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Determinants of Child Mortality in Oyo State, Nigeria

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Abstract

This paper examined and identified some important determinants of infant and child mortality in Oyo state using Atiba Local Government as a case study. A total of 150 respondents were randomly selected from the entire populace in the metropolis. Logistic regression method was used to determine the factors that determine child mortality in the region. Findings reveals that out of the major determinants listed, Poverty, Malaria, Postnatal care, Health scheme and Breastfeeding are the major determinants of Child mortality in the state while HIV though catalyses child mortality was not a major determinant. It was therefore advised that policies should be revised for proper implementation and health intervention programmes that focus on

mothers' and children's health should be strengthened to achieve the Millennium Development Goals (MDGs) of infant and child mortality in the remaining years. In addition, parents' economic conditions especially the father should be improved to encourage prolonged breast feeding.

Key words: Infant mortality, child mortality, breastfeeding, Malaria, Poverty

Introduction

Death of children under five is a factor that defines the well-being of a population and it is usually taken as one of the development indicators of health and socioeconomic status which indicate the quality of life of a given population, as measured by life expectancy. That is why reduction of infant and child mortality is a worldwide target and one of the most important key indices among Millennium Development Goals (MDGs) in reducing infant and under-five child mortality rates by two-thirds from the 1990 levels by 2015 (Desta, 2011).

As a result of this, in October 2008, the Nigerian government's National Health Insurance Scheme (NHIS) launched a pilot health project, titled the "NHIS/MDG Maternal and Child Health Project" (hereafter referred to as "the Project"). The Project focuses on reducing maternal and child mortality and uses funds from the World Bank's Heavily Indebted Poor Countries Initiative (HIPC), which provides dollar-for-dollar debt reduction against government allocation of funds to poverty-reduction programs. Nigeria's Office of the Presidency/Millennium Development Goals (MDGs)—in coordination with the NHIS, Nigerian Congress, and Ministry of Health—designed the Project to leverage HIPC support in the fight against maternal and child mortality. By late 2009, it was clear that the Project was having a positive effect on the women, children, and facilities enrolled in the pilot. The Project's investments reduce maternal and child mortality and benefits Nigeria far beyond the costs of the Project through the increased health of its citizens and the value

these lives represent, including the ability of citizens to lead more productive lives (USAID, 2010).

According to the State Ministry of Health report, 2011, Oyo State is among the 6 pilot States that started the project about 36 months ago and were to enrol 100,000 pregnant women and Under 5 Children into the scheme with about a hundred million Naira made available to the state by the MDG office whose fund is being managed by Health Maintenance Organizations (HMOs) and NHIS. The state government as at this period approved 3 LGA areas to benefit in the programme at the take off. These are: Ogbomoso North, Atiba and Ibadan South East. Following the slow pace in the registration exercise, 3 other LGAs were recently approved to join the project which includes: Saki West, Ibadan North East and Iseyin in addition to other interventions (see MDG report, 2008) towards the attainment of the MDGs target on child mortality.

However, despite all efforts put in place, child mortality rates still remain unacceptably high in the State as can also be found in Nigeria and in sub-Saharan African countries. Approximately, half of the world childhood deaths take place in sub-Saharan Africa despite the region having only one fifth of the world's children population (Smith, 2010). For instance, in sub-Saharan Africa, 1 child in 8 dies before age five- nearly 20 times the average of 1 in 167 in developed parts of the world (Ojikutu, 2008). Similarly, UNICEF (2010)'s World Children Report noted that 8.1 million children across the world who died in 2009 before their fifth birthday lived in developing countries and died from a disease or a combination of diseases that could easily have been prevented or treated. It also noted that, half of these deaths occurred in just five countries namely, India, Nigeria, the Democratic Republic of Congo, Pakistan and China with India and Nigeria together accounting for one third of the total number of under five deaths worldwide. The report describes the declining rate as disturbing and grossly insufficient to achieve the MDG goal by 2015 as only 9 out of the 64 countries with high child mortality rate are on track to meeting the MDG goal.

