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Willingness to pay for routine immunization services in Kano State: A contingent valuation survey

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Abstract

Background: willingness to pay for routine immunization services is the maximum amount a household or individual is hypothetically prepared to give up to benefit from routine immunization services. Determining the monetary value of given healthcare services such as vaccinations create challenges to health policymakers, particularly in developing countries.

Objective: to determine the amount residents of urban areas in Kano State are willing to pay for routine immunization and its associated determinants.

Method: a cross-sectional descriptive study was carried out among 418 residents of urban areas in Kano State. Contingent Valuation Method and Logit regression was used to estimate the respondent's willingness to pay for routine immunization services and its associated determinants.

Results: about 50.5% of the respondents were willing to pay for routine immunization services. Respondents were willing to pay an average of twenty two thousand one hundred and six Naira eighty Kobo with standard deviation of twelve thousand nine hundred and ninety seven Naira eighty Kobo only. (N22106.8 ± 12997.8). The determinants of WTP for routine immunization services include educational status, monthly income, place of delivery, health care expenditure and knowledge on benefit of routine immunization services and the age of the head of household. Also, the pseudo-adjusted coefficient of determination revealed was 0.235.

Conclusion: health care providers and other relevant stakeholders should sensitize people in order to increase awareness on the importance of routine immunization services; this will improve the overall health status of children below the age of five years.

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Keywords: Willingness to pay; Routine immunization; Contingent valuation method; Monetary value

1. Introduction

Immunization is one of the most cost-effective public health intervention developed in the history of mankind [1]. Routine immunization (RI) contributes immensely to reduction in both morbidity and mortality from vaccine preventable diseases (VPD) among children, particularly in developing countries [2-4]. It prevents debilitating illness and disability, and saves millions of lives every year. It is also key to achieving the Sustainable Development Goals (SDGs) – commitments made by world leaders in 2015 to reduce poverty and improve human development [5]. The contribution of immunization is especially critical to achieving the goal to reduce deaths among children under five years old [5]. Vaccines have the power not only to save, but also to transform, lives – giving children a chance to grow up healthy, go to school, and improve their life prospects. When vaccines are combined with other health interventions – such as vitamin A supplementation, provision of deworming medicine and bed-nets to prevent malaria – immunization becomes a major force for child survival. Immunization services are usually delivered via two main strategies namely routine immunization (RI) and supplemental immunization activities (SIAs) [3]. RI is the regular provision of immunization services to successive cohorts of infants through the administration of vaccines (antigens) in a scheduled regimen [3].

Vaccination policies should be based on solid evidence and rigorous science; efforts are underway to ensure that all countries have an established body that can make evidence-based decisions about vaccine policy [6]. While, experiences with new vaccines, such as pneumococcal and rotavirus vaccines, have shown that vaccine access for children in developing countries can be accelerated, but this process needs to be improved further to meet the needs of new vaccines on the horizon [7].

Globally, it is estimated that about two to three million deaths occurs yearly as a result of vaccine preventable diseases (VPD) with approximately 1.5 million deaths among under-five children [8]. Vaccines are a key contributor to public health, especially in developing countries [9]. Despite numerous demonstrations of the cost-effectiveness of immunization, vaccines spending accounted for only 1.7% of the total pharmaceutical market in 2002, when UNICEF estimated that 34 million children were not reached by routine immunization, most of them in developing countries [10].

Given the significant burden of vaccine-preventable diseases in Nigeria, improving RI coverage would reduce child mortality and accelerate progress towards the MDG 4 target [11]. Nigeria has succeeded in implementing major improvements in routine immunization (RI) over the past three years; national DTP3 coverage rates reached a high of 69% in 2010 [12]. However, this progress comes in the context of ongoing vaccine stock-outs, significant coverage heterogeneity among states, an overall coverage rate below the average for Africa, and an under-five mortality rate of 138 child deaths per 1,000 live births—the 18th highest rate in the world. Scaling up coverage for current and future vaccines can reduce mortality from childhood killers like pneumonia, diarrhea and malaria, which account for over 60% of deaths among Nigerian children less than 5 years of age. Vaccines can bring economic benefits as well: according to recent IVAC projections, achieving 90% immunization coverage in the next decade could add $17 billion to the Nigerian economy [12].

