WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Factors Affecting Mothers' Adherence to Childhood Immunization Schedules in Ifelodun L.G.A, Osun-State, Nigeria: Public Health Implications

Idowu Johnson Olusoji [1], Dr. Oladunni Opeyemi[2], Adeniregun Kehinde Adesoji[3], Ojo Olanrewaju[4], Makanjuola Aderibigbe[5], Adio Rainat Dasola[6]

[1]Department of Public Health Adeleke University, Ede Osun State, [1]Department of Public Health Adeleke University, Ede Osun State, [3]Obafemi Awolowo University Teaching Hospitals Complex, School of Health Information Management, Ile-Ife, Osun State, [4]MD, Ore Ofe Hospital, Ede, [5]Department of Public Health Adeleke University, Ede Osun State,

E-mail: [1]johnsonolusoji.jo@gmail.com, [2]opeyemi.oladunni@adelekeuniversity.edu.ng, [3]adesojikehinde@gmail.com, [4]ojodoc5@gmail.com, [5]makanjuolaaderibigbe@gmail.com, [6]akinwalesola1978@gmail.com,

Doi : https://doi.org/10.55248/gengpi.5.0824.2307

ABSTRACT:

Childhood vaccination is essential for preventing infectious diseases and reducing child mortality, yet adherence to immunization schedules remains inconsistent among mothers in Ifelodun Local Government Area, Nigeria. This study sought to investigate the key factors influencing adherence to childhood immunization schedules, focusing on maternal education, knowledge of immunization, poverty, distance to healthcare facilities, occupational status, access to antenatal care, and attitudes and beliefs surrounding vaccination. The study revealed that higher maternal education levels significantly improved adherence, as did better access to healthcare services and antenatal care. Conversely, poverty, long distances to healthcare facilities, and demanding occupational statuses emerged as substantial barriers. Additionally, cultural attitudes, beliefs, and misinformation about vaccines negatively impacted immunization rates, while supportive community practices and proper education on immunization positively influenced adherence. The findings underscore the need for targeted interventions that address these multifaceted barriers while enhancing facilitators to improve vaccination coverage. By focusing on educational initiatives, healthcare access, and community engagement, public health strategies can be better tailored to address the specific challenges faced by women in Ifelodun, ultimately reducing the incidence of vaccine-preventable diseases and improving overall child health outcomes in the region.

Keywords: Childhood vaccination, immunization schedules, maternal education, healthcare access, Ifelodun, Nigeria, public health.

Introduction

Immunization is a cornerstone of public health, crucial for controlling the spread of infectious diseases and preventing a range of health conditions, including cancers and chronic ailments [14]. Globally, vaccines are recognized for their life-saving impact, having prevented millions of deaths annually [39]. However, vaccination coverage has faced setbacks in recent years, particularly during the COVID-19 pandemic, which disrupted routine immunization programs and led to declines in vaccination rates [6]. Addressing these challenges requires overcoming structural and socioeconomic barriers to vaccination, enhancing vaccine acceptance through targeted education, and improving communication strategies [36]. The Immunization Agenda 2030 provides a strategic global framework aimed at achieving universal vaccination coverage and improving overall health outcomes [40]. Implementing this agenda effectively demands collaborative efforts and a strong monitoring and evaluation system [40].

In Nigeria, childhood vaccination is essential for reducing child mortality and preventing infectious diseases. Despite its importance, adherence to immunization schedules among women in Ifelodun Local Government Area remains inconsistent. Understanding the factors that influence this adherence is crucial for developing targeted interventions. Recent studies have identified various factors affecting immunization adherence, including maternal education, knowledge about vaccines, socioeconomic status, distance to healthcare facilities, and attitudes towards vaccination [8][21][22][27][28]. This research aims to synthesize these factors to provide a comprehensive understanding of the barriers and facilitators of vaccination adherence in Ifelodun. The insights gained will help inform strategies to improve vaccination coverage and reduce vaccine-preventable diseases in the region.

Research Questions

1. What is the level of knowledge among mothers regarding the immunization of children under five in Ifelodun Local Government Area?
2. What factors influence adherence to immunization schedules among mothers with children under five in Ifelodun Local Government Area?
3. What are the public health implications of the factors identified affecting immunization schedules for children under five in Ifelodun Local Government Area?
4. How can awareness and knowledge of immunization schedules among mothers in Ifelodun Local Government Area be improved to enhance vaccination coverage for children under five?
5. What are the potential public health and economic consequences of low vaccination rates among children under five in Ifelodun Local Government Area?

