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COMPARISON OF LEAST ABSOLUTE SHRINKAGE AND SELECTION OPERATOR AND MAXIMUM LIKELIHOOD ESTIMATORS TO ESTABLISH DETERMINANTS OF IMMUNIZATION IN TRANS-NZOIA COUNTY[1]

Sheilla Aoko OTIENO[a], Benson Munyali WAMALWA[b], Nelson Owuor ONYANGO[c], Joseph Antony Makoteku OTTIENO[d], Victor ONGOMA[e]

Abstract

The client factors that influence under-five child guardian compliance to the immunization schedule are interlinked based on household characteristics, socioeconomic status, and maternal health practices. An incentive to motivate the mothers to prioritize their child's health practices especially on vaccination, works perfectly towards the achievement of full immunization coverage. A randomly sampled study carried out within Weonia Location– Trans Nzoia County in March 2014 with target population of under-five children showed the vital role an incentive innovation plays towards immunization coverage. Multinomial logistic regression model was used to analyze the determinant of partial or none-immunized and the parameters estimated using the maximum likelihood estimator (MLE) and the shrinkage estimator-Least Absolute Shrinkage and Selection Operator (LASSO). The shrinkage estimator method gave a sparse model that was easy to interpret and increased the estimated predictability accuracy. Maternal health practices and access to a motivating intervention are significant factors that ensure a guardian's compliance to their child immunization.

Keywords: Immunization, Logistic regression, LASSO, MLE
JEL Classification: C50, C51, C52

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1. Introduction

Immunization is effective in the reduction of childhood mortality towards the achievement of the Millennium Development Goal (MDG4); the reduction of under-five mortality rates by two-thirds in 2015 (UNICEF, 2005). Immunization is enshrined as one of the utmost medical accomplishment that has succeeded in saving more lives than any other health care intervention in the 20th century (Wiysonge et al., 2009).

Children are more vulnerable to all kinds of hazards as compared to adults because they are dependent on their parent/guardians/caregivers to provide for their daily needs and care especially health care. Therefore, the relationship between vaccination coverage and care taker's motivation and willingness to seek childhood vaccinations still need to be explored and studied (Holte et al., 2012). Since immunization is the most effective (and cost-effective) means of reducing morbidity, disability and mortality among children, it has to be the principle message to every mother and child caretaker (Ibnouf et al., 2007).

Immunization for the under-five child and infants against preventable diseases is a cost-effective public health intervention to improve the child's health. Recent estimates suggest that approximately 34 million children are not completely immunized, with almost 98% of them residing in developing countries (Kumar et al., 2010). The determinants for none/partial under-five child immunization within the scheduled time significantly revolve around access to funds to facilitate the whole process. Studies conducted earlier in Kenya pointed several socio-demographic factors associated with full vaccination, among them: socioeconomic status, religion, maternal occupation, parents' education, maternal age and ethnicity (Maina et al., 2013; Moisi et al., 2010; Kamau and Esamai, 2001).

The delivery of vaccines later in the schedule after the infant stage of a child's life and achieving 100 percent complete immunization coverage among under-five children is a great challenge in the country with particular reference to the study area. A study conducted in the rural areas of the Nyanza and Western Provinces in Kenya showed that approximately 79.4% of children aged 12 to 23 months were fully vaccinated; however, timeliness of vaccination was not assessed (Kawakatsu and Honda, 2012; Calhoun et al., 2014). An analysis of the determinants of partial/ incomplete immunization coverage among under-five children would be essential to establish an effective empowerment mechanism to the community to ensure all children are immunized against preventable disease within the scheduled time.

A review of the value of an agricultural intervention to motivate guardians to comply with the immunization schedule and the determinants of none-compliance using the Least Absolute Shrinkage and Selection Operator (LASSO) based on a multinomial logistic regression is thus very essential in providing the guidelines towards the achievement of 100% immunization coverage within the right time.

The main objective of the study was to identify the determinants of partial/incomplete and none- immunization for the under-five children and develop mechanism compatible to the community toward the achievement of full immunization.

2. Data and Methodology

A survey conducted in Weonia Location in Trans-Nzoia County in March 2014 to collect data on under-five child immunization practices and influencing factors that determine the compliance to the vaccination schedule by guardians/mothers. The questionnaire were administered on a one on one interview basis for the individual mothers of the under five children by the research assistants. The target population was all children under the age of five years within the study area and their guardians.

