Available online at www.elixirpublishers.com (Elixir International Journal)

Medical and Health Sciences

Elixir Medical and Health Sci. 99 (2016) 43116-43135

ISSN: 2229-712X

Barriers to full Immunization Coverage of under Five Years Children in Benadir Region, Somalia

Abdirisak Mohamed Abdi, Simon Karanja and Rahma Udu Yusuf
Jomo Kenyatta University of Agriculture and Technology.

ARTICLE INFO

Article history:
Received: 3 September 2016;
Received in revised form:
2 October 2016;
Accepted: 12 October 2016;

Keywords
Caregiver,
Fully Immunized Child,
Full Immunization Coverage,
Vaccination,
Immunization.

ABSTRACT

Immunization is an important public health intervention aimed at reducing child mortality and morbidity in line with the fourth goal of the Millennium Development Goals. It is an important means for controlling six vaccine-preventable diseases, namely, Tuberculosis, Diphtheria, Whooping cough, Tetanus, Polio, and Measles. World Health Organization recommends that all children should receive full immunization by the age of two years to boost their immunity. Although immunization coverage has improved significantly over the past four decades, about one-fifth of the world's children still fail to receive full doses of the standard antigens, majority of who are natives of the African region. In Somalia, empirical studies on immunization coverage do not provide detailed information about immunization coverage and key determinants at the community level and within specific groups such as pastoralists. The main objective of this study was to determine barriers to full immunization coverage among under-five years children within Benadir region. The study applied a cross-sectional survey design, with both quantitative and qualitative methods. Primary data will was sourced from under-five children, service providers in selected health facilities, public health officers and community health workers. A mixture of probability and non-probability sampling procedures were applied to select participants in each category. Fisher's formula for sample size determination from large populations will be used to select a representative sample of the under five years children. The study applied a survey questionnaire with both closed and open-ended questions, as well as Focus Group Discussion and Key Informant Interview guides. Both quantitative and qualitative approaches were applied to process, analyze, and interpret the data.

1. Introduction

Quantitative data techniques will include univariate analyses to produce frequency distributions, percentages, Chi-square (χ^2) statistic, one-way Analysis of Variance, and binary logistic regression. In addition, qualitative data was organized and summarized in line with the thematic areas; described, followed by thematic analysis. The study found that children having less than 5 siblings had about 5 times the odds of being fully immunized as those having 15 or more siblings (OR = 5.063; CI = 2.657-9.649); children whose caregivers attended clinic more than thrice during pregnancy had about 11 times the odds of being fully immunized as those whose caregivers attended clinic once (OR = 10.538; CI = 8.412-13.202; while those whose caregivers reported incomes of USD 1500 or more had about 3 times the odds of accessing full immunization as their colleagues whose caregivers indicated income of less than USD 100. Children whose caregivers received support from husbands/partners were about 8 times as likely to access full immunization as those whose caregivers never received such support (OR = 8.207, CI = 6.426-10.465); those whose caregivers negated the belief that 'immunization is a form of family planning' were about 3 times as likely to access full immunization as those whose caregivers affirmed the belief (OR = 2.729; CI = 1.636-4.552); while those whose families had never changed residence (migrated) over the preceding one year period indicated about 7 times the odds of being fully immunized as those whose families migrated more than twice (OR = 7.043; CI = 4.740-10.464).The study concludes that children's immunization status is influenced by factors at the individual, household, community, and health facility levels, which can best be addressed through collaboration between Ministry of Health and development agencies. The study recommends the need to: provide more information on childhood immunization, targeting women of all ages; promote family planning methods, emphasizing birth spacing and smaller family sizes; encourage more women to attend antenatal care clinics, where they can access correct information about childhood immunization. The study further recommends the need to: promote women's economic status to enable them afford costs associated with accessing immunization services; improve male involvement in childhood immunization by creating an information package targeting men of all ages; establish rural maternal and child health centers to reach communities that are far from health facilities with primary healthcare services, including immunization and information.

Immunization is an important public health intervention aimed at reducing child mortality and morbidity in line with

the fourth goal of the Millennium Development Goals (MDGs) (UNICEF, 2009). It is an important means for controlling six vaccine-preventable diseases, viz. tuberculosis, Diphtheria, whooping cough (Pertussis), Tetanus, Polio, and Measles (Centers for Disease Control 2006; World Health Organization 2013), and has been considered the most cost-effective intervention against such debilitating diseases (Rahman, and Obaida-Nasrin., 2007). WHO recommends that all children should receive full immunization by the age of two years to boost their immunity.

Full immunization includes one dose of Bacillus Calmette-Guerin vaccine (BCG), three doses of Diphtheria-Tetanus-Pertussis (DPT) vaccine; three doses of vaccine against Hib; as well as three doses of Hepatitis B (HepB) vaccine (UNICEF, 2009; WHO, 2013). In addition, a child is considered to be fully immunized after receiving three doses of either Oral Polio Vaccine (OPV) or Inactivated Polio Vaccine (IPV), and one dose of a Measles Virus-Containing Vaccine (MVCV), either as anti-measles alone or in combination with other antigens (WHO, 2010; 2013). The BCG vaccine is usually given at birth or at first clinical contact, while DPT-HepB-Hib and polio vaccines require three vaccinations at approximately 6, 10, and 14 weeks of age, and measles should be given at or soon after reaching nine months of age (UNICEF, 2009; WHO, 2013).

Full immunization forms a key public health goal at the global and national levels. In 1974, WHO established the Expanded Program on Immunization (EPI) to ensure that all children access vaccines (WHO, 2013). To synergize EPI, the United Nations General Assembly Special Session (UNGASS) set a goal to ensure full immunization of children under one year at 90% coverage nationally with at least 80% coverage in every district by 2010 (WHO, 2006; CDC, 2010; WHO, 2013).

Building on this goal, the World Health Assembly endorsed the Global Vaccine Action Plan (GVAP) in 2012 to extend immunization to all children across the globe. GVAP's key targets include achieving and sustaining 90% national DPT_3 coverage and $\geq$ 80% DPT_3 coverage in every District by 2015 (WHO, 2013). In Somalia, the Expanded Program on Immunization (EPI) aims at reducing child mortality and morbidity resulting from the six immunizable diseases; thus, contribute towards the realization of the fourth MDG.

Available data show that during 2012, an estimated 83% of infants worldwide received three doses of DPT vaccine; however, coverage varied significantly across the WHO regions. Among 194 WHO member states, 131 (68%) achieved $\geq$ 90% DPT_3 national coverage, and 59 (30%) achieved $\geq$ 80% DPT_3 coverage in every district. However, 22.6 million children did not receive the recommended three doses of DPT, a key indicator of immunization program performance (WHO, 2013).