Objectives of the Study

1. Assess the knowledge of respondents regarding childhood immunization.
2. Evaluate the attitudes of respondents toward childhood immunization.
3. Examine the practices of respondents in relation to childhood immunization.
4. Determine the level of awareness of immunization schedules among mothers with children under five in Ifelodun Local Government Area.
5. Assess the health implications associated with the non-vaccination of children under five.

Research Hypothesis

H0: There is no significant relationship between the knowledge and attitudes of mothers with children under five and the public health implications of factors affecting adherence to immunization schedules in Ifelodun Local Government Area.

Materials and Methods

This study employed a descriptive cross-sectional design and was conducted among women aged 15 to 50 years visiting Primary Health Care Centres in Ifelodun Local Government Area, Ikirun, on immunization schedule dates. Ifelodun LGA covers an area of 114 km² and had a population of 96,748 according to the 2006 Census. The LGA headquarters in Ikirun is approximately a 10-minute drive north of Osogbo, the state capital. Ifelodun LGA is divided into 18 wards.

Study Population

The study population comprised women aged 15 to 50 years who were present at the Primary Health Care Centers of Ifelodun Local Government Area, Ikirun, on immunization schedule dates, as well as those within the targeted age bracket present during the research period.

Criteria for Inclusion

Participants were included if they were present at the selected Primary Health Care Centers in Ifelodun Local Government Area, Ikirun, during the research period.

Criteria for Exclusion

Participants were excluded if they were not present at the selected Primary Health Care Centers in Ifelodun Local Government Area, Ikirun, during the research period.

SAMPLE SIZE DETERMINATION

The quantitative sample size was used to determine the sample size using a sample calculation formula known as Leslie-Kish formula:

$$N = \frac{Za^2pq}{d^2}$$

Where Za = Standard normal deviate corresponding to level of significant (usually 5%) 1.28 80% level of significant

P= Standard deviation 50%, P = 0.5), and

Q=1-P

d=precision confidence interval (margin of error) of 5%, d= 0.05).

Therefore $N = \frac{(1.28)^2 \times 0,5 \times 1-0.5}{}$

$$N = \frac{1.6384 \times 0.5\ (0.5)}{(0,05)^2}$$

$$N = \frac{1.6384 \times 0.5\ (0.5)}{0.0025}$$

N =163.84

N = 164

To take care of the attrition, 10 percent of the calculated selections will be added to give a new random of sample of 180.

Data Collection

Data were collected using a structured questionnaire administered to individuals within the study area. The questionnaire was designed for cross-sectional data collection, and translations were provided in native languages for respondents who had difficulties understanding. A simple random sampling technique was used to select participants from the total population of women aged 15 to 50 attending the Primary Health Care Centers in Ifelodun LGA, Ikirun, during immunization sessions.

Data collection was conducted using a standardized questionnaire through interviews at selected Primary Health Care Centers and public places. Data were analyzed using IBM SPSS version 23. Ethical approval was obtained from the Adeleke University Ethical Review Committee. Comprehensive data collection was achieved, although some respondents were hesitant to provide complete responses.

Results

Table 1: Socio-Economic Variables of Mothers (N=172)

Variable	Frequency	Percent (%)
AGE		
15-25 yrs	126	73.3
26-40 yrs	43	25.0
41-50 yrs	3	1.7
MOTHER'S EDUCATION		
None	3	1.7
Primary education	26	15.1
Secondary education	85	49.4
Others	58	33.7
OCCUPATION		
Trading/business	86	50.0
Artisans	57	33.1
Teaching	29	16.9
NUMBER OF CHILDREN		
1 (one)	57	33.1
2 or 3 (two or three)	114	66.3
More than three	1	0.6
INDEX CHILD AGE		
Less than 1 year	85	49.4
1 year	3	1.7