Generally, the health outcome in Nigeria is on the decline. For example as observed by Abimbola and Katherine, (2012), every 10 minutes, one woman dies on account of either pregnancy or childbirth in Nigeria, giving a total of 53,000 per year. This means about 800 women die in every 100,000 live births. Nigeria's newborn death rate (neonatal mortality) – 528 per day – is one of the highest in the world. More than a quarter of the estimated 1 million children who die under the age of 5 years annually in Nigeria die during the first 28 days of life (neonatal period). About 9 out of ten of newborn deaths are preventable. On account, about 5.3 million children are born yearly in Nigeria that is about 11,000 everyday 1 million of these children die before the age of 5 years. One quarter of all under-five deaths was newborns which equates to around 241,000 babies each year across Nigeria.

The above portends the complex scenario experienced from each of the components of Nigerian State; the proportion coming from each component cannot be assumed as equal, since the differences in child mortality across states and regions are overwhelmingly explained by economic and social factors therein given the different approaches employed by various governments. This present situation notwithstanding, may not mean that there was no improvement in the child mortality situation as a result of different public and donor interventions, but, the pace still remains too slow to achieving the Millennium Development Goals of reducing child mortality by a third by 2015 in Oyo State.

One question that comes to mind is; what are the factors that determine the unrelenting and persistent child mortality in the country and in particular in Oyo State? The objective of this paper is to examine the factors determining Child Mortality in Oyo state.

The rest of this paper is divided into four sections; section II reviews the relevant literature; section III contains the materials, methods, description and detailed specification of the model; section IV

presents and discuss the resulting findings, while section V conclude and recommends**.**

Conceptual framework and review of literature

a. Theoretical framework of child mortality

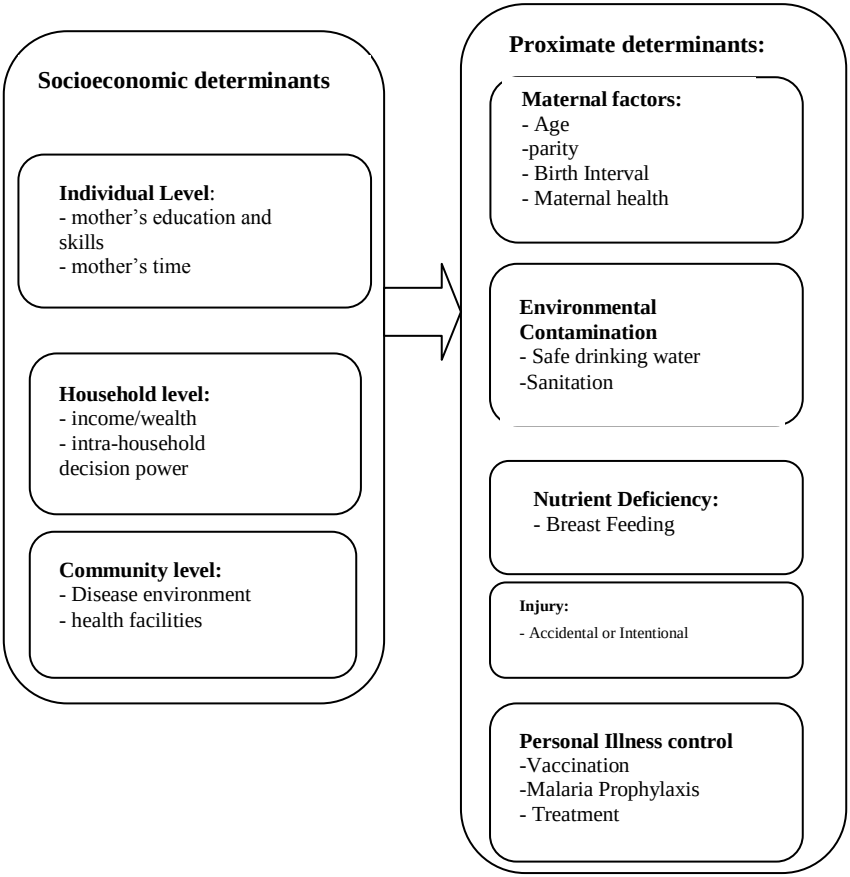
Studies have used a number of different conceptual frameworks to analyze the impact of different factors on child survival. In effect, Mosley and Chen (1984) and Schultz (1984), classified the determinants of infant and child mortality as exogenous (socioeconomic or extrinsic) such as cultural, socioeconomic, community and regional determinants and endogenous (bio-medical or intrinsic) such as maternal, environmental, nutrition, injuries and personal illness. Accordingly, Abimbola and Akanni, (2012) defined child mortality as the likelihood for a child born alive to die between its first and fifth birthday. Desta (2011) described infant mortality as the probability of dying between birth and the first birth day, while, Child mortality is the probability of dying between the first and the fifth birth day.