In Somalia immunization coverage is only 30%–40% of children immunized against the six major childhood diseases. This is relatively low compared to the global coverage of almost 80%. Routine child immunization coverage among one-year-old children for measles is 24% and for Diptheria, Tetanus and Pertussis (DTP3) is 31 % (UNICEF, 2010) . Benadir region of Somalia; immunization coverage is estimated at about 40% (UNICEF, 2010). Existing literature does not reveal factors underlying the low level of full immunization coverage in the region.

Increasing immunization coverage in developing countries is not only a matter of programmatic intervention, but also a rich subject for academic investigations, with a view to making interventions more responsive to community-specific needs (Edmunds *et al*., 2002). In Somalia immunization coverage is only 30%–40% of children immunized against the six major childhood diseases. This is relatively low compared to the global coverage of almost 80%. Routine child immunization coverage among one-year-old children for measles is 24% and for Diphtheria, Tetanus and Pertussis (DTP3) is 31 % (UNICEF, 2010). Existing academic literature reveals various factors underlying the immunization coverage within a wide spectrum of socio-economic and cultural contexts. However, in Somalia especially in Benadir region studies were not done on parents/caregivers' demographic, socio-economic, psychosocial and environmental factors influencing full immunization coverage.

This study responded to the stated gaps by focused on parents/caregivers' demographic, socio-economic, psychosocial and environmental factors influencing full immunization coverage among under five years children in Benadir region Somalia. The findings will be of great importance to various stakeholders, including the Ministry of Health and development agencies involved in maternal and child health (MCH) within Benadir region and entire Somalia in planning and implementation of immunization programs.

2. Related Literature

Theoretical Literature

The Health Belief Model

This study is founded on the theoretical constructs of the Health Belief Model (HBM). This theory provides details of health behavior change process, as well as key personal and environmental factors influencing the decision to utilize health services. This theory also provide foundations for planning, implementing, and evaluating health interventions designed to promote the uptake of services in various socio-cultural contexts (Piotrow, *et al.*, 1997).

The HBM was developed in the 1950s to explain why medical screening programs offered by the US Public Health Service were not always successful (Hochbaum , 1958). The model is often applied to understand health-seeking behavior and possible reasons for non-utilization or non-adherence to recommended health measures (Becker, and Rosenstock, 1984). The model holds that health behavior is determined by perceptions about a disease and strategies available to decrease chances of its occurrence (Hochbaum, 1958).

The original HBM consisted of four main constructs, namely: perceived seriousness, perceived susceptibility, perceived benefits, and perceived barriers. Each of these theoretical constructs may be used to explain health-seeking behavior individually or in combination. More recently, the accuracy of the model was improved by adding three new theoretical constructs, including cues to action, modifying factors, and self-efficacy *(*Glanz, *et al*., 2002).

Perceived seriousness

This construct signifies an individual's belief about the seriousnessof a disease. While the perception of seriousness is often based on medical information or knowledge, it may also come from beliefs a person has about the difficulties a disease would create or the effects it would have on his or her life (McCormick-Brown, 1999). For instance, an individual may view that flu is less serious than tuberculosis infection, because, while flu may require a few days to clear out, tuberculosis requires a longer period of management and treatment. Hence, one is likely to seek for health services

faster when threatened by the risk of tuberculosis than when facing a threat from flu.

Perceived susceptibility

Perceived susceptibility is one of the powerful perceptions influencing the uptake of health services such as immunization. The greater the perceived risk of infection, the higher the chance of service uptake. When people perceive that they are at risk of contracting an infection, they are likely to prevent it from happening by adopting some measures (Belcher *et al*., 2005). Even though a perception of high susceptibility is likely to influence better uptake of health services, this is not always the case for parents/caregivers of children aged below 1 year, particularly in developing countries. This was confirmed by a study which revealed that although 82% of the mothers of children aged 12 to 23 months reported awareness of risks associated with non-immunization, up to 47% had not taken the initiative to have their children immunized (Nath *et al*., 2007). In this regard, the perception of susceptibility explains behavior in some situations but not in all.

Perceived benefits

This theoretical construct refers to an individual's opinion of the value or usefulness of a particular health service in decreasing the risk of contracting an infection. People tend to seek health services when they believe such services will decrease their chances of developing a disease. Perceived benefits play an important role in the adoption of preventive measures, such as honoring repeat visits to health facilities to enable children complete their immunizations (Stretcher and Rosenstock, 1997).

Perceived barriers

This theoretical construct addresses the issue of perceived barriers to health service accessibility. The construct refers to an individual's own evaluation of obstacles in his or her way of accessing and utilizing a particular health service. To take children for immunization services as early as possible, a mother needs to believe that the benefits of such services outweigh the consequences of none or under-immunization (Nath,*etal*., 2007). This bolsters the will to overcome perceived barriers and encourages one to seek for immunization services for their children. Some of the barriers to uptake of immunization services may include the myth that immunization is a form of family planning, long distance, long queuing time and providers' attitude, among others. The model may be summarized as indicated in figure 2.1 below.

Modifying variables

The four main theoretical constructs of the model are modified by variables such as gender, age, religion, marital status, education level, and average income, awareness of services, as well as parity and previous birth intervals, among other individual attributes. These characteristics influence personal perceptions regarding particular health services and the likelihood of service uptake (Ali, 2002).

Cues to action

The model further holds that the uptake of health services is influenced by cues to action, which include events, people or things that may influence an individual to seek for certain services. Examples include illness of a neighbor's child, advice from religious leaders, peer influence or health messages disseminated through audio, visual, and print media (Ali, 2002).

Self-efficacy

In 1988, the model was improved by adding the construct of self-efficacy (Rosenstock, *et al*., 1988), which refers to the belief in one's own ability to do something (Bandura, 1977). Generally, people don't try out new things unless they believe they can do it. If someone thinks he or she is capable of utilizing the service, chances are high that such services may not be sought. For instance, if a mother believes that immunization makes children sick, and then she is less likely to honour re-visit appointments.

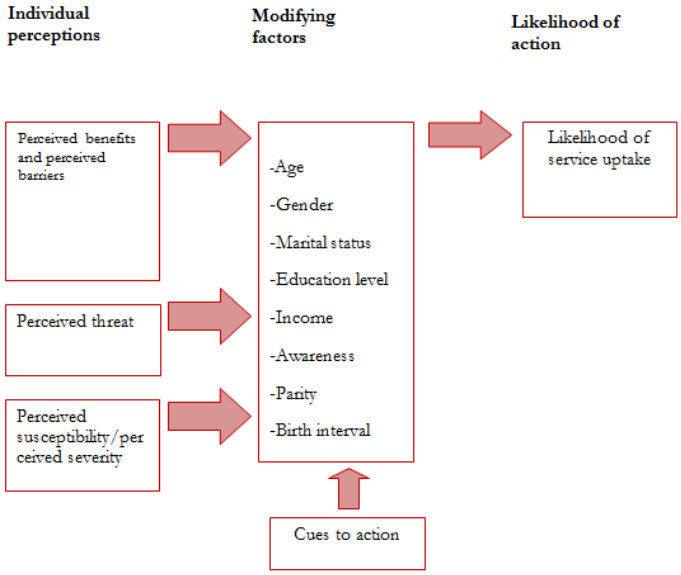

Figure 2.1. Health belief model.

