



Mums' wellbeing looking for conduct and financial differentials: a factor examination of full youth inoculation in South-Western Nigeria

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Abstract

As many countries have achieved 85% full childhood immunization coverage with a sharp drop in the incidence of six major diseases, the situation in many other countries especially in Nigeria still call for concern and thereby suggesting that this indicator may not have been responding to prior policy and technical interventions. Globally, mothers play a major role in determining the health of their children. Thus, the influence of mothers' health seeking behaviour and their socio-economic differentials on childhood immunization status was examined. Data on 4,519 women aged 15 to 49 years with at least a child within the last five years were extracted from the 2008 Nigeria Demographic and Health Survey (NDHS) kids-recode data set for this study and complemented with In-Depth Interviews (IDIs). The study found that 36.2% of the mothers did not receive any antenatal care, 6.9% received antenatal care at home, 30.0% of them delivered at home as 63.2% did not receive any postnatal care. Overall, only 36.5% of children aged 12 to 23 months were fully immunized, 51.0% received partial vaccination, while 12.5% did not receive any vaccine. The study revealed that mothers' place of antenatal care, place of delivery, level of education, type of occupation, place of residence and wealth quintile significantly influence childhood vaccination status ($p < 0.05$).

Keywords: Health Behaviour Socio Economic Childhood Immunization Antenatal Delivery Postnatal Nigeria.

INTRODUCTION

Studies in Africa have shown that about 3 million children in developing countries still die and many more are crippled, blinded, or otherwise disabled from six major diseases that are preventable through immunization (World Health Organization (WHO)/United Nations Children's Fund (UNICEF), 2010). These six diseases are measles, pertussis (whooping cough), tetanus, polio, tuberculosis, and diphtheria. Meanwhile, for all these six diseases, vaccines and the means to provide them are readily available, relatively inexpensive, and of proven effectiveness

in saving lives. According to the WHO (2010), one goal of the Global Immunization Vision and Strategy 2006 to 2015 is for each country to reach at least 90% coverage nationally and 80% in every district or equivalent administrative unit by 2015. In 2009, only 122 member states had reached national-level coverage of 90%. The slow progress or even lack thereof, in some countries with large birth cohorts affects global coverage, while coverage was estimated to be less than 80% in 36 countries, and 6 countries (Chad, Equatorial Guinea, Gabon, Nigeria,

Palau and Somalia) failed to achieve 50% coverage level (WHO/UNICEF, 2010). Globally, evidences from studies have shown that of all the child survival interventions, the greatest gains have been achieved in immunization (WHO, 2009). At the beginning of the 1980s, immunization coverage against the six target diseases was about 20%. During the past decade many programs have expanded coverage greatly and some countries have now reached over 70% coverage while the reported incidence of these diseases has dropped sharply in some countries (Centers for Disease Control and Prevention (CDC), 2006, 2009). However, despite the successes in some countries, coverage levels in many other countries remain low. Coverage averages below 40% in some acquired immunodeficiency syndrome (AIDS) assisted countries which includes many of the world's poorest nations with the least developed health systems (AIDS, 2010). In Nigeria, despite the effort to increase full childhood vaccination coverage, the situation over the years has not improved. For instance, the 1999 Nigeria Demographic and Health Survey (NDHS) found that full immunisation coverage had dropped to 17% from 30% in 1990 (National Population Commission (NPC) and ORC Macro, 2004), with a marked decline in the northern parts of the country (in 1999, coverage was 7.5% in the north-east and 4.3% in the north-west). In 2008, coverage was found to be approximately 23% which is almost double that of 2003 (NDHS, 2003, 2008).

Currently, Nigeria is among the ten countries in the world with vaccine coverage rates below 50% (WHO, 2010), having been persistently below 40% since 1997 (WHO, 2003). Efforts to prevent these childhood diseases dated back as far as 1979 when the Federal Government established the Expanded Programme on Immunisation (EPI) in 1979. In 1997, this programme was renamed the National Programme on Immunisation (NPI) and was charged with the responsibility of effectively controlling, through immunisation and provision of vaccines, preventable diseases by the end of 2005 and 2015 as target years (NPI, 2000). The realization of these goals faced many setbacks as more than half of the children aged 12 to 23 months in 2004 were not vaccinated and the ratio of unimmunised children against each of the diseases was inconsistent (Onwu, 2004). Nigeria operates the immunization schedule of the EPI which prescribes five visits to receive one dose of Bacille Calmette Guerin (BCG), four doses of oral polio vaccine, three doses of diphtheria, pertussis and tetanus vaccine, three doses of hepatitis B at birth, at six weeks of age, and at 14 weeks of age and measles vaccine at nine months of age (Federal Ministry of Health, 1995; WHO, 2010). The standard measure of vaccination coverage is the percentage of children who have received the requisite number of vaccine doses irrespective of the age at receipt of the vaccine (Luman et al., 2005). However, for maximum protection against vaccine-preventable diseases, a child should receive all immunizations within

recommended intervals (Glauber, 2003). Receipt of vaccines at recommended ages and intervals ensures that the child is adequately protected from target diseases at all times.

To ensure the adequate receipt of the recommended vaccines and to increase the vaccination coverage, UNICEF in collaboration, with the Nigerian Government started supporting the implementation of an Accelerated Child Survival Development intervention (ACSD) in Nigeria in 2006. The strategy focused on the use of low cost and high impact intervention packages such as strengthening routine immunisation, Vitamin A supplementation, exclusive breastfeeding, oral rehydration therapy (ORT) and the use of insecticide treated nets (ITNs). These interventions are integrated at facility, community and family levels, targeting pregnant women and under-five children and accessing the hard-to-reach in order to ensure that the impact is sustainable and equitable (UNICEF, 2008). Despite all these intervention programmes, the country situation is still a matter of concern as coverage was found to be approximately 23%, while these vaccine preventable diseases still account for 22% of child death in Nigeria, amounting to over 200,000 deaths per year (NPC & ORC Macro, 2008; WHO, 2010). Though, in 2008 Nigeria recorded a drop in under-five mortality from 201 deaths per 1,000 live births to 157 against the millennium development goals (MDGs) 2015 targets of 63 per 1000 births. Currently, 75 children per 1,000 live births are still dying before their first birthday (NPC and UNICEF, 2009), which represents a slight decrease from 100, eight years ago.

Worldwide, and most especially in developing countries, discussion of vaccination demand is often reduced to narrow issues of knowledge, services and education. Missing is a deeper understanding of the mother's health seeking behaviour that influences its acceptance, use and effectiveness. Maternal health seeking behaviour has a huge impact not only on lives of mothers, but also on the lives of their children. Substantial body of health seeking behaviour work directed specifically at women typically highlights that mothers' demand for and utilization of maternal health services depends on numerous factors, many beyond a woman's direct control, including the physical accessibility of facilities to her home; direct and indirect costs of obtaining services; provision of quality care; demonstrating cultural sensitivity to her needs, and the availability of the needed essential drugs and vaccine supplements (Lashman, 2006).