In recent years, national governments and the international health community have become increasingly concerned with the issue of financing vaccines and immunization programs [13]. Despite tremendous gains in immunization coverage in the 1980s in nearly all developing countries with the establishment of National Expanded Programs on Immunization (EPI)—now often called National Immunization Programs (NIPs)—coverage rates in the 1990s have plateau or even declined in a number of countries—especially in Sub-Saharan Africa—as donors reduce their funding for immunization, as national health budgets decline with deteriorating economic conditions, and as other health priorities, such as HIV/AIDS, consume increasing attention and limited health funds [12,13-15] The introduction of additional vaccines, including Hepatitis B and Haemophilus influenzae type B (Hib),1 into national immunization programs has also been delayed in many countries, due at least in part to the high costs of these vaccines relative to the pennies-per-dose costs of the six traditional EPI antigens [16-17]

According to the UNICEF, "sustainable financing of current and new vaccines is the biggest problem facing immunization today [18-19]. Unless we can develop new solutions and new attitudes toward the funding of vaccination, all of the advances in science and all of the investment to establish the delivery infrastructure will have no further value to most of the world's children." Tackling the financing challenge posed by GAVI is founded on several key assumptions: (i) that five years would be sufficient for countries to plan the transition away from Vaccine Fund support and move towards other sources of funding; (ii) that the GAVI push to renew the global immunization effort would catalyze additional

support by partners; and (iii) that helping 75 of the poorest countries introduce costly vaccines would drive the cost of these vaccine to their mature price, which would be affordable for countries at or near the termination of the Vaccine Fund funding commitment [20].

Vaccines that are presently used in Ministry of Health (MOH) Nigeria National Immunization Programme (NIP) have been based on the World Health Organization Expanded Immunization Programme (WHO-EPI) [21-22]. These vaccines are given free-of-charge to all babies at the government healthcare centers, inclusive of the essential vaccine-preventable childhood diseases; Bacillus tuberculosis, diphtheria, tetanus, pertussis, polio, Hepatitis B, mumps, measles, rubella, bacterial influenza and pneumococcal vaccines. This vaccines are usually given free of charge with the support from GAVI [21]. A fully immunized child is one who has received the complete doses of the standard six antigens – BCG, Diphtheria Tetanus Pertussis (DTP) (3 doses), polio (3 doses), and measles vaccines. It was stated that the two main types of costs in immunization are recurrent costs and capital costs. In estimating the cost of immunizing a child, it categorized cost into three areas: Total estimated cost of routine immunization; program specific cost for immunization and current variable non-personnel costs [23]. A study in Nigeria revealed that, the cost per fully immunized child in Nigeria was US$38, higher than that of Cote d'Ivoire (US$24.29), Morocco (US$20.89) and Bangladesh (US$23.39) [24-26]. But in Iran, the average cost of vaccination was 40.94 USD. Sensitivity analysis of the population and inflation rate indicates that the vaccination cost may fluctuate between 37% and 53% over 6 years (2021) from the data of 2015 [27]. It also revealed the need to reduce wastage costs in the process of immunization. The cost per fully immunized child (US$38) that is about 63% of the current minimum wage in Nigeria. From 2006 through 2014, Nigeria's Gross National Income rose from US$840 to $2,970 per capita, a 254 percent increase; the Nigerian government spent $17 on routine immunization per surviving infant in 2006 compared with $8 per infant in 2014. In addition, the government share of total routine immunization expenditures dropped from 87 percent to 24 percent over the same period [28].

