Relationship between household wealth and childhood immunization in core-North Nigeria

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Abstract

Background: Childhood immunization rate is lowest in the core-North Nigeria. We examined the relationship between inequality in household wealth and complete childhood immunization in that part of the country.

Methods: A cross-sectional survey was conducted among 4079 mothers with children 12-23 months of age. Children were considered 'fully-immunized' if they received all the vaccines included in the immunization schedule. Data were analyzed using descriptive statistics and logistic regression models (α=5.0%).

Results: About 39% and 5.0% children of the rich and poor received complete immunization respectively. Also, 64.2% and 49.6% children of the rich women received BCG and DPT 3 compared to 15.9% and 8.7% observed among the children of the poor. Higher proportion of children from poor households (40.6%) received no immunization than 20.8% found from the rich households. The likelihood of receiving complete immunization was 1.95(C.I=1.35-2.80, p<0.001) times higher among the children of the rich than the poor. Other important predictors of childhood immunization were age, religion, media access, working status, husband's education, prenatal attendants and delivery place.

Conclusion: Disparities existed in childhood immunization between the poor and rich in the core-North part of Nigeria. Policy makers should institute effective interventions that will assist children from poor households to improve their immunization access.

Keywords: Household wealth, immunization, child health, Nigeria.

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Introduction

Immunization averts an estimated 2 to 3 million deaths yearly from diphtheria, tetanus, pertussis and measles. However, global coverage remains below the WHO recommended rates.[1] In addition, immunization is a known strategy for preventing childhoodmortality not only by combating childhood killer diseases but also by providing a platform for assess to broader health care services.[2]

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Nevertheless, there is a great variation in the immunization coverage rates globally with sub-Saharan Africa having the worst indices.[3-6] Nigeria, the most populous African Nation is among countries with low rates of immunization coverage in sub-Saharan Africa.[3,7]

In cognizance of the persistently low immunization uptake, the Nigerian Government introduced several child survival strategies and the existing ones were expanded to strengthening routine immunization system.[8] For its implementation, several supplemental immunization campaigns were steered to ensure rapid improvement in the immunization coverage among children and to forestall or respond to disease outbreaks.[8-9] Despite government efforts, the level of immunization coverage in many parts of Nigeria is far from optimal and equitable with Core-North Nigeria consistently recording the least coverage

level.[10,11] According to Sustainable Development Goals (SDGs), there is a mandate for government to ensure healthy lives and promote wellbeing for all and reduce inequality within and among countries by 2030.

In spite of Nigeria Government's determination to uphold the tenets of the SDGs, huge challenges still remain in the country with respect to child survival. The infant and under-five mortality rates are still high at 69 and 128 per 1,000 livebirths respectively.[12] It is worrisome that these indices are remarkably higher in the core-North which comprises of North-East and North-West part of Nigeria than these national estimates[12] It is indispensable to note that any efforts gearing towards fertility and childhood mortality reduction will be unrealizable, if the level of childhood immunization coverage remains low in Nigeria. The core-North in particular is faced with the challenge of preventable diseases peculiar to tropical environment such as: measles, tetanus, whooping cough and polio.[12] Researchers have shown that childhood morbidity and mortality are preventable by setting up a health system that can deliver vaccines to all children during the first year of life and complete immunization before 23 months of age.[2,13,14]

There is an increasing body of literature divulging various sociodemographic factors as predictors of immunization coverage rates among children aged 12-23 months in different population groups.[6,15-17] among which household wealth is often cited.[10,18-20] In a study conducted in 45 Gavi-supported countries, where inequalities in vaccination coverage was examined, level of wealth index poverty was one of the dimensions found to be associated with the largest inequalities in childhood immunization coverage.[21] It has also been proved that complete vaccination probability was higher among children from highest wealth quintile households compared with the poorest.[16]

Generally, there is inequality in wealth distribution and a wide gap exists between the rich and the poor in terms of accessing health care even at public health facilities in Nigeria where majority of its population earn less than two dollars a day.[12] The gap becomes wider if the poor's place of residence is far from the health facility which is the peculiar situation in the core-North Nigeria.[12,19] Unfortunately, not all health facilities can administer childhood immunization vaccines in Nigeria, they are only available at designated facilities. In an instance where the location of such facility is far from home of an impoverished mother, lack of transportation fare can deprive the woman from immunizing her child. Likewise, repeated failed attempts as a result of vaccine and equipment shortage can be equally discouraging for a mother striving to immunize her child in a facility.These circumstances all have dire implications on completeness of immunization of the child. In the core-North Nigeria, there is a large disparity in wealth distribution between the rich and the poor, therefore, this is likely to cause variation in health care access between them. The inequality in household wealth has been identified to be responsible for the low immunization coverage rates in areas characterized by core-north situation[10,19], however this is yet to be fully documented in Northern Nigeria.