b. Theoretical Framework: Mosely-Chen model

The theoretical framework for this paper is based on the Mosely – Chen model that motivated the idea that countries with the same income per capita will have differing mortality rate since the relationship is mediated in several ways. For example analysis of household data shows a very strong relationship between mortality and both preceding and succeeding birth interval. Hence, higher fertility, in turn is associated with income, but imperfectly so as both cultural factors and livelihood strategies (crucially the availability of alternative safety nets) play a role. So, policy to reduce fertility, either through promotion of productive health or through the provision of reliable safety nets, will bring down mortality. Mosley and Chen (1984) set the framework of child survival based on the assumption of all socioeconomic factors of child mortality necessarily operate through a common set of intermediate factors, they identify clearly the

proximate and socioeconomic determinants of infant and child mortality and they categorized fourteen proximate determinants of infant and child mortality into five general groups based on some reasons; in an optimal setting, over 97 percent of children born can be expected to survive until the fifth birthday, proximate determinants through the socioeconomic factors operate to influence the infant

Fig 1: Conceptual and theoretical framework for child mortality



Source: Based on Mosely and Chen (1984) and Desta (2011) theoretical framework

and child mortality and socioeconomic, biological and environmental factors are the driving forces behind the reduction of infant and child mortality. Given these assumptions, we present the theoretical framework graphically above:

c. Empirical framework

Empirically, many studies have shown that child mortality is influenced by a number of socio economic and demographic factors such as sex of the child, mother's age at first birth, birth order, preceding birth interval among others (Bello, 2002; Abimbola and Akanni, 2012). However, Adeyemi et al (2008) gesticulates that the cause of disease and death over which not much controversies and uncertainties exist is the total environment of man. Malaria, acute respiratory infections, measles, and diarrhoea which are today major causes of mortality for children under five are consequence of the built environment of man. In developing countries like Nigeria, one in eight children does not live to see their fifth birthday due to avoidable environmental threats, resulting into approximately 11 million avoidable childhood deaths yearly (WRI, 2009; World Bank, 2011). According to World Bank (2010), environmental risk factors were estimated to account for about one-fifth of the total burden of disease in low income countries. The WHO (2002) similarly, reported in Mutunga (2007) that among the ten identified leading mortality risks in high mortality developing countries, unsafe water, sanitation and hygiene ranked second while smoke from solid fuels ranked fourth.

Kumar and File (2005) used data from the Ethiopia Demographic and Health Survey [EDHS] conducted in 2005 to investigate the predictors' of child [0-5 years] mortality in Ethiopia. The cross tabulation technique was used to estimate the predictors of child mortality. Results revealed that birth interval with previous child and mother's standard of living index were the vital factors associated

with child mortality. Furthermore, Mother's education and birth order were found to have substantial impact on child mortality in Ethiopia. The study concluded that an increase in Mothers' education and improved health care services are significant in reducing child mortality in Ethiopia. This was also found to be causing infant and child mortality across African sub-Sahara as contained in Bello (2002).