Source: Stretcher, V. and Rosen stock, I.M. (1997)

Conceptual frame work

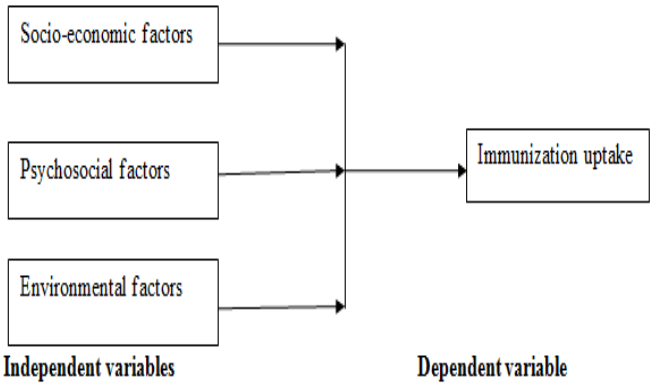

Figure 2.2. Conceptual framework.

Source: author Abdirisak Mohamed, (2015)

Factors influencing child immunization

Socio-cultural factors

The study conducted by (Nath *et al*. 2007) reported significant statistical relationship between immunization coverage and factors such as parents/caregiver's income, literacy and cultural background. Participants cited lack of money for transport as a key factor influencing the immunization status of their children. In Greece, (Michail *et al*. 2000), revealed a significant relationship between complete immunization and mothers' education, income and immigration status. In their study, (Rahman, and Obaida-Nasrin,2007) reported that up to 70.1% of children of mothers with college education were fully immunized compared to 63.0% of those with secondary education, 60.6% of those with primary, and 55.5% of those with no education. In Kenya, the KDHS 2008-09 report found that among mothers with no education, the immunization coverage was 67.4%, those with primary incomplete had 71.2% coverage rate, primary complete reported a coverage rate of 80.3%, while among

mothers with secondary or more of education the coverage was 87.0% (KNBS and ICF Macro, 2010).

The KDHS 2008-09 report further shows that immunization coverage varied with the wealth quintile. The variation range from 65.9% among those in the lowest wealth quintile to 85.1% for those in the highest wealth quintile (KNBS and ICF Macro, 2010). Arguably, full immunization requires multiple visits, which often translate into high travel costs and other incidental costs, which prevent women with no regular income from taking their children to health facilities. The study noted that the difference between mothers with and those without paid jobs regarding the immunization coverage of their children, was about 6% (χ^2=8.43, p<0.05).

In Ethiopia, (Kidane and Tekie2000) conducted a study on factors influencing child immunization coverage in a rural district and found that full immunization significantly associated with mothers' educational attainment. In this regard, children whose mothers had college education were about 3.2 times as likely to be fully immunized as those whose mothers had no formal education. Similar findings were reported in a study conducted in the Lao People's Democratic Republic (Maekawa *et al*.2007). In this regard, the proportion of fully immunized children was highest among women with post-secondary education (66.4%), followed by women with secondary education (57.7%), as well as those with primary and no formal education at 48.9% and 42.5%, respectively.

In Sudan, (Ibnouf, *et al*.2007) reported that children in urban and rural areas differed significantly in their reported immunization status. The immunization coverage was influenced by factors such as limited community participation due to high illiteracy levels and low educational attainment in the community, particularly among women. The uptake of immunization services was also linked to average household income, which constrained the per capita consumption of health boosting goods and services.

The study conducted by (Singh,2007) also reported linkage between immunization coverage and illiteracy as well as poverty levels. In another study conducted in two urban villages of East Delhi, India,(Chhabra *et al.*2007) reported that immunization coverage significantly associated with education level of mothers and fathers, as well as father's occupation and residential area. Furthermore, (Tugumisirize, *et al.*2002) reported that complete vaccination coverage was 44.6% and mother's educational attainment was the most important socio-economic factor influencing immunization status, followed by mother's income.

In Bangladesh, (Rafiqul, *et al*. 2007) found that immunization coverage significantly associated with mother's education, father's occupation, and household income. In Turkey, (Sebahat, and Nadi,2006) brought out the statistical relationship between immunization coverage and mother's as well as father's education level. The results showed that children whose mothers had secondary education were more likely to be fully immunized than those whose mothers had no formal education.

In Nigeria, (Anah, *et al*. 2006) reported that 60.9% of the children whose immunization status was verified were fully immunized, 26.6% were partially immunized, while 12.5% had no form of immunization. Some of the reasons for missing scheduled immunization included ignorance about repeat visits, low education level and low income for most women. Similarly, (Bataringaya, 2010) found that children of women with regular income were about twice as likely to complete their immunizations as those whose mothers had no income. In their study, (Rahman, and Obaida-Nasrin,2007) also found that 68.3% of children whose mothers were in the richest wealth index were completely immunized, followed by 63.5%, 62.1%, 59.9%, and 51.4% for the rich, middle, poor, and poorest wealth indices, respectively.

Related to education level is the lack of awareness about childhood immunization services, its importance and services provided in local facilities. For instance, (Kidane, and Tekie,2000) reported a positive relationship between full immunization and mothers' awareness about necessary childhood immunizations. In this regard, mothers who were able to state at least one type of vaccine were about 2.4 times as likely to have their children fully immunized as those not aware of any type of vaccine.

In China, (Cheyne,1994) that poor uptake of immunization services was associated with lack of mother's awareness about repeat visits, which constrained the uptake of subsequent doses and full immunization coverage. (Rafiqul, et *al*. 2007) found that mothers who were exposed to any form mass media were more likely to have their children fully immunized than mothers who lacked such exposure. In Uganda (Tugumisirize,*et al*.2002) reported that knowledge of immunization schedule was one of the key factors significantly influencing immunization coverage. (Rahman, and Obaida-Nasrin,2007) also reported a positive relationship between full immunization of children and home visits by CHWs, with families visited being twice as likely to have their children fully immunized as families that were never visited.

Psychosocial factors

A number of studies have found that parents/caregivers' decision to take children to health facilities for immunization is a function of their psychosocial orientation. Ibnouf, *et al*. 2007, reported a significant relationship between immunization coverage and parents/caregivers' attitude towards child immunization. (Rahman, and Obaida-Nasrin, 2007), noted that education level influences individual perception about particular health services. Consequently, women with secondary education were 2.3 times the odds of perceiving their children to be at risk of diseases as those with no formal education. Thus, continuous provision of correct information to care givers developing countries should be considered a key option for immunization programs.