Data analysis was conducted using the multinomial Logistic Regression Model (MLR) to evaluate the significance of the various none-compliance determinants in the research area. The logit equations of the MLR form a comparison the log odds of each of the non-reference K response variables to the categorical variable of choice (Shakhawat et al., 2012), logit (Equation 1) and the unique category probability in Equation 2;

$$\log\left[\frac{\pi_{ij}}{\pi_{io}}\right] = log\left(\frac{P(Y=j/X_i)}{P(Y=0/X_i)}\right) = X\beta;\ j = 0,1,2\ and\ i = 1,2,3,\cdots\cdots\cdots,n \quad (1)$$

$$P(Y=j/X_i) = \pi_{ij} = \frac{\exp(x_i\beta_j)}{1+\sum_{j=0}^{K}\exp(x_i\beta_j)} \text{ and } P(Y=0/X_i)\pi_{i0} = \frac{1}{1+\sum_{j=0}^{K}\exp(x_i\beta_j)} \quad (2)$$

The likelihood function interpreted as the joint probability of the observed outcomes expressed as a function of the chosen regression model (Dietz et al., 2005). The model coefficients are unknown quantities and are estimated by maximizing their probabilities and the likelihood function given by Equation (3).

$$L(\beta) = \prod\prod_{i=1}^{n}\left(\frac{exp\left(\sum_{j=0}^{p}x_{ij}\beta_j\right)}{1+exp\left(\sum_{j=0}^{p}x_{ij}\beta_j\right)}\right)^{yi1}\cdots\cdots\left(\frac{exp\left(\sum_{j=0}^{p}x_{ij}\beta_j\right)}{1+exp\left(\sum_{j=0}^{p}x_{ij}\beta_j\right)}\right)^{yij} \quad (3)$$

The maximization process to estimate the coefficients is accomplished by getting the log of the likelihood function, log-likelihood (Equation 4).

$$l(\beta) = \sum_{i=1}^{n}\left[\left(x_{ij}\beta_1\right)Y_{i1} + \left(x_{ij}\beta_2\right)Y_{i2} + \cdots + \left(x_{ij}\beta_j\right)Y_{ij}\right] - \sum_{i=1}^{n} log\left[1+\sum_{j=0}^{k}x_{ij}\beta_j\right] \quad (4)$$

The first and second derivatives of the log-likelihood function with respect to beta equated to zero are used to obtain the Maximum Likelihood Estimates (MLE) of the model.

Least Absolute Shrinkage and Selection Operation (LASSO) perform variable selection and coefficient shrinkage simultaneously. LASSO minimizes the log-likelihood of the MLR model subject to constrain. The penalty term in the LASSO estimator shrinks some coefficients while setting others exactly to zero as given by Equation 5:

$$\widehat{\beta^{LASSO}} = \underset{\beta}{argmin}\left\{\frac{1}{n}\left[-l(\beta) + \lambda\sum_{k=1}^{j}\|\beta\|\right]\right\} \quad (5)$$

3. Results and Discussion

Table 1 shows the tabulation of the household size based on the respondent guardian's age, approximately, 71.1 % household size was made of 2 - 6 members. The average reproductive age for the women in the sampled population was 25-29 years of age (111 women), had a household size of 5-6 members.

Table 1: Cross Tabulation of the Household Size Based on the Respondent Guardian's Age.

	Respondent Guardian's age (Years)							
Household size/members	15-19	20-24	25-29	30-34	35-39	40-44	>45	Total
2-4	41	96	70	10	9	6	8	240
5-6	8	41	111	45	18	5	11	239
7-8	0	2	43	46	18	8	13	130
>9	1	5	7	11	9	7	25	65
Total	50	144	231	112	54	26	57	674

The most defaulted vaccines were measles and PCV, while BCG had the highest rate of compliance compared to the other vaccines. The dropout rates in under-five child vaccine indicate that the chance of dropping out of the schedule was on increase from one prior vaccine (dose) to the next (Table 2). The chance of dropping out on DPT1 after the BCG vaccine were 7.6% likely to happen compared to 34.1% for dropping out on measles given that one got BCG vaccine. The negative signs for the dropout rates indicate that the vaccine ought to have been received prior to the particular reference vaccine apart from the PCV3 and measles case since a few number of children access PCV3 vaccine dose given that most of them delay within the immunization schedule for over a year.

Table 2: Under-Five Child Vaccine Dropout Rate (%).