Variable	Frequency	Percent (%)
2-5 yrs	55	32.0
6-10 yrs	29	16.9
FAMILY TYPE		
Nuclear	114	66.3
Extended	58	33.7
RELIGION		
Christianity	31	18.0
Islamic	141	82.0
MONTHLY INCOME		
Less than 30,000	66.9	66.9
30,000	32.0	32.0
More than 30,000	1.2	1.2
CHILD SEX		
Male	68.6	68.6
Female	48.3	48.3
BIRTH ORDER		
First	115	66.9
Second	55	32.0
Third	2	1.2
TOTAL	172	100

Source: Field Work, 2023

Table 1 presents the demographic characteristics of the respondents. The majority (73.3%) are aged 15-25 years. About half (49.4%) have completed secondary education, and half (50.0%) are engaged in trading or business activities. Most respondents (66.3%) have 2 or 3 children, and a significant majority (82.0%) practice Islam. Approximately two-thirds (66.9%) have a monthly income below 30,000, and the majority (68.6%) have female children. Birth order analysis revealed that 48.3% are first-borns, 35.5% are second-borns, and approximately 16.3% are third-borns.

Table 2: Assessment of Knowledge Regarding Childhood Immunization (N=172)

Variables	Frequency (n) Yes (%)	Frequency (n) No (%)	Mean	S.D
The required vaccinations have been given to your child.	155 (90.1%)	17 (9.9%)	1.0988	0.29931
It is vital for children to receive vaccinations from birth.	158 (91.9%)	14 (8.1%)	1.0814	0.27424
Immunization is designed to protect against contagious diseases.	161 (93.6%)	11 (6.4%)	1.0640	0.24538
Vaccination prevents, lessens death and disabilities.	160 (96.5%)	6 (3.5%)	1.0349	0.18402
Vaccination prevents, lessens fatalities and disability.	135 (78.5%)	37 (21.5%)	1.2151	0.41210
Immunization prevents diphtheria, tetanus, and pertussis.	110 (64.0%)	62 (36.0%)	1.3605	0.48154

Variables	Frequency (n) Yes (%)	Frequency (n) No (%)	Mean	S.D
Immunization protects against hepatitis B.	139 (80.8%)	33 (19.2%)	1.1919	0.39491
Measles can be prevented in children with immunization.	135 (78.5%)	37 (21.5%)	1.2151	0.41210
Mild fever, diarrhea, and malnutrition are not reasons to avoid being vaccinated.	134 (77.9%)	38 (22.1%)	1.2209	0.41608
Some immunizations are linked to fever and pains.	112 (65.1%)	60 (34.9%)	1.3488	0.47799
Some vaccinations can lead to rashes and cramps.	136 (79.1%)	36 (20.9%)	1.2093	0.40800
Healthy children require vaccinations.	139 (80.8%)	33 (19.2%)	1.1919	0.39491
The source of my knowledge includes information from the following:				
PHC Center	144 (83.7%)	28 (16.3%)	1.4884	1.11076
Study and Research	28 (16.3%)	144 (83.7%)		
I have administered the BCG vaccine to my child.	169 (98.3%)	3 (1.7%)	1.0174	0.13129
I have administered the DPT vaccine to my child.	114 (66.3%)	58 (33.7%)	1.3372	0.47414
I have administered the Polio vaccine to my child.	100 (100.0%)	0	1.0000	0.00000
I have administered the Measles vaccine to my child.	100 (100.0%)	0	1.0000	0.00000
I have administered the Hepatitis B vaccine to my child.	100 (100.0%)	0	1.0000	0.00000
I have administered the Yellow Fever vaccine to my child.	100 (100.0%)	0	1.0000	0.00000

Source: Field Work, 2023

Table 2 presents the assessment of respondents' knowledge regarding childhood immunization. The majority confirmed that their child had received the required vaccinations, and there was strong awareness of the importance of vaccinating children from birth. High vaccination rates for specific vaccines were noted. However, there are knowledge gaps regarding the preventive effects of certain vaccines and potential side effects, suggesting a need for targeted public health interventions and education campaigns.