Determining the monetary value of given healthcare services such as vaccinations and their distributions as healthcare resources create challenges to health policymakers in many health systems, especially to those in the under-resourced or under-utilized resources countries [29-31]. Assigning the monetary value of public goods or services is highly complicated because they are devoid of a formal market [25,30]. However, there existed several methods, including the contingent valuation (CV) method, for eliciting the monetary value of nonmarket goods and services [32]. The CV is a direct method of eliciting the monetary value of public goods or services by means of surveys and employing the willingness-to-pay (WTP), which indicates the participants' maximum amount of money they are willing to give up to obtain the good or service [32]. The amount that a person is willing to pay is a rationale decision and is crucial to cost-benefit analysis [33-34]. The CVM is used in the health-care sector because health care has a number of special characteristics that may make standard demand models inappropriate to value consumer surplus [34]. Willingness-to-pay (WTP) is an approach to estimate the maximum amount that an individual is willing to allocate to programs, services and health technologies. The decision to vaccinate depends on the willingness of society to pay for increased health benefits [35-36].

Determining the monetary value of given healthcare services such as vaccinations and their distributions as healthcare resources create challenges to health policymakers in many health systems, especially to those in the under-resourced countries [37]. There is no other health intervention as simple, powerful, and cost-effective as a vaccine [38]. With just a few doses, these products have protected billions of people from the scourges of smallpox, polio, measles, and numerous other diseases that once threatened our world [39].

Nigeria has an estimated population of 186 million with 23% of eligible children aged 12-23 months fully immunized. Government spending on routine immunization per surviving infant has declined since 2006, meaning the immunization budget needs to improve [40-41]. By 2020, Nigeria would have been ineligible for additional Global Alliance for Vaccination and Immunization (GAVI) grants and will be facing an annual vaccine bill of around US$426.3m [15]. Because, GAVI support to countries is for a limited period of time – five to eight years – and quantity of resources [42]. The resources are intended to be enough to meet program plans for improvement in the three categories of support for five years, though this support can be spread over the longer period [42].

In Nigeria, the immunization coverage is very low as only 23% of children aged 12-23 months are fully immunized, and 29% of the children do not receive any vaccination [4]. But, Vaccination coverage in Nigeria has improved over the past 10 years. The percentage of children age 12-23 months who received all basic vaccinations increased from 23% in 2008 to 31% in 2018. The percentage of children who received none of the basic vaccinations declined from 29% to 19% during the same period. While these trends show improvement, they still fall short of Sustainable Development Goal 3, for which the target is achieving more than 90% coverage of all basic vaccinations among children age 12-23 months [3-4,43]. It has been noted that children are not fully immunized in Nigeria due to the non-availability of vaccines, place

of immunization being too far, unaware of the need of immunization, fear of side effects, and mother being too busy[3,43].

2. Materials and Methods

2.1. Study Area

The study was carried out in Kumbotso local government area (LGA), one of the 44 LGAs of Kano state selected by simple random sampling technique (balloting). Kumbotso LGA is about 22 kilometers away from Kano metropolis and has a land area of 161Square Kilometers, an estimated 2010 population of 333,921 people projected from the 2006 census. The population is made up of 188,484 males and 145,437 females with a population density of 2,074 people per square kilometer and 13,357 women within the reproductive age group. The LGA lies between latitudes 11^0 50' and 12^0 North of the Equator and Longitudes 8^0 20' and 8^0 40' east of the Prime Meridian.

2.2. Study design

The study was community-based cross-sectional descriptive study carried out among the eligible and selected participants in urban areas of Kumbotso LGA, Kano State, Nigeria.

A payment scale format was used for this study, and respondents were shown a list of prefixed and ordered values (<N10,000.00, N20,000.00, N30,000.00, N40,000.00, and N60,000.00) from which they were asked to choose their answers. Using this format, the WTP was assessed.

