**AN ANALYSIS OF THE DETERMINING FACTORS OF CHILD MORTALITY IN NIGERIA.**

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***Abstract***

*Nigeria is still one of the countries in sub-Saharan Africa with the highest cases of child mortality and still far from the recommended 25 per 100 live births by the Sustainable Development Goals (SDG). The study therefore set out to investigate the factors responsible for the causes of this high mortality rate, especially among children under five years of age. The study employed a modified VAR and Error correction model to determine the causes of child mortality in Nigeria using secondary data. The results from the study revealed that factors such as income, household behavior, female illiteracy and low physician density were statistically significant in determining child mortality in Nigeria. The study concludes that apart from low government spending on healthcare services there are other factors that influence under-five malaria mortality rate. The study, therefore, recommends that the government should roll out programs to increase citizen's income, increase girl child education participation, female labor force participation, increase awareness of immunization, and increase the supply of physicians to reduce the high doctor-patient ratio.*

Key words: Child mortality, Malaria, VAR, Income.

**Introduction**

Malaria remains one of the most pressing public health issues in Nigeria, particularly affecting children under the age of five, who are the most vulnerable to the disease's severe and often fatal consequences. Despite ongoing global and national efforts to combat malaria, Nigeria continues to report some of the highest under-five malaria mortality rates globally. According to the World Health Organization (2022), Nigeria accounted for approximately 31% of global malaria deaths, with a significant proportion of these occurring in children under five years old. This staggering statistic highlights the urgent need to identify and address the factors contributing to under-five malaria mortality in the country.

Several factors influence malaria mortality in this vulnerable age group, including biological, environmental, socio-economic, and healthcare-related determinants. Age, nutritional status, and the presence of concurrent infections significantly affect a child’s susceptibility to severe malaria and the likelihood of death (Weiss et al., 2019). Environmental factors such as the prevalence of malaria vectors, climate variability, and living conditions also play a critical role in determining malaria transmission and associated mortality rates (Bhatt et al., 2021).

Socio-economic disparities are another crucial determinant of under-five malaria mortality. Children from poorer households are less likely to have access to preventive measures such as insecticide-treated nets (ITNs) and are more likely to experience delays in receiving appropriate treatment (Oluwole et al., 2019). Furthermore, the education level of caregivers, particularly mothers, significantly influences the likelihood of timely and appropriate care-seeking behaviors, which are vital for reducing malaria mortality (Eze & Kalu, 2020).

The quality and accessibility of healthcare services also determine the outcomes of malaria infections in children under five. Factors such as the availability of skilled healthcare workers, the promptness of malaria diagnosis, and the effectiveness of treatment protocols are critical in managing severe malaria cases and reducing fatalities (Aregawi et al., 2021). However, disparities in healthcare infrastructure between urban and rural areas in Nigeria often result in unequal access to life-saving interventions (Okafor et al., 2022).

This paper seeks to analyze the key determinants of under-five malaria mortality in Nigeria, focusing on the socio-economic and healthcare-related factors that exacerbate this public health issue. By understanding these determinants, the study aims to inform more effective and targeted malaria control strategies that could significantly reduce mortality rates among children under five in Nigeria.

**LITERATURE REVIEW**

Bello and Joseph (2014) empirically investigated some important determinant of infant and child mortality in Oyo. Infant and child mortality as the independent variables while the regressors includes poverty, malaria, postnatal care, Health scheme and breast feeding; HIV . employing Linear regression using binary logic, finding revealed that out of the major determinant of infant and child mortality are poverty, malaria, postnatal care, health scheme and breast feeding are the major determinant of infant and child mortality. A finding from this study is different from previous studies in the sense that the study was diseases specific (malaria) but not age specific.

Quinhas (2014) also investigated effect of health system strengthening on under-five and infant and neonatal mortality in Mozambique for a period of eleven years (2000-2010). Explanatory variable included in the model includes health work force density, maternal and child health nurse density, higher population by health facility and public financing per head. The study employed binomial mixed model. Result shows that under-five mortality have significant negative relationship with all the explanatory variables. The weakness of the study is that it did not consider socio-economic factors in determining child mortality and it did not specify the type of diseases mostly responsible for under-five mortality. in a related study, Anja (2015) studied health insurance and child mortality in rural Burkina Faso from 2000-2010. Using Cox regression, he estimated under-five mortality rates with the following explanatory variables; socio-economic status, father’s education distance to the health facility, year of birth and insurance status of the mother at the time of birth. Finding from the study revealed that under-five mortality is negatively related to all the explanatory variables. Therefore, health insurance is significantly related to under-five mortality in rural Burkina Faso.