Vaccine	BCG	DPT1	DPT2	DPT3	OPV1	OPV2	OPV3	PCV1	PCV2	PCV3	Measles
BCG	0	7.6	19.2	26.3	8.7	19.2	27	17.8	27.9	35.8	34.1
DPT1	0	0	12.5	20.3	1.2	12.5	20.	11	21.9	30.5	28.7
DPT2	0	0	0	8.9	-12.9	0	9.6	-1.7	10.7	20.5	18.5
DPT3	0	0	0	0	-24	-9.7	0.8	-11.6	2.1	12.8	10.5
OPV1	0	0	0	0	0	11.5	20	10	21	29.7	27.8
OPV2	0	0	0	0	0	0	9.6	-1.7	10.7	20.5	18.5
OPV3	0	0	0	0	0	0	0	-12.5	1.3	12.1	9.8
PCV1	0	0	0	0	0	0	0	0	12	22	19.8
PCV2	0	0	0	0	0	0	0	0	0	11	8.6
PCV3	0	0	0	0	0	0	0	0	0	0	-2.6

Figure 1 presents the attributed to non-compliance to the immunization schedule by the respondent mothers/guardians. Most mothers/guardians of the under-five who missed some contact vaccines on time and this was attributed to ignorance and laziness at 36 % level. Lack of vaccine fee was cited by approximately 15.6% of the respondents. Only 1% and 3% of the

respondents attributed their failure to complete the immunization to lack of lack of vaccine at the medical facility and long distance to the facility respectively.

The largest percentage of default for the partially immunized children was within households of 5-6 members for a period of 1-6 months this was attribute to the mothers' ignorance and laziness.

Households with more than nine members had a high level of partial immunization compared to the other household sizes (Figure 2).

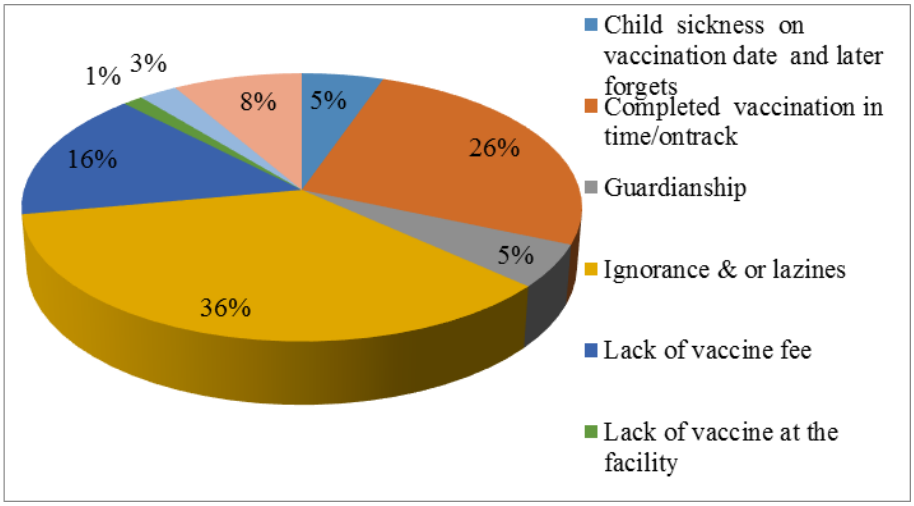

Figure 1: Reasons Attributed to Non-Compliance to the Immunization Schedule by the Respondent Guardians.