These service quality factors and access to the facility has limited impact when compared with factors within mothers' direct control (that is, her health-seeking behaviour) regarding her decision on modern health care utilization for antenatal care and delivery services. The impact of their health seeking behaviour is particularly higher among pregnant mothers as majority of them do resort to the use of traditional medical practitioners, mission houses and spiritual healers as alternative

providers of health care services during pregnancy and childhood health care (El-Sefly, 2001; Mairiga, 2003). This was clearly reflected in the 2008 NDHS report as many mothers did not attend antenatal care; many of those that attended delivered at home, while majority did not seek postnatal care to immunize their children. Based on the findings from studies that mothers' utilization of health care services during pregnancy and delivery is a precondition that mothers will seek subsequent care after delivery (Phathamavong et al., 2010), and the fact that it is the women that bear the brunt of the responsibility in the case of immunization. It is therefore vital to examine those aspects of their health seeking behaviour during pregnancy, delivery and after delivery as well as their socio-economic differentials that really influence childhood immunization.

METHODOLOGY

Study area

This study was conducted in Southwestern Nigeria. The South West region straddles a range of diverse climates, from the Guinea Savannah in its northern parts to the coastal climate in the south. It has large areas of tropical rainforest. The southwest geo-political zone comprises six states namely, Lagos, Ogun, Oyo, Osun, Ondo and Ekiti with their total population put at 27.7 million, which is about 20% of the entire population of the country according to the 2006 NPC figure (NPC, 2006). Majority of the inhabitants of this region are Yoruba speaking people with shared religious affiliations such as Christianity, Islam and traditional religion. Apart from the state and local administration, each town in the region has an Oba (king) and chiefs who manage the affairs of their subjects. The region has the highest number of educated people in the country.

Sample design

The NDHS kids recode dataset was used for this study. The survey was cross-sectional. It was designed to provide specific information on population and health indicators at the national, zonal, and state levels. Information collected includes birth histories, in-depth demographic and socio-economic information on illnesses, medical care, immunizations, and anthropometric details of children. The sampling frame used for the 2008 NDHS was the 2006 Population and Housing Census of the Federal Republic of Nigeria conducted in 2006, provided by the NPC.

This study makes use of both quantitative and qualitative data. The 2008 NDHS collected a nationally representative data on 33,385 women of ages 15 to 49 and 15,486 men of ages 15 to 59 in the entire country. However, the target population in this study were mothers of children aged 12 to 23 months residing in the Southwestern part of Nigeria at the time of the 2008 NDHS survey. Therefore, from the sampling frame of 5,025 (women interviewed in the southwest region), after excluding women who have not had at least a child within the last five years among women of ages 15 to 49 years and applying weighting factors to the sampling frame, we were left with sample size of 4,519.

Besides the household questionnaire, there are two other questionnaires used in the 2008 NDHS. The women questionnaire for currently married men aged 15 to 59 years. The women questionnaire collected information on the background characteristics (Age, education, women's occupation, etc.), first

time of antenatal visits, place of antenatal care, place of delivery, family planning method, reproductive history and fertility preferences, etc. The men's questionnaire also collected much of the same information found in the women's questionnaire with exception to detailed reproductive history or questions on maternal and child health or nutrition (NPC & ORC Macro, 2008). Therefore, variables relevant to this study were selected and defined "mothers' health seeking indicators and mothers' socio-economic factors".

Qualitative method of data collection

In addition to the quantitative data, primary data were obtained through in-depth interviews (IDI) of currently married women that have had at least a child within the last five years. The in-depth interview focused on mothers of children between the ages of 12 to 23 months. Multi-stage sampling technique was used: simple random sampling technique was used to select two states out of six states in Southwest Nigeria. From each of the selected state, two local government areas (LGA) were selected, and from each of the selected LGAs, one rural areas and one urban center were purposively selected. The locations that were eventually selected are Egbeda and Ibadan (in Oyo State), Sekona and Osogbo (in Osun State). Three in-depth interviews were conducted in each of the four locations.

The research instrument used was in-depth interviewers' guide developed by the author based by drawing some specific questions from NDHS questionnaires based on its methodology in order to be consistent with data used and to ensure its validity. The guide permits greater depth of meaning and seeks detailed and open ended responses to questions. The guide contained outlines of topics and a set of general questions; and details that are not brought out initially are sought through follow-up questions or probes. Information on vaccination coverage was obtained in two ways, from vaccination cards, and from mothers' verbal reports. All mothers were asked to show the interviewer the health cards in which immunisation dates are recorded. If a card is available, the interviewers check and noted 'full or non-full', based on the vaccination status of the child. In a situation where a child never received a health card or the mother was unable to show the card to the interviewer, the vaccination information for the child was based on the mother's verbal report only. In such cases, questions were asked for each vaccine type. Mothers were asked to recall whether the child had received BCG, Polio, DPT, and measles vaccinations. If the mother indicated that the child had received the Polio or DPT vaccines, they were also asked about the number of dose received by the child and also check for the scar at the soulder of the child to confirm. Appropriate general questions were also asked under each topic. The guide was translated into Yoruba, the local language in Southwestern parts of Nigeria.

Data analysis

Having obtained the dataset and extracted the eligible respondents, the data was analyzed using STATA 12 software. The analysis involved three stages. The first stage is univariate analysis. The bivariate analysis involved comparison of two variables (dependent and one independent). The second stage, involved the multivariate analysis which further analyses the relationships and patterns between independent and dependent variables. At this stage, logistic regression models were used.

The general logistic regression model used for this study according to Newman (2001) is:

$$P(Y = \beta) = \frac{e^{\beta_0 + \beta_1 X_1 + \dots + \beta_n X_n}}{1 + e^{\beta_0 + \beta_1 X_1 + \dots + \beta_n X_n}}$$

which gives the probability that the response variable Y is 1 subject to the covariate vector $X = (x_1 \dots x_n)$ and parameter vector $\beta = (\beta_0 \dots \beta_n)$.

The following regression models were developed to predict the likelihood of full childhood immunization.

Model I (Model built with socio – economic factors)

$$\log(P/1-P) = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots b_n X_n$$

where P is the probability of having full childhood vaccination, a is the intercept, b_i's are the slopes, X₁ is the respondents level of education, X₂ is the respondent's type of occupation; X₃ is the respondents place of residence, X₄ is the respondents wealth quintile (n = 4).

Model II. (Model built with mothers` health care seeking indicators)

$$\log(P/1-P) = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots b_n X_n$$

Where P is the probability of having full childhood vaccination, a is the intercept, b_i's are the slopes, X₁ is respondents` time of first ANC visit; X₂ is respondent`s number of ANC visits; X₃ is respondents` place of ANC care received; X₄ is respondent`s place of delivery; X₅ is respondent`s place of postnatal care received. n = 5.

All the analysis was done at 95.0% significant level (p-value < 0.05).

Ethical consideration

This study used secondary data in large part. NDHS 2008 has already taken care of ethical issues; hence, there was no risk of breaking any interviewee confidentiality or associated consideration as all participants` identifiers have been removed. For the in-depth interview, participants were informed of the nature of the study and participation was voluntary. Informed consents were obtained from all the participants prior to their participation in the survey. The code of ethics for research relating to sensitivity and confidentiality of information provided was followed. Interviews were conducted in an environment where privacy was ensured and the anonymity and confidentiality of information given was assured.