Examining the difference in full immunization coverage between the rich and the poor will assist immunization programme managers in their quest for improvement in immunization coverage in the core-North part of Nigeria. Reduction in childhood mortality level in core-North is likely to be achieved if childhood immunization is fully accessed in the region.

Methods

Study area

This study was conducted in the North East (NE) and North West (NW) regions in Nigeria. The two regions have similar socio-demographic characteristics to an extent. They are predominantly Muslims and theliteracy level is lowest among the people living in the region compared to other regions in Nigeria.[22] The total fertility rate is highest in the country (TFR=6.3 (N.E) and TFR=6.7(N.W)).12 The under-five mortality rate in NE and NW are 160 and 185 per 1000 live birth respectively while the infant mortality rate was 77/1,000 live birth in the N.E, it was 89/1000 live birth in the N.W.[12] It is important to note that public health facilities in Nigeria are underserved but there are variations between and within regions in Nigeria. The pattern of accessing health care including post-natal care is similar in the NE and NW.12 Men still play a domineering role on the decision of women to access health care for themselves and their children in the region.[12] Although, this is a common practice among Nigeria families, but the behavior is more

prevalent among the families in core-North part of the country.

Study design and sample selection

The study utilised a secondary data analysis of 2013 Nigeria Demographic and Health Survey and the analysis focused on sample of women currently having children aged 12-23 months in the NE and NW. The survey data was large and nationally representative. It also allows sub-regional analysis of the data across all spectrum of health and demographic research. Cluster design sampling technique was used for data collection. This involved the use of complete list of enumeration areas (EAs) that were prepared for the last population census exercise in Nigeria which was conducted in 2006. The primary sampling unit was defined on the basis of EAs with each EA constituting a cluster where a fixed sample of 45 households were selected per cluster. Samples were selected using a stratified three-stage cluster design taking into consideration of rural-urban dichotomy of Nigeria. Specifically, a sample of 4079 was used which consisted of 3349 and 730 women from poor and rich households respectively.

Outcome variable

The outcome variable was complete immunization status. Vaccination coverage information focused on children 12-23 months of age. According to vaccination schedule in Nigeria, a child is considered fully immunized if he or she has received Bacille Calmette-Guerin (BCG) vaccination against tuberculosis which is given at birth; three doses of DPT vaccine to prevent diphtheria, pertussis, and tetanus; at least three doses of oral polio vaccine (OPV); and one dose of measles vaccine. These vaccines should be received during the first year of life.[23] Although, it is expected that within the first 12-23 months of life, all basic vaccinations should have been received by the children. Thus, a child is said to be fully immunized if he had received all of the immunizations recommended in the official immunization schedule while, a partially immunized child has not received all of the immunizations, but he or she has received at least one of the vaccines.Lastly, an unvaccinated child is the one who has not received any of the stipulated vaccines in the schedule.

Information on immunization coverage was collected during the survey in two ways–visual verification of vaccination cards or by verbal reporting.. For those who could provide their cards, the research assistants entered the vaccination dates into the questionnaires. However, in situations where no vaccination card was presented or in cases where a vaccine had not been recorded on the card, the respondent was asked to recount the vaccines that had been administered to her child.[12]

Data analyses

Data were weighted by creating avariable using the sampling weight. This is necessary because cluster design approach was used for data collection and there would be a need to stretch the data to increase coverage. Frequency distribution, Chi-square and logistic regression were used for data analyses. The Chi-square was used to examine factors that are associated with immunization among children. In this context, both child and maternal characteristics were investigated. At the level of multivariate analysis, binary logistic regression was used to identify factors influencing completeness of immunization among children age 12-23 months. Here, the categories was dichotomized as 1 (if the child had completed the needed immunization) and 0 (if otherwise). Using this statistical tool, four regression models were generated. In the first model, wealth index and health related factors were introduced into the equation to ascertain the influence of these factors on the relationship between wealth and immunization. The second and third models were generated to identify predictors of complete immunization among the rich and the poor respectively. The last model is the full model obtained by pooling all the data for both rich and poor together to see if household wealth will retain its strength with respect to its relationship with the outcome variable in the midst of other factors. The models are illustrated in equations (1)-(4).

