

Modelling Factors Associated With Attitude Of Mothers Towards Immunization Of Their Children

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Abstract: Immunisation is one of the utmost essential preventive health actions in children's lives. It protects the children against some common infectious diseases. Hence it has a major impact on the well-being status of the populace, as it prevents cases of contagious diseases among the children. Effective vaccines is an important element of immunization programme. It is a collective duty between the period the vaccine is manufactured and the time it is administered. A lot of teenagers were dying while some are disabled due to common diseases like measles, cough, whooping, tuberculosis, tetanus, polio etc, hence, there is need to sensitize the parents towards the immunization of their children. This study therefore, aimed at fitting binary logistic model that will describe the pattern of mother's attitude towards immunisation in Nigeria in order to identify the factors that responsible for the attitudes in Nigeria. Questionnaires were administered to 5000 women in some states in Nigeria to elicit relevant information regarding their general attitudes to child's vaccination. Binary logistic regression was used to analyze the data obtained on Demographic and other factors considered. Results from analyses showed that mothers' locality, place of vaccination, mothers' educational status, age at vaccination, spouses' educational status, mothers' religious beliefs as well as mothers' age group, child's age at birth are all positively associated with attitudes of mothers towards vaccination. Further results finally revealed that donation of gift items to mothers serves as positive inducement towards improving the attitudes of mothers towards immunization of their children.

Keywords: Logistic Modeling, Immunisation, Demographic-Characteristics

I. INTRODUCTION

Immunization is one of the most essential public health interventions and cost effective strategy to reduce childhood morbidity and mortality. It is estimated to prevent between 2 and 3 million deaths each year (WHO, 2012). Despite this fact, vaccine-preventable diseases remain the most common cause of childhood mortality with an estimated three million deaths each year (Olugbenga et al, 2017). Childhood immunization is the initiation of immunity through application of vaccine (WHO, 2008). It is considered important for improving child survival. This is because more than 10 million children in developing countries die every year because they do not access effective interventions such as immunization that could fight common and preventable childhood illnesses (Lee, 2005).

Although, about three quarters of the world's child population is reached with the required vaccines, only half of the children in Sub-Saharan Africa get access to basic immunization (Lee, 2005). Further, in poorer remote areas of developing countries, only one in twenty children have access to vaccination. Immunization against vaccination preventable diseases (VPDs) through the expanded programme of Immunization (EPI) is one of the most economical public health interventions available that contributes extensively to achieving the Millennium Development Goal to reduce the mortality rate of children under five by two thirds between 1990 and 2015 (UNICEF, 2009).

Routine immunization coverage in Nigeria is one of the lowest national coverage rates in the world with 38% for January-December 2005 and 50% January- May 2006 (NPI, 2005; 2006). In recent time, scholars working on child health

in Nigeria have started documenting various factors militating against child survival and ethnic differentials in under-5 mortality in the country (Adedini, et al, 2014).

Moreover, the attitude of mothers towards immunization services is quietly positive and relies on the efficiency of the vaccine to protect against diseases, among respondents who believe that it contains anti-fertility agents, decision making of vaccination of a child lies predominantly on the father and was rejected because of rumors, non-payment or charges and priority accorded to it. Because of the attitude of mothers towards vaccination, thousands of children were dying and some are disable as a result of the some common childhood diseases which are measles, polio, tetanus, whooping cough, tuberculosis e.t.c. These as a result brought about the introduction of immunization, programmed by united Nation children fund (UNICEF, 2009).

The main objective is by establishing immunization programmed that will function smoothing year as part of the solid primary health care system. UNICEF worth with government and partners including the world health organization, the World Bank, the vaccine industry civil society groups, the Gate foundation, Technical health institutes and Research to make full immunization for children health.

VACCINE SCHEDULE

This schedule may vary depending up on where you live, your child's health, the type of vaccine and the vaccines available. Some of the vaccines may be given as part of combination vaccine so that your child gets fever shots.

At Birth: First dose vaccine administer are Hepatitis B vaccine (HBV₀), Bacillu Cal mate Guerin (BCG), Oral Polio Vaccine (OPV₀),

1-2 Months: Second dose vaccine given are Pneumococcal conjugate vaccine (PCV), HBV, Pental

2 Months: Third dose administer are Diphtheria tetanus and pertussis Vaccine (DPT), OPV₂, Pental₂, PCV₂

3 Months: Fourth dose administer are OPV₃, PCV₃, Penta₃

4 Month: Fifth dose given are DPT, PCV

6 Months: Sixth dose administer are, Vitamin A, Measles,

9 Months: Seventh dose given are, Vitamin A₂, Measles₂

6 – 18 Months: Eighth dose given are HBV, IPV (WHO, 2005).