RESULTS

Findings from the in-depth interviews are integrated "where necessary" to complement and strengthen the result of this study.

Socio-demographic characteristics of respondents

The total number of women extracted for this study having applied the weighting factor is 4,519. Mother's age ranged from 15 to 49 with mean age of 30.4 and standard deviation of 6.3. A significant number of them (56.9%) are within the age bracket of 25 to 34 years. More than 94.0% of the mothers are currently married, while the percentage of those who are never married, living together, widowed, divorced and not living together constitute only 5.2%. Residentially, 55.2 and 44.8% of the mothers are urban and rural residents, respectively

with more than half of them (60.7%) being Christian, while about one-third (38.7%) are Muslim (Table 1). Analysis based on the mother's level of education revealed that 14.9% of the mothers interviewed had no formal education, about 12.2% had tertiary education while others, 44.0 and 28.9% had secondary and primary education, respectively. By type of occupation, 14.1% of them were full house wives at the time of the survey, more than half 55.0% were into sales and services, 22.5% were into agriculture/unskilled manual jobs, while others 8.4% were into professional services.

In terms of mothers' wealth quintile, almost half (45.0%) of them are within the upper wealth quintile (rich), about one-fifth (6.2%) are within the lower quintile (poor) with more than one-third (38.8%) within the middle wealth quintile (average). Parity (number of children alive) ranged from 1 to 13. However, due to smaller numbers and the spread of the variable, the range of parity collapsed and more than one-thirds of mothers 37.1 and 38.8% are in parity 2 (1 to 2 children) and parity 4 (3 to 4 children), respectively, while others, 24.1% are in parity 5 (5 or more children) at the time of the survey. With the use of preceding birth interval to the index child, a significant number of respondents (83.7%) had long birth interval.

Health seeking behaviour of respondents

In compliance with the WHO recommendation, almost half of the mothers (48.8%) went for 1st antenatal care within the first trimester (1st to 4th months) of their recent pregnancy, while a little above half (52.2%) went for their 1st antenatal care outside the first trimester (5th month or more) (Table 2). Findings from the in-depth interview also corroborate this pattern as majority of mothers who are in parity 3 and above did not initiate antenatal care until they are at least within the fifth month of their pregnancy in the absence of any complaint or complications. This attitude according to some of them emanated from the fact that they do not attach much importance to seeking antenatal care at the early stage of their pregnancy since they are not new to pregnancy related issues. These are some of the excerpts from their discussions:

"Since I didn't have any complaint concerning my pregnancy, ... I started attending antenatal care when I was 5 months pregnant" (40 years old mother of 6 from Ibadan).

"I was so confident since the pregnancy was not my first time, but my husband was a bit scared... He forced me to go for antenatal care when I was five months pregnant" (28 years old mother of 4 from Sekona).

However, a significant number (89.5%) of mothers had at least four antenatal care visits while about one-tenth (10.5%) had less than four visits during their recent pregnancy. More than one-third (36.2%) of the mothers

Table 1. Percentage distribution of respondents by socio-demographic characteristics.

Variable	Frequency	Percentage
Age		
15-19	100	2.2
20-24	638	14.2
25-29	1,402	31.0
30-34	1,172	25.9
35-39	769	17.0
40-44	341	7.6
45-49	97	2.1
Current marital status		
Never married	86	1.9
Married	4,285	94.8
Living together	64	1.4
Widowed	38	0.8
Divorced	16	0.4
Not living together	30	0.7
Place of residence		
Urban	2,495	55.2
Rural	2,024	44.8
Religion		
Christian	2,736	60.7
Islam	1,727	38.4
Others	41	0.9
Level of education		
No education	673	14.9
Primary	1,307	28.9
Secondary	1,987	44.0
Higher	552	12.2
Type of occupation		
Full house wife	632	14.1
Professionals	378	8.4
Sales/Services	2,461	55.0
Agriculture/unskilled manual	1,006	22.5
Wealth quintile		
Lower	730	16.2
Middle	1,754	38.8
Upper	2,034	45.0
Birth interval		
Short birth interval	557	16.4
Long birth interval	2,849	83.7
Parity		
1-2 children	1,675	37.1
3-4 children	1,753	38.8
5 children+	1,091	24.1
Total	4,519	100.0

Data computed from 2008 NDHS.

Table 2. Percentage distribution of respondents' health seeking behaviour.

Health seeking indicators	Frequency	Percentage
1st time of ANC visit		
between 1-4 months	1,405	48.8
5 months plus	1,473	51.2
Number of ANC visits		
Less than 4 visits	290	10.5
4 visits plus	2,482	89.5
Place of ANC care		
No ANC	1,637	36.2
Home	312	6.9
Public health facilities	1,389	30.7
Private health facilities	1,181	26.2
Place of delivery		
Home	1,357	30.0
Public health facilities	1,581	35.0
Private health facilities	1,581	35.0
Postnatal check within 2 months		
No	691	63.2
Yes	403	36.8
Place of postnatal care		
Home	224	55.5
Public health facilities	112	27.9
Private health facilities	67	16.6
Total	4,519	100.0

Data computed from 2008 NDHS.

did not receive any antenatal care, 6.9% received antenatal care at home, while others, 30.7% and 26.2% received their antenatal care within the public and private health facilities respectively. In terms of delivery, about one-third (30.0%) of mothers delivered their last birth at home and 70.0% of them delivered within the health care facilities (35.0% in public health facilities and 35.0% in private health facilities, respectively). This pattern was not substantially different from what was observed during the in-depth interview as majority of the mothers reported that they delivered at home. These are some of the excerpts from their discussion:

"I registered in the hospital but I did not deliver there, instead I went to deliver at our mission house" (28 years old mother of 4 from Sekona).

"I did not use any other place and I never missed any of my appointment date, but I later delivered at a nearby home..., the labour started in the night" (26 years old mother of 2 in Ibadan).

Table 3. Percentage distribution of children age 12-23 months who had received the (*Nine*) basic vaccines at 12 months of age, by source of information (vaccination card or mother's report), and percentage not vaccinated.

Source of information	Percentage of children age 12 to 23 months who had received specific vaccines at 12 months of age, by source of information (vaccination card or mother's report) and percentage not vaccinated, in South-western Nigeria												
	BCG		DPT			Polio			Measles	All basic vaccinations		No vaccination at all	Number of children
	-	1	2	3	0	1	2	3		Full	Partial		
Child vaccinated before survey	-	1	2	3	0	1	2	3				-	-
Vaccination on card	36.8	37.4	36.0	33.2	34.1	36.6	34.5	31.8	30.4				
Reported by mothers	45.5	44.1	42.3	36.3	31.5	47.2	43.7	23.4	39.8				
Either source	82.3	81.5	78.3	69.5	65.5	82.8	78.2	55.2	70.2	36.5	51.0	12.5	1, 590
No Vaccination	17.7	18.5	21.7	30.5	34.4	16.2	21.8	44.8	29.8				
Vaccinated by 12 months of age	80.5	80.7	78.2	67.5	63.4	82.3	77.0	54.4	65.6	35.4	51.8	12.8	814

¹ Polio 0 is the polio vaccination given at birth. ² BCG, measles, and three doses each of DPT and polio vaccines (are the basic vaccines a child must complete by 12 months). Data computed from 2008 NDHS.