Tugumisirize, *et al*. (2002) reported that immunization coverage was constrained by rumors that vaccines weaken children, as well as the perception that immunization is a form of family planning. Similarly, (Anah *et al*. 2006) reported that the uptake of immunization services was influenced by the perception that vaccines make children sick. The fear of pain is a key factor preventing women from taking their children to health facilities for immunization. (Maekawa,*et al*. 2007) reported similar findings in Lao and further noted that misinformation associated with child immunization can be addressed through continuous health education interventions.

Environmental factors

In Kenya, (Ndiritu *et al*.2006) carried out a cluster survey with sample size of 204 children aged 9-23 months. The purpose of the study was to investigate immunization coverage and factors preventing women from immunizing children below one year for DPT. Among other findings, the study revealed that immunization coverage was significantly associated with annual patterns of rainfall. In this regard, fewer mothers were likely to honour repeat visits during wet seasons that during dry seasons. (Ibnouf *et al* 2007) also reported that immunization coverage was a function of

migration and weather patterns, while (Anah *et al*.2006) indicated that immunization coverage significantly associated with frequent change of residence. (Sebahat, and Nadi, 2006) also reported the influence of intra-country migration on immunization of children.

3. Materials and Methods

Study Design

This study applied cross-sectional survey design to guide the research process. Consequently, data was sourced from the target population at a single point in time (Babbie, 1973; Fowler, 1993). The design is the most commonly used form of survey design due to its cost and ability to source a wide range of information, including demographics, perceptions and attitudes (American Statistical Association, 2009). The proposed design had two key approaches - quantitative and qualitative.

Whereas the quantitative approach elicited information used for descriptive and inferential purposes, the qualitative approach obtained in-depth information used in validating descriptive and inferential statistics (Mwanje, 2001). Open-ended questions were useful in enhancing validity of the data by allowing respondents to express their experiences and perspectives. This addressed potential biases that may arise from pre-coded structured questions, which is the main attribute of the quantitative approach.

Study Area

The study will be carried out in Benadir region, Somalia. Benadir is bordered by the regions of middle Shebelle (Shabeellaha Dhexe) and Lower Shebelle(Shabeellaha Hoose), as well as the Indian Ocean. The region has sixteen districts:- Abdiaziz , Bondhere ,Daynile , Dharkenley , Hamar-Jajab , Hamar-Weyne , Hodan , Howl-Wadag , Huriwa , Karan , Shangani , Shibis ,Waberi , Wadajir , wardhigley and Yaqshid Districts

Mogadishu is the capital Benadir region as well as the capital city of Somalia and it's the most populous city in the country. Although no official census has been carried out in Mogadishu following the collapse of the formal state, the united development programme projects that the estimated population of Mogadishu in 2014 to be (1, 587,183) persons (UNDP, 1997).

Target Population

The primary participants targeted by the study included mothers of children under-five years of age. The study focused on the immunization status of the youngest child within the specified cohort. The study also targeted service providers in selected health facilities who were directly involved in immunization services, key staff of the Ministry of Health, including public health officers and Community Health Workers (CHWs). These participants were targeted as key informants and were expected to provide in-depth information on factors influencing immunization coverage in the community, as well as appropriate strategies to improve uptake of immunization services.

Inclusion and exclusion criteria

The study included mothers of children under-five years of age; and themselves, aged 18-49 years. However, the studyexcluded mothers who were aged below 18 years or above 49 years for ethical reasons and inability to provide competent information. The study also excluded caregivers of children in the targeted age bracket who are not biological parents because they may not provide accurate information about the immunization of children. Besides, they may not be able to locate immunization cards in the absence of parents

3.6 Sampling Procedures and Sample Size

The study will use a mixture of probability and non-probability sampling procedures to select participants. The data was collected from the eight districts of Benadir region namely Bondhere , Daynile , Hodan , Karaan , Shangani , Shibis , Waberi , wadajir and Yaqshid. These eight districts were purposively selected from the sixteen districts of Benadir region because they had the majority of children of under five years and represented different geographical zones.

The households in each district were sampled systematically based on the major streets of the Benadir region. In each household, mothers of children within the specified age bracket and themselves, aged between 18 and 49 years were consented and interviewed. Another set of women meeting similar inclusion criteria and men were selected purposively and recruited for Focus Group Discussions (FGDs). In each district, the research team comprising of the researcher and his assistants randomly identified the first house to be visited using existing listings of household names for Community Units. The team then applied random methods such as spinning-the-pen technique to identify random directions to ensure geographical representation.

The sample size will be calculated using the statistical formula of fisher *et.al*. For population sample size estimation used by (Kothari, 2004).

Sample size

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

Where:

n = desired minimal sample population (where population is greater than 10,000)

z = standard normal deviate which is 1.96 at 95% confidence level.

p = estimated immunization coverage among under five children in Somalia (38%).

d = degree of accuracy (0.05)

q = 1-p

Therefore using a confidence of 95% that corresponds to the standard normal deviate of 1.96, the proportion in the target population estimated at 38% and the degree of accuracy required set at 0.05 the sample size, the sample size will be;

n= $(1.96^2 \times 0.38 \times 0.62)/0.05^2$ n ≈362

The calculated sample size will be increased by 10% (36) to provide for non-response, making a total sample size of 398 children.

Table 3.1. Proportionate sample distribution of selected Benadir districts.

	Districtsof Benadir region	Under five children Population (D)	Percentage % D/N*100%	sample	Cumulative total
1	Hodan	14318	12.0	48	48
2	Karaan	24634	20.6	82	130
3	Waberi	10173	9.0	36	166
4	Daynile	6554	5.3	21	187
5	Wadajir	10022	8.3	33	220
6	Bondhere	12229	10.2	40	260
7	Yaqshid	25698	21.4	85	345
8	Shibis	15950	13.2	53	398
	Total	119578	100	398	

Source: UNDP (1997)

Key informants, including health facility staff, public health officers and technicians, as well as CHWs shall be selected purposively based on their direct or indirect

Table 4.1. Caregiver's demographic attributes and full immunization status.