$$\log it\left\{\frac{p(y_{h_1}=1)}{1-p(y_{h_1}=1)}\right\}=\beta_{01}+\sum_{j=1}^{3}\beta_{j1}x_{j,1} \quad (1)$$

$$\log it\left\{\frac{p(y_{h_2}=1)}{1-p(y_{h_2}=1)}\right\}=\beta_{02}+\sum_{j=1}^{11}\beta_{j2}x_{j,2} \quad (2)$$

$$\log it\left\{\frac{p(y_{h_3}=1)}{1-p(y_{h_3}=1)}\right\}=\beta_{03}+\sum_{j=1}^{11}\beta_{j3}x_{j,3} \quad (3)$$

$$\log it\left\{\frac{p(y=1)}{1-p(y=1)}\right\}=\beta_0+\beta_1x_{i1}+\beta_2x_{i2}+\cdots+\beta_mx_{im} \quad (4)$$

Results

The data show that across all the immunization vaccines received by the children, the prevalence was consistently higher among the rich women than the poor. While 38.6% of the children of the rich received complete immunization, only 5.0% of the poor did. About 64.2% and 49.6% children of the rich women received BCG and DPT 3 compared with 15.9% and 8.7% observed among the children of the poor respectively. Also, 57.9% vs 17.8% and 61.2% vs 52.1% of the children of mothers who belong to rich and poor wealth category received oral polio and polio 3 respectively. Approximately, 56% of the children of the rich women had been immunized against measles whereas only 17.1% of the poor women received the vaccine. Complete DPT was least taken by the children across the two wealth categories, while oral polio (17.8%) was mostly taken by the children of the poor, BCG (64.2%) was mostly received by the children of the rich.