“I received antenatal care both at the mission house and the hospital.... Though, I later delivered at the mission house...” (18 years old mother of 1 from Ibadan).

In addition, the study found that more than two-thirds (63.2%) did not receive postnatal care at all, and of those that received postnatal care, more than half (55.5%) received postnatal care at home while others received their postnatal care within public (27.9%) and private (16.6%) health care facilities, respectively. This pattern was also revealed during the in-depth interview as majority of the mothers did not see postnatal care as important aspects of obstetric care in the absence of any complaint or complications. Many of them affirmed that there is no reason for postnatal care unless the child is sick or develop some symptoms. According to some of them:

“I did not go for any postnatal check-up since there was no problem with me and my child, I only took him back to hospital for vaccination” (36 years old mother of 4 from Sekona).

“Since I have given birth and up till now, neither I nor my child has fallen sick.... So, we only go to hospital for vaccination” (40 years old mother of 6 from Ibadan).

Vaccination status of children of age 12 to 23 months

Table 3 shows vaccination coverage by source of information for children of age 12 to 23 months, the age at which they should have received all vaccinations based on the information on vaccination card and mothers' verbal report. Overall, 36.5% of children aged 12 to 23 months are fully vaccinated, 51.0% of the children received partial vaccination (between 1 and 8 vaccines). On each of the vaccines, 82.3% received vaccinations for BCG and 70.2% received for measles. Fewer children received DPT 3 (69.5%) and polio 3 (55.2%), compared with those who received DPT 1 and 2 (81.5 and 78.3%) and polio 1 and 2 (82.8 and 78.2%), respectively. In

all, more than one-tenth (12.5%) of children aged 12 to 23 months in South-Western Nigeria have not received any of the recommended vaccines at the time of the survey. Meanwhile, the percentage of children aged 12 months that have received full immunization slightly increased from 35.4 to 36.5% when compared with the percentage of children aged 12 to 23 months that have received full immunization by 12 months of age. Likewise, the percentage of children that were partially immunized or not immunized at age 12 months slightly dropped from 51.8 to 51.0% and 12.8 to 12.5%, respectively when compared with children aged 12 to 23 months that were immunized by 12 months of age.

Respondents' reasons why child was not delivered within health care facilities or not vaccinated

The 2008 NDHS, collected information on whether each of the following factors constitute a big problem

Table 4. Percentage distribution of respondents by reasons why child was not delivered within the health care facilities or not vaccinated.

Variable	Frequency	Percentage
Reasons for not delivered within health care facilities		
Cost too much	72	8.5
Facility not open	23	2.7
Too far and no transport	198	23.2
Don't trust facility/poor service	57	6.7
No female provider	4	0.5
Husband/family didn't allow	37	4.4
Not necessary/customary	292	34.3
Others	168	19.7
Total	851	100.0
Reasons why child was not vaccinated		
lack of info	91	19.0
Fear of side effect	154	32.0
Vaccine do not work	8	2.0
Religious reason	13	4.0
Post too far	77	16.0
Child was absent	28	6.0
Others	110	23.0
Total	480	100.0

Data computed from 2008 NDHS.

in delivering within the health care facilities: cost too much, facilities not open, post too far and no transport cost, no female provider or any health provider, husband or family did not allow, and not necessary/customary to deliver within health care facilities and others. Of all the mothers that responded to these questions, a significant number 34.3% reported that they do not find it necessary or customary to deliver within health care facilities, followed by 23.4% of those who reported that the health care post is too far and there was no transport money (Table 4). Also, 9.0% mentioned cost of treatment as a serious problem in accessing health care for delivery, while 7.0% reported that they do not trust the facility as they were concerned that there would be no drugs available within the facility. Meanwhile, only 1.0% of these mothers were concerned that there would be no female provider to attend to them. Whereas, problems getting permission from husband or family to go for treatment was mentioned by 4.4% of them as another major reason for not delivering their last pregnancy within the health care facilities.

Furthermore, this study, “through the in-depth interview”, discovered that a significant number of mothers that received antenatal care within the health care facilities often withdraw to deliver at home or mission houses. In all, about half (5 out of 12) of the mothers interviewed did not deliver within the health care facilities. However, various reasons were advanced for this behaviour; ranging from late night labour, prolonged

labour and un-caring attitude of the nurses as the major reason. These are some of the excerpts from their discussion:

“I decided not to deliver there because of the stress and the un-caring attitudes of the nurses that are unbearable to me” (28 years old mother of 4 from Egbeda).

“I was one month pregnant when I went for immunization at the hospital, but I later deliver at mission house because they do exercise patience for those of us that normally have a prolonged labour” (34 years old mother of 4 from Egbeda).

Also, various reasons on why children aged 12 to 23 months were not fully vaccinated or did not receive any of the vaccines at any time before the survey were also assessed. In all, fear of side effects (32.0%) was the commonly reported reasons for children not being immunised, followed by lack of information (19.0%), and the post being located too far away (16.0%). Meanwhile, 23.0% of mothers mentioned other reasons why their children were not immunized which range from lack of money, vaccines not available to waste of time in the hospitals.

Findings from the in-depth discussion also complements this result by revealing that about two-thirds of the mothers interviewed partially vaccinate their

Table 5. Percentage distribution of mothers' socio-economic factors and childhood vaccination.

Socio-economic factor	Childhood vaccination status		Total N	Chi square	p-value
	Non full	Full (% , N)			
Level of education					
No education	81.2 (195)	18.8 (45)	240	89.6131	0.0000*
Primary	72.6 (328)	27.4 (124)	452		
Secondary	59.4 (394)	40.6 (269)	663		
Tertiary	36.2 (85)	63.8 (150)	235		
Type of occupation					
Full house wife	57.8 (130)	41.2 (91)	221	35.0213	0.0000*
Professionals	40.8 (64)	59.2 (93)	157		
Sales and services	65.3 (557)	34.7 (296)	853		
Agriculture/unskilled	70.0 (251)	30.0 (108)	359		
Wealth quintile					
Lower	85.0 (223)	15.0 (57)	280	89.2295	0.0000*
Middle	70.8 (423)	29.2 (175)	598		
Higher	50.0 (356)	50.0 (356)	712		
Place of residence					
urban	52.4 (462)	47.6 (420)	882	76.6372	0.0000*
rural	77.3 (540)	22.7 (168)	708		
Total	63.0 (1,002)	37.0 (588)	1,590		

*P < 0.05. Data computed from 2008 NDHS.

children, while about one-third of them did not receive any vaccine for their children. Some of them reported that they deliberately decided not to vaccinate their children; while others mentioned various reasons why they could not vaccinate or fully vaccinate their children. Below are some of the excerpts from them:

"I did not vaccinate my child, it was deliberate, the one I took for his brother led to complication to the extent that it was operated. Since then, I can't even advice people around me on child vaccination" (36 years old mother of 4 from Ibadan).