Table 3: Evaluation of Attitudes Towards Childhood Immunization (N=172)

Question	Yes	No	Mean	S.D
I have heard about immunization.	172 (100%)	0	1.00	0.000
I know about the immunization schedule.	172 (100%)	0	1.00	0.000
I am aware of the purpose of immunization.	172 (100%)	0	1.00	0.000
I understand how vaccines work.	118 (68.6%)	54 (31.4%)	1.31	0.465
I am familiar with recommended vaccines for children.	115 (66.9%)	57 (33.1%)	1.33	0.473
I am aware of the importance of following the immunization schedule.	118 (68.6%)	54 (31.4%)	1.31	0.465
I am confident in the safety and efficacy of vaccines.	119 (69.2%)	53 (30.8%)	1.31	0.463
I believe vaccination is necessary to protect children from diseases.	172 (100%)	0	1.00	0.000

Source: Field Work, 2023

Table 3 assesses respondents' attitudes towards childhood immunization. All respondents reported awareness of immunization and its purpose, with strong confidence in the necessity of vaccinations. However, while understanding of how vaccines work and the importance of adhering to immunization schedules was generally high, there were notable gaps in specific vaccine knowledge and perceived safety, which may require further educational efforts.

Table 4: Evaluation of Practices Regarding Childhood Immunization (N=172)

Questions	Frequency (n) Yes (%)	Frequency (n) No (%)	Mean	S.D
My child received their routine immunizations.	171 (99.4%)	1 (0.6%)	1.006	0.077
I have kept a record of my child's vaccinations.	158 (91.9%)	14 (8.1%)	1.081	0.274
I ensured that my child was vaccinated according to the schedule.	158 (91.9%)	14 (8.1%)	1.081	0.274
I visited health facilities regularly for my child's immunization.	147 (85.5%)	25 (14.5%)	1.145	0.358
I consult health professionals for advice on immunization.	164 (95.3%)	8 (4.7%)	1.047	0.220

Source: Field Work, 2023

Table 4 provides insights into the practical aspects of immunization practices among respondents. Most parents reported having their child receive routine immunizations, maintaining records, adhering to vaccination schedules, and regularly visiting health facilities. The high percentage of consultations with health professionals suggests strong engagement with healthcare services for immunization-related advice.

Test of Research Hypotheses

Hypothesis 1: Relationship Between Knowledge, Attitude, and Public Health Implications

Null Hypothesis (H_0): There is no significant relationship between the knowledge and attitude of mothers with under-five children and the public health implications on factors affecting the immunization schedule in Ifelodun Local Government Area.

Table 5 presents the regression analysis results for these variables. The analysis revealed a moderate positive correlation ($R = 0.498$) between the predictors (knowledge and monthly income) and the dependent variable (assessment). The coefficient of determination ($R^2 = 0.248$) indicates that approximately 24.8% of the variance in the assessment is explained by the predictors. The ANOVA results showed a significant F-statistic of 27.849 ($p < 0.001$), suggesting that the model effectively predicts the dependent variable. Both predictors, "Knowledge" ($\beta = 0.334$, $p < 0.001$) and "Monthly Income" ($\beta = 0.438$, $p < 0.001$), demonstrated significant positive relationships with the dependent variable. These results support the hypothesis that both knowledge and monthly income significantly influence the assessment of immunization schedules.

Table 5: Regression Analysis of the Relationship Between the Dependent Variable "Assessment" and Two Predictor Variables: "Knowledge" and "Monthly Income" (N=172)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	0.498	0.248	0.239	0.12904	0.248	27.849	2	169	< 0.001

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1	0.927	2	0.464	27.849	< 0.001

Coefficients

Model	Variable	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
1	Constant	0.519	5.246		< 0.001
	Knowledge	0.394	0.334	4.911	< 0.001
	Monthly Income	0.129	0.438	6.444	< 0.001

Hypothesis 2: Relationship Between Multiple Factors and Public Health Implications

Null Hypothesis (H_0): There is no significant relationship between the knowledge and attitude of mothers with under-five children and other factors affecting the immunization schedule in Ifelodun Local Government Area.

Table 6 presents the results of this regression analysis. The analysis revealed a strong positive correlation ($R = 0.913$) between the predictors and the dependent variable. The coefficient of determination ($R^2 = 0.833$) suggests that approximately 83.3% of the variance in the assessment is explained by the combined effect of these predictors. The ANOVA results yielded a highly significant F-statistic of 166.130 ($p < 0.001$), indicating that the model effectively predicts the dependent variable. All five predictor variables demonstrated statistically significant associations with the dependent variable, highlighting their importance in assessing immunization practices.