In a study conducted by Riayati and Junaid (2016) between 1984-2009, examined public health expenditure, governance and health outcome in Malaysia. The study employed autoregressive distributed lag (ARDL) cointergration to test for the relationship between under-five mortality and infant mortality and public health expenditure, income level, corruption and government stability. The results based on the bounds testing procedure shows that a stable long run relationship exist between health outcome and there determinants namely, income level, public health expenditure, corruption and government stability. The result also shows that public health expenditure and corruption affect long and short run health outcomes in Malaysia. This study includes variables not fond in previous studies for example corruption and stability of government. These variables are very relevant in explaining child mortality especially in developing country where corruption and political instabilities are still major issues.

In conclusion, in all the literature reviewed, majority employed logistic regression in estimation except for Riatu and Junaid (2016) who employed ARDL. However, finding from the studies reviewed revealed that father and mother education, income, access to health care facility and quality of governance are very important variable in determining under-five mortality. However, most studies except for Riati and Junaid omitted government expenditure in explaining under-five mortality especially in developing countries were majority are living below poverty line.Secondly, all work reviewed ignored two important variable in determining child mortality which female labor force participation and household’s health behavior especially in this part of the world were culture and religion influence most of our action

**METHODOLOGY**

The study adopt modify VAR to examine determinants of under-five malaria mortality in Nigeria. The model assumed that the under-five malaria mortality may not only be influenced by insufficient funding from the government but as result of some factors which need to be identified hence, the need to identify those factors with a view to addressing them through appropriate policy. The econometrics model capturing this objective was adopted from the works of Imam and Koch (2004) on Determinants of Infant, Child and Maternal Mortality in Sub-Saharan Africa.



Where *i represents the optimal lag which will be determined based on the information criterion (AIC, SIC, HIC). From the unit root test, the maximum order of differencing is denoted by dmax which is constant with the order of intergration of the series. Hence, the modified VAR in the spirit of Toda and Yamamoto (TY) is determine by i+dmax =g.*

 *Therefore from equation 3.6 the modified VAR model is given as,* *Where g≥ i*

***U5M*** is under-five malaria mortality, ***rgdpc*** is income, ***hivaids*** is HIV/AIDS, ***malnutrn*** is malnutrition, ***immrt*** is immunization rate proxy for household’s behavior, ***fpmedu*** is female education at primary level proxy for female literacy and ***phyden*** is physician density.

Hence, modified VAR technique of estimation is adopted for this model because of stationarity of the sries at different levels.

To understand the factors responsible for under-five mortality in Nigeria we estimated data on under-five mortality and variables assumed to be responsible for under-five mortality in Nigeria. The variables (under-five mortality, female labour force participation, female literacy, income, household’s behavior, malnutrition, physician density and HIV/AIDS) were stationary at different levels (table 4.2). hence, we used modified VAR, in the spirit of Toda and Yamamoto (1995) and Bello and Sanusi (2018). The VAR lag order selection criterion was also employed in selecting maximum lag order (see appendix 5).

**4.3.1 Modified VAR Model Results**

Modified VAR model was employed investigate the determinants of under-five mortality in Nigeria. Other results ancillary to the VAR estimation (impulse response function, variance decomposition and granger walds causality test) is presented and discuss below.

**Figure 4.1 Impulse Response Function results**

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**Interpretation and discussion of the Impulse Response Function Results**

From figure 4.1 it is observed that female labour force participation affects under-five malaria mortality negatively. This result suggests that when women are employed under-five malaria mortality decreases. In other words, as more women are gainfully employed they become empowered and able to provide better medical care for their sick children which inturn reduce the number of children dying from severe malaria attack. The result is in line with our priori expectation of negative relationship between employment and reduction in under-five malaria mortality. The results also concurred with findings of Imam and Koch (2004) that identified positive impact of female employment on under-five mortality. Female literacy produced positive shock to under-five malaria mortality. This implies that under-five malaria mortlity increases as female literacy increase. The result did not conform to our a priori expectation of negative relationship between female literacy and under-five malaria mortality. Income affects under-five malaria mortality positively though very weak. The result is in line with the apriori expectation. This implies that as income increases under-five malaria mortality decreases. Because income enable individual to be more efficient in preventing malaria through purchase of insecticides, drugs and get treatment on time without allowing it to become complicated. This seriously reduces under-five malaria mortality. The finding is in consistent with findings of Riatu and Junaid (2016) who established negative relationship between income and under-five mortlity.