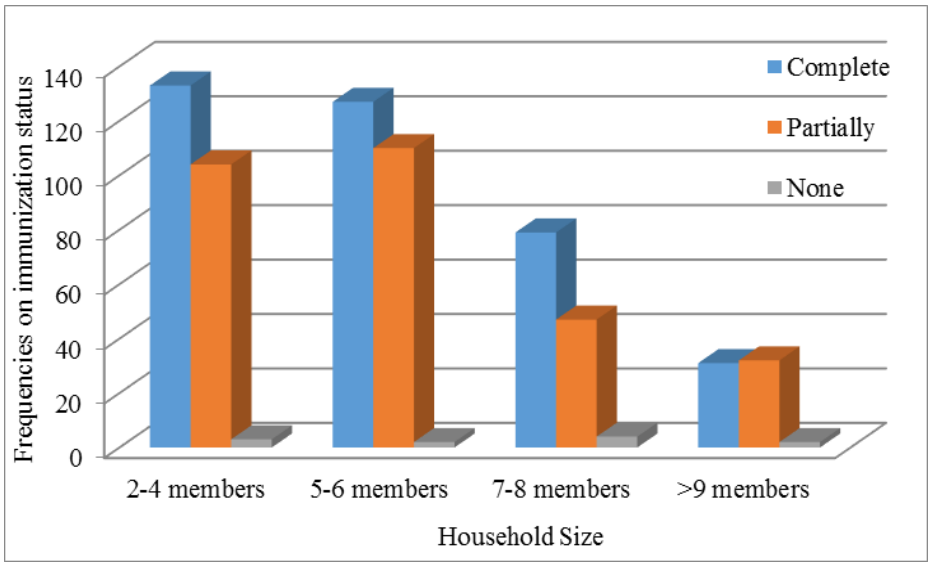

Figure 2: Under-Five Child Immunization Status with Reference to the Household Size.

The observation in Figure 2 is in agreement with a study by Calhoun et al., (2014) and Kamau and Esamai, (2001). Calhoun et al., (2014) carried out to establish the determinants and coverage of vaccination in children in western Kenya from a 2003 cross-sectional survey.

A comparison of the MLE and LASSO estimates shows that, the LASSO estimate are of a little bit lower value to the MLE values, increasing their interpretability with an exception of the land size and incentive estimates which were higher for the lasso estimate given the MLE estimates (Table 3).

The main determinants of a parents/guardian's compliance to the child's immunization schedule based on the LASSO estimator were the household size, the family's source of health information, wealth index-land size, maternal health practices (ANC), access to an incentive, the child's place of birth and the guardian/parent's marital status (Table 3). ANC practices, as a determinant to the compliance to immunization was a common factor to this study finding, similar observations were made by Mutua et al., (2011). Donsa (2013) also had similar results concerning the significance of funds/wealth index to the level of compliance to the immunization schedule as determined by the LASSO estimators. Yet for the maximum likelihood, in addition to the LASSO estimates: the other determinants were the religious affiliation of the family, the guardian's education level, and occupation. A study by Payne et al., (2013) also had similar findings on religion, education level, and awareness and occupation effects to the child's immunization status.

The LASSO estimators are in general agreement with most observations in previous studies including Donsa (2013) and Calhoun et al., (2014). The statistic accuracy is in consistent agreement with Ibrahim et al., (2011); the study simulated fixed and random effects in a general class of mixed effects models using Maximum Penalized Likelihood (MPL) estimation along with the smoothly Clipped Absolute Deviation (SCAD) and adaptive least absolute shrinkage and selection operator (LASSO) penalty functions. It was noted that LASSO penalty functions using estimate performed best and had significantly less estimation error than the MLE.

Table 3: The Multinomial Logistic Regression Estimates; MLE and LASSO Comparison (α=0.05)

Dependent variable	Estimates	
	MLE	**LASSO**
Household size	0.6667	0.162
Radial distance	-12.3375	0
Source of health information	1.7171	0.069
Religion	-0.3190	0
Land size	-0.7659	-0.11
ANC	0.7591	0.097
Incentive	0.7402	0.124
Education level	1.4785	0
Occupation	0.3072	0
Place of birth	0.9353	0.117
Marital status	0.1547	0.116

The size of household was a significant factor in determining the immunization and overall health condition of the child. Households with fewer children was strongly associated with full vaccination as compared to their counterparts with more than six members, a similar situation occurred for the families in either polygamous marriage or in parent-separated/divorced families. Practically, mothers with lesser children may have more attention to each child and may not need to organize child care for other children while travelling to health facility for immunization thus making vaccine visits easier to uptake and complete (Kamau and Esamai, 2001; Calhoun et al., 2014).

Religion has minimal impact on the immunization status of an under-five child. The same observation on effect of religion on immunization is made by Sanou et al., (2009) in Burkina Faso, the study noted insignificantly lower immunization rates compared to the rest.

Socio economic status of a family influences its health seeking behavior and hence the child's vaccination, the wealth index of a family measured in terms of the land size in acres directly determined the immunization status of a child. The families with two acres and above of land complied with the immunization scheduled more than their counterparts who owned less than half an acre piece of land. Education level of the guardian had a direct impact on child vaccination compliance since those who at least attended school attempted to vaccinated their child, while those who had post-secondary education complied to the schedule and within the right time. The same observations were made in Bangladesh by Rahman and Obaida-Nasrin (2010) and by Odusanya et al., (2008) in Nigeria. The studies found that those children with educated mothers or of higher wealth status were more likely to be immunized.