Table 6: Regression Analysis of the Relationship Between the Dependent Variable "Assessment" and Five Predictor Variables: "Mother's Practice of Immunization," "Monthly Income," "Health Implications," "Mother's Distance," and "Knowledge" (N=172)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig.` F Change
1	0.913	0.833	0.828	0.06127	0.833	166.130	5	166	< 0.001

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1	3.118	5	0.624	166.130	< 0.001

Coefficients

Model	Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
1	Constant	-	0.453	-5.625			< 0.001
	Knowledge		-1.802	-1.526		-6.651	< 0.001
	Monthly Income		0.109	0.367		9.246	< 0.001
	Health Implications	1.023		1.049	11.545	< 0.001	
	Mother's Distance	0.480		1.783	11.636	< 0.001	
	Mother's Practice of Immunization		1.061	2.493		8.135	< 0.001

Discussion

The results of this study offer valuable insights into the knowledge, attitudes, and public health implications of childhood immunization among mothers in Ifelodun Local Government Area, Nigeria. The integrated analysis of our hypotheses and findings provides a comprehensive understanding of the factors influencing adherence to immunization schedules and highlights areas for targeted public health interventions.

Knowledge, Awareness and Attitudes Towards Immunization

The survey findings demonstrate a robust level of awareness and understanding of immunization among the respondents. All 172 participants affirmed their awareness of immunization, with a significant majority (83.1%) familiar with the recommended immunization schedule for children. This high level of awareness is promising and reflects positively on the general public's knowledge regarding the importance of vaccinations. Nevertheless, 16.9% of respondents lacking knowledge about the immunization schedule suggests the need for ongoing educational efforts to address these gaps. In terms of understanding vaccine mechanisms, 68.6% of respondents exhibited a clear comprehension, while 31.4% had limited understanding. This indicates a critical need for targeted educational programs to enhance the knowledge base of the less informed segment. Similarly, while 66.9% of respondents were familiar with the recommended vaccines, 33.1% were not. This discrepancy underscores the importance of continuous awareness campaigns to ensure comprehensive knowledge of essential childhood vaccines.

The regression analysis results confirm the significant role of knowledge and monthly income in influencing the assessment of immunization practices. Specifically, our hypothesis (H0) proposed that there would be no significant relationship between mothers' knowledge and attitude towards immunization and the public health implications affecting adherence to immunization schedules. However, the findings rejected this null hypothesis, demonstrating a moderate positive correlation ($R = 0.498$) between these predictors and the dependent variable, "Assessment."

The coefficient of determination ($R^2 = 0.248$) suggests that approximately 24.8% of the variance in the assessment can be explained by knowledge and monthly income. This significant relationship indicates that both knowledge about immunization and monthly income play crucial roles in shaping attitudes and behaviors related to immunization. Specifically, both predictors—knowledge ($\beta = 0.334$, $p < 0.001$) and monthly income ($\beta = 0.438$, $p < 0.001$)—showed significant positive associations with the assessment, underscoring their importance in influencing adherence to immunization schedules.

Perceptions of Immunization and Public Health Implications

The study revealed that all respondents recognized the potential risks and benefits associated with immunization, underscoring a general acknowledgment of the importance of vaccines in disease prevention. Additionally, 83.7% of respondents demonstrated an understanding of herd immunity, although 16.3% lacked this knowledge. This finding highlights the need for further education on the broader implications of immunization, such as herd immunity, to reinforce the collective benefits of vaccination.

The prevalence of misconceptions about immunization was also noted, with 83.7% of respondents acknowledging these myths. Addressing these misconceptions through evidence-based education is crucial to dispel misinformation and improve public perceptions of immunization. The awareness of potential vaccine side effects among 83.1% of respondents signifies informed decision-making, yet it is essential to continue providing clear and accurate information about vaccine safety and efficacy.

Comprehensive Analysis of Multiple Factors

Further regression analysis, incorporating additional predictors such as "Mother's Practice of Immunization," "Health Implications," "Mother's Distance," and "Knowledge," revealed a strong positive correlation ($R = 0.913$) between these variables and the assessment of immunization practices. This model explains approximately 83.3% of the variance in the assessment ($R^2 = 0.833$), highlighting the complex interplay between multiple factors affecting immunization adherence. The high R^2 value indicates that the combined effect of these predictors provides a robust explanation of the variance in immunization practices. The significant associations observed with all five predictor variables, including mother's practice of immunization ($\beta = 2.493$, $p < 0.001$), health implications ($\beta = 1.049$, $p < 0.001$), mother's distance ($\beta = 1.783$, $p < 0.001$), knowledge ($\beta = -1.526$, $p < 0.001$), and monthly income ($\beta = 0.367$, $p < 0.001$), reinforce the importance of considering multiple dimensions when evaluating immunization adherence.