To elicit consumers' WTP the study applied contingent valuation method (CVM), which helps to find out how much an individual would be willing to pay by using hypothetical survey questions. Double bounded dichotomous choice contingent valuation method (DBDC-CVM) was used. In this study, designing hypothetical prices (bid amount) to apply double bound dichotomous bid was based on the estimated amount of cost of routine immunization from the previous literature. Using double bounded approach, respondents were asked two questions. Two questions were used from the survey: are you willing to pay for routine immunization services? How much are you willing to pay for routine immunization services?

2.3. Study Population

The study population consisted of all the eligible and selected head of household in urban areas (Na'ibawa and Sheka Ward) of Kumbotso local government area of Kano state.

2.4. Sample Size Determination

The sample size was calculated using the formula as stated below:

$$n = \frac{z^2 pq}{d^2}$$

n= Represents the sample size (if the target population is less than 10,000).
Z=Represents the standard normal deviation at the required confidence level, in this cases its 1.96.
p=Represents the proportion in the target population estimated to have characteristics being measured is 55.3%=0.553 [44]

q=Represents (1-p) which is equal to 1- 0.553 = 0.447
d=Represents the degree of accuracy / level of statistical significance set which is 0.05 (5%) sample error. Therefore;

$$\frac{1.96^2 \text{ x } 0.533 \text{ x } 0.477}{0.05^2}$$

$$\frac{3.84 \text{ x } 0.254241}{0.0025}$$

$$\frac{0.97628544}{0.0025}$$

=379.8

n= 380

Approximately (**n**) = 380

With 10% of non-respondent rate = n×10%

$$\frac{380 \times 10}{100} = 38.00$$

=100

Approximately = 38

The overall sample size= $n = \frac{z^2pq}{d^2}$+10%

= 380+38

= 418

Therefore the overall calculated sample size was 418. Therefore, four hundred and eighteen questionnaires were administered to the head of household in the study area to obtain information about socioeconomic characteristics and other parameters.

2.5. Sampling Techniques

Multistage sampling technique was used for selection of study participants as follows;

- Stage I: One senatorial district out of three in Kano was selected by using simple random sampling.
- Stage II: this involves listing of all the local government areas within Kano Central Senatorial District and Kumbotso was selected by balloting.
- Stage Ill: Two urban wards were selected from Kumbotso LGA by using simple random sampling.
- Stage IV: Study participants were selected by using simple random sampling based on probability proportionate to size.

2.6. Model specification

Following economic theory and given their budget constraints, study participants strive to attain the highest possible satisfaction from the consumption of goods and services. If payment for routine immunization services were introduced, a resident would then opt for routine immunization services only if they expected an improvement in their welfare. For different benefit packages, resident might make varied choice decisions. For example, the resident might be willing to pay N18,000.00 as amount to purchase routine immunization services if it covered the entire package for a child to be fully immunized according to the national schedule for routine immunization services, but might be willing to pay less than N18,000.00 if the routine immunization services covered only some selected diseases.

It is assumed that a study participant's decision to join or to pay a certain amount of money for routine immunization services depends on their socio-economic characteristics. The residents' decision process can thus be expressed as:

U; = U; (X; I Z)..... .. .. (1)

Where U; =utility that a resident is expected to derive from routine immunization services

X; = a vector of socio-economic characteristics specific to residents i.

Z = a vector of the attributes specific to the routine immunization services.

Since a resident is assumed to behave rationally, their wish is to maximize expected utility. The amount they are willing to pay for routine immunization services can be expressed as:

Pi = f (Xi, Z) .... (2)

Where, Pi = maximum amount resident is willing to pay for routine immunization services,

Xi= f (age; education status; household size; place of delivery; income; distance to health facility; knowledge of importance of RI; type of residence; health care expenditure) ..... (3)

Z = f (benefit package; perceived quality**) (4)**

Growth in the amount of money a resident is willing to pay for routine immunization services can be represented by taking the logarithm of the amount they are willing to pay, and can be expressed as:

Log Pi= f (Xi; Z) + Ɛi ..... (5)

Where Pi, Xi, and Z are defined as before and Ɛi is the error term, assumed to be well behaved. The final form of the equation would then be:

WTP =β_0 + β_1EDUC + β_2 MONI+ β_3AGE+β_4PD+ β_5HCE + β_6HHS+β_7KIRIS +β_8DHF+ ε_i..... (6)

Disaggregating Xi and Z, yields the set of independent (explanatory) variables, which are listed and defined below (Table 1).

