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Female labour participation and infant mortality in Nigeria: implication for the sustainable development goal 3

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Abstract

Over the time, link between female labour participation and infant mortality has become a subject of debate among scholars and policymakers in developing countries. This subject becomes more critical for a country like Nigeria where there is a persistent challenge to attain minimal global infant mortality rates by 2030, and where over 47% of female working population is unemployed. Against this background, this study utilizes fully modified ordinary least squares to estimate the relationship between female labour participation and infant mortality in Nigeria. The results show that at least 98 children per 1,000 births died in Nigeria between 1990 and 2020. Similarly, over 47% of female working population is currently unemployed in Nigeria. Female labour participation and infant mortality possess a significant negative relationship. Consequently, participation of women in the labour market has a significant effect in reducing infant mortality in Nigeria. In the same vein, female employment contributed to the reduction of infant mortality, though not substantial in nature. As such, the Nigerian policymakers should create a conducive environment that will facilitate participation of more women in the Nigerian labour market so that there will be further reduction of infant mortality in order to achieve the SDG 3. (*Afr J Reprod Health 2024; 28 [3]: 30-37*).

Keywords: Female population, SDG 3

Résumé

Au fil du temps, le lien entre la participation des femmes au travail et la mortalité infantile est devenu un sujet de débat parmi les universitaires et les décideurs politiques des pays en développement. Ce sujet devient plus critique pour un pays comme le Nigeria, où il est toujours difficile d'atteindre des taux de mortalité infantile mondiaux minimaux d'ici 2030 et où plus de 47 % de la population active féminine est au chômage. Dans ce contexte, cette étude utilise les moindres carrés ordinaires entièrement modifiés pour estimer la relation entre la participation des femmes au travail et la mortalité infantile au Nigeria. Les résultats montrent qu'au moins 98 enfants pour 1 000 naissances sont morts au Nigeria entre 1990 et 2020. De même, plus de 47 % de la population active féminine est actuellement au chômage au Nigeria. La participation des femmes au travail et la mortalité infantile entretiennent une relation négative significative. Par conséquent, la participation des femmes au marché du travail a un effet significatif sur la réduction de la mortalité infantile au Nigeria. Dans le même ordre d'idées, l'emploi des femmes a contribué à la réduction de la mortalité infantile, même si elle n'est pas substantielle. En tant que tel, les décideurs politiques nigériens devraient créer un environnement propice qui facilitera la participation d'un plus grand nombre de femmes au marché du travail nigérian afin de réduire davantage la mortalité infantile afin d'atteindre l'ODD 3. (*Afr J Reprod Health 2024; 28 [3]: 30-37*).

Mots-clés: Population féminine, ODD 3

Introduction

Infant mortality, defined as the death of a child before the first year of life, stands as a critical indicator of a nation's health condition. The rate of infant mortality is quantified as the number of infants who succumb to mortality within their first year per 1,000 live births in a specific year¹.

In the pursuit of the overarching Sustainable Development Goal (SDG) to improve global health and well-being, the reduction of infant mortality has emerged as a pivotal international and national endeavour¹. The harrowing loss of infants, both on a global scale and notably in Nigeria, can be attributed to a multifaceted array of factors, encompassing sex, occupation, technological

development, education, social class, standard of living, and the state of healthcare infrastructure²⁻⁷.

Despite the global success in reducing infant mortality rate from 93 deaths per 1,000 live births in 1990 to 41 deaths per 1,000 live births in 2016, and further to 27.4 deaths per 1,000 live births in 2020, the challenge of high infant mortality persists in Nigeria^{8,9}. The urgency of addressing infant mortality was amplified during the COVID-19 pandemic, particularly underscored by the United Nations¹⁰. Amidst this persistent challenge and the collective commitment to attain minimal global infant mortality rates by 2030, a notable gap exists in recent empirical studies. Specifically, there is a dearth of research focused on understanding the role of female labour participation in influencing infant mortality in Nigeria, a nation that significantly contributes to the global infant mortality rate.

