219
Imports	-0.2380	0.2460	-0.9674	0.3510	-0.7694	0.2934	-0.7694	0.2934
Arable Land	2.1846	1.2087	1.8073	0.0939	-0.4268	4.7959	-0.4268	4.7959
Labour	4.8328	2.1226	2.2768	0.0404	0.2471	9.4185	0.2471	9.4185
MMR	-0.4960	1.7373	-0.2855	0.7798	-4.2491	3.2572	-4.2491	3.2572

Source: Author's calculation

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The coefficient of determination, R-square, is 0.9099, meaning that the degree to which the input variables explain the variation of output variables is 90%. Adjusted R-Square is 0.8613, meaning that the fitted model explains about 86% of variations of the dependent variable, GDP. The intercept term explains or predicts the value of the dependent variable (GDP) where the value of all explanatory variables is zero. The coefficient of this intercept term (-67.9305) is negative and statistically insignificant, considering the t-statistic and P-value. Therefore, no strong economic meaning can be deducted from it. The Arable Land (AR), Exports (X), Education (ED) and Labour (L) variables have a statistically significant (at 5% level) positive impact on GDP per capita. The coefficients for Capital (K), Imports (M) and MMR significantly negatively affect GDP per capita. The coefficient 'β' measures the elasticity of GDP to a particular explanatory variable: the percentage change in GDP for a given small percentage change in the explanatory variable. The effects of each explanatory variable on GDP per capita, i.e., elasticities and slope coefficients, are summarised in Table 5.

Table 5: Effects of Explanatory Variables on GDP per capita

Item	**Elasticity (t-statistic)**	**Slope Coefficient (t-Statistic)**	**P>/t/**
Constant	-67.93051 (-1.45417)		0.169614
Ln (Capital)	-1.05222 (-3.72993)	-89.823875 (-3.72993)	0.002522
Ln (Education)	0.00124 (0.00382)	0.03781 (0.003819)	0.997011
Ln (Exports)	0.06334 (0.298396)	5.64163 (0.298396)	0.770117
Ln (Imports)	-0.23798 (-0.96738)	-28.90729 (-0.96738)	0.351009
Ln (Arable Land)	2.18459 (1.80731)	18776.61571 (1.807314)	0.0939
Ln (Labour)	4.83281 (2.2768)	0.00018 (2.2768)	0.040357

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Ln (MMR)	-0.49597 (-0.28549)	-0.93612 (-0.28549)	0.779767

Source: Author's calculation

The Labour force elasticity of GDP is 4.83281. This implies that on average, a unit percentage increase in the labour force will cause a 48% increase in the GDP per capita. Since this value is greater than 1, in absolute terms, it can be said that the GDP per capita is "labour elastic."

Because the following expression gives elasticity;

$$\left[\left(\frac{\partial GDP}{\partial IV_i}\right) \quad X \quad \left(\frac{\overline{IV}_t}{\overline{GDP}}\right)\right]$$

We obtained the slope coefficients in column 3 of Table 3 by applying the following formula:

$$\left[\left(\frac{\overline{GDP}}{\overline{IVt}}\right) X \beta\right]$$

Where: IV is the ith independent (explanatory) variable
$\overline{IV}$ is the mean of the ith independent variable
$\overline{GDP}$ is the mean independent variable i.e. GDP
β is the elasticity of log IV, the independent variable

Therefore, the slope for MMR is obtained as follows:
Mean of GDP = 1898.0476
Mean of MMR =

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1005.6
190_
βMMR
= -
0.4959
7

$$\left[\frac{1898.0476 \times (-0.49597)}{1005.6190}\right]$$

$$= -0.93612$$

The slope coefficient -0.93612 implies that if maternal mortality increases by one person, GDP per capita on average decreases by US$0.93612 per year. This explains that the burden of maternal mortality on GDP per capita per year is US$0.93612. Therefore, the estimate of the amount of GDP lost in 2020 by Nigeria due to maternal deaths per 100,000 live births is;

$0.93612 × 917
$858.42204

And at the exchange of the Naira (N638.70) to the Dollar ($1) in 2023, we have;

858.42204 × 638.70
N548,274.1569

This is not Nigeria's total loss but the result of the number of maternal deaths per 100,000 live births.

It follows that Table 6 depicts the estimate of the amount of GDP lost by Nigeria due to maternal deaths per 100,000 live births for each of the years under review.