Demographic attributes	Fully immunized		Under immunized		Chi square	df	p-value
	Frequency	*Percent*	*Frequency*	*Percent*			
Respondent's age							
<20 years	22	32.8	4	1.5			
20-29 years	31	46.3	143	55.0			
30-39 years	13	19.4	79	30.4	58.632	3	0.000***
40-49 years	1	1.5	34	13.1			
Total	67	100.0	260	100.0			
No. of living children							
< 5 children	41	61.2	32	12.3			
5-9 children	23	34.3	130	50.0			
10-14 children	3	4.5	93	35.8	66.426	3	0.000***
15 children+	0	0.0	5	1.9			
Total	67	100.0	260	100.0			
Gender of the child							
Male	39	58.2	135	51.9			
Female	28	41.8	125	48.1	0.573	1	0.449
Total	67	100.0	260	100.0			
Attended clinic during pregnancy of the child							
Yes	53	79.1	153	58.8			
No	14	20.9	107	41.2	10.172	1	0.001***
Total	67	100.0	260	100.0			
No. of ANC attendance							
Once	4	10.0	70	33.7			
Twice	24	60.0	132	63.5			
Thrice	9	22.5	6	2.8	18.283	3	0.000***
>Thrice	3	7.5	0	0.0			
Total	40	100.0	208	100.0			
Place of birth							
Health facility	15	22.4	10	3.8			
Home	52	77.3	250	96.4	9.638	1	0.002***
Total	67	100.0	260	100.0			

*,**,*** show significance at ρ=0.1, ρ=0.05 and ρ=0.01 error margins, respectively.

Table 4.2. Socio-economic status and full immunization status.

Demographic attributes	Fully immunized		Under immunized		Chi square	df	p-value
	Frequency	*Percent*	*Frequency*	*Percent*			
Education level							
No formal education	53	79.1	218	83.8			
Primary complete	12	17.9	42	16.1	0.317	2	0.853
Secondary complete	2	3.0	0	0.0			
Total	67	100.0	260	100.0			
Occupation							
Dependant	28	41.8	124	47.7			
Formal business	1	1.5	5	1.9			
Informal business	36	53.7	117	45.0	2.455	4	0.653
Casual labour	1	1.5	9	3.5			
Livestock rearing	1	1.5	5	1.9			
Total	67	100.0	260	100.0			
Income level							
<USD 100	1	1.5	10	3.8			
USD 101-499	44	65.6	216	83.1			
USD 500-999	15	22.4	34	13.1	9.439	4	0.051*
USD 1000-1499	4	6.0	0	0.0			
USD 15,000 +	3	4.5	0	0.0			
Total	67	100.0	54	100.0			
Marital status							
Married	57	85.0	234	90.0			
Divorced	6	9.0	26	3.6	1.313	2	0.519
Widowed	4	6.0	0	0.0			
Total	67	100.0	260	100.0			
Marriage type							
Monogamy	52	77.6	173	66.5			
Polygamy	15	22.4	87	33.5	2.724	1	0.099*
Total	67	100.0	260	100.0			
Ever received partner support							
Yes	26	38.8	65	25.0			
No	41	61.2	195	75.0	4.331	1	0.037**
Total	67	100.0	260	100.0			

*,**,*** show significance at ρ=0.1, ρ=0.05 and ρ=0.01 error margins, respectively.

involvement in childhood immunization within the Benadir region community.

Purposive sampling is a non-probability procedure, which allows a researcher to use cases that have the required information with respect to subject of the study. Such cases are often handpicked because they are informative or possess the required characteristics (Mugenda, and Mugenda, 1999).

Ethical Considerations

The proposed study sought informed consent from sampled mothers of children aged under-five years. In this regard, respondents were briefed on the research process and its purpose. They were notified that participation will be purely on voluntary terms. Again, their withdrawal of consent did not affect their subsequent treatment or relationship with their institutional administration. Those who declined to participate in the research was substituted for appropriately. In addition, participants were assured that information on their personal life and opinions were handled and processed in confidentiality. Research Assistants were requested not to capture participants' names or other personal identifiers to assure confidentiality. Ethical clearance for the study was obtained from the Pwani University Ethics Review Committee NACOSTI accredited.

4. Findings

Factors influencing children's immunization status: Bivariate results

Demographic factors

The caregivers were aged between 18 and 49 years, with the mean age being 27 years (95% CI, 26.1-27.4) for those whose children were fully immunized and 33 years (95% CI, 30.3-35.1) for those whose children were under-immunized. Using one-way analysis of variance, the study found a significant variation in the age of women whose children were fully immunized and those whose children were under-immunized (computed $F_{(1,323)}$ statistic = 44.402 and p-value = 0.000). Furthermore, the results summarized in Table 4.1 show that about 70% of women whose children were fully immunized were aged below 30 years, compared to 41% of those whose children were under-immunized. Contrastingly, the 40 to 49 years bracket had only 1.5% of those whose children were fully immunized, compared to 13.1% whose children were under-immunized.

In this regard, the analysis indicated up to 99% chance that caregivers' age significantly associated with children's full immunization status (computed χ^2 = 58.632, df = 3 and p-value = 0.000). The results further show that up to 61.2% of the participants whose child were fully immunized had less than 5 children; among those whose children were under-immunized, only 12.3% had less than five children. In addition, 4.5% of those whose children were fully immunized compared to 35.7% reported having 10 children or more. The analysis revealed up to 99% chance that children's immunization status significantly associates with the family size (number of children born to a participant) (computed χ^2 = 66.426, df = 3 and p-value = 0.000). On the same note, FGD participants indicated that due to low uptake of family planning methods, some women were overwhelmed by the number of children, for whom they provided care, leading to some missing out on their scheduled appointments for immunizations.

The results in Table 4.1 shows that among the children that accessed full immunization, 58.2% were boys, while among those who were found to be under-immunized, boys constituted 51.9%. The analysis shows lack of significant relationship between children's full immunization status and their gender (computed χ^2 = 0.573, df = 1 and p-value = 0.449). The KII and FGD participants confirmed lack of gender biases in access to childhood immunizations. In this regard, participants noted that all children were given a fair chance to access health services, including immunization.

The study found that up to 79.1% of the mothers whose children had accessed full immunization attended antenatal care clinic during pregnancy of the child in question. Among those whose children were under-immunized, 58.8% attended clinic. The results suggest that a higher proportion of those whose children were fully immunized attended clinic during pregnancy. The results further show up to 99% chance that children's immunization status significantly associated with clinic attendance (computed χ^2 = 10.172, df = 1 and p-value = 0.001). In addition, KII and FGD participants indicated that during clinic attendance, women accessed health education on various maternal, newborn and child health topics, including childhood immunization. Such knowledge encouraged women to take their children to health facilities for immunization.

Regarding the number of clinic attendance during pregnancy, the results in Table 4.1 indicate that 60.0% of the mothers whose children had accessed full immunization attended clinic twice, while 7.5% attended clinic more than thrice. Among those whose children were under-immunized, 63.5% attended clinic twice, 33.7% indicated once, while none attended clinic more than thrice. The analysis revealed a significant relationship between children's immunization status and the number of clinic attendances made during pregnancy (computed χ^2 = 18.283, df = 3 and p-value = 0.000). The results suggest that the number of clinic attendance during pregnancy is likely to influence full immunization status among children.