BRIEF HISTORY OF HOW THE IMMUNIZATION INTRODUCED INTO THE COUNTRY

Immunization remains the primary strategy in both the control and prevention of common childhood diseases, particularly in the developing countries. The Expanded programmed on immunization (EPI) was first launched in the country in the year 1978. However due to number of factors that militated against its success such as lack of qualified trained personnel, poor transportation and inadequate equipment. The programmed failed to achieve its objectives (WHO, 2002).

The federal government was undoubted about the initial set back and reintroduced the programmed again with the primary Health care plan (PHC) in August 1987 which

President Ibrahim Babangida announced as the cornerstone entire national population.

Its main stated objectives included accelerated health care personnel development, improved collection and monitoring of health data, ensured availability of essentials drugs in all areas of the country, improved nutrition throughout the country, promotion of health awareness and widespread promotion of vaccines for treatment of childhood diseases infant and children.

Implementation of this mainly through collaboration between the ministry of health and participating Local government councils which received direct grant's from the federal government. The programmed aimed also focused at ensuring that the children under age of 0-2 years were immunized against polio, tetanus, whooping cough, measles, tuberculosis, diphtheria etc. under these programmed pregnant woman were also immunized against the tetanus. This is done to ensure that the rate at which the children are contacting these diseases are reduced and consequently reduced the infant mortality rate (WHO, 2005).

The federal government being noted for her numerous medical problems; a campaign was carried out calculating the nursing mothers on the essence of immunizing their children. Hope rate, due to the problem vaccine supply cold chain and vaccine delivery coverage was low, which impact minimal contribution of 10 percent to 20 percent compared to the population in need of it. The federal ministry of health and UNICEF, to correct identified deficiencies in the previous programmed, a new vaccine distribution based on cold boxes and ice packs was developed after some months from 10 percent to 65 percent which is now functional in all 774 Local government Area in the country as an entry points to primary health care (Babalola, 2009).

In 2005, in Bali Local Government Area of Taraba State, the primary health care was able to provide some gifts to women during vaccination and also advised them that children will not be admitted in nursery and primary school if is not fully vaccinated.

In the first year of the operation in Bali, immunization coverage increase from 35% to 65%. The attitude of mothers towards immunization of their children was set up to achieve some goals which are

- ✓ To achieve 85% immunization coverage of the target population of children from 0-2 years and pregnant women.
- ✓ To reduce by at least 60% of the incidence rate of the childhood diseases.

The State government produced E.P.I equipment through the United Nation International Children Fund (UNICEF) in collaboration with European Union and non-governmental Agency (NGA) while the Local Government provides offices, accommodation, transport, furniture and other materials (UNICEF, 2008).

Therefore, the epidemiological section of the state ministry of health, supply vaccines to the area selected for immunizing children against the diseases, such as federal medical centre (FMC), specialist hospital, primary health care, District unit (P.H.U) etc

II. MATERIALS AND METHOD

Data were collected via interview with the use of data sheets, Questionnaire method and records from Government hospitals. The survey covered all the states in the North Eastern part of Nigeria, which comprises; Taraba, Adamawa, Borno, Gombe, Bauchi and Yobe state. 5,000 married women in some selected local government area of the states were interviewed and the major hospitals in the states were visited. The Questionnaires were administered to the married women who have one or more children from five selected local governments each of the states under study:

The questionnaire containing questions relating to the personal data, geographical and immunization data of each respondents as well as question relating to age, number of children, sex of the child, immunization of children etc. the forms are made short with limited number of questions needed.

A. LOGISTIC REGRESSION

Logistic regression is used to predict a categorical (usually dichotomous) variable from a set of predictor variables. With a categorical dependent variable, discriminant function analysis is usually employed if all of the predictors are continuous and nicely distributed, logit analysis is employed if all of the predictors are categorical, and logistic regression is used if the predictor variable are a mixture of continuous and categorical variable or if they are not nicely distributed [logistic regression makes no assumption about the distribution of the predictor variables]. Logistic regression has been especially popular with medical research in which the dependent variable is whether or not a patient has a disease.