Mesike and Mojekwu (2012) in their study examined the environmental determinants of child mortality in Nigeria using principal component analysis and simultaneous multiple regression for child mortality modelling in Nigeria. Estimation from the stepwise regression model showed that household environmental characteristics do have significant impact on mortality as lower mortality rates were experienced in households that had access to immunization, sanitation facilities, good and proper refuse and solid waste disposal facilities, good healthy roofing and flooring materials as well as those using low polluting fuels as their main source of cooking.

The meta-study by Charmarbagwala et al. (2005) suggests that, although there can be little doubt that household income is a crucial factor in determining child health, it appears that income is not a significant determinant of infant mortality in the majority of cases. This can partly be explained by the fact that as mortality falls, the bulk of under-five-mortality is rather those of infants than child death, and these deaths are more sensitive to health provision than socio-economic conditions (White, 2004).

Omariba, Beaujot and Rajulton (2007) using the 1998 Kenyan DHS portends that while demographic factors are more important in explaining infant (under 12 months) mortality, socioeconomic, socio-cultural and hygienic factors are more important in explaining child (under five) mortality. Younger (2007), however, do not find significant effects of variables related to the quality of drinking water and of sanitation on infant mortality.

Aguayo-Rico et al (2005), evaluate empirically the Solow model with human capital, the model was estimated through a panel data analysis, which includes the growth rates of physical capital, labour, schooling and health indices. The "heath index" includes four determinants of health; lifestyles, environment, health services and socio-economic conditions. It was observed that variables were all significant showing the impact health has on economic growth. It was observed that among the determinants of health considered, health service result became the most significant. They concluded that a higher awareness of the health of the people is necessary if sustainable growth is pursued especially for the third world for policy implications.

Goro (2007) used data from 1993, 1998, and 2003 DHS surveys in Ghana to examine the determinants of infant and child mortality in three northern regions by using multivariate logistic regression model found that education of mothers, birth order of child and marital status of mothers are powerful significant determinants for infant mortality, while only mothers education have a significant impact for child mortality. Similarly, Jinadu et al. (2010), in a study, found dirty feeding bottles and utensils, inadequate disposal of household refuse and poor storage of drinking water to be significantly related to the high incidence of diarrhoea. Twum-Baah et al (1994) indicated that children born to mothers with higher educational level associated with lower risk of infant and child mortality as compared to children born to mothers with primary education level or non-educated.

Kombo and Ginneken (2009) using the result of 2005-2006 Zimbabwean DHS investigate the maternal, socioeconomic and sanitation factors on infant and child mortality by using Cox regression model. They found an evidence of birth order (6+) with short preceding interval significantly associated with high risk of infant and child mortality. Multiple births tend to increase infant and child mortality. On the other hand the expected U shape relationship between birth order and infant and child mortality, and mothers age and infant and child mortality is not conformed in their analysis, that children who are first born and those born to mothers aged 40-49

years are found tend to decrease infant and child mortality. However socioeconomic determinants are rather small and insignificant effect on infant and child mortality. They suggest that the influence of birth order, preceding birth intervals, maternal age, type of birth and sanitation factors are more pronounced on infant mortality while weak effect on child mortality.

Kenya, Mustafa and Odimegwu (2008) in their study in Kenya, using also 2003 DHS data set for children by using logistic regression models. They examined socioeconomic determinants of infant mortality rate both urban and rural setting. They found similar result like in the case of Tanzania above that regional variation exists in infant and child mortality between the different provinces of Kenya. Most of the socioeconomic factors are not associated with the risk of infant and child mortality while children born in the richest household has lower probability of infant mortality relative to children born in the poorest households. However ethnicity and breast feeding in both urban and rural areas have a significant influence on infant mortality and sex of the child in urban areas and birth order and birth interval in rural areas are important determinants for the risk of infant mortality. Although they found that the incidences of HIV/AIDS in both urban rural areas increase the risk of dying at infancy period.