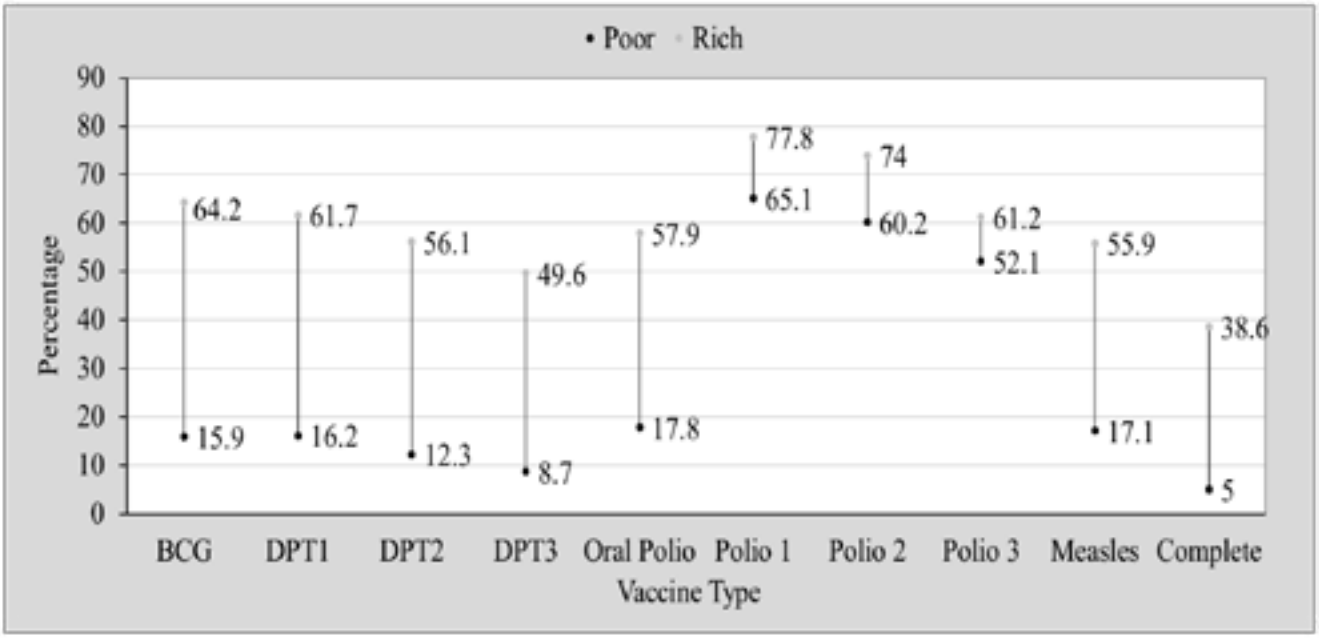

Figure 1: Prevalence of immunization by household wealth among children aged 12-23 months in Nigeria (NDHS, 2013)

NDHS: Nigeria Demographic Health and Survey

The distribution of the women by household wealth status who provided information on the immunization status of their children aged 12-23 months are as shown in Table 1 below. The age distribution shows that women in age group 15-24 years constituted the highest proportion of women from households with poor wealth (31.5%). Although, in the two wealth categories, there was an equitable distribution of women in different age groups. It is striking that 87.7% of women in poor wealth category do not have any formal education compared with 30.8% of those in rich wealth class. While 51.8% of rich class women had at least secondary education, only 3.1% was observed among women in poor wealth class. Eighty four percent and 73.3% of the women in poor and rich wealth class respectively, reported that their husband/partner alone has a final decision on their health care. In terms of the pre-natal attendance of the women during the pregnancy of the investigated children, 64.2% and 9.6% of the poor and rich respectively did not seek any ante-natal care.

Table 1: Percentage distribution of the respondents by background characteristics (NDHS, 2013)

Background characteristics	Poor		Rich	
	Frequency	%	Frequency	%
Total	3349	100.0	730	100.0
Age				
15-24	1054	31.5	173	23.7
25-29	866	25.9	189	25.9
30-34	588	17.6	174	23.8
35-49	840	25.1	194	26.5
Child's birth order				
1st Birth	489	14.6	113	15.4
2-3	931	27.8	216	29.6
4-5	802	24.0	199	27.2
6+	1126	33.6	202	27.7
Religion				
Christianity	172	5.1	153	20.9
Islam	3147	94.0	575	78.8
Others	30	0.9	2	0.3
Media Access				
None	1926	57.5	60	8.2
Low	1266	37.8	223	30.5
Medium	153	4.6	331	45.3
High	4	0.1	117	16.0
Level of Education				
No education	2938	87.7	225	30.8
Primary	309	9.2	127	17.4
Secondary	99	3.0	287	39.4
Higher	2	0.1	91	12.4
Working status				
No	1403	41.9	258	35.4
Yes	1945	58.1	472	64.6
Husband/Partner's level of education				
No education	2515	75.1	145	19.9
Primary	505	15.1	71	9.8
Secondary	277	8.3	260	35.6
Higher	51	1.5	254	34.8
Decision on health care				
Respondent alone	33	1.0	39	5.4
Respondent and husband/partner	494	14.7	156	21.3
Husband/partner alone	2822	84.3	535	73.3
Ethnicity				
Hausa/Fulani	2628	78.5	465	63.6
Other tribes	721	21.5	265	36.4
Pre-natal Attendant				
None	2148	64.2	70	9.6
Semi-skilled	284	8.5	34	4.6
Skilled	916	27.4	626	85.8
Place of Delivery				
Home	3120	93.2	392	53.7
Health Facility	229	6.8	338	46.3

In Figure 2, the data shows that 20.8% of children from rich households did not receive any immunization as against 40.6% of children of women from poor households. Higher proportion of children of poor women (54.4%) had incomplete immunization compared with 40.6% of women who belong to rich households. The gap between the children of women who received complete immunization and that of the poor was 33.6% (38.6% vs 5.0).