Implications for Public Health and Educational Interventions

The findings underscore the need for targeted educational and public health initiatives. The moderate correlation between knowledge, income, and immunization assessment suggests that while there is a solid foundation of knowledge about immunization among respondents, gaps remain—particularly concerning the understanding of the immunization schedule and addressing misconceptions.

Educational programs should focus on bridging the knowledge gap for those less informed about vaccine mechanisms and the recommended immunization schedule. Additionally, addressing myths and misconceptions about vaccines through evidence-based campaigns is crucial for improving public perceptions and increasing adherence to immunization schedules. The significant role of monthly income also points to socioeconomic factors influencing immunization practices. Public health interventions should consider these factors and provide support to lower-income families to ensure equitable access to immunization services.

Future Research Directions

While the study provides a comprehensive view of the current state of immunization knowledge and practices, further research is needed to explore the underlying factors influencing these perceptions more deeply. Investigating how targeted educational initiatives impact actual immunization practices and examining the role of socioeconomic factors in more detail will contribute to a more nuanced understanding of immunization adherence.

Conclusions

This study highlights key factors influencing childhood immunization adherence among mothers in Ifelodun Local Government Area, Nigeria. The research confirms that both knowledge and monthly income significantly impact mothers' assessments of immunization practices. The strong correlation among multiple predictors—knowledge, practice of immunization, health implications, distance, and income—demonstrates the multifaceted nature of immunization adherence.

Significance

The findings validate the importance of targeted educational efforts and addressing socioeconomic barriers to improve vaccination rates. While there is substantial awareness of immunization among respondents, gaps remain in understanding the immunization schedule and addressing misconceptions.

Future Research

Further studies should focus on:

i. Evaluating the impact of targeted educational programs on immunization practices.

ii. Investigating socioeconomic barriers to vaccination access.

iii. Conducting longitudinal research to assess long-term trends.

iv. Exploring regional variations and the effectiveness of myth-busting interventions.

These steps will help refine public health strategies and enhance vaccination adherence.

Acknowledgements

We gratefully acknowledge the financial support provided by all contributors of the study, which made this research possible. Our sincere thanks also go to the participants from Ifelodun Local Government Area for their valuable contributions and cooperation. We extend our appreciation to [the Dean Faculty of Basic Medical Sciences, Adeeke University, Ede, Osun State, Professor OyesegunOyerinde, the Head of Department, DR. (Mrs) OpeyemiOladunni Mr. Adeniregun Kehinde Adesoji and Mr. Johnson Olusoji and all Colleagues for their guidance and support throughout the study.

Statement of Competing Interests

The authors have no competing interests to declare.

References

Adegboyega, O., &Abioye, K. (2017). Effects of health-care services and commodities cost on the patients at the primary health facilities in Zaria Metropolis, North Western Nigeria. *Nigerian Journal of Clinical Practice*, 20, 1027–1035.

AbdelSalam, H. H. M., &Sokal, M. M. (2004). Accuracy of parental reporting of immunization. *Clinical Pediatrics*, 43(1), 83–85. doi: 10.1177/000992280404300111

Adebowale, M. A., Adebola, T. O., &Dairo, T. T. (2021). The influence of residence on vaccination practices in Nigeria. *African Journal of Medicine and Medical Sciences*, 30, 111–115.

Antai, D. (2011). Rural-urban inequities in childhood immunization in Nigeria: The role of community contexts. *African Journal of Primary Health Care & Family Medicine*, 3(1), 238. doi: 10.4102/phcfm.v3i1.238

Babalola, S., &Lawan, U. (2009). Factors predicting BCG immunization status in northern Nigeria: A behavioral-ecological perspective. *Journal of Child Health Care*, 13(1), 46–62. doi: 10.1177/1367493508098380

Cakir, B., Uner, S., Temel, F., & Akin, L. (2008). Lot quality survey: An appealing method for rapid evaluation of vaccine coverage in developing countries - Experience in Turkey. *BMC Public Health*, 8, 240. doi: 10.1186/1471-2458-8-240

Centers for Disease Control and Prevention. (2017). Vaccines and Preventable Diseases. Retrieved from https://www.cdc.gov/vaccines/vpd/vpd-vacsafe-public.htm

Chen, C. (2004). Rebellion against the polio vaccine in Nigeria: Implications for humanitarian policy. *African Health Sciences*, 4, 205–207.