Muntago (2004) used data from 2003 DHS in Kenya to investigate the impact of socioeconomic and environmental variables of infant and child mortality in urban areas of Kenya. The results show that the infant and child mortality were lower for those who were of birth order 2-3, birth interval more than 2 years, single births, living in wealthier households, had a access to drinking water and sanitation facilities, and users of low polluting fuels as their main source of cooking. However, maternal age, maternal education and gender of the child had no significant association with child mortality. Other study in Kenya by Hill (2001) found that mother's educational levels and economic status have a significant impact on infant and child mortality while urban areas are associate with high risk of infant and

child mortality than rural areas, however, controlling for HIV prevalence child mortality are lower in urban areas.

Sahn and Stifle (2003) used data from DHS for 24 African countries, found that the infant mortality in urban areas lower relative to in rural areas. Various factors contribute for this urban- rural variation such as better education, improvement of public and health infrastructures in urban than in rural areas. However, HIV/AIDS epidemic are partly responsible for the high risk of infant and child mortality in Africa, particularly in sub-Saharan countries.

Material and method

For infant and child mortality that either the child die before celebrating the first birth day (the fifth birthday), or the child survives in the first year (the first five years), the dependent variables are binary, for which the response outcome for each subject is "died or alive", thus the logistic regression method of analysis is employed to estimate the odd of a child dying before reaching the first year or the first five years due to the binary characteristics of these dependent variables. It is the most popular model for binary data analysis and investigation of the significant socioeconomic and bio-demographic determinants of infant and child mortality. In this study, both descriptive and logistic regression was applied. The logistic regression has multiple independent variables, in which all are categorized in to k levels. The dependent variables are explained by the odd ratio of the explanatory variables. The logistic regression is similar to the ordinary least squares regression analysis, however, it violate the assumption of explanatory variables such as Heteroskedasticity, linearity and normality assumption of ordinary least square regression. Many researchers used logistic regression model to predict the probabilistic estimation of the child survival as predicted by the maximum likelihood coefficients. The dependent variable denoted by 1 if the child dies before reaching certain age and denoted 0 if otherwise.

Following Abimbola et al (2012), therefore, with a slight moderation, we postulate the determinants of child mortality as:

$CM = f(PO, MAL, HIV, PNC, AM, HS, BF)$……(1)

Where CM= Child mortality which is derived by the probability that child mortality occurs 1 and 0 for not occurred); PO is Poverty; HIV= Human Immune Deficiency Virus; PNC = Postnatal Care; AM = Age of Mother; HS = Health Scheme and BF= Breast Feeding.

In mathematical form, the model is specified as:

$CM = \beta_0+\beta_1 PO +\beta_2 MAL + \beta_3 HIV + \beta_4 PNC + \beta_5 AM + \beta_6 HS + \beta_7 BF + e_t$…..... (2)

Where: β_0 =constant, β_1 to β_7 are the coefficients of the independent variables and e_t= Error term.

On the a priori, we expect:

$\beta_1>0$, $\beta_2>0$, $\beta_3>0$, $\beta_4<0$, $\beta_5<0$ and $\beta_6<0$ and $\beta_7<0$

Estimation techniques

The study will employ the use of linear regression using Binary Logit to estimate the above equation. The binary logit becomes necessary since the researcher will source his data from the response of the respondents on the questionnaire administered. The Binary Logit method takes the dependent variable data to range from 0 to 1 while other variables can take any number for the coding.

Presentation of results

Table 1 shows the distribution of respondents by gender. 50 (33.3%) of the respondents are male, while 100 (66.7%) of the respondents were female. The result shows that there were more female respondents than male. The table also shows the distribution of respondents by their religion. 38 (25.3%) of the respondent are Christians, while 108(72.0%) of the respondents are Islam and only 4 (2.7%) of the respondent reveals that they practice other religion apart from Christianity and Islamic. Hence, there were more Islamic respondents than Christianity and other religion.