"My child was unable to get the nine month vaccine, we were always asked to come back. The last time I went there, I waited for hours before I left to attend to customer and some other important issues" (34 years old mother of 4 from Egbeda).

Relationship between mothers' socio-economic factors and childhood vaccination

This study revealed that significant relationships exist between mothers' socio-economic differentials (level of education, type of occupation, place of residence and wealth index) and childhood immunization ($p < 0.01$). The

result revealed that the chances of a child being fully immunised varies consistently with mothers' level of education: 18.8% for no education, 27.4% for primary, 40.6% for secondary, and 63.8% for tertiary education, respectively (Table 5). The significant relationship between education and full childhood vaccination was also justified during the in-depth interview as one of the important determinants of full childhood vaccination as some the mothers expressed their views:

"I think lack of education as well as ignorance is a major factor. You see, when you advise some mothers in this environment, they will be asking you what benefit have you derived from vaccination, one of my friend even told me that it was that vaccine that killed her first child" (36 years old mother of 4 from Sekona).

"I know that the vaccines do protect children from diseases, but I think ignorance is the major factor why some mothers don't care about child vaccination" (34 years old mother of 4 from Egbeda).

Majority of mothers (59.2%) whose work falls within the formal sectors (professionals) fully immunized their children when compared with their counterpart that are into sales and services (34.7%) as well as those in agricultural/unskilled manual jobs (30.0%). Meanwhile,

Table 6. Percentage distribution of mothers' health seeking behaviour and childhood vaccination.

Health seeking indicators	Childhood vaccination status		Total N	Chi square	p-value
	Non full (% , N)	Full (% , N)			
1st time of ANC visits					
Between 1-4 months	55.7 (328)	44.3 (260)	588	15.8660	0.0018*
5 months plus	68.5 (448)	31.5 (206)	654		
Number of ANC visits					
Less than 4 visits	87.5 (513)	12.5 (73)	586	27.0446	0.0024*
4 visits plus	49.2 (499)	50.8 (515)	1,014		
Place of ANC care					
No antenatal care	68.8 (215)	31.2 (96)	311	22.9763	0.0006*
Home	69.1 (103)	30.9 (46)	149		
Public health facilities	65.5 (421)	34.5 (222)	643		
Private health facilities	54.1 (263)	45.9 (224)	487		
Place of delivery					
Home	80.8 (388)	19.2 (92)	480	55.3752	0.0000*
Public health facility	58.3 (341)	41.7 (244)	585		
Private health facility	52.0 (273)	48.0 (252)	525		
Place of postnatal care					
Home	76.7 (84)	23.3 (26)	110	4.9475	0.0998
Public health facilities	76.1 (32)	23.9 (10)	42		
Private health facilities	55.4 (24)	44.6 (19)	43		
Total	63.0 (1,002)	37.0 (588)	1,590		

*P < 0.05. Data computed from 2008 NDHS.

more than half (57.8%) of the mothers who were full house wife at the time of the survey partially immunize their children. Also, as revealed by the in-depth interview, mothers occupation competes with full childhood vaccination as some of the mothers pointed out that majority of their counterparts cannot wait for a longer time or revisit the hospital to ensure that their child received full vaccination:

"There are some mothers that don't have time for their children, some will tell you that they are going to farm..., and that waiting at hospital for vaccination will take much of their time"
(32 years old mother of 5 from Egbeda).

"..., some cannot sacrifice their time for their children" (35 years old mother 4 from Osogbo)

The last time I went there, I waited for hours before I left to attend to customer and some other important issues" (36 years old mother of 4 from Sekona).

Analysis on the relationship between mothers' wealth quintile is strongly and significantly associated with the

chance of full childhood immunisation; majority of the children, whose mothers are within the higher wealth quintile, were fully vaccinated (50.0%), when compared with those children whose mothers are within the middle wealth quintile (29.2%) and lower wealth quintile (15.0%), respectively.

For all antigens, the percentage of children that received full immunisation varies by place of residence: it was higher in urban areas (47.6%) than in rural areas (22.7%). This pattern also prevailed in two of the rural areas (Egbeda and Sekona) involved in the in-depth discussion as many of the mothers interviewed in those areas partially immunized their children while some did not vaccinate their children at all.

Relationship between mothers' health seeking behaviour and childhood vaccination

Analysis on the mothers 1st time of antenatal care visit revealed a significant relationship between 1st time of visit and full childhood vaccination ($p < 0.01$). For instance, 44.3% of the mothers that had their first antenatal care visit within the first trimester (1 to 4th

Table 7. General binary logistic regression Model I and II for the likelihood of full childhood vaccination among children age 12 to 23 years.

Variable	Model I			Model II		
	Odds-ratio (standard error)	p-value	95% CI	Odds-ratio (standard error)	p-value	95% CI
Socio-economic factor						
Level of education						
None	RC	-	-	-	-	-
Primary	1.13 (0.34)	0.676	0.63 – 2.04	-	-	-
Secondary	1.68 (0.51)	0.091	0.92 – 3.07	-	-	-
Tertiary	3.27 (1.26)	0.003**	1.52 – 7.01	-	-	-
Type of occupation						
Professionals	RC	-	-	-	-	-
Full house wife	0.87 (0.28)	0.653	0.46 – 1.62	-	-	-
Sales/Services	0.84 (0.23)	0.508	0.49 – 1.43	-	-	-
Agriculture/unskilled	0.89 (0.33)	0.86	0.57 – 1.96	-	-	-
Place of residence						
Rural	RC	-	-	-	-	-
Urban	1.80 (0.37)	0.005*	1.20 – 2.72	-	-	-
Wealth quintile						
Higher	RC	-	-	-	-	-
middle	0.65 (0.12)	0.022*	0.21 – 0.76	-	-	-
Lower	0.40 (0.13)	0.005*	0.45 – 0.94	-	-	-
Health seeking indicators						
1st time ANC visit						
1 – 4th months	-	-	-	RC	-	-
5 months plus	-	-	-	1.09 (0.59)	0.875	0.37 – 3.18
No. of ANC visits						
More than 4 visits	-	-	-	RC	-	-
Less than 4 visits	-	-	-	0.33 (0.34)	0.283	0.04 – 2.55
Place of ANC care						
Private H. facilities	-	-	-	RC	-	-
No ANC/home	-	-	-	0.82 (0.36)	0.761	0.23 – 2.93
Public H. facilities	-	-	-	1.56 (1.25)	0.413	0.14 – 2.27
Place of delivery						
Home	-	-	-	RC	-	-
Public H. facilities	-	-	-	2.90 (1.17)	0.000**	1.29 – 1.80
Private H. facilities	-	-	-	1.10 (0.19)	0.000**	0.01 – 0.89
Place of postnatal						
Home	-	-	-	RC	-	-
Public H. facilities	-	-	-	2.53 (1.76)	0.188	0.63 – 10.12
Private H. facilities	-	-	-	2.42 (1.81)	0.958	0.54 – 10.73

*P < 0.05; **P < 0.01; Model I = model built with mothers socio- economic factors; RC = reference category; Model II = model built with mothers' health seeking indicators. Standard errors are in parenthesis.

months) of their last pregnancy fully immunized their children while only 33.1% of those that had their 1st visit outside the 1st trimester (5th months and above) of their recent pregnancy fully immunized their children (Table 6). Furthermore, the in-depth interview revealed that about two-thirds of those that initiated antenatal care outside the first trimester did not fully vaccinate their children for one reason or the other. These are excerpts from their statements:

“Since I didn’t have any complaint concerning my pregnancy,.... I started attending antenatal care when I was six months pregnant...‘noted’- vaccines not completed” (22 years old mother 4 from Ibadan).