The results summarized in Table 4.1 further show that among mothers whose children had accessed full immunization, 22.7% accessed skilled birth attendance in health facilities, while 77.3% gave birth away from health facilities. Among those whose children were under-immunized, up to 96.4% gave birth away from health facilities. Based on this, the analysis indicates up to 99% chance that full immunization status significantly associates with the place of birth (computed χ^2 = 9.638, df = 1 and p-value = 0.002). More still, FGD participants noted that although some women still delivered their babies at home or most they often to health facilities for postnatal care, which provided opportunity to access education on the importance of childhood immunization.

Socio-economic attributes

The study found that among the participants whose children had accessed full immunization, the majority (81.8%) had no formal education, while 17.8% indicated having primary education. The situation was nearly the same among those whose children were under-immunized, with 83.9% indicating lack of formal education. The analysis found no significant relationship between children's immunization status and mothers' educational attainment (computed χ^2 = 0.317, df = 2 and p-value = 0.853).

Most participants (53.7%) whose children were fully immunized reported to be engaged in informal businesses while about (48.1%) were dependent. Among the participants whose children were under-immunized, informal businesses constituted 45.0%, while 47.7% were dependant. However, the analysis revealed lack of significant relationship between

children's immunization status and mothers' type of occupation.

The results in Table 4.2 further indicate that 65.6% of the participants whose children had accessed full immunization reported an average monthly income of USD 100 to 499; another 22.4% indicated incomes ranging between USD 500 and 999, while 4.5% reported incomes of USD 1500 and above. Among those whose children were under-immunized, the majority (83.1%) were in the USD 100 to 499 income bracket, while 13.1% stated incomes of between USD 500 and 999. The analysis indicated up to 95% chance that children's immunization status significantly associated with mothers' average monthly income (computed χ^2 = 9.439, df = 4 and p-value = 0.051). In addition, FGD participants noted that low or lack of income was a key factor preventing women from honoring immunization appointments, particularly in relation to the ability to afford transportation costs.

The results in Table 4.2 further show lack of significant relationship between children's immunization and mothers' marital status (computed χ^2 = 1.313, df = 2 and p-value = 0.519). However, a significant relationship exists between children's full immunization status and the type of marital union. In this regard, 77.3% of those whose children had accessed full immunization and 66.7% of those whose children were under-immunized indicated to be in monogamous unions. Contrastingly, 22.7% of those whose children were fully immunized compared to 33.3% of those whose children were under-immunized were in polygamous marriages (computed χ^2 = 2.724, df = 1 and p-value = 0.099). More still, the FGD sessions revealed that in monogamous unions, children received better attention from both parents, which enabled women to overcome challenges such as long distance and cost of transport to health facilities. However, in polygamous unions, it's the mothers who were more attentive to the health of children, albeit with minimal support from their partners.

Among the participants whose children had accessed full immunization, 38.8% had received support from their partners to enable children access services, while about two-thirds (61.2%) had not. Among those whose children were under-immunized, 25.0% had accessed partner support, while three-quarters (75.0%) had not. The analysis show up to 95% chance that children's immunization status significantly associated with access to partners' support by the caregivers. The KII and FGD participants affirmed the importance of partners' support in relation to children's access to immunization services. In this regard, they identified various forms of support provided by their partners, including money for transport, accompaniment to health facilities, as well as child care and domestic chores when mothers go to clinic for immunization.

Cognitive and psychosocial factors

a. Awareness and knowledge

The results presented in Figure 4.2 below show that all the participants (100.0%) whose children were fully immunized were aware of childhood immunization and so were 94.6% of those whose children were under-immunized. The analysis indicated up to 99% chance that children's immunization status significantly associated with caregivers' awareness of childhood immunization (computed χ^2 = 9.277, df = 1 and p-value = 0.002).

Participants were requested to indicate the age at which children should complete their immunizations. The results in Figure 4.2 show that 81.8% of those whose children had accessed full immunization and 58.9% of those whose children were under-immunized correctly stated that children should complete their immunizations by the first birthday. Overall, 77.8% of the participants provided correct response. The analysis indicated up to 99% chance that children's immunization status significantly associated with caregivers' knowledge of the ideal age for full immunization (computed χ^2 = 14.040, df = 1 and p-value = 0.000).

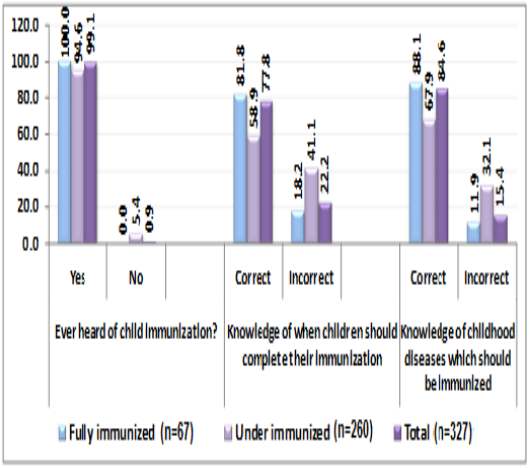

Figure 4.2. Awareness and knowledge of childhood immunization.

The study found that 88.1% of the participants whose children had accessed full immunization and 67.9% of those whose children were under-immunized correctly identified at least one immunizeable childhood diseases. Overall, 84.6% of the participants provided correct responses, including tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles. Again, the analysis revealed up to 99% chance that children's immunization status and mothers' knowledge of immunizeable childhood diseases were significantly related (computed χ^2 = 14.596, df = 1 and p-value = 0.000).

Participants were requested to identify any public health facility providing immunization services to children in their community. The results show that 98.1% of those whose children had accessed full immunization and 96.4% of those whose children were under-immunized were able to identify such facilities. However, the results showed lack of a significant relationship between children's immunization and caregivers' knowledge of health facilities providing immunization services.

On the same note, KII and FGD sessions revealed that immunization services were accessed from public health facilities, medical outreaches and during Ministry of Health's public immunization campaigns, mainly targeting polio and measles outbreaks.

b. Access to information on childhood immunization

Participants were requested to indicate how often they read newspapers, listen to radio and watch television. The intention was to identify the channels through community members were likely to receive information about maternal, newborn and child health, including childhood immunization and the influence of such channels on full immunization status. The results presented in Table 4.3 show that up to 95.5% of those whose children had obtained full immunization and 98.2% of those whose children were under-immunized said they never read newspapers. The results show lack of significant relationship between children's immunization status and caregivers' access to newspapers (computed χ^2 = 0.756, df = 2 and p-value = 0.685).

Table 4.2. Access to information on childhood immunization.