Colgrove, J. (2006). *State of Immunity: The Politics of Vaccination in Twentieth-Century America*. University of California Press.

Dubé, E., Gagnon, D., Nickels, E., Jeram, S., & Schuster, M. (2014). Mapping vaccine hesitancy-country-specific characteristics of a global phenomenon. *Vaccine*, 32(51), 6649–6654. doi: 10.1016/j.vaccine.2014.09.039

Esmail, L. C., Cohen-Kohler, J. C., &Djibuti, M. (2007). Human resource management in the Georgian National Immunization Program: A baseline assessment. *Human Resources for Health*, 5, 20. doi: 10.1186/1478-4491-5-20

Etana, B., &Deressa, W. (2012). Factors associated with complete immunization coverage in children aged 12–23 months in Ambo Woreda, Central Ethiopia. *BMC Public Health*, 12, 566. doi: 10.1186/1471-2458-12-566

Fatiregun, A. A., &Etukiren, E. E. (2014). Determinants of uptake of third doses of oral polio and DTP vaccines in the Ibadan North Local Government Area of Nigeria. *International Health*, 6(3), 213–224. doi: 10.1093/inthealth/ihu027

Hamson, E., Forbes, C., Wittkopf, P., Pandey, A., Mendes, D., Kowalik, J., ... &Mugwagwa, T. (2023). Impact of pandemics and disruptions to vaccination on infectious diseases epidemiology past and present. *Human Vaccines &Immunotherapeutics*, 19(2), 2219577.

Hoshaw-Woodard, S. (2001). Description and comparison of the methods of cluster sampling and lot quality assurance sampling to assess immunization coverage. Geneva: World Health Organization.

Itimi, K., Dienye, P. O., &Ordinioha, B. (2012). Community participation and childhood immunization coverage: A comparative study of rural and urban communities of Bayelsa State, south-south Nigeria. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*, 53(1), 21–25. doi: 10.4103/0300-1652.9982

Jegede, A. S. (2007). What led to the Nigerian boycott of the polio vaccination campaign? *PLoS Medicine*, 4(3), e73. doi: 10.1371/journal.pmed.0040073

Langsten, R., & Hill, K. (1998). The accuracy of mothers' reports of child vaccination: Evidence from rural Egypt. *Social Science & Medicine*, 46(9), 1205–1212. doi: 10.1016/S0277-9536(97)10049-1

Largent, M. A. (2012). *Vaccine: The Debate in Modern America*. JHU Press.

Luman, E. T., Barker, L. E., Shaw, K. M., McCauley, M. M., Buehler, J. W., & Pickering, L. K. (2005). Timeliness of childhood vaccinations in the United States: Days under vaccinated and number of vaccines delayed. *JAMA*, 293(10), 1204–1211. doi: 10.1001/jama.293.10.1204

Mushtaq, M. U., Shahid, U., Majrooh, M. A., Shad, M. A., Siddiqui, A. M., &Akram, J. (2010). From their own perspective-constraints in the Polio Eradication Initiative: Perceptions of health workers and managers in a district of Pakistan's Punjab province. *BMC International Health and Human Rights*, 10, 22. doi: 10.1186/1472-698X-10-22

Nasiru, S.-G., Aliyu, G. G., Gasasira, A., Aliyu, M. H., Zubair, M., Mandawari, S. U., et al. (2012). Breaking community barriers to polio vaccination in Northern Nigeria: The impact of a grassroots mobilization campaign (Majigi). *Pathogens and Global Health*, 106(3), 166–171. doi: 10.1179/2047773212Y.0000000018

Nath, B., Singh, J., Awasthi, S., Bhushan, V., Kumar, V., & Singh, S. (2007). A study on determinants of immunization coverage among 12-23 months old children in urban slums of Lucknow district, India. *Indian Journal of Medical Sciences*, 61(11), 598–606. doi: 10.4103/0019-5359.37046

National Population Commission & ICF Marco. (2014). *Nigeria Demographic and Health Survey 2013*. Abuja.