Similarly in this study WTP for routine immunization services can be presented as a function of a number of independent variables like the age, marital status, educational status, monthly income, household size, distance to the health facility, general health care expenditure, knowledge on importance of the benefit of community based health insurance, knowledge of co-payment when accessing care and type of residential status (table 1). This can be shown thus:

WTP=f(EDUC;MONI;AGE;PD;HHS;KIRI;DHF;HCE).....(7)

From the above specification, WTP is a binary variable and it takes the values of either 0 or 1. Data was collected through the use of interviewer administered questionnaires. To this extent the study relied on primary data.

2.7. Ethical Consideration

Ethical clearance was obtained from the Ethical Review Committee of Kano State Ministry of Health before conducting the study. Informed consent was also obtained from individual study participants.

3. Results

3.1. Socio-economic Characteristics of Study Participants

The mean and standard deviation of age of the study participants were 42.3 ± 12.1. Over 90% of them were males. The predominant ethnic group was Hausa/Fulani. About two third (68.4%) of the participants had educational level of secondary school and above. Nearly half of them were civil servant. Majority of the participants have household size of six and below (70.1%). About two third of the study participants had a monthly income of more than fifty thousand Naira. While, nearly half of the study participants delivered their index child in the hospital(51.5%). Majority of study participants (71.6%) are within five kilometers walking distance to health facility and about two third of them spent more than three thousand Naira as health care expenditure in the last one month preceding this study as depicted in table 2.

3.2. Willingness to pay for routine immunization services

Two hundred and six (206), i.e about half of the participants (50.5%) were willing to pay for routine immunization services. Among those who were willing to pay, about 80.6% were willing to pay twenty thousand Naira and above. On average, the mean and standard deviation of the amount respondents were willing to pay was twenty two thousand one hundred and six naira as well as twelve thousand nine hundred and ninety seven Naira eighty Kobo only respectively (Table 3 and 4).

3.3. Determinants of Willingness to pay for routine immunization services

A logistic regression model was estimated to determine the potential effects of independent variables in explaining willingness to pay for routine immunization services. The model looked at a number of potential independent variables that include age, marital status, educational status, monthly income, household size, distance to the health facility, health care expenditure one month prior to this study, knowledge on the importance of routine immunization, and residential status. The independent variables that were statistically significant and positively related with willingness to pay for routine immunization services were educational status, monthly income, health care expenditure one month prior to this study and knowledge on the benefit of routine immunization among the head of households. While, only age of the head of household was found to be statistically significant and negatively related with willingness to pay for routine immunization services i.e this implies that an increase in the age of head of the household is likely to decrease willingness to pay for routine immunization services; elderly head of the household were less likely to pay (Table 5)

Table 1 Description of independent variables of willingness to pay (WTP) for routine immunization services among the study participants

Variable	explanation	measurement
Age (AGE)	How old in years the respondents are?	1 ≥ 45 years 0 < 45 years
Place of delivery of index child (PD)	Place of delivery of index child	1= Health facility 0= Home
Educational status (EDUC)	Educational status of the head of household	1= formal education 0=informal education
Monthly income (MONI)	Average amount of income of the head of household per month	1= or> N30,000.00 0 < N30,000.00
Household size (HHS)	The number of the respondents within each household	1=> 6 people 0 =≤ 6 people
Distance to the health facility (DHF)	Distance covered by any member of the household in kilometers before accessing health care	1= > 5 kilometers 0=≤ 5 kilometers
Health care expenditure (HCE)	Amount in Naira the household spend in health care per episode of illness among their sick children	1= > N 2000.00 0=≤ N 2000.00
Knowledge on the importance of routine immunization services (KIRI)	Knowledge on the benefit of CBHI among head of the household	1= good knowledge 0= poor knowledge

The overall fit of the model showed a strong relationship between the independent variables combined together and dependent variable (i.e willingness to pay for routine immunization services as Yes or No response). The LR X^2 of 51.67 ($P<0.05$) was found to be statistically significant meaning that at least one of the independent variables contributes to the prediction of the outcome (willingness to pay for routine immunization services). In the above model six out of the eight predictors were found to be statistically significant.