The response of income to shocks in female literacy is positive and strong. The shocks which began from the first year did not die out at all. This means that increase in female letracy rate will increase there chances of employment which leads to increase in their income level. The response of household’s behavior to shocks from female literacy is negative and strong. This means that as more women are educated the more they enlightened on advantages of immunizations and drug administration. Female literacy rate also produce strong negative shocks to malnutrition which last throughout. This infers that female literacy will reduce malnutrition.

Income produces a strong negative shock to malnutrition which increases throughout without dying out. This implies as people income increases more will be spent on diet food and consumption of food that have nutritive value. Household’s behavior transmit a strong negative shocks to HIV/AIDS which continues without dying out. This implies that if household’s are well mobilized and informed about HIV/aids there will be positive bahavioural change in their sex life which will reduce the infection.

**Table 4.2: Variance Decomposition of Determinants of Under-five Malaria Mortality**



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**** The variance decomposition in table 4.3 shows ten years chosen for the forecast policy on determinants of under-five mortality in Nigeria. In the first year 100% of forecast error variance in under-five malaria mortality is explained by the variable itself. Meaning that other variables in the model do not have any influence on under-five mortality in the first year. However, as we move in to the future the forecast error variance dwindles to 81% in the 10th year..

The variable female labor force participation influences under-five malaria mortality at an average of 8% in the both periods (short and long run). This implies that increase in female labour force participation decreases under-five malaria mortality in the both periods (short and long run). The forecast error variance of female literacy is also weak at 2.2% in the long run. This infer that increase in female literacy does not affect reduction in under-five malaria mortality significantly. Income, malnutrition and HIV/AIDS do not have significantly influence in reduction of under-five mortality both in the short and long run.

Household’s behavior and physician density influences the under-five malaria mortality by 3% in the 10th year respectively. This explains that increase in positive household’s behaviours will diminish under-five malria mortality and like wise increase in number of physician will reduce the rate of under-five malaria mortality in both the short and long run respectively.

Under-five malaria mortality has a strong influence on female labour force participation. The variance forecast error is 98% from the first year to the tenth year. This implies that increase in under-five malaria mortality will reduce the participation of women in labour force because of the time they require to take care of their child. However, decrease in under-five malaria mortality will mean more time for the women to participate in labor.

Female literacy influences malnutrition with 17% forecast error variance in the 4th year. It began to dwindle after the 6th year signifying that female literacy in the long run has less influence on malnutrition. The results shows that increase in female literacy will reduce malnutrition because of the knowledge of balance diet acquired through literacy. Income has influence on malnutrition with about 10% forecast error variance in the 8th year. This infers that increase in income will reduce hunger and improve the consumption of richer food which could lead to decrease in malnutrition. HIV/AIDS does not have influence on malnutrition. Household’s behavior has 8% forecast error variance on malnutrition and dwindles as we move in to the future. This signifies that household’s behavior towards consumption of balace diet food will reduce malnutrition. Malnutrition is strong influencer of itself in the first three years with an average of 69% forecast error variance, but it declines after the 4th year which continues till the 10th year. Physician density has a strong influence on malnutrition in the long run with 56% forecast error variance. This means that with more number of physician people have access to physicians and health information on combination of balance diet food which can result in reduction of malnutrition.

**CONCLUSION AND RECOMMENDATION**

Based on the result the study concludes that the high rate of under-five malaria mortality rate in Nigeria is attributed to low income and poverty level of majority of households. Secondly, illiteracy especially on the part of majority of women also contributed to under-five malaria mortality. Other factors include low physician density or high doctor-patient ratio, lack of female labour force participation contribute immensely to high rate of under-five mortality. The study therefore recommends more employment opportunity for women, awareness campaign, enrolment of girl child in school and training of more medical personal as a way of reducing under-five malaria mortality in Nigeria.

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