Therefore, this study embarks on a quest to fill this critical research gap. By investigating the complex interplay between female labour participation and infant mortality in Nigeria, the study endeavours to shed light on the nuanced factors that underlie the nation's infant mortality rates. Through rigorous analysis and empirical exploration, this study aims to uncover valuable insights that can inform evidence-based policies and interventions aimed at reducing infant mortality in Nigeria, ultimately contributing to the broader global effort to ensure that every child has the opportunity to thrive and survive beyond their first year of life.

Literature review

Igboanugo and Saibu¹¹ examined female labour force participation and child death rate in Nigeria. The research used econometric and Fully Modified Ordinary Least Square (FMOLS) methods and adopted the Grossman theoretical model. The FMOLS analysis found a significant association between infant death rate and maternal labour, but an adverse association between child death rate and female labour force participation. The study concluded that context-specific evidence is crucial for identifying policies and initiatives that address cultural norms regarding infant survival in Nigeria as well as the need to increase the involvement of women in official jobs.

Adewusi and Nwokocha's³ research examined the link between parental schooling and infant death rate in Nigeria. The research utilised both descriptive and inferential statistical methods to analyse data from the 2013 Nigerian Demographic Health Survey. Although variables including the number of households, sect of religion, financial index, and gender of the family head have a major impact on these mothers, it was discovered that infant death is substantially higher among moms without an educational background and considerably less among those with various degrees of schooling.

Ahmed and Fielding¹² analysed the effects of fertility and employment on infant death rates. The research examined 1995–2016 macro-panel data from 18 African and Asian nations. It was shown that increasing the length of women leave generally results in decreases in workforce and new-born deaths. The research found inadequate proof that motherhood leaves compensation rates have any impact on child death rate or workforce; however, larger maternity leave compensation does increase conception.

Akinyemi *et al.*¹³ examined the association between mother's work, and new-born and infant death rate in Nigeria. In the research, Cox proportional hazards models were used to evaluate cross-sectional data on a weighted group of 31,828 under-five-year-olds taken from the birth history in the 2013 Nigeria Demographic and Health. The results of the analysis showed that 68.7% of mothers of under-five children had a job, and that most of them worked for themselves with physical work, small-business ownership, or sales. Children of working mothers had a somewhat lower child death rate than those who were unemployed. The likelihood of baby and infant death was greater among jobless mothers, according to the hazard regression methods.

Oyedele¹⁴ analyzed the connection between women's employment and infant death. Data for the research came from the 2010 Harmonised Nigeria Living Standard Survey in Nigeria. The research found that women's employment substantially lowers infant death for mothers with education higher high school and higher education for both instances of informal and formal sector jobs. This was determined by using the Hausman test and a two-stage estimation approach to a simultaneous equation framework.

Methods

An ex-post facto type of research design was used for this study. The study covered the period 1990 and 2020, while the data for the analysis is obtained from the World Development Indicators published by the World Bank¹⁵.

Model specification

To assess the nexus between female labour participation and infant mortality in Nigeria, the study adapted its model from similar studies like Adegun et al.¹⁶, Aderemi et al.¹⁷, Zhou et al.¹⁸ and Aderemi et al.¹⁹ as follows

$$\text{Infant mortality, IM} = f(\text{Female labour participation, FLP}) \tag{1}$$

Restating model (1) in econometrical form, with the introduction of some control variables changes the structure of the model to this form,

$$\text{IM}_t = \alpha_0 + \alpha_1 \text{FLP}_t + \alpha_2 \text{FM}_t + \alpha_3 \text{FP}_t + \alpha_4 \text{TOP}_t + u_t \tag{2}$$

It is instructive to state that the explicit explanations of each of the variables in the model 2 are given in the Table 1. Moreover, t represents the scope of the study which spans between 1990 and 2020. And the selection of these periods was driven by data availability.