Thus, the overall equation can be written as follows:

$$WTP=2.1275 + 1.3906EDUC + 0.6876MONI - 0.2351AGE + 0.5743PD + 0.3299HCE - 0.4311HHS + 1.0995KIRIS - 0.0973DHF + \varepsilon_i \quad (8)$$

Table 2 Socio-demographic characteristics of respondent's

Variables	**Frequency**	**Per (%)**
Age (years)		
20 – 29	44	10.8
30 – 39	152	37.3
40 – 49	87	21.3
50 – 59	74	18.1
60 – 69	51	12.5
Mean ± SD	42.3 ± 12.1	
Sex		
Male	306	75.0
Female	102	25.0
Ethnic Group		
Hausa/Fulani	245	60.0
Yoruba	82	20.1
Igbo	38	9.3
Others	43	10.5
Educational Status		
None	0	0
Non-formal	32	7.8
Primary	56	13.7
Secondary	182	44.6
Tertiary	138	33.8
Marital Status		
Married	388	95.1
Others	20	5.2
Occupational status		
Civil servant	206	50.5
Farmer	33	8.1
Business	102	25.0
House wife	56	13.7
Others	11	2.7
Household size		
≤6	286	70.1
>6	122	29.9
Monthly Income		
<N30,000.00	47	11.5

N30,001.00 – 50,000.00	94	23.0
N50,001.00 – 100,000.00	205	50.2
>100,000.00	62	15.2
Place of delivery		
Home	198	48.5
Hospital	210	51.5
Distance to health facility		
≤5 KM	292	71.6
>5 KM	116	28.4
Health Care Expenditure		
≤ 3000.00 (Naira)	150	36.8
> 3000.00 (Naira)	258	63.2

Source: Field work August, 2021

Table 3 Distribution of respondents by willingness to pay for routine immunization services

WTP	Frequency	Percentage (%)
YES	206	50.5
NO	202	49.5
Total	408	100.0

Table 4 Distribution of respondents by amount they were willing to pay for routine immunization services

WTP	**Frequency**	**Percentage (%)**
N<10,000.00	40	19.4
N 20,000.00	101	49.0
N 30,000.00 N 40,000.00	33 20	16.0 9.7
N60,000.00	12	5.8
Total	206	100

Table 5 Logistic regression analysis of the determinants of WTP for routine immunization services among the study participants

Variable (s)	**Coefficient**	**Std. Err**	**OR**	**P-value**	**95% Conf. interval**	
Age (AGE)	-0.2351	0.1528	0.7905	<0.05*	0.4911	0.9433
Educational status (EDUC)	1.3906	1.2495	4.0173	<0.05*	1.5683	5.2688
Monthly income (MonI)	0.6876	0.4390	1.9889	<0.05*	1.1284	2.4279
Household size (HHS)	-0.4311	0.5671	0.6498	0.125	0.0827	1.7614

Distance to health facility (DHF)	-0.0973	0.9273	0.9073	0.632	-0.0203	2.7248
Health care expenditure (HCE)	0.3299	0.1352	1.3908	<0.05*	1.1258	1.5260
Knowledge on importance of RI	1.0995	0.5123	3.0027	<0.05*	1.9986	3.5150
Place of delivery (PD)	0.5743	0.1572	1.7759	<0.05*	1.4677	1.9331
Constant	2.1275	2.9289	8.3939	<0.05*	2.6533	11.3228