Similar to land ownership given the agricultural economic background of the study population, the form of occupation a parent engaged in, had a great impact on immunization, in terms of time and availability of funds. Those who engaged in salaried employment and were farmers on their own land complied more than those who engaged in casual labour form of occupation.

4. Conclusion and Recommendations

Access to a motivating factor and adherence to maternal health practices were the significance to the guardian's compliance to their children immunization schedule. The incentive played a significant role in the mothers' activities since it was able to save on their time, logistic of access to necessary daily needs and enabled them to forgo other activities for their child immunization. The study recommends diversity of incentives to motivate more mothers to avail their children for immunization on time. The same view is shared in Bangladesh by Andrews-Chavez et al., (2012); policy makers should focus future interventions to households with observed poverty related risk factors.

The factors such as the mother's education, household size and its source on health information, place of birth, wealth index, maternal health practices (ANC), greatly influence compliance to the immunization schedule. In consistency with prior studies (e.g. Andrews-Chavez et al., 2012; Ibnouf et al., 2007; Parashar, 2005; Kawakatsu and Honda, 2012), the

level of mother's education is singled out as one of the most important factor in the uptake and completion of child vaccination.

The factors identified in this study, especially incentives and mother's literacy should be factored in future immunization plans to increase its efficiency.

In conclusion, the shrinkage estimator method gave a sparse model that was easy to interpret and increased the estimated predictability accuracy. The shrinkage estimator-LASSO was a better estimated compared to the maximum likelihood estimator in terms of interpretation and prediction of the multinomial logistic regression model, in agreement with other studies (e.g. Ibrahim et al., 2011; Fan and Li, 2001; Steyerberg et al., 2000). The study thus recommends for use shrinkage estimator-LASSO in similar studies with small and complete data sets, especially with prespecified predictors.

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Appendix I

UNIVERSITY OF NAIROBI / GRAND CHALLENGES CANADA
BARCODES FOR IMPROVED CHILD VACCINATION AND FAMILY NUTRITION
QUESTIONNAIRE ON UNDER-FIVE CHILD IMMUNIZATION
……**KENYA**……COUNTRY
UNDER-FIVE CHILD IMMUNIZATION HOUSEHOLD SURVEY/VALIDATION TOOL
IDENTIFICATION PAGE

COUNTY.....**TRANS- NZOIA**.....
DIVISION.....
LOCATION.....
SUB-LOCATION.....
VILLAGE.....
NEAREST CLINIC .....…DISTANCE .....KM
CLUSTER..... CODE ……
Household code | | | | |

Name of enumerators.....
Date of interview.....Month....**MARCH**.....Year.....**2014**.....
Supervisor.....Signature.....

CONSENT

BARCODES FOR IMPROVED CHILD VACCINATION AND FAMILY NUTRITION

Description/Purpose of the study

To eliminate persistent pocket areas of Kenya where children are not vaccinated or under vaccinated, researchers will create a barcoded vaccination card redeemable for farm seeds and fertilizer. Each time a child gets a vaccine, the card is taken to one of about 20,000 local agro-vet outlets, where the barcode is scanned using an application on a camera-equipped Smartphone. The farmer would then redeem an "agri-credit" for essential farm inputs.

This would powerfully incentivize parents to seek and adhere to their children's immunization schedule even when hard pressed financially to reach a distant vaccination centre. This is a practical solution that would significantly boost small farm productivity and incomes for poor household while safeguarding the general health of children in farming villages through up-to-date immunizations."

Research Site

Western Kenya

Research team

The research team is composed of: Dr. Benson Wamalwa (Principal Investigator), Dr. Edward Muge (Project co-ordinator/logistician, Ms. Everlyne Munanga (Supervisor Immunization staff), Ms. Caroline Aura (Supervisor Agri-business staff) and eight research assistants.

Benefits of Participation in the Study

Participants will have their immunization cards affixed with a redeemable voucher. The value of each voucher will be 2,000 Ksh worth of fertilizer or any agricultural seed type as per the choice of the participant. The Researchers will obtain data to inform on reduced pockets of non and under-immunization in the study area.