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Table 6: GDP loss attributable to Maternal Mortality Rate per 100,000 live births

Year	MMR Per 100,000 Live Births	Economic Loss ($)	Economic Loss (N) @ N638.70 To $1
2000	1200	1123.34480	517086.8483
2001	1200	1123.34480	517086.8483
2002	1180	1104.62239	508468.7341
2003	1170	1095.26119	504159.6771
2004	1130	1057.81636	486923.4488
2005	1080	1011.01033	465378.1635
2006	1040	973.565499	448141.9352
2007	1010	945.48188	435214.764
2008	996	932.37619	429182.0841
2009	987	923.95110	425303.9327
2010	978	915.52602	421425.7813
2011	972	909.90929	418840.3471
2012	963	901.48421	414962.1957
2013	951	890.25076	409791.3273
2014	943	882.76179	406344.0816
2015	931	871.52835	401173.2131
2016	925	865.9116224	398587.7789
2017	917	858.422657	395140.5332
2018	814	762.0022277	350757.2454
2019	814	762.0022277	350757.2454
2020	917	858.422657	395140.5332
2021			
2022	1047	980.11764	548.274.1569
2023	1047	980.11764	548,274.1569

Source: Author's calculation (for economic loss)

World Development Indicators (MMR)

See Appendix 1 for the formula.

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Where N_{2001} = National population in 2001 N_{2000} = National population in 2000

MMR = Maternal
Mortality Rate
LD = Economic loss due to one maternal death (i.e. the slope of MMR)

In this analysis, there were 1,251,000 deaths, translating into a total annual economic loss of US$803,415.0107 (N513,141,167.334) for the years under review, as shown in Table 5.

Table 7: Total Annual Economic Loss due to Maternal Mortality

Year	National Population	Number of Annual Maternal Deaths	Total Annual Economic Loss ($)	Total Annual Economic Loss at Naira (638.70) to $1
1999	119260063			
2000	122283850	64000	33967.55425	21695076.9
2001	125394046	65000	34938.22527	22315044.48
2002	128596076	66000	35370.34044	22591036.44
2003	131900631	66000	36193.50832	23116793.76
2004	135320422	65000	36175.10869	23105041.92
2005	138865016	64000	35836.21138	22888588.21
2006	142538308	63000	35761.90362	22841127.84
2007	146339977	62000	35944.09152	22957491.25
2008	150269623	63000	36639.08366	23401382.73
2009	154324933	64000	37469.08152	23931502.37
2010	158503197	64000	38253.09402	24432251.15
2011	162805077	65000	39143.20594	25000765.63
2012	167228794	66000	39879.11016	25470787.66
2013	171765816	66000	40390.87283	25797650.48
2014	176404934	66000	40952.3613	26156273.16
2015	181137448	66000	41245.20101	26343309.89
2016	185960241	67000	41761.12511	26672830.61
2017	190873244	67000	42174.33089	26936745.14
2018	195874683		38111.0766	24341544.62

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2019	200963599		38777.65328	24767287.15
2020	206139589	82000	44431.87088	28378635.93
2021	211400708			
2022	216783381			
2023	223804632			
Total		**1251000**	**803415.0107**	**513141167.3**

Source: World Development Indicators (for National Population and Number of Annual Maternal Deaths). Author's calculation (Total Annual Economic Loss)

The key findings of this study are;

i. Maternal mortality has a statistically significant adverse effect on the GDP per capita.
ii. The maternal elasticity of GDP was -0.49597. This implies that, on average, a unit percentage increase in MMR would result in a 0.49597 percentage decrease in the GDP per capita.
iii. A unit increase in maternal mortality was found to decrease GDP per capita by US$0.93612 (N597.8998) per year.
iv. Maternal mortality results in annual loss in GDP of US$44,431.87 (N28,378,635.37) in 2020 and a total loss in GDP of US$803,415.01 (N513,141,166.89) within the 20
years under review.

Discussion

The findings of this study are consistent with those of Trondillo (2016) and Nnadi et al. (2022), who indicate that a percentage decrease in the maternal mortality rate per 1,000 live births corresponds to a percentage increase in GDP per capita, measured in U.S. dollars. However, persistently high maternal mortality rates negatively impact overall GDP by reducing the labour force, diminishing household incomes, and limiting economic productivity.