Table 1: Measurement of variables

In table 1, the operational definitions of various variables in the study are discussed as follows.

Abbreviation	Variable	Operational Definition	Expected sign
IM	Infant mortality.	This is measured as infant mortality rate, infant (per 1,000 live births).	
FLP	Female labour participation.	Female labour force participation as percentage of female population between age of 15 and 64.	-
FE	Female employment.	Female employment as percentage of total employment	-
FP	Female population	Female population as percentage of total population.	-
TOP	Trade openness	Imports plus exports as percentage of GDP	-

Source: Authors` Computation (2023)

Estimation procedures

To estimate the dependent variable and set of the independent variables, this study embarked on preliminary analyses on the data as follows:

Descriptive Statistics: These were used to describe the main characteristics of the data in the study, and they provided succinct summaries of the sample. The statistics included comprehensive information regarding the characteristics, distribution, and behavior of the variables under consideration by presenting statistics such as the mean, median, kurtosis, skewness, standard deviation, maximum and minimum value among others.

Correlation Analysis: This was a bivariate analysis that used the correlation coefficient to examine the degree of association and direction between two variables. This served as guide against including two or more regressors which were highly

correlated and constituted a major problem to the estimated model.

Consequently, the preferred methods of estimation for the study are fully modified least squares and canonical cointegrating regression. These are analytical techniques used to estimate unknown parameters. The regression model included deterministic variables, integrated processes and their powers as regressors. The errors were allowed to be correlated across equations, over time and with the regressors. Also, the regression was constructed in such a way that the usual least squares procedure yielded asymptotically efficient estimators.

Ethical consideration

The data in the WDI were obtained using appropriate ethical procedures and guidelines. Consequently, further ethical issues were minimal.

The data were completely anonymized, while the data was already freely available to the general public. Hence, further ethical clearance was not obtained for this study.

Results

Infant mortality, female labour participation, female employment, female population and trade openness were the variables in this study. It is necessary to show the distribution of the data to

capture these variables over the period of the analysis. Firstly, female employment in Nigeria has a mean value of 52.3% with a minimum and a maximum value of 54.8% and 43.5% respectively.

Female labour participation possesses a mean value of 53.7%, as both minimum and maximum values of the variables stand at 48.6% and 55.4% simultaneously. Female population has an average value of 49.5%. Meanwhile, female population recorded 49.7% and 49.3% as both maximum and minimum values in the country.

Table 2: Descriptive statistics

	FE (%)	FLP (%)	FP (%)	IM (per 1,000 live births).	TOP (%)
Mean	52.33727	53.66290	49.50730	98.14516	36.89020
Median	54.44950	55.27000	49.50431	95.00000	37.02160
Maximum	54.75900	55.38000	49.69472	124.6000	53.27796
Minimum	43.50900	48.62000	49.32092	72.20000	20.72252
Std. Dev.	3.725335	2.693312	0.125843	18.31760	8.675701
Skewness	-1.246787	-1.054722	0.026783	0.183527	0.005043
Kurtosis	2.887367	2.200420	1.577848	1.497149	2.398221
Jarque-Bera	7.788249	6.573399	2.616123	3.091334	0.467892
Probability	0.020361	0.037377	0.270344	0.213170	0.791404
Sum	1570.118	1663.550	1534.726	3042.500	1143.596
Sum Sq. Dev.	402.4654	217.6178	0.475097	10066.04	2258.034
Observations	31	31	31	31	31

Table 3: Correlation analysis

	FE	FLP	FP	IM	TOP
FE	1.000000				
FLP	0.971229 (0.0000)	1.000000			
FP	0.738326 (0.0000)	0.770925 (0.0000)	1.000000		
IM	0.673350 (0.0000)	0.707210 (0.0000)	0.994563 (0.0000)	1.000000	
TOP	0.624876 (0.0002)	0.638129 (0.0001)	0.335442 (0.0700)	0.290738 (0.1191)	1.000000

In the same vein, infant mortality recorded a minimum value as 72 and maximum value as 124 alongside a mean value of 98 over the periods of the analysis. Also, trade openness recorded an average value of 36.9% alongside its maximum and minimum values pegged as 53.3% and 20.7% respectively. However, the mean values of all the variables of the study are greater than their

respective values of their standard deviation. This demonstrates that all the data for the study are moderately dispersed from the mean.