Archiving of specimens

N/A

Sharing of samples

N/A

Risks of participation

None

Confidentiality

All information obtained about you and the results of the research will be treated confidentially. This information will be coded and kept under a password-protected database.

The study files will be kept electronically at the Department of Chemistry, University of Nairobi, under the responsibility of Dr. Benson Wamalwa. Your participation and your Child/children immunization results will not be shared with other medical personnel with your identifying information. The results of this study maybe published, deposited on a public database or communicated in other ways but it will be impossible to identify you.

Disclosure of potential economic gain

There are no potential economic gains that the researchers will receive from using your child/children immunization data.

Basis of participation

You are free to consent or refuse to give consent for your participation in this study. You are also free to withdraw your consent to participate in the study at any given point in time. Your choice to consent or not consent to this study will in no way affect your relationship with University of Nairobi or the other stakeholders involved in this project.

Obtaining additional Information

You are free to seek clarity or ask any questions at any point in time in the course of the study. If you desire to get more information concerning the study, feel free to call or sms Dr. Benson Wamalwa @ +254729903792, or Dr. Edward Muge @ +254716059466 or Ms. Everlyne Munanga @ +254702365996 or Ms. Caroline Aura @ +254724511323.

CONSENT

BARCODES FOR IMPROVED CHILD VACCINATION AND FAMILY NUTRITION

I have read the information stated above and have had the opportunity to ask questions regarding the study. I therefore consent to:

- Participate in this study
- My child/children immunization card be affixed with the barcode sticker
- My child/children immunization records be used in the study
- Withdraw my participation in the study after prior discussion with the research team member.

Name……Signature…….Date……

I, the undersigned, have fully explained the relevant details of this study to the patient.

Name……Signature…….Date……

Witness……Signature:……Date…….

SECTION 1: UNDER-FIVE SOCIO-DEMOGRAPHIC INFORMATION

HOUSEHOLD SCHEDULE (H/H – House Hold) Respondent code ……..

101 Code of H/H member	102 Name of H/H member eating regularly for the last months	103 Age in completed in year 00-under 1 years	104 Marital status 1.Married (monogamy) 2.Married (polygamy) 3.widow(er) 4.Separated/ divorced 5.Single 6.Others (specify) 7.N/A	105 Relationship to H/H head 1.Head 2.Spouse 3. Child by birth 4.grandchild 5.other child by relation 6. others (specify)	106 Education 0.None 1.Primary complete 2.Primary incomplete 3.Secondary complete 4.Secondary incomplete 5. Post-secondary 6. Others (specify)	107 Occupation /source of income 0.None 1.Farming 2.Casual worker 3.Business person 6.Others (specify)	108 Remittance per month 1.500 2.1000 3.1001-2000 4. 2001-3000 5.5000 6. Others (specify) 7. N/A	109 Religion 1.Protestant 2.Catholic 3. Muslim 4.Indegenous church 6.Others (specify)	110 Group membership 0.None 1.Wome group 2.Men group 3.Church group 4.Club 6.Others (specify)
01									
02									
03									
04									

SECTION 2: IMMUNIZATION OF UNDER-FIVE CHILDREN

201. Access vaccinations received and indicate in the relevant space

<5's name/code					
Place of birth					
Date of birth					
Age-months					
Sex					
Birth order					
Clinic card					
Date first seen					
Date of last vaccination					
Drop out period					
BCG					
DPT 1					
DPT 2					
DPT 3					
OPV 1					
OPV 2					
OPV 3					
PCV 1					
PCV 2					
PCV 3					
Measles					
Vitamin A					

Date format-------DD/MM/YY

Sex: **Female---- F** **Male------M**

Vaccine reception: **Not Given-------0** **Given -------- 1**

No BCG scar ----- 2 BCG redone ------ 3 Not applicable ---- 7

202. Find out the reason for defaulting on immunization

203. Find out the reason for the time taken after birth to visit the health facility for child vaccination

204. Were all of your elderly (above 5 years of age) immunized?

Yes	No	Do not know

205. Who/what is the family's source of information on immunization (Health care)

Source	Tick where appropriate
Health facility	
CHW	
Community	
Relatives	
Media	
Others (specify)	

206. What time does it take to walk to the nearest health facility for vaccination (treatment)?

Less than 30 minutes		30 – 1 hour		More than 1 hour	

207. When do you take your child for vaccination?

Time of vaccination	Tick where appropriate
On the indicated T.C.A date	
During outreaches	
When the child is sick	
Others (specify)	