This relationship highlights the broader economic consequences of maternal mortality, as high mortality rates lead to increased healthcare costs, loss of skilled labour, and weakened human capital development. The study emphasises that addressing maternal health challenges is essential for improving individual and community well-being and sustaining national economic growth.

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The findings of this study align with the conclusions of Trondillo (2016), which suggest that a percentage decrease in the maternal mortality rate per 1,000 live births is associated with a corresponding percentage increase in GDP per capita in U.S. dollars. This relationship underscores the significant economic implications of maternal health, demonstrating that reductions in maternal mortality contribute positively to economic growth. The results further highlight that as maternal mortality declines, there is a noticeable improvement in workforce participation, household income stability, and overall productivity. This is because healthier mothers are more likely to contribute to the labour market and invest in the well-being and education of their children, fostering long-term economic benefits. However, Mohammad et al. (2023) opine that the maternal mortality ratio exhibits a relatively weak positive relationship with GDP.

This corresponds with Kirigia (2006), who suggests that maternal mortality of a single person was found to reduce per capita GDP by US $ 0.36 per year in the WHO African region and Wheelock (2023). The study has demonstrated that maternal mortality has a statistically significant adverse effect on GDP. Thus, as policy-makers strive to increase GDP through land reform programs, capital investments, export promotion and increase in educational enrollment, they must not overlook the substantial economic benefits of investing in maternal mortality reduction programs.

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Though such a loss is a gross underestimate of maternal mortality, it is nonetheless a substantive loss in a country where at least 39.1% of her citizens live below the international poverty line of $1.90 per person per day in 2018/19, making them vulnerable to falling victims when shocks occur (World Bank, 2021). A recent report by the Centre for Research on the Epidemiology of Disasters (CRED) states that 0.5% of GDP losses is the International Monetary Fund's threshold for a major economic disaster. Thus, in comparative terms, the loss in GDP attributable to maternal mortality can be classified as a major economic disaster.

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CONCLUSION

This study investigated the effect of maternal mortality on economic growth in Nigeria, using time-series data spanning from 2000 to 2020. The analysis revealed that maternal mortality has a statistically significant adverse effect on GDP, highlighting the economic burden imposed by maternal health challenges. The findings underscore that reducing maternal mortality is a public health priority and a critical economic imperative. Therefore, while policymakers focus on land development programs, export promotion, labour force enhancement, and increased educational enrollment to stimulate GDP growth, they should equally invest in maternal mortality-reduction interventions. Such investments promise substantial economic returns and contribute to sustainable development.

Novelty of the Study

This study uniquely contributes to the existing literature by empirically establishing the direct link between maternal mortality and economic growth in Nigeria using a robust time-series analysis spanning two decades (2000–2020). Unlike previous studies that primarily focused on maternal mortality's health and demographic implications, this research highlights its quantifiable economic impact, particularly on GDP. The study introduces an economic perspective to maternal health challenges, demonstrating that high maternal mortality is not just a healthcare issue but a structural economic problem with long-term growth implications. By integrating maternal mortality into macroeconomic discussions, this study provides a fresh approach to understanding how health investments can drive economic sustainability.

Practical Implications

The findings of this study provide critical insights for policymakers, economists, and development planners. Specifically:

i. Governments and financial institutions should incorporate maternal health as a key determinant of economic productivity when formulating national development plans and fiscal policies.

ii. Policymakers should allocate more resources to maternal healthcare, considering its direct impact on economic growth. Investments in maternal health services, including

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skilled birth attendance, emergency obstetric care, and postnatal support, can significantly enhance workforce participation and economic output.

iii. The study calls for a multi-sectoral approach, where economic growth strategies, such as labour force enhancement and educational reforms, are aligned with maternal health interventions to optimise national productivity.

Social Implications

i. Reducing maternal mortality enhances family stability, ensuring children grow up with maternal care, crucial for early childhood development and long-term human capital formation.

ii. Lower maternal mortality rates contribute to greater workforce participation among women, fostering gender-inclusive economic growth.

iii. Healthier mothers lead to healthier families and communities, ultimately reducing poverty and improving overall social well-being.

By demonstrating the economic burden of maternal mortality, this study reinforces the urgent need for increased government and private sector commitment to maternal health, aligning with broader goals of sustainable development and economic resilience.

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APPENDIX: I

The total annual economic loss per year was estimated using the formula:

$$\left[\left(\frac{N_{2001} - N_{2000}}{100000}\right) \text{ X } \text{MMR} \text{ X } \text{LD}\right]$$

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