Table 2 shows correlations between explanatory variables in the study as follows; correlations between female employment and female labour participation is 0.97, female population and female employment is 0.73, female population and female

Table 4: Unit root test

Augmented-Dickey Fuller Stationarity Test				
Variable	I(0)	I(1)	I(2)	Decision
FE	NA	NA	-3.317927 (0.0258)	I(2)
FLP	NA	NA	-5.709407 (0.0001)	I(2)
FP	NA	-7.215615 (0.0000)	NA	I(1)
IM	NA	-4.354057 (0.0022)	NA	I(1)
TOP	NA	-5.175199 (0.0002)	NA	I(1)

Table 5: Johansen cointegration test

Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.908382	150.2083	79.34145	0.0000
At most 1 *	0.755784	85.67494	55.24578	0.0000
At most 2 *	0.581716	47.61300	35.01090	0.0014
At most 3 *	0.556994	24.07996	18.39771	0.0072
At most 4	0.074738	2.097303	3.841466	0.1476
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.908382	64.53336	37.16359	0.0000
At most 1 *	0.755784	38.06194	30.81507	0.0055
At most 2	0.581716	23.53304	24.25202	0.0620
At most 3 *	0.556994	21.98265	17.14769	0.0092
At most 4	0.074738	2.097303	3.841466	0.1476

labour participation is 0.77, infant mortality and female employment is 0.67 and trade openness and female employment is 0.62 respectively.

The estimated results of unit root displayed in Table 3 show that both female employment and female labour participation are I (2) variables, which indicate that these variables are stationary after second differencing. Also, female population, infant mortality and trade openness are (1) variables, which means that these three variables are stationary after first differencing. In a nutshell, all the variables are not stationary at level, as such, there is a need to investigate the existence or otherwise of the long run relationship among these variables because of the short run disequilibrium that are usually attributed to variables that are not stationary at level.

Due to the nature of all the variables in this study, this study investigates the existence of the long run

relationship among these within the instrumentality of Johansen Cointegration Test. The results in the above table indicate that a long run relationship exists among the various variables of interest in the study.

Table 6 displays the estimated results of the relationship between female employment and infant mortality in Nigeria. Starting from the R squared value, it reads 0.93, which implies that about 0.93% of variation in infant mortality is jointly explained by the set of the model's regressors, female employment, female labour participation, female population and trade openness. It therefore implies that the selected model is relative robust in addressing the objective of the study. Consequently, female labour participation and infant mortality possess a significant negative relationship in Nigeria. Likewise, female employment and infant mortality have a negative

Table 6: FMOLS regression analysis of female employment and infant mortality in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FLP	-0.994977**	0.304271	3.270035	0.0032
FE	-0.182676	0.202902	0.900316	0.3769
FP	165.5683*	2.520422	65.69070	0.0000
TOP	0.063277**	0.027987	2.260966	0.0331
R-squared	0.998329	Mean dependent var		96.33103
Adjusted R-squared	0.998050	S.D. dependent var		17.51190
S.E. of regression	0.773255	Sum squared resid		14.35014
Long-run variance	0.926268			

*Significant at 1% **Significant at 5% ***Significant at 10%

relationship, but the relationship is not significant. However, female population has a significant direct relationship with infant mortality. In the same vein, trade openness causes a positive impact on infant mortality, which is significant.