Attributes	Indicators	Fully immunized		Under immunized		Summary of Chi square tests		
		Frequency	*Percent*	*Frequency*	*Percent*	*Chi square*	*df*	*p-value*
Frequency of newspaper reading	*Always*	1	1.5	0	0.0			
	Occasionally	2	3.0	5	1.8	0.756	2	0.685
	Never	64	95.5	255	98.2			
	Total	67	100.0	260	100.0			
Frequency of radio listenership	*Always*	10	15.0	13	9.0			
	Occasionally	23	34.3	65	27.0	9.529	2	0.009***
	Never	34	50.7	182	64.0			
	Total	67	100.0	260	100.0			
Frequency of TV watching	*Always*	22	32.8	77	29.6			
	Occasionally	19	28.4	81	31.2	0.209	2	0.648
	Never	26	38.8	102	39.2			
	Total	67	100.0	260	100.0			
Most accessible source of information on immunization	*H/facility*	13	19.4	44	16.9			
	Radio	19	28.4	92	35.4			
	Friends	10	15.0	34	13.1	18.117	3	0.003***
	Family	25	37.2	90	34.6			
	Total	67	100.0	260	100.0			

*,**,*** show significance at ρ=0.1, ρ=0.05 and ρ=0.01 error margins, respectively.

More still, Table 4.3 shows that among the caregivers whose children had accessed full immunization, 15% indicated that they listen to radio 'always', while 34.3% do so 'occasionally'. As for those whose children were under-immunized, 9% were consistent radio listeners, while 27.0% stated that they listen to radio 'occasionally'. The analysis revealed up to 99% chance that children's immunization status significantly associated with caregivers' frequency of radio listening (computed χ^2 = 9.529, df = 2 and p-value = 0.009).

The results in Table 4.3 further show that (61.2%) of the caregivers whose children were fully immunized and (60.8%) of those whose children were under-immunized indicated that they watch television. Again, the analysis found no significant relationship between children's immunization status and television watching frequency by caregivers (computed χ^2 = 0.209, df = 2 and p-value = 0.648).

Regarding the most accessible source of information on childhood immunization, the results in Table 4.3 indicate that among the caregivers whose children had obtained full immunization, 37.2% accessed information from family members while 28.4% indicated radio. Among those whose children were under-immunized, the most accessible sources of information included radio (35.4%), and family (34.6%). Based on this, the analysis obtained a computed χ^2 value of 18.117, with 3 degrees of freedom and a p-value of 0.003, which was significant. This implies up to 99% chance that children's immunization status and the most accessible source of information about childhood immunization were significantly related.

c. Perceptions and beliefs about childhood immunization

Participates were requested to indicate whether they thought the children in question were susceptible/vulnerable to the immunizeable childhood diseases, including tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles. The results show that out of 327 participants, 96.6% affirmed that the children were susceptible. Among those whose children had accessed full immunization, 98.9% were affirmative, while among those whose children were under-immunized, 85.7% indicated that the children were susceptible to the cited diseases.

Regarding the perceived level of susceptibility, the results presented in Figure 4.3 show that among caregivers whose children were fully immunized, 65.8% felt that the children were 'very susceptible', while 34.2% believed they were 'somehow susceptible'. Among those whose children were under-immunized, 60.4% believed the children were 'somehow susceptible', while 39.6% indicated the view that they were 'very susceptible'. The analysis obtained a computed χ^2 value of 10.743, with 1 degree of freedom and a p-value of 0.001; thus, suggesting up to 99% chance that children's immunization status significantly associated with caregivers' perceptions about their susceptibility to the immunizeable childhood diseases.

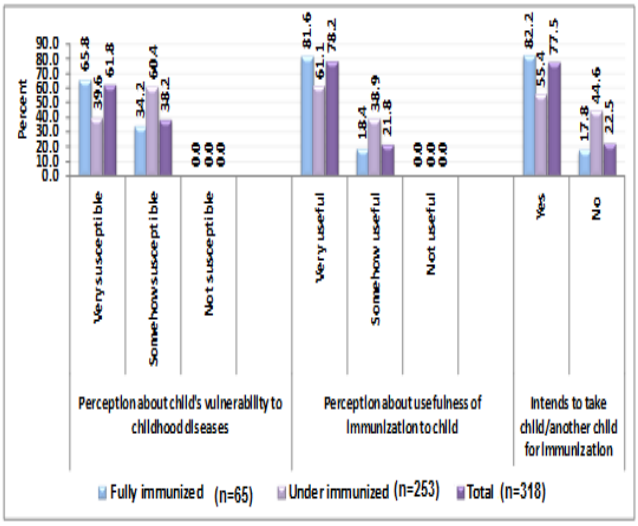

Figure 4.3. Perceptions associated with the uptake of childhood immunization.

Caregivers were further requested to indicate their perceptions about usefulness of immunization to children's health. In this regard, 96.9% of the participants affirmed that taking children for immunizations was beneficial to their health. The caregivers expressing this view included 99.3% of those whose children had accessed full immunization and 85.7% of those whose children were under-immunized.

Regarding perceptions about usefulness of immunization to children, the results in Figure 4.3 show that 81.6% of the caregivers whose children were fully immunized believed that immunization was very helpful to children, while 18.4% expressed the view that immunization was 'somehow useful'.

Among those whose children were under-immunized, 61.1% felt that immunization was 'very useful', while 38.9% rated the service as 'somehow useful'. The results revealed up to 99% chance that children's immunization status and caregivers' perceptions about the usefulness of immunizations to children were significantly related (computed χ^2 = 9.938, df = 1 and p-value = 0.002).

When asked about the intention to take child/another child to a health facility for immunization, 77.5% of the caregivers were affirmative, while 22.5% were not. Among those whose children were fully immunized, 82.2% indicated the intention to take child/another child for immunization; while among those whose children were under-immunized, 55.4% indicated similar intentions. Based on this, the analysis revealed up to 99% chance that children's immunization and caregivers' intentions to take a child/another child for immunization were significantly associated (computed χ^2 = 17.606, df = 1 and p-value = 0.000). According to FGD participants, the main factors likely to influence intentions to take child/another child to health facility for vaccination included long distance to health facilities, lack of transportation means and insecurity in some parts of the community.

d. Perceptions of partners and peers about child immunization

Caregivers were further requested to indicate their partners' perspectives/opinion regarding childhood immunization. In this response, 90.2% of the participants noted that their partners considered childhood immunization as 'very important', while 7.4% indicated 'somehow important', as their partners' perspective/opinion about childhood immunization. However, 2.5% rated their partners' opinion as 'not important'.

Among those whose children were fully immunized, 92.2% rated their partners' perceptions as 'very important', while less than 1% indicated 'not important'. Contrastingly, among those whose children were under-immunized 80.4% stated that their partners regarded immunization as 'very important', while about one-tenth (10.7%) said childhood immunization was 'not important' to their partners. Based on this, the analysis obtained a computed χ^2 value of 19.659, with 2 degrees of freedom and a p-value of 0.000, suggesting up to 99% chance that children's immunization status significantly associated with partners' perceptions of childhood immunization.

Furthermore, KII and FGD participants acknowledged the important role of their partners in influencing women's decisions regarding children's immunization. Participants also identified older women, particularly mothers-in-law as people influencing health-seeking decisions regarding immunization of children. Whereas some men associated childhood immunization with family planning, elderly women argued that they raised their children without immunizations and they grew up healthy; hence, taking children for immunization was not important.