Source: Field work August 2021; P<0.05 * significant factors affecting willingness to pay; Logistic regression; Number of obs = 408; LR chi2(7) = 53.76; Prob > chi2 = 0.0000; Log likelihood = -1382.84; Pseudo R2 = 0.235

4. Discussion

Many studies were conducted in different places across the world in order to evaluate the factors that determine people's willingness to pay (WTP) for routine immunization services. Potential factors include age, income, education, household size, geographic location, occupation, health care expenditure and distance to health facility [40, 44-45]. In this study, the mean and standard deviation of age of the study participants were 42.3 ± 12.1 in the urban areas and 39.2 ± 9.8 years in the rural areas; while the mean and standard deviation of age of all the study participants were 40.9 ± 12.3 years. This was very much higher than the findings by Ossai & Fatrigun in Enugu that reported the mean age of the clients in the urban areas as (28.9±4.5 years) and that in the rural areas as (26.7±5.1 years) [44].

The association between age and willingness to pay for routine immunization services has been mixed in the existing literature [40, 44-45]. In this study, respondent's age was found to have a negative effect on WTP, this was similar to findings by Ossai et al 2016 that younger age group were more likely to pay for routine immunization services in Enugu [44]. Meanwhile, Sarker et al 2020 had a contrary findings on WTP for oral cholera vaccine and age of the study participants in urban areas of Bangladesh; this finding might be as a result that the authors used only a single antigen i.e cholera vaccine, rather than using the whole antigen under the guidelines of National Programme on Immunization in Bangladesh [45]. Also, findings by Rezaei et al among mothers in Iran indicate negative relationship between age of the study participants (mothers) and WTP for routine immunization services [37]

Meanwhile, distance to the nearest health facility has been found to have a negative effect on WTP in this study i.e short distance increased the likelihood of WTP; although the relationship was not found to be statistically significant. This is similar to the findings by Ossai & Fatiregun in both in rural and urban areas of Enugu State; though, the distance used in their study was less than or greater than one kilometer [44]. In 2008, 36% of Nigerian women reported distance to a health facility as an obstacle to seeking medical care. Furthermore, distance to a health facility was the number one reason mothers gave for failing to vaccinate their children [40].

This study has shown that income has a positive effect on WTP, this was similar to the findings by Sardar et al., 2018; Rezaei et al., 2020 and Javan-Noughabi et al., 2017 [37,45-46]. Findings of this study in relation to household income was similar to the study conducted by Rezaei, S et al in Iran, which found out that mothers in the higher monthly household income category showed statistically significant positive associations with the logarithm of the mothers' WTP for the vaccines [37]. In another findings by Javan-Noughabi et al have indicated income is an important predictor for willingness to pay for routine immunization services; they further stated that If income increases by 1%, private WTP will increase 1.38% [46]. Moreover, with an increase of 1% of income, the altruistic WTP was increased by $251 [46]. This was further supported by a study in Pakistan which stated positive coefficient of income implies that wealthier people are likely to pay more money to avoid hepatitis B disease [45].

Other factors that have been found to significantly influence WTP for routine immunization services include education, household size, place of delivery of index child, sex, knowledge on the importance of routine immunization place of residence [44].

5. Conclusions

The study found out that, about 50% of the head of the household were willing to pay for routine immunization services. Using Logit model, the determinants of WTP for routine immunization services assessed in this study were age, marital status, educational status, monthly income, household size, distance to the health facility, place of delivery of index child, health care expenditure one month prior to this study, knowledge on the importance of routine immunization services.

It was recommended that, the National Primary Health Care Development Agency (NPHCDA) in collaboration with state and local governments as well as development partners should sensitize and increase awareness on the benefit of routine immunization services to people, so as to increase the overall immunization coverage.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Author's contribution

- Dr Usman Sunusi Usman- contributed in the design, analysis and interpretation of data as well as drafting the article for intellectual content
- Dr Abubakar Muhammad Kurfi-contributed in the analysis, discussion and interpretation of data. Also revises the article critically
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