“;... So, he forced me to go for antenatal care when I was five months pregnant,.... I have decided not to immunize any of my children again” (28 years old mother of 4 from Sekona).

“I was 4 months pregnant when I started antenatal care,....., you see, when someone is pregnant, it depends on your body situation, and that will make you to run for check-up,.... My child completed her vaccination” (30 years old mother of 3 from Osogbo).

Also, number of antenatal care visits was found to be significantly related to full childhood vaccination ($p < 0.01$). Less than one-fifth (12.5%) of mothers with less than four antenatal care visits during their last pregnancy fully immunized their children, while more than half (50.8%) of mothers with more than four antenatal care visits during their last pregnancy fully immunized their children.

Place of antenatal care was also found to be strongly and significantly associated with full childhood vaccination. The proportion of children that received full vaccination varies with mothers’ place of ANC care: 25.8% of mothers that received antenatal care at home; 34.0% of mothers that received antenatal care at public health facilities; and 45.9% of those that received antenatal care at private health facilities fully immunized their children whereas, only 31.2% of mothers who did not receive any antenatal care fully immunized their children.

Analysis on the relationship between mothers’ place of delivery and full childhood vaccination also showed a significant relationship ($p < 0.01$). Mothers who delivered within the health care facilities are more likely to fully immunize their children than those that delivered at home. Less than one-third (19.2%) of mothers with home delivery fully immunized their children, while about half of mothers that deliver within the health care facilities (41.7% for public health facilities and 48.0% for private health facilities) fully vaccinate their children. this finding was also discovered in the in-depth interview as some mothers tend to substitute going to mission houses

during pregnancy for hospitals, while a significant number of those that received antenatal care within the health care facilities often withdraw to deliver at home or mission house. These are some of the excerpts from them:

“....I did not use any other place and I never missed any of my appointment dates, but I later delivered at a nearby home where a friend nurse took the delivery because the labour started in the night..., but she had already missed some of the vaccines by the time I took her to the hospital” (26 years, mother of 2 from Ibadan).

“This is my 4th child and I have never delivered at hospital before....., since I do have a prolonged labour of about 4 to 5 days , I normally go to my mothers` place to deliver my baby... I have decided not to immunize any of my children again” (28 years old mother of 4 from Sekona).

“I was going to the hospital and I was equally using some home based clinic. I later delivered at a nearby home based clinic because the labour started in the night. I took him to hospital for vaccination. But the nine month vaccine was not available” (35 years old mother 5 from Osogbo).

Though there is no significant relationship between mothers’ place of postnatal care and full childhood vaccination ($p > 0.05$). However, full childhood vaccination varies proportionately with place of postnatal care (23.3% for home, 23.9% for public health facilities, and 44.6% for private health facilities). Discussion on the issue relating to mothers’ postnatal care during the in-depth interview revealed that majority of the mothers did not seek postnatal care as some of them affirmed that there is no reason for postnatal care unless the child is sick or develops some symptoms. Therefore, we cannot reasonably relate mothers’ postnatal care with full childhood vaccination as some of them only took their children back to the hospital for the sole purpose of vaccination alone.

Binary logistic regression of mothers’ socio-economic factors and health seeking behaviour on childhood vaccination

Here, presents the odds ratio from the general binary logistic regression Model I and II for the likelihood of full childhood vaccination among children aged 12 to 23 years. Obviously, the significant relationships that exist between mothers’ socio-economic factors, her health seeking behaviour and full childhood vaccination at the bivariate level can be due to isolated effects of other unmeasured factors and non-interaction among

variables. We therefore at this stage used multilevel modelling to determine the predictors of full childhood vaccination having allowed for interrelationships among the various measured independent and intervening factors.

The result from model I revealed the most significant predictors of full childhood vaccination to be: level of education, place of residence, and wealth quintile. The odds ratio of reporting full childhood vaccination increase steadily with level of education such that mothers with tertiary education are significantly three times more likely to fully immunize their children (OR = 3.27; $p < 0.01$; 95% CI = 1.52 – 7.01) than their counterparts with no formal education. Also, mothers with primary (OR = 1.13; $p > 0.05$; 95% CI = 0.63 – 2.04) and secondary (OR = 1.68; $p > 0.05$; 95% CI = 0.92 – 3.07) education are almost twice more likely to have their children fully immunized than their counterpart with no formal education. At this level, significant relationship was found between mothers' type of occupation and childhood vaccination ($p > 0.05$). But our findings further revealed that mothers within the formal sectors are more likely to fully immunize their children than those who are full house wife or within agricultural/unskilled manual activities (OR = 1.60; $p > 0.05$; 95% CI = 0.57 – 1.96), and those that engaged in sales and services as well. Meanwhile, the odds ratio of full childhood immunization decreases monotonically with mothers' wealth quintile as the analysis revealed that majority of the mothers within the middle (OR = 0.65; $p < 0.05$; 95% CI = 0.21 – 0.76) and lower (OR = 0.40; $p < 0.05$; 95% CI = 0.45 – 0.94) wealth quintile are less likely than those in the upper wealth quintile to fully immunize their children. Also, mothers in the urban areas were found to be twice more likely to have their children fully vaccinated (OR = 1.80; $p < 0.05$; 95% CI = 1.20 – 2.72) than their counterpart in the rural areas.

Result from model II revealed that mothers who delivered within public health facilities are thrice more likely to fully immunize their children (OR = 2.90; $p < 0.01$; 95% CI = 1.29 – 1.80) than mothers with home delivery. Likewise, the odds of full childhood vaccination is significantly higher for mothers that delivered within private health care facilities (OR = 1.10; $p < 0.01$; 95% CI = 0.01 – 0.89) than those that delivered at home. Mothers with less than four ANC visits are less likely to fully immunize their children (OR = 0.33; $p > 0.05$; 95% CI = 0.04 – 2.55) compared with those that had more than four ANC visits, whereas mothers who received antenatal care within public health care facilities are more likely to fully immunize their children (OR = 1.56; $p > 0.05$; 95% CI = 0.14 – 2.27) than those who received antenatal care at private health facilities. Conversely, mothers who did not receive any antenatal care and those that received antenatal care at home are both less likely to fully immunize their children (OR = 0.82; $p > 0.05$; 95% CI = 0.23 – 2.93) (Table 7) when compared with those that received ANC care at either public or private health care

facilities. With regards to place of postnatal care, mothers that received postnatal care within either public (OR= 2.53; $p > 0.05$; 95% CI = 0.63 – 10.12) or private health care facilities (OR = 2.42; $p > 0.05$; 95% CI = 0.54 – 10.73) are twice more likely to fully vaccinate their children than mothers who received postnatal care at home.