Regarding peers' perspectives about childhood immunization, the results in Figure 4.4 show that among caregivers whose children had accessed full immunization, 90.0% indicated that most of their peers considered immunization 'very important', while 1.1% stated 'not important'. Among those whose children were under-immunized, 78.6% reported their peers' perceptions as 'very important', while 1.8% felt that most of their peers considered childhood immunization 'not important'. The analysis revealed up to 90% chance that children's immunization status significantly associated with peers' perceptions about childhood immunization (computed χ^2 value = 5.800, df = 2 and p-value = 0.055).

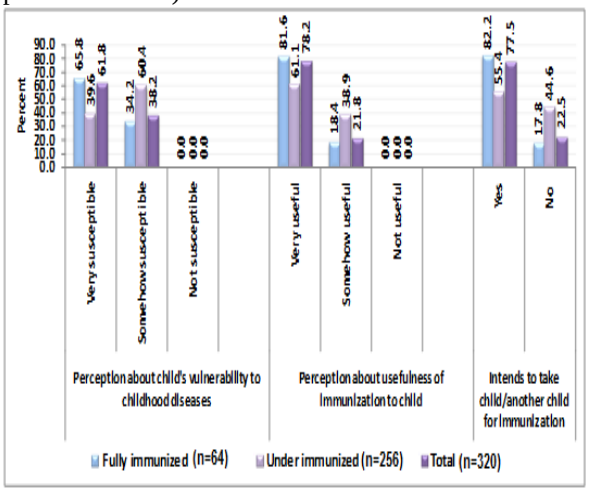

Figure 4.4. Perceptions of partners, peers and providers about immunization.

Caregivers were further requested to indicate their perspectives about most providers at the facilities where their children accessed immunization services last. In response, 65.1% of those whose children were fully immunized indicated that service providers were 'very supportive', while 1.5% were of the view that providers were 'not supportive'. Among those whose children were under-immunized, 50.0% indicated that most providers in the visited facilities were 'very supportive', while 8.9% hinted that they were 'not supportive'. The analysis obtained a computed χ^2 value of 11.724, with 2 degrees of freedom and a p-value of 0.003; suggesting up to 99% chance that children's immunization significantly associated with providers' supportiveness as perceived by caregivers.

e. Myths associated with childhood immunization

Participants were requested to indicate their views about the common perception that 'immunization makes children very sick'. The results presented in Figure 4.5 below show that among the caregivers whose children had accessed full immunization, 64.7% affirmed the myth, while 35.3% did not. Among those whose children were under-immunized, 83.8% agreed with the statement, while 16.1% disagreed. The analysis revealed up 99% chance that children's immunization status significantly related to caregivers' beliefs about the myth linking immunization and sickness among children (computed χ^2 = 7.029, df = 1 and p-value = 0.008).

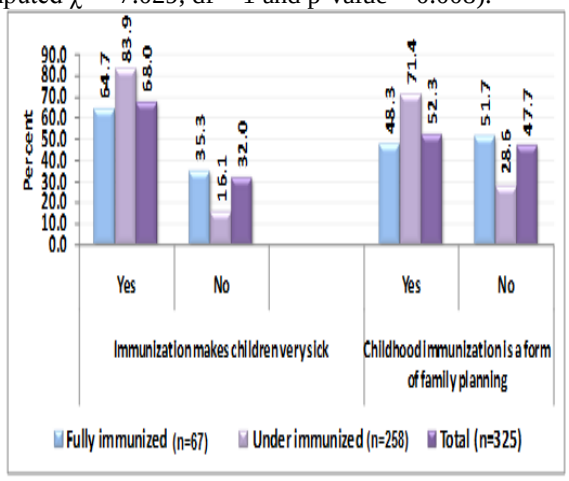

Figure 4.5. Myths associated with childhood immunization.

Table 4.3. Environmental factors associated with childhood immunization.

Attributes	Indicators	Fully immunized		Under immunized		Summary of Chi square tests		
		Frequency	*Percent*	*Frequency*	*Percent*	*Chi square*	*df*	*p-value*
Frequency of change in residence in the past year	*Never*	42	62.7	97	37.3			
	Once	16	23.8	60	23.1			
	Twice	6	9.0	79	30.4	26.302	3	0.000***
	More than twice	3	4.5	24	9.2			
	Total	67	100.0	260	100.0			
Perception about security status in the community	*Very safe*	21	31.3	85	32.7			
	Fairly safe	29	43.3	117	45.0	1.601	2	0.449
	Not safe	17	25.4	58	22.3			
	Total	67	100.0	260	100.0			

*,**,*** show significance at ρ=0.1, ρ=0.05 and ρ=0.01 error margins, respectively.

Table 4.4. Distance to health facilities and transportation costs.

Attributes	Indicators	Fully immunized		Under immunized		Summary of Chi square tests		
		Frequency	*Percent*	*Frequency*	*Percent*	*Chi square*	*df*	*p-value*
Duration taken to the h/facility using the most accessible means	*<15 min*	1	1.5	0	0.0			
	15 to 30 min	17	25.4	107	41.2			
	31 to 1 hour	19	28.4	88	33.8	8.673	3	0.034**
	>1 hour	30	44.7	65	25.0			
	Total	67	100.0	260	100.0			
Perception about the cost of transport to the h/facility	*Too high*	36	53.8	197	75.8			
	High	22	32.8	37	14.2			
	Moderate	9	13.4	26	10.0	10.400	2	0.006***
	Total	67	100.0	260	100.0			

*,**,*** show significance at ρ=0.1, ρ=0.05 and ρ=0.01 error margins, respectively

Participants were further requested to indicate their views about the myth stating that "immunization is a form of family planning". The results presented in Figure 4.5 indicate that among participants whose children were fully immunized, about one-half (51.7%) did not agree with the statement, while among those whose children were under-immunized, 71.4% affirmed the statement. Based on this, the results showed up to 99% chance that children's immunization status and caregivers' perspectives linking childhood immunization with family planning were significantly associated (computed χ^2 = 9.011, df = 1 and p-value = 0.003).

Environmental factors

As presented in Table 4.4, the study found that among the caregivers whose children were fully immunized, 62.7% never changed their residences over the preceding one-year period, 23.8% changed their residences once, while 4.5% changed their residences more than twice over the reference period. Among those whose children were under-immunized, 37.3% never changed their residences, while 9.2% did so more than twice. Based on this, the analysis showed up to 99% chance that children's immunization status significantly associated with the frequency of changing residences over the preceding year. In relation to change of residences/migration, the FGD participants noted that migration affected access to immunization services by increasing distance to health facilities and outreach centers, especially when families migrate to peripheral villages or towns which in turn