Table 1: demographic information of respondents

SEX		Frequency	Percent
	Male	50	33.3
	Female	100	66.7
	Total	150	100.0
RELIGION		Frequency	Percent
	Christianity	38	25.3
	Islam	108	72.0
	Other Religion	4	2.7
	Total	150	100.0
MARITAL STATUS		Frequency	Percent
	Single	28	18.7
	Married	117	78.0
	Widow	5	3.3
	Total	150	100.0
YEARS OF WORKING EXPERIENCE		Frequency	Percent
	Less than 30 Years	10	6.7
	30 - 50 Years	108	72.0
	51 Years and above	32	21.3
	Total	150	100.0
Educational Qualification		Frequency	Percent
Valid	No qualification	10	6.7
	Primary School Certificate	16	10.7
	SSCE/NECO/NAPTEB	23	15.3
	NCE/OND	36	24.0
	BSc/NHD	31	20.7
	Others	34	22.7
	Total	150	100.0

Source: Field Survey, 2013

Moreover, it reveals that out of the 150 respondents, 28(18.7%) of the respondent are single, while 117(78.0%) of the respondents are married and only 5(3.3%) of the respondent are widow. Furthermore, 10(6.7%) of the respondent are less than 30 years of age. 108(72.0%) of the respondents are between the age of 30 and 50 years while 32(21.3%) of the respondent falls within the age of 51 and above. In addition, the table shows that 10(6.7%) of the respondent have no educational qualification. 16 (10.7%) have Primary School Certificate. 23(15.3%) have Secondary School Certificates 36(24.0%) of the respondents have first degree while 34(22.7%) of the respondent reveals that they have other certificates apart from the listed ones.

Presentation and discussion of results

Variable	Coefficient	Std Error	Z - Stat	P	REMARK
PO	2.277939	0.771363	2.953136	0.0031	Sig.
MAL	0.599007	0.301134	1.989174	0.0467	Sig.
HIV	0.490753	0.362165	1.355056	0.1754	Not Sig.
PNC	-1.050965	0.444998	-2.361732	0.0182	Sig.
AM	-0.059092	0.360822	-0.163769	0.8699	Not Sig.
HS	-0.305170	0.268913	4.134830	0.0064	Sig.
BF	-0.545382	0.323722	-1.684464	0.0921	Sig.

Source: Authors' computation from field survey

Mean Dep. Var. = 0.61

Akaike info criterion = 1.19

Hanan– Quin criterion = 1.258

The table above shows a good outcome from the result most of the variables turn out with their opinion expectation. From the results, poverty shows a positive relationship with child mortality. The result however confirm with the opinion expectation. Based on the result, a

1percent increase in the ratio of poverty in Oyo state will lead to about 228percent increase in child mortality in the state. Response from the respondents from oral interview shows that majority of the household are poor and could not be able to enjoy a favourable standard of living before and even after child delivery due to high rate of unemployment and high illiteracy rate in the state. The result however was significant with $P<0.01$. This shows that it is significant at 1percent. The implication of this is that poverty in Oyo state stand as a significant factor that determine child mortality in Oyo state.

Malaria, as an ailment shows a positive relationship with child mortality. This indicates that a frequent infection of children with malaria will increase child mortality in the state. The result was also significant at 5percent with $P < 0.05$. This suggests that in Oyo state, malaria is an important factor that determines child mortality in the state. Oral investigation from some of the respondents shows that about 30percent of children die as a result of short time illness with malaria.

Human Immunodeficiency Virus as a variable though positively related to child mortality was not significant in determining child mortality in Oyo state. A survey from some of the health workers in the state hospital shows that majority of the pregnant women that put to bed were not infections with HIV/AIDS. However they confirm that in a situation where by a nursing mother is affected with HIV/AIDS, it is about 90percent sure that the child may also be a career and hence leads to infant mortality in the state.