B. INTERPRETING PARAMETERS IN LOGISTIC REGRESSION

For a binary response variable Y which represent the success and failure outcomes 1 and 0.

$$Y = \begin{cases} 1 & \text{if success} \\ 0 & \text{if failure} \end{cases}$$

$$\Pr(Y=1) = \pi \text{ and } \Pr(Y=0) = 1 - \pi$$

$$f(y; \pi) = \pi^y (1 - \pi)^{1-y} = \left[1 - \pi \left(\frac{\pi}{1 - \pi} \right)^y \right]$$

The log odd, called logit has the linear relationship:

$$\log \left(\frac{\pi_i}{1 - \pi_i} \right) = \sum_{k=0}^k \beta_k x_{ik} \quad 1$$

For solving π_i

$$\frac{\pi_i}{1 - \pi_i} = \exp \sum_k \beta_k x_{ik}$$

$$\pi_i = \exp \sum_k \beta_k x_{ik} - \pi_i \exp \sum_k \beta_k x_{ik} \quad 2$$

$$\pi_i = \frac{\exp \sum_k \beta_k x_{ik}}{1 + \exp \sum_k \beta_k x_{ik}} \quad 3$$

C. ODDS RATIO

Odd ratio of an event is the number of those who experience the event divided by the number of those that do not experience the event. If π is the probability of success and $1 - \pi$ is the probability of failure, then the odd of success is the ratio $\Omega = \pi / (1 - \pi)$

The logit model is especially appropriate when the issue of interest is to describe the odds of success or another substantive outcome, or the odds of success faced by one group relative to another. Odds are defined as the ratio of probability of one outcome to another.

If π is the probability of success and $1 - \pi$ is the probability of failure, then the odd of success is the ratio

$$\Omega = \frac{\pi}{1 - \pi} \quad 4$$

For the logit transformation, the quantity will be recognized as the antilog of the logit, $\exp \Omega$.

To interpret β , its sign determine whether π is increasing or decreasing. Exponentiating both sides of (1) shows that odds are an exponential function of the explanatory variable X , this provide the basic interpretation for the magnitude of β . In other words, e^β is an odd ratio.

D. LEVEL OF MEASUREMENT OF THE DEPENDENT AND INDEPENDENT VARIABLES

The dependent variable (number of unions) was grouped into nominal categories which satisfies the binary logistic regression requirement for dependent variable. The independent variables are wealth (Rich, Middle, and Poor), religion (Islam, Christianity, and Traditional), partners' education level (No education, Primary, Secondary, and Tertiary), work at home (Away or At home), beating wife when she refuse sex (Yes or No), partner's tired/mood (Yes or No), fertility preference (Fertile, Sterilized, and Not fertile) which are all categorical variables.

III. DATA ANALYSIS

We present the summary of the data collected from the survey conducted on attitudes of mothers towards immunization of their children in table 1. Also, the analyses of the data are reported in the table. Using the approach of binary logistic regression to analyze the data on mothers enrolled their children for immunisation from the General Hospitals of the states' capital. Based on the nature of the data, 21 independent variables (predictors) all categorical were suspected to influence the response variable (mother's attitude). In the course of carrying out of this analysis, SPSS package and R package are being used to analyze the data.

Value Coding

Mother's attitude: $\begin{cases} 1, & \text{if she enrolled her child for immunisation} \\ 0, & \text{if she does not enrolled her child for immunisation} \end{cases}$

Marital Status:

Single: $\begin{cases} 1, & \text{if single} \\ 0, & \text{if otherwise} \end{cases}$

Married: $\begin{cases} 1, & \text{if Married} \\ 0, & \text{if otherwise} \end{cases}$

Divorce: $\begin{cases} 1, \text{if Divorce} \\ 0, \text{if otherwise} \end{cases}$

Widow: $\begin{cases} 1, \text{if widow} \\ 0, \text{if otherwise} \end{cases}$

The rest of predictors were coded accordingly using one category as the reference category and presented in table 1 below

FACTORS		EVER VACCINATED		TOTAL	P-VALUE
		NO	YES		
Marital status	Single	8	31	39	0.004
	Married	16	305	321	
	Divorce	6	56	62	
	Widowed	3	35	38	
Mother's age group	15 or less	3	5	8	0.010
	16-30years	19	267	286	
	31-50years	10	138	148	
	51years and above	1	17	18	
Spouse age group	15 or less	2	14	16	0.328*
	16-30years	16	140	156	
	31-50years	12	220	232	
	51years and above	3	52	55	
Mother's educational status	No educated	9	46	55	0.001
	Primary	5	55	60	
	Secondary	5	161	166	
	Higher level	8	139	147	
	Qur'an	3	25	28	
Spouse educational status	No educated	5	22	27	0.047
	Primary	5	32	37	
	Secondary	8	139	147	
	Higher level	12	209	221	
	Qur'an	3	25	28	
Mothers religion	Christian	12	217	229	0.001
	Muslim	17	201	218	
	Tradition	2	9	11	
	Others	2	0	2	
Spouse religion	Christian	12	213	225	0.001
	Muslim	17	201	218	
	Tradition	2	13	15	
	Others	2	0	2	
Spouse occupational status	C/Servant	9	220	229	0.002
	Self employed	14	62	76	
	Private worker	4	99	103	
	Unemployed	6	46	52	
Mothers' locality	Rural area	30	408	438	0.229*
	Urban area	3	19	22	
Spouse locality	Rural area	23	295	318	0.961*
	Urban	10	131	141	
Number children		33	427	460	0.541*
Child's age	0-1year	14	102	116	0.169*
	2-3years	13	186	199	
	3-4years	3	81	84	
	More than 5 yr	3	57	60	
Age at vaccination	0-1year	18	285	303	0.461*
	2-3years	8	72	80	
	3-4years	5	57	62	
	6 & more years	2	13	15	
Presented last child	No	25	50	75	0.000
	Yes	8	377	385	
Received full vaccine for	No	22	150	172	0.001
	Yes	11	277	288	