Discussion

Discussing these findings within the context of the research question and objective of this study. Infant mortality possesses a mean value of 98. This implies that on an average basis, at least 98 children per 1,000 births died in Nigeria between 1990 and 2020. This indicates that Nigerian situation is still off the SDG 3 targeting to prevent death of new born baby to 12 per 1,000 live births before the end of 2030.

Similarly, female employment figure in Nigeria shows that on average, about 52.3% of women working population are productively engaged in the country. This implies that over 47% of female working population is currently unemployed. The reason for this exorbitant figure might be as a result of gender discrimination in employment recruitment activities of some of employers of labour in Nigeria. Furthermore, female labour participation in Nigeria has a mean value of 53.7%. This implies that about 53.7% female population between age of 15 and 64 are actively engaged in the labour market. The reason for this kind of scenario in Nigeria could be attributed to the preference for employment in the informal sector by some Nigerian married women due to traditional and religious beliefs. In addition, female population recorded an average value of 49.5%. This is an indication that the Nigerian population is moving towards even distribution between male and female genders.

Consequently, female labour participation contributes a significant reduction in infant mortality in Nigeria. Based on the finding of the study, a unit change in female labour participation causes a reduction in infant mortality by 0.99% in the country. This shows that participation of women in the labour market has a significant effect in reducing infant mortality in Nigeria. This finding is in tandem with the submission of Igboanugo and Saibu¹¹ in similar research in Nigeria. As such, the Nigerian policymakers should create a conducive environment that will facilitate participation of more women in the Nigerian labour market so that there will be further reduction of infant mortality in order to achieve the SDG 3 focusing on reduction of infant mortality to 12 per 1,000 live births.

Furthermore, female employment contributed to the reduction of infant mortality, though not significant. As such, a unit change in female employment in Nigeria brings about 0.18% reduction in the country's infant mortality. The finding in this study is in agreement with the submission of Oyedele¹⁴ in a similar study. Therefore, this current study emphasizes that engagement of women in productive ventures in Nigeria is an important way of reducing infant mortality in the country so the policymakers in the country should provide motivating environment that will expand more employment opportunities for women workforce.

However, female population has a significant direct relationship with infant mortality. This implies that contribution of female population does not reduce infant mortality in Nigeria. This unpleasant result might be an aftermath effect of lack of formal education among majority of female population in Nigeria. Therefore, this study emphasizes that an urgent action should be taken by

the Nigerian policymakers to make education of female population a matter of priority, due to critical role education plays in the context of human capital development.

It is instructive to state that female labour participation is a strategic component of economy that can drive the achievement of SDG 3 in Nigeria. As such, the policy that will make female gender more inclusive in the Nigerian labour market should be implemented.

The strength of this study lies in its high level of novelty in terms of its contribution to the body of knowledge. High level of rigorous quantitative analysis was employed in providing a clear answer to the research question. This study is limited and serves as a future direction for other researchers. The study focused on only Nigeria. Studies therefore could be carried out on the entire African continent in one hand, sub regional studies could also be carried out to cater for peculiar nature of each of the African sub regions.

Strengths and limitations

The study's strengths lie in its clear research question, robust analysis and emergence of the new empirical evidence in the study. The limitation of study is primarily attributed to its scope, as the study focuses on only Nigeria. Further studies could therefore be carried out on the sub Saharan Africa to provide a wider policy implication for the entire continent.

Conclusion

This study therefore concludes that on an average basis, at least 98 children per 1,000 births die in Nigeria between 1990 and 2020. This indicates that Nigerian situation is still off the SDG 3 targeting to prevent death of new born baby to 12 per 1,000 live births before the end of 2030. Similarly, over 47% of female working population is currently unemployed in Nigeria. Consequently, participation of women in the labour market has a significant effect in reducing infant mortality in Nigeria. In the same vein, female employment contributed to the reduction of infant mortality, though not substantial in nature.

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