Post natal care shows an inverse relationship with child mortality, the result however conform to a priori criteria. Based on the result, a 1percent increase in post natal care will reduce child mortality rate with about 105percent. The result also was significant at 5percent with $P<0.05$, hence we conclude that post natal care is a major determinant of child mortality in Oyo state. Further inquiry from some of the respondent shows that most nursing mother apply the orthodox

method after child bearing in the training up of their child and this has not affect many household both positively and negatively.

The age of mother though inversely related to child mortality was not significant. The result shows that a matured age of woman before nursing a baby will help to reduce child mortality in the state than the little age ladies that have no prior knowledge on nursing a baby. From that result maturity of a woman before nursing a child will help to reduce child mortality with about 6percent in the state. However, with P<0.1, the result shows that age of mother does not determine child mortality in Oyo state.

Health scheme from the result though inversely related to child mortality was significant. The result shows that the introduction of health scheme by the government has really assisted in the reduction of child mortality in Atiba local government area of the state. From the analysis of the result, it proves that the introduction of the health scheme must have helped to reduce child mortality by about 31 percent in the local government. This result was also significant with P<0.1. The above findings portend the fact that Oyo state government's effort in the health scheme be aggressively pursued and expanded to more Local Government Areas. Hence, health scheme determine child mortality in Oyo state.

Breast feeding as part of the health scheme, from the result though inversely related to child mortality was significant. The result shows that exclusive breast feeding reduces child mortality in Atiba local government area of the state. From the analysis of the result, it means that improvement in exclusive breastfeeding will help to reduce child mortality with about 55 percent in the local government. This result was also significant with P<0.10, further explaining the importance of health scheme as a determinant of child mortality in Oyo state.

The Mean dependent variable indicate that child mortality is explained with about 61 percent of the explanatory variables and the model selection criteria (the Akaike Information Criterion and Hanan-Quine) shows low values indicating that the model selection is good.

Conclusion and recommendations

This study examines the determinants of Child Mortality in Oyo state. A total of 150 respondents were randomly selected from the entire populations in Atiba Local Government Area in the state. The result reveals that out of the entire determinants enlisted in the model, Poverty, Malaria, Postnatal care, Health scheme and Breastfeeding stands as major determinants of child mortality in Atiba Local government Area of Oyo state while HIV and Age of mother at first birth were not significant determinants. However, HIV engenders child mortality in the area while mother's age reduces the spread of child mortality. The implication here is that marriage at ripe age should be encouraged generally. Hence, the study recommends that government policy should be focused on the above important determinants of child survivals and in the remaining years, health intervention policies should revise and implement to achieve the Millennium Development Goals (MDGs) of reducing infant and child mortality by 2015. Also, women should be educated on the importance of ensuring adequate breastfeeding to their children especially at infant when exclusive breastfeeding has been medically proved to be life enhancing, and this may be a function of ripe age before conception and child birth when all the necessary hormones must have fully developed. Encouragements and enlightenment should also be extended to parents on the importance of health scheme and constant patronage of the health centres/facilities after birth, as against reliance on the orthodox post natal care for children. Finally, the importance of the finding, if taken into cognizance and extended to cover the entire state will not only reduce child mortality, but will bring the State close to achieving this MDGs target by 2015.

References

Adeyemi, S. L., Raheem, U. A. & Olorunfemi, F. B. (2008). Under-Five Mortality and the Environment of Health in the Third World: A Nigerian Example. *Journal of Human Ecology*, 24 (2), 117-124.

Bello, R.A. (2002). Determinants of Infant and Child Mortality in the African Sub-Region, *Political Science Review, 2(1)*:74-83

Kumar, PP, File G (2010). Infant and Child Mortality in Ethiopia: A Statistical Analysis Approach, *Ethiopian Journal of Education and Science*, 5(2):51-7

Mesike, C.G., Mojekwu J. N. Environmental (2012), Determinants of Child Mortality in Nigeria. *Journal of Sustainable Development*, 5(1): 65-75

Goro, M. (2007). The stalling child mortality: the case of three northern regions. The 5th Conference of Union for African population, Tanzania.