all child					
Full vaccine for last child	No	22	114	138	0.003
	Yes	11	313	324	
Sex of last child	Male	19	215	234	0.706*
	Female	14	211	225	
Frequency of vaccination	1-2 times	20	76	96	0.001
	2-3times	8	118	126	
	3-4times	4	100	104	
	6 or more	1	133	134	
Place of vaccination	Home	0	1	1	0.002
	Road	13	65	78	
	Hospital	16	352	366	
	Market	2	5	7	
Do you received gifts	No	13	105	118	0.005
	Yes	20	322	342	
Mothers occupational status	C/Servant	5	117	122	0.002
	Yes	8	132	140	

Table 1: Frequency distribution of Number of Ever Vaccinated and the predictors (Socio-demographic factors)

Coefficients	Estimate	Std. Error	Z value	P-value	Odd Ratio
(Intercept)	-1.56616	0.08642	-8.745	<1.2e-16	
Marital status	0.1243	0.07791	3.892	0.00567	0.9865
Mother's age group	-0.1278	0.0494	-1.743	0.02247	1.7705
Mother's educational status	0.18883	0.05089	-3.363	0.0353	2.20784
Spouse age group	0.12631	0.06238	3.2967	4.72e-12	2.59508
Spouse educational status	0.15858	0.04387	3.2297	0.00901	2.79975
Mothers religion	0.19084	0.06536	-3.1627	1.25e-05	0.7715
Spouse religion	0.12311	0.04685	3.0957	1.98e-08	1.74326
Spouse occupational status	0.20537	0.01834	-3.0287	0.01323	3.71501
Mothers' locality	0.20764	0.00983	-2.9617	0.02965	2.68676
Spouse locality	0.13199	0.00832	-2.8947	0.00346	1.65852
Number children	0.35217	0.0972	12.627	0.01103	0.93027
Child's age	0.24167	0.0842	12.493	0.01188	2.97377
Age at vaccination	0.44896	0.1327	12.426	1.23e-02	1.54553
Presented last child	0.28123	0.1041	-6.359	0.01273	0.51728
Received full vaccine for all child	0.11349	0.0797	-7.292	1.31e-02	1.48903
Full vaccine for last child	0.14576	0.1058	1.225	1.36e-02	2.46079
Sex of last child	0.07802	0.2066	2.158	0.014	0.73254
Place of vaccination	0.11029	0.0753	2.091	0.01442	3.40429
Do you received gifts	0.64255	0.0838	2.627	0.03484	3.37605
Mothers occupational status	0.67482	0.0923	3.565	0.01527	3.9478

Table 2: Model parameters estimate for the six states in the North Eastern zone of Nigeria using Logistic Regression Approach

Table 2 shows the analysis of the data obtained from the responses of the attitude of mothers towards the immunization using the logistic regression. The parameter estimates with their standard errors and their p-values which show the significant test for the parameters estimates are presented in the table. The parameters whose p-values are less than 5% are said to be significant

It can be observed from the above that each factor contributed differently to the mother's attitude towards immunization in Nigeria. Positive attitude of mothers towards immunization is common most from those mothers that received gifts from the Health Centre, mother's occupation status, place of vaccination full vaccine for last child and mother's education in the North eastern of Nigeria.

The chances that mothers show a positive attitude towards the immunization than the chances that they do not under a factor are shown in the last column of the table. For instance, mothers and spouse education, mother and spouse occupation, place of vaccination and the mother that received gifts from a health centre are three times more likely to enroll their children for immunization than they do not. The odd other factors contributed to the attitude are presented in table 2.

IV. CONCLUSION

Base on the whole analysis carried out, it revealed that there is significance relationship between mother's locality, mothers' religious, place of vaccination, mother's educational status, Age at vaccination, frequency of vaccination, spouse educational status as well as giving of gifts to mothers'. These mean that the factors mentioned above are the main effect that contributed to the attitude of mothers towards immunization which gives an indication that those factors should be considered as early as possible in North Eastern Zone of Nigeria.

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