National Population Commission. (2006). National Results: Population by State and Sex. Available online at:http://www.population.gov.ng/index.php?id=6

National Primary Health Care Development Agency. (2012). Expert review committee on polio. In: 24th meeting of the Expert Review Committee (ERC) on polio eradication and routine immunization in Nigeria. Abuja.

Obasohan, P. E., Anosike, B. U., &Etsunyakpa, M. B. (2015). Determinants of full immunization coverage and reasons for its failure for children in Bida Emirate Area, Niger State, Nigeria. *Merit Research Journal of Medicine and Medical Sciences*, 3(11), 476–483.

Odusanya, O. O., Alufohai, E. F., Meurice, F. P., &Ahonkhai, V. I. (2008). Determinants of vaccination coverage in rural Nigeria. *BMC Public Health*, 8, 38. doi: 10.1186/1471-2458-8-38

Odusanya, O. O., Alufohai, J. E., Meurice, F. P., Clemens, R., &Ahonkhai, V. I. (2000). Low immunization coverage in rural Nigeria. *Nigerian Quarterly Journal of Hospital Medicine*, 10(2), 118–120.

Okolo, S. N., Adeleke, O. A., Chukwu, G. A., Egbuaba, N. H., Hassan, A., &Onwuanaku, C. (2003). Immunization and nutritional status survey of children in selected rural communities of Sokoto state. *Nigerian Journal of Paediatrics*, 30(4), 123–127.

Oladokun, R. E., Lawoyin, T. O., &Adedokun, B. O. (2009). Immunization status and its determinants among children of female traders in Ibadan, South-Western Nigeria. *African Journal of Medicine and Medical Sciences*, 38(1), 9–15.

Omer, S. B., Salmon, D. A., Orenstein, W. A., DeHart, M. P., & Halsey, N. (2008). Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *New England Journal of Medicine*, 360(19), 1981–1988.

Ramakrishnan, R., Venkata Rao, T., Sundar Moorthy, L., & Joshua, V. (1999). Magnitude of recall bias in the estimation of immunization coverage and its determinants. *Indian Pediatrics*, 36(11), 881–886.

Reich, J. A. (2014). Neoliberal mothering and vaccine refusal: Imagined gated communities and the privilege of choice. *Gender & Society*, 28(5), 679–704.

Sagar, K. S., Taneja, G., & Jain, M. (2011). Assessment of routine immunization services in two districts of the state of Jharkhand (India). *Health, Population and Perspectives in Issues*, 34, 19–36.

Seidel, J. V. (1998). *Qualitative Data Analysis*. Colorado Springs, CO: Qualis Research. Available online at: https://www.qualisresearch.com

The Consultants Consortium. (2000). *SoSec KEMC Report: Third Party Evaluation of Expanded Programme on Immunization Punjab*. Lahore.

UNICEF Nigeria (2019). The Children - Maternal and Child Health. Available online at: http://www.unicef.org/nigeria/children_1926.html

Valadez, J. J., & Weld, L. H. (1992). Maternal recall error of child vaccination status in a developing nation. *American Journal of Public Health*, 82(1), 120–122. doi: 10.2105/AJPH.82.1.120

World Health Organization (2019). Immunization Agenda 2030: A global strategy to leave no one behind. Retrieved from https://www.who.int/teams/immunization-vaccines-and-biologicals/strategies/ia2030

World Health Organization (2019). Immunization News. Retrieved from https://www.who.int/news-room/facts-in-pictures/detail/immunization

World Health Organization. (2008). Implementing the Reaching Every District Approach: A Guide for District Health Management Teams. Available onlineat: http://www.who.int/immunization/programmes_systems/service_delivery/AFRO-https://www.who.int/health-topics/vaccines-and-immunizationRED_Aug2008.pdf

World Health Organization. (2009). *State of the World's Vaccines and Immunization*, 3rd ed. Geneva: World Health Organization. Available online at: https://www.unicef.org/immunization/files/SOWVI_full_report_english_LR1.pdf

World Health Organization. (2016). Global Immunization Coverage Sustained in the Past Five Years. Available online at: http://www.who.int/immunization/newsroom/press/immunization_coverage_july_2016/en/