Hill, K., Bicego, J. & Mahy, M. (2001). Childhood mortality in Kenya: An examination of trends and determinants in the late 1980s to mid 1990s.

Kombo, J. & Ginneken, V. (2009). Determinants of infant and child mortality in Zimbabwe: Result of multivariate hazard analysis.

Kumar, P. and Gemechis. (2010). Infant and child mortality in Ethiopia: As statistical analysis approach.

Mosley, W. H & Chen L. C. (1984). An analytic framework for the study of child survival in developing countries. *Population and Development Review* Supplement to Vol.10, 3-21.

Mustafa, E. & Odimegwu, C. (2008). Socioeconomic determinants of infant mortality in Kenya: Analysis of Kenya DHS 2003.

Mutunga, C. J. (2007). Environmental Determinants of Child Mortality in Kenya, UNU-WIDER *Research paper* No. 2007/83. Helsinki: United Nations University World Institute for Development Economics Research.

Ogunjuyigbe P.O (2004) Under-Five Mortality in Nigeria: Perception and Attitude of the Yoruba towards the Existence of Abiku. *Demographic Research: 11*: 43-56

Ojikutu, R. K. (2008). Pattern of Under-Five Deaths in Lagos State, Nigeria *Sudanese Journal of Public Health*, 3 (4).

Sahn, D. E. & Stifel, D. C (2003). Exploring alternative measures of welfare in the absence of expenditure data. *Review of income and wealth* 49(4): 463-489.

Omariba, D.W.R. (1993) 'Socio-economic determinants of child survival in Upper Matasia sub-location, Kajiado district, Kenya' MA Thesis, Population Studies and Research Institute, University of Nairobi, Kenya.

Schultz, T. (1984). Studying the Impact of Household Economic and Community Variables on Child Mortality, Population *and Development Review*, 10, 215-35.

Smith, E. G. (2010). Maternal Schooling and Child Mortality in Nigeria: The importance of the Actual curriculum [Online] Available: Princeton.edu/download.aspx?submissionld =100377 (February 18, 2011)

Twum–Baah et al. (1994). A study of infant, child and maternal mortality in Ghana. Ghana Statistical service in collaboration with Ministry of Health and UNICEF, Accra, Ghana 24-32

UNICEF (2010). Levels and Trends in Child Mortality, *Report 2010*, New York: UNICEF.

World Bank. World Bank (2010). The changing wealth of nations: Measuring sustainable development in the new millennium, Washington, DC.

World Health Organisation. (2002). *The world health report 2002: Reducing risks, promoting healthy life,* Geneva: World Health Organisation.

WRI (World Resources Institute). (1999). *World Resources (1998-99): Environmental change and Human Health,* Washington DC.

Appendix

Dependent Variable: CM

Method: ML - Binary Logit (Quadratic hill climbing)

Date: 07/11/13 Time: 12:59

Sample: 1 150

Included observations: 150
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.177917	1.735358	-3.560025	0.0004
PO	2.277939	0.771363	2.953136	0.0031
MAL	0.599007	0.301134	1.989174	0.0467
HIV	0.490753	0.362165	1.355056	0.1754
PNC	-1.050965	0.444998	-2.361732	0.0182
AM	-0.059092	0.360822	-0.163769	0.8699
HS	-0.305170	0.268913	4.134830	0.0064
BF	-0.545382	0.323772	-1.684464	0.0921

Mean dependent var	0.606667	S.D. dependent var	0.490126
S.E. of regression	0.444452	Akaike info criterion	1.193728
Sum squared resid	28.05040	Schwarz criterion	1.354295
Log likelihood	-81.52958	Hannan-Quinn criter.	1.258961
Restr. log likelihood	-100.5324	Avg. log likelihood	0.543531
sLR statistic (7 df)	38.00559	McFadden R-squared	0.189022
Probability(LR stat)	3.02E-06		
Obs with Dep=0	59	Total obs	150
Obs with Dep=1	91		