SECTION 3: FOOD SECURITY AND NUTRITION

301. Do you/ the family own any of the following?

Property	Tick where appropriate
Land	
A phone	
Television	
Radio	
Livestock	
Others (specify)	

302. What size of land do you own? (Tick where appropriate)

Land size	Owned land	Portion of land cultivation	leased land
Less than quarter an acre(< 0.25)			
Quarter An acre (0.25)			
Half an acre (0.5)			
An acre (1)			
Two acre (2)			
Others (specify)			

303. What farm products do you plant, /preferred, when do you plant, harvest and in what quantities?

Farm product	Farming practiced	Planting season	Harvest season	Quantity in 80kg bags
Cash crops				
Stable crops				
Subsistence farming				
Livestock farming				

Poultry farming				
Others (specify)				

304. What amount of time do you spent on the farm and household chores in a day (probe):

Time	Land preparation	Planting	Wedding	Harvesting	Post harvesting	Household chores
1-3 hrs.						
4-6 hrs.						
7-9 hrs.						
>10 hrs.						

305. Incentive given on immunization

Incentive		Tick where appropriate
Seed	Beans	
	Maize	
	Local vegetable	
	Others (specify)	
Fertilizer	CAN	
	DAP	
	Urea	
Vaccine		
Clinic card		
Others (specify)		

SECTION 4: HEALTH SEEKING BEHAVIOUR

401. What do you consider as danger signs for a serious illness in under-five children? (Do not read the alternative: probe and tick where appropriate)

Serious/ dangerous signs	
Difficult / fast breathing	
Repeated vomiting	
Breast feeding/drinking poorly or not all	
Not eating/drinking well	
Blood in stool	
High fever/temperature	
Getting more sick/very sick	
Not getting better	
Convulsions	
Unconscious/difficult to walk	
Others (specify)	

402. What action do you take on noting any of the above stated conditions? Visit:

Place	Tick where appropriate
Hospital	
Health facility	
Bought drug Chemist	
No action	
Traditional herbalist	
CHW	
Self-medication	
Faith healing	

403. What was the outcome of the action taken?

Feedback	Tick where appropriate
Recovery	
Still sick on treatment	
Still sick not on treatment	
Others (specify)	

SECTION 5: MATERNAL HEALTH (Circle where appropriate)

501. What is the mother to the child parity? ……children

502. a) Are your entire live birth present today?

Yes	No	Do not know

Yes	No	Do not know

b) If No, how many died? …….. Children

503. Do you use family planning?

Yes	No	Do not know

If yes, which modes of family planning do you used?

Family planning method	Trick where appropriate	Perception on the FP
Injection		
Pills		
Implants		
Natural family planning		
Condoms		

504. What is her partner's opinion on family planning?

For family planning	Against family planning	Do not know

505. Are you pregnant now?

Yes	No	Do not know

506. If yes, how many months pregnant? ……months

503. At the time you become pregnant was it planned or not?

Yes	No	Do not know

505. Have you had a miscarriage, abortion or stillbirth?

506. If the pregnancy was miscarried, aborted or ended in a still birth, when did the last such pregnancy end?

Date…….Month……..Year…….

507. How many months pregnant were you when the last such pregnancy ended?

…….months

508. Have you ever had any other pregnancies, which did not result in a live birth?

509. Did you attend

Yes	No	Do not know

any antenatal care during your last pregnancy?

Yes	No	Do not know

510. If yes, who attended to you for antenatal care during your last pregnancy?

Health professional	
Doctor	
Nurse/midwife	
Traditional Birth Attendant	
Other persons	
No one	

511. How many months pregnant were you when you first received antenatal care?

……months Do not know

512. How many times did you receive antenatal care during this pregnancy?

Once	
Twice	
Thrice	
Four time	
More than four time	
Do not know	

513. During this pregnancy were you given/did any of the following and how many times was this done?

	1= Given , 2= Not given	Number of times
Tetanus injection		
Iron syrup		
Malaria drugs		
Blood pressure		
Weight measured		
Height measured		
Urine test		
Blood sample test		
Others (specify)		

514. Who assisted you during delivery?

Health professional	
Doctor	
Nurse/midwife	
Traditional Birth Attendant	
Friend/ Relative	
Others (specify)	
No one	

515. How much did the newborn child weigh at birth?

……..grams Do not know

516. Was the birth (NAME) registered?

Yes	No	Do not know