DISCUSSION

This discussion focused on the quantitative findings of this study as well as findings “excerpts” from the qualitative (in-depth interview).

As part of the health intervention programme and strategic policy, pregnant mothers are expected to initiate their 1st ANC visit within the first trimester (1 to 4th month) and also required to have a minimum of 4 visits before delivery in the absence of any complain or complications (WHO, 2010). However, more than one-third of mothers in this study did not receive any ANC care, while significant number (52.2%) of those that received did not initiate their 1st ANC visit within the first trimester. More than one-tenth (10.5%) received less than four antenatal care, while about one-third (30.0%) had their last delivery at home. These patterns of maternal health seeking behaviour among mothers also reflect their behaviour towards the health of their children. For instance, a significant number of children whose mothers displayed these negative maternal health seeking behaviour were not fully vaccinated: 68.8% for no ANC, 68.5% for those that initiated 1st ANC outside the first trimester, 86.8% for those that received less than four ANC, and 78.7% for those that delivered at home. Also, the study further discovered that many mothers tend to substitute going to mission houses during pregnancies for hospitals, while some of those that even received antenatal care within the health care facilities often withdraw to deliver at home or mission due partly to the inpatient attitude of health workers and partly to the distance to the health care centers.

Analysis on the mothers first time of antenatal care visit revealed a significant relationship between first time of visit and full childhood vaccination and this is in agreement with the study conducted by Catherine et al. (1996). Our results further showed that majority of the children whose mothers went for 1st ANC visit outside the first trimester of their pregnancy are at increased risk of incomplete vaccination unlike those children whose mother initiated 1st ANC visit within the first trimester. The strong and significant relationships found by Meredith et al. (2011) between number of ANC visits and EPI attendance in all the three countries: Chad, Mali and Niger were also substantiated by this study. Our findings revealed that mothers with more than 4 ANC visits are more likely to fully immunize their children than mothers with less than 4 ANC visits. This finding is consistent with

some of the earlier studies by Phathamavong et al. (2010), where they concluded that ANC visits enhanced hospital deliveries and child immunizations. Also, findings from the in-depth interview further corroborate this result as mothers who reported not to have missed any of their appointment fully immunized their children. According to one of them:

“I started attending ANC clinic when I was two months pregnant, since then I’ve never missed any of my appointment, and if you check this card, you will see that my child completed her vaccination” (22 years old mother of 1 from Ibadan).

Evidence that mothers’ place of delivery is significantly related with full childhood vaccination was also provided by the findings of this study. Mothers who delivered within health care facilities (both public and private health care facilities) are almost thrice more likely to fully immunize their children than those that delivered at home. This result is in conformity with some of the earlier findings by Cutts et al. (1991) and Oditt and Amuge. (2003), their study concluded that delivery in a hospital affected whether the child began immunization or not. This could be due to the fact that majority of mothers were aware of the importance of immunization as they gave birth in the hospital settings.

Similarly, this study revealed that the odds of reporting full childhood vaccination increases steadily with mothers’ level of education such that mothers with primary, secondary and tertiary education are increasingly more likely to fully immunize their children than mothers with no formal education. This finding is consistent with some earlier findings by Hobcraft (1993), where he argued that the more educated women are more likely to have initiated immunization and even more likely to have their children fully vaccinated. This finding is in support of a report from Turkey study (Altinkaynak et al., 2004) that education of mothers increases the full vaccination chance of a child and reduces missed opportunity.

The significant relationship found in-terms of mothers’ wealth quintile also justified the WHO-sponsored study by Heggenuhogen and Clements (1987), which summarized their research findings that low socio-economic status, and especially low educational level of mothers, is usually associated with low acceptance of immunization. The logistic regression further reiterated that the odds of full childhood immunization decreases monotonically with mothers’ wealth quintile: mothers within the middle and lower wealth quintile are less likely to fully immunize their children compared with those in the higher wealth quintile. This result also conforms to earlier findings by Klevens and Luman (2001): a study that associated family income with immunization coverage levels, and low family income as a risk factor for low immunization (Klevens and Luman, 2001). Parents with lower household incomes are more likely to experience

barriers, such as transportation or access to health care services that make staying up-to-date on immunizations difficult (Klevens and Luman, 2001).

Also, the logistic regression further provides a substantial and significant evidence as it shows that mothers in the urban areas are twice more likely to have their children fully vaccinated than mothers in the rural areas. This could be due to the fact that mothers in the rural areas are at increased risk of inadequate knowledge of vaccination schedule as well as lack of primary health care facilities and qualified personnel.

Contrary to some of the earlier findings, majority of mothers were knowledgeable about importance and schedule visit for immunization. However, fear of side effect, child’s health and sickness were the most common reported cause of incomplete vaccination, followed by non-availability of the vaccines as some of the mothers recount their experiences:

“I did not vaccinate my child, it was deliberate, the one I took for his brother led to complication to the extent that it was operated,..... So, I can’t even advice people around me on child vaccination” (36 years old mother Of 4 from Ibadan).

Another mother from Sekona in Osun State also added:

“When I had my first child I took him for immunization, but it led to complication that almost paralysed his leg if not for the intervention of some doctors and the fact that I was not also careless. Since then, I have decided not to take any of my children for immunization again” (28 years old mother of 4 from Sekona).

Therefore, findings from the reasons for not or incomplete vaccination suggest that different strategies are needed to address the varying reasons for incomplete immunization especially for mothers who are concerned with immunization safety. Earlier findings suggested that addressing parents’ concerns about vaccine safety (National Health and Medical Research Council, 2003; Hall et al., 2001) will help parents make informed decisions. Health workers should address parents’ concerns regarding the few appropriate side effects and medical contraindications to immunisation to help reduce unnecessary missed opportunity and often lengthy postponement due to illnesses (Burgess et al., 1998; Prislin et al., 2002). Also, the concerns and experiences of previously compliant parents after a child experiences minor anticipated vaccine side effects, or a more serious adverse event, should be addressed and managed appropriately (Prislin et al., 2002) including referral to a specialist immunization clinic for intensive treatment if necessary (Wood, 2003; Gold et al., 2003).

Finally, this study having being disaggregated at both bivariate and multivariate level, pointed to mothers’ socio-economic factors (level of education, wealth quintile and

place of residence); mothers' health seeking behaviour (1st time of ANC visit, number of ANC visits, place of ANC care and place of delivery); fear of side effect; as well as systemic factors (non-availability of vaccines) as the major factors affecting the full uptake of childhood vaccination in South-Western Nigeria. These findings are consistent with Nichter (1995) and Raharjo (1990) research conclusion that vaccination demand and acceptance depend on factors that are far more numerous and complex. This was also corroborated by Streatfield et al. (1999) and WHO (2010) as their study revealed that supply-related factors are clearly important, particularly the relationship between health-care workers and mothers (including attitudes of vaccinators towards mothers, as well as their perceived motives and technical competence).