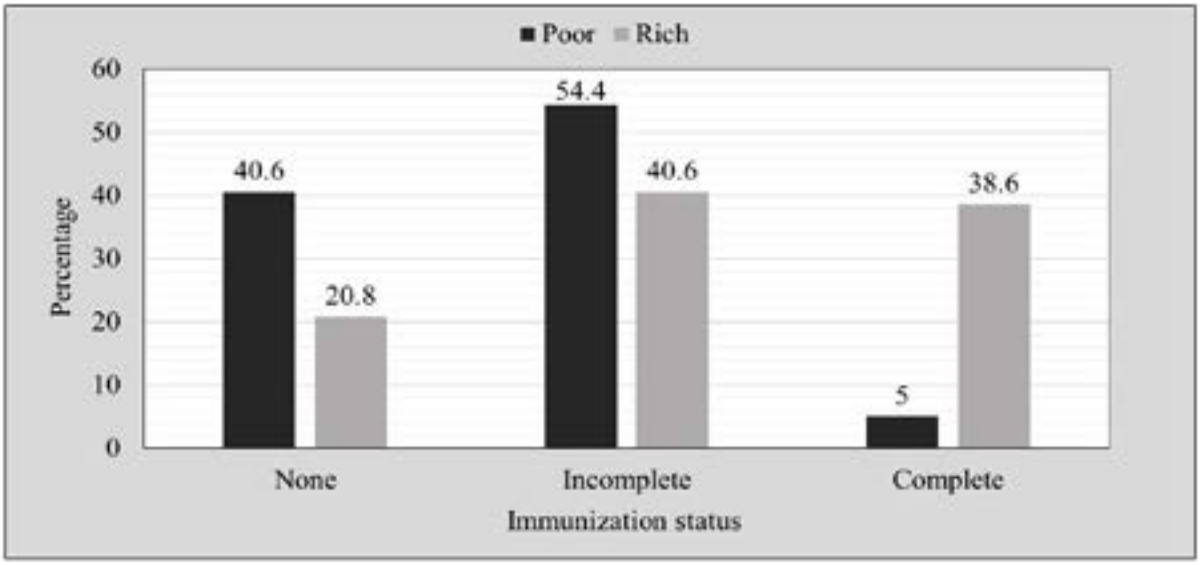

Figure 2: Percentage distribution of children aged 12-23 months by immunization status according to household wealth (NDHS, 2013)

NDHS: Nigeria Demographic Health and Survey

The data depicts that mothers in the youngest age group reported least coverage of childhood immunization in the two wealth classes and the coverage was more pronounced among the children of Christian mothers than their Muslim counterparts. About 25.6% of Christians in the poor wealth class had fully immunized their children compared with only 3.8% among the Muslims. Similar pattern was observed for the rich class but with much higher prevalence (78.0% and 28.2% among the children of Christians and Muslim respectively). While only 3.6% of children of women with no formal education among the poor class had received complete immunization, 18.5% was reported among the rich class. Among mothers with at least secondary education, 20.8% of the children of the poor and 51.2% of the rich had complete immunization. However, in the two classes, the data showed that an increase in level of education was associated with increasing childhood immunization level. The percentage of childhood immunization was higher among the working class women than those who are not working for the two wealth groups.

Table 2: Percentage distribution of children aged 12-23 months by immunization status according to background characteristics (NDHS, 2013)

Background characteristics	Poor			Rich		
	Complete immunizn	Total women	χ^2-value (p-value)	Complete immunizn	Total women	χ^2-value (p-value)
Total	5.0(162)	3255		38.6(274)	710	
Mother's age			22.0**			13.8*
15-24	3.7(38)	1023	(0.001)	27.7(46)	166	(0.031)
25-29	5.8(49)	843		44.4(83)	187	
30-34	4.4(25)	574		42.3(71)	168	
35-49	6.0(49)	815		39.2(74)	189	
Child's birth order			19.7**			17.3**
1st Birth	3.4(16)	473	(0.003)	44.4(48)	108	(0.008)
2-3	5.4(49)	912		38.4(81)	211	
4-5	4.9(38)	783		46.4(90)	194	
6+	5.4(59)	1088		27.9(55)	197	
Religion			167.7***			125.6***
Christianity	25.6(43)	168	(<0.001)	78.0(117)	150	(<0.001)
Islam	3.8(117)	3056		28.2(157)	557	
Others	6.9(2)	29		0.0(0)	2	
Media Access			91.5***			88.6***
None	3.5(65)	1883	(<0.001)	10.2(6)	59	(<0.001)
Low	6.1(74)	1218		29.4(63)	214	
Medium	14.7(22)	150		43.0(139)	323	
High	25.0(1)	4		57.5(65)	113	
Level of Education			128.3***			79.1***
No education	3.6(102)	2850	(<0.001)	18.5(40)	216	(<0.001)
Primary	12.9(39)	303		36.3(45)	124	
Secondary +	20.8(21)	101		51.2(189)	369	
Working status			78.3***			38.6***
No	2.8(38)	1371	(<0.001)	26.5(67)	253	(<0.001)
Yes	6.5(123)	1883		45.3(207)	457	
Husband/Partner's level of education			169.8***			35.6***
No education	2.9(71)	2446	(<0.001)	19.7(28)	142	(<0.001)
Primary	7.4(36)	487		39.4(28)	71	
Secondary+	17.1(55)	321		44.1(219)	497	
Decision on health care			41.9***			56.4***
Respondent alone	6.2(2)	32	(<0.001)	80.0(32)	40	(<0.001)
Respt.& partner	10.0(48)	481		53.0(79)	149	
Partner alone	4.0(111)	2741		31.3(163)	520	
Ethnicity			144.0***			50.2***
Hausa/Fulani	3.4(87)	2546	(<0.001)	28.8(129)	448	(<0.001)
Other tribes	10.6(75)	709		55.6(145)	261	
Pre-natal Attendant			204.8***			104.6***
None	1.3(28)	2094	(<0.001)	4.6(3)	65	(<0.001)
Semi-skilled	11.3(31)	274		28.1(9)	32	
Skilled	11.5(102)	886		42.8(262)	612	
Place of Delivery			76.8***			90.4***
Home	4.1(125)	3031	(<0.001)	23.0(87)	379	(<0.001)
Health Facility	16.5(37)	224		56.5(187)	331	

The unadjusted model showed that the likelihood of complete childhood immunization receipt was 12.0(C.I=9.66 -14.97, p<0.001) times higher among the children of the rich than the poor. The analysis result as shown in Table 3 consists of 4 models. In the first model, the likelihood of receiving complete immunization was 3.8 (C.I=2.94 - 4.95, p<0.001) times higher among children of mothers from rich homes than those from poor homes. The model 2 was constructed based on information from the poor households. In this model, variables like religion, media access, work status, husband's education, ethnicity, prenatal attendants and delivery place were identified

as the predictors of complete childhood immunization. Similar to model 2, the third model was solely based on information from the women from the rich households. Age, religion, media access, prenatal attendants and delivery place were found as the predictors of complete childhood immunization among the children of women from the rich class.

The last model is the full model where all the variables, wealth class inclusive were introduced into the regression model to see how others variables influence the relationship between wealth class and complete immunization among children age 12-23 months in the study area. The data shows that wealth class was an important predictor of full immunization coverage in the study area and the chances of complete immunization was (AOR=1.95; C.I=1.35-2.80, p<0.001) times higher among the children of the rich than that of the poor. The identified factors important in this differential between the childhood immunization of the rich and the poor were age, religion, media access, working status, husband's education, prenatal attendants and delivery place.

Table 3: Multiple logistic regression model of factors predictors of complete immunization among children aged 12-23 months according to background characteristics (NDHS, 2013)

Background characteristics	Model 1	Model 2	Model 3	Full model
	AOR(95% C.I)	AOR(95% C.I)	AOR(95% C.I)	AOR(95% C.I)
Mother's age				
15-24		1	1	1
25-29		1.73(0.99-3.01)	2.38(1.27-4.46)**	1.95(1.29-2.93)**
30-34		1.31(0.65-2.63)	1.61(0.77-3.34)	1.42(0.87-2.32)
35-49		1.80(0.86-3.72)	2.82(1.21-6.55)*	2.08(1.21-3.57)**
Child's birth order				
1st Birth		1	1	1
2-3		1.21(0.62-2.34)	0.71(0.37-1.36)	0.92(0.58-1.43)
4-5		0.95(0.43-2.06)	0.73(0.34-1.54)	0.83(0.49-1.38)
6+		0.96(0.41-2.26)	0.49(0.19-1.21	0.69(0.38-1.26)
Household Wealth				
Poor	1			1
Rich	3.82(2.94-4.95)***			1.95(1.35-2.80)***
Religion				
Christianity		1	1	1
Islam		0.52(0.28-0.96)*	0.19(0.09-0.37)**	0.31(0.20-0.48)***
Others		1.21(0.26-5.66)		0.71(0.15-3.20)
Media Access				
None		1	1	1
Low		1.61(1.09-2.37)*	1.30(0.49-3.37)	1.59(1.12-2.24)**
Medium		2.99(1.64-5.42)***	1.97(0.76-5.02)	2.46(1.59-3.78)***
High		0.83(0.04-15.62)	3.08(1.09-8.69)*	3.49(1.90-6.40)***
Level of Education				
No education		1	1	1
Primary		1.16(0.71-1.87)	1.44(0.78-2.64)	1.24(0.85-1.80)
Secondary +		0.97(0.48-1.96)	1.41(0.79-2.48)	1.12(0.74-1.70)
Working status				
No		1	1	1
Yes		1.68(1.11-2.53)*	1.40(0.93-2.10)	1.59(1.19-2.11)**
Husband/Partner's level of education				
No education		1	1	1
Primary		1.15(0.72-1.84)	1.47(0.69-3.12)	1.24(0.84-1.83)
Secondary+		2.42(1.50-3.89)***	0.99(0.55-1.77)	1.51(1.04-2.19)*
Decision on health care				
Respondent alone	1	1	1	1
Res..& partner	0.53(0.28-0.98)*	1.45(0.29-7.08)	0.48(0.18-1.28)	0.58(0.28-1.19)
Partner alone	0.26(0.14-0.47)***	1.35(0.28-6.48)	0.43(0.16-1.16)	0.53(0.25-1.07)
Ethnicity				
Hausa/Fulani		1	1	1
Other tribes		1.85(1.17-2.91)**	0.75(0.44-1.26)	1.24(0.88-1.75)
Pre-natal Attendant				
None	1	1	1	1
Semi-skilled	6.24(3.77-10.31)***	5.31(2.97-9.46)***	3.33(0.77-14.31)	4.91(2.89-8.32)***
Skilled	7.98(5.34-11.91)***	5.76(3.64-9.11)***	5.06(1.58-16.14)**	5.71(3.75-8.67)***
Place of Delivery				
Home	1	1	1	1
Health Facility	2.57(1.98-3.33)***	1.62(1.01-2.57)*	1.95(1.30-2.99)**	1.77(1.31-2.37)***
-2loglikelihood	***1919.4432***	***1013.413***	***728.529***	***1768.581***
Nagelkerke R^2	***0.377***	***0.247***	***0.359***	***0.437***

******Significant at 0.1%; **Significant at 1.0%; *Significant at 5.0%; NDHS: Nigeria Demographic Health and Survey***

Discussion

Clearly evident in this study and which cannot be under-estimated is the association of household wealth with child immunization status. In this perspective, the prevalence of complete immunization was found to be considerably higher among children of the rich compared to the poor. This finding substantiates the outcome of previous studies.[4,6] An implication that being rich is protective of complete immunization in the core-North Nigeria and consequently better health – a viscous cycle that could be attributed to underlying pervasive structural inequities and social determinants of health in existing literature.[24] These findings also establish the existence of health disparities as a result of differences in wealth status in Northern Nigeria. Health disparities/inequalities has been a topic of concern and debate for decades now-described succinctly as differences in health between people with different positions in a socioeconomic hierarchy; not only unnecessary and avoidable but, also considered unfair and unjust.[25,26] The evident divergence observed with immunization coverage in this study calls attention to the persistent health disparities that exist between poor and rich households in Northern Nigeria.

Optimizing immunization particularly in Northern Nigeria has been daunting due to several factors. Such factors that contribute to this uphill task include the literacy level as evidenced by this study and validating literature.[12,27] Association of household wealth status with completion of immunization as observed with richer households compared to poorer households was significant for both educational status of respondents' mothers and spouse's educational status. This corroborates the finding from another study.[10]

Religion, media access, prenatal attendants and place of delivery were identified as common predictors of complete immunization among the children of the poor and rich women. These factors have been identified in previous studies as essential to complete immunization among children age 12-23 months.[4,6,10] The direction and pattern of the relationship of the factors and complete childhood immunization are similar to what exists in literature.[4,6,10] However, in addition to these factors, other factors were established to be specific to the poor and rich households. Maternal age is a predictor of complete immunization among the rich but not the poor with children of the younger women less likely to receive complete immunization than the children of the older women. Reduction in the odds of child vaccination among younger women has been documented in earlier studies.[4,6] Experience of older women in childcare provision and knowledge of the benefits of immunization with increasing age are likely possible reasons for this finding. Maternal age which was found to be an insignificant factor among the poor might be a result of dominance of women with no formal education among the poor as observed in this study. The study further showed that, work status, husband's education and ethnicity are the determinants of complete child immunization that are peculiar to the poor. These outcomes are expected since the majority of the rich women who participated in this study are literate, and education is imperative to reduction in the ethnic and husband's education effect on child immunization.

Notably, irrespective of the wealth class, our study demonstrates the relative importance of men as major players with respect to decision making on health related matters. This offers credence to some studies that have been conducted in Northern Nigeria[28]; however refutes literature as men's involvement and decision making was poor in SouthWestern Nigeria.[29,30] The relative increase in involvement of Northern Nigerian men with decision making for health issues may be explained by the subservient roles expected of women which is still deeply entrenched in the cultural values of the Northern sect.[31,32] Victoria argues succinctly for the need to consider equity issues very seriously when planning for scale up of interventions relating to immunization for the households in poorest wealth quintiles[33], if these vulnerable and socially dis-advantaged populations are to be effectively reached and the "inverse care law" is to be halted and reversed.

The findings from this study ought to be considered in view of the noting the following limitations.

Limitations

First, since our study was conducted as a secondary analysis from a national data set, the authors of this research had no way of ensuring or verifying the authenticity and rigor with ensuring the quality of the data during its collection. Secondly, the study results were generated from a DHS survey which does not collect information specific to income and expenditure. Income and expenditure spe-

cific questions are indicators used to capture wealth index more appropriately. Instead, asset based wealth profiles that are generated from this study served as a proxy for determining and classifying the households into wealth and non-wealthy households respectively, which might have been subject to a minimal level of bias.[34]

Despite the limitations, the use of the National Demographic Health Survey, a nationally representative and largedata set remains the strength of this study.

Program and policy implications

The World Health Organization (WHO) has substantiated the focus on improving the health of the most vulnerable and reducing inequalities between population subgroups by stating that "the objective of good health is twofold: the best attainable average level and the smallest feasible differences among individuals".[35] In view of this, several factors have been implicated as factors underlying health disparities which could be supply or demand oriented factors.[36] Though, a bit problematic to attribute the disparities with utilization of immunization among poor and rich households to supply or demand side factors, it is important to proffer holistic approaches when formulating policies that not only takes into cognizance the supply and demand factors but also the individual and more complex underlying contextual factors as relate to the household wealth. Some factors established by literature to contribute to such disparities range from barriers to access, underestimation of personal risk and misunderstanding of vaccination risks to mistrust in the health care system.[37] Notable myths that are propagated against benefits of immunization, such as allegations that the polio vaccination campaign was being used for the purpose of depopulating developing countries,[38] should be considered and properly addressed in policy formulation at every tier of the government. The impact of population densities in masking or diluting the effects of mass immunization campaigns is equally very pertinent in the formulation of a feasible, sustainable and equitable immunization policy.

Proposed strategies to minimize the disparities between the rich and poor that can be adopted have been summarized.[38] Nonetheless, special attention should be accorded to culture and dynamics of our local setting. These include: (1) Changes to health care system structural factors that eliminate access barriers. (2) Education to increase awareness and improve demand for vaccines. (3) Participation of community-based organizations to assess local needs and design responsive solutions (4) Support with community financing in form of fee waivers implemented through health cards, micro-credit schemes, vouchers, conditional cash transfers[37] can help to provide different degrees of insurance against unexpected expenditures and thus reducing demand barriers for poorer households and its accompanying inequalities considerably.

Conclusion

This study exhibited that health disparities still largely occur that inhibit significantly the completion of immunization between the poor and rich households. Complete immunization was higher among the children of the rich than the poor. These disparities are avoidable, unfair and preventable. Feasible and sustainable policies that take into account dynamics of the local context and culture are advocated for to enable elimination of disparities between the rich and poor households in Nigeria at large. Household wealth is a crucial element to complete immunization among children. It is therefore imperative for policy makers and programme managers to implement effective interventions that consider household wealth as a strategy for full immunization coverage in Nigeria.

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Competing interests

None declared.

Ethical approval

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sought from the respondents and granted before the interview was conducted. The respondents were assured of the anonymity and confidentially of the information they provided.

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