CONCLUSION AND POLICY RECOMMENDATION

Having employed both secondary (quantitative) and primary (qualitative) data, respectively; the study examined the influence of mothers' health seeking behaviour and their socio-economic background details on full childhood vaccination. Findings from this cross-sectional study revealed that mothers' health seeking behaviour is not just a one off isolated event, but the result of an evolving mix of socio-economic, personal and experiential factors. The process of responding to 'illness' or seeking preventive care involves multiple steps (Uzma et al., 1999), and cannot be explained by a single model of health seeking behaviour only, but must also be related to some socio-economic factors.

As shown by this study, mothers' level of education, her wealth quintile and her place of residence significantly influence full childhood vaccination. This can be adduced to the fact that mothers with formal education, within higher wealth quintile and living within urban center are better informed about child susceptibility to diseases and severity of some diseases and therefore will want to take some preventive care unlike their counterparts who are less educated, within lower wealth quintile and living in rural areas. This result reinforces and strengthens the conclusion that education programs are vital to improving antenatal care, immunization coverage, and ultimately child health. Also, women within higher wealth quintile are more empowered to take some decisive decision as regards their personal health and that of their children. Furthermore, mothers in the urban centres are found to be more likely to fully immunize their children than those in the rural area. This could partly be as a result of the affordability and availability of the health care facilities in urban areas. Thus improving and increasing the availability of health care facilities in the rural areas could be a way forward to improve childhood preventive care in the rural areas as well.

Of all the mothers' health seeking indicators used,

mothers' place of delivery was revealed as a strong significant predictor of full childhood vaccination both at the bivariate and multivariate level of analysis. Meanwhile, at bivariate level, mothers' 1st time of ANC visit, number of ANC visits, place of ANC care and mothers' places of postnatal care significantly related to full childhood vaccination. Majority of the children whose mothers went for 1st ANC visits outside the first trimester are at increased risk of incomplete childhood vaccination unlike those children whose mother initiated 1st ANC visit within the first trimester.

Also, mothers with more than four ANC visits are more likely to vaccinate their children than mothers with less than four ANC visits. Likewise, mothers who received antenatal care within the health care facilities (both public and private) are more likely to fully vaccinate their children than mothers who received antenatal care at home. Also, mothers who received postnatal care within health care facilities were found to be twice more likely to fully vaccinate their children than those who received postnatal care at home. This result is consistent with the conclusion of the WHO/UNICEF (2010) findings that mothers' utilization of health care services during conception and delivery is a precondition that mothers will seek subsequent health care services for both themselves and their children.

The complexity of these findings traced in detail, and also disaggregated, in all sense of actual reality shows that mothers' health seeking behaviour needed to be focused and improved because it is a process that extends over time, space and cannot be picked out as something intrinsic to the individual alone but also influenced by their socio-economic circumstances as well.

Therefore, if the childhood survival programmes and strategies must succeed and the needless loss of children lives prevented, the following recommended strategies and programmes must be embarked upon by all the three tiers of government, non-governmental organization as well as international agencies to achieve 85 to 90% full national immunization coverage: expanding educational opportunities for women as well as focusing on literacy training for mothers as many countries have done; develop strategies and programmes that will be targeted at improving the health seeking behaviour of mothers through (sensitization programmes targeted at pregnant women to inform them on the value of modern medicine; programmes that lay emphasis on the importance of ANC care, place of delivery as well as postnatal care; programmes and strategies that will help women in developing familiarity with health care systems which will further increase the likelihood that they will rely on health care services again to the benefit of their children); above all, the national health care system must be restructured, the number of available facilities must be increased, well-equipped primary health care centres must be located in the rural areas as well as some

remote places and all the basic vaccines must always be made available within the health care facilities.

LIMITATION OF THE STUDY

This study makes use of a secondary data obtained from the 2008 National Demographic and Health Survey (NDHS), which is a nationally representative data. Thus, there are some limitations as predetermined by the data in term of the questionnaire design and variable measured. For instance mothers' perception of child susceptibilities to the six vaccine preventable diseases (VPD) as well as perceived benefit of immunization were not specifically measured and therefore cannot be measured by this study. Also, cases of missing values and non-response rate are common in the dataset and this was responsible for some variation in the row totals in the analysis.

AREAS FOR FURTHER RESEARCH

The study focused on the influence of mothers' health seeking behaviour and their socio-economic differentials on full childhood immunization. Mothers' perceptions of child susceptibilities to the vaccine preventable diseases (VPD) as well as mothers' perceived benefit of immunization were not specifically measured in the NDHS 2008 dataset used for this study. This create the need for further study since mothers' perceptions of child susceptibility to illness and anticipated severity as well as her perceived benefit of preventive care interact to influence mothers' health seeking behaviour towards their personal health and that of their children. Therefore, subsequent research should focus on the influence of mothers' perception of child susceptibilities to diseases, its anticipated severity and perceived benefit of preventive care on childhood vaccination status.

Measurement of variables and definition of terms

Mothers' place of antenatal care/postnatal care

Mothers' place of antenatal care and postnatal care were measured as the percentage of mothers who received antenatal care and post natal care within health care facilities (public or private health care facilities) as well as those who did not receive any antenatal care or received antenatal care at home (their home, other homes/traditional birth attendants' homes or in the church's mission houses).

Number of antenatal care visits

The antenatal care policy in Nigeria follows the newest WHO approach to promote safe pregnancies, recommending at least four ANC visits for women without

complications. Therefore, this study used the ideal number of ANC visits, measured as the proportion of mothers' that had at least four ANC visits before delivery and those with less than four visits (NDHS, 2008).

First time of antenatal visit

The new schedule of visits is as follows: the first visit should occur by the end of 16 weeks of pregnancy (1st trimester); the second visit should be between 24 and 28 weeks of pregnancy; the third visit is at 32 weeks; and the fourth visit takes place at 36 weeks. However, women with complications, special needs, or conditions beyond the scope of basic care may require additional visits. Therefore, the new schedule of visits was followed appropriately in this study.

Place of delivery

Place of delivery was captured as the percentage of mothers who delivered within health care facilities (public and private health facilities) and at home (their home, other homes/traditional birth attendants' homes or in the church's mission houses).

Parity

This was measured by making reference to the number of living children and was categorised into three: parity 2 (1 to 2 children), parity 4 (3 to 4 children), and parity 5 (5 children and above).

Birth interval

A birth interval is defined as the period of time between two successive live births. Using the preceding birth interval to the index child, the birth interval was captured in two ways: short birth interval (<24 months) and longer birth intervals (more than two years).

Full vaccination

The vaccination is measured as full if a child has received one dose of Bacille Calmette Guerin (BCG), four doses of oral polio vaccine, three doses of diphtheria, pertussis and tetanus vaccine, three doses of hepatitis B at birth, at six weeks of age and at 14 weeks of age and measles vaccine at nine months of age (Federal Ministry of Health, 1995; WHO, 2010).

Conflict of Interests

The author(s) have not declared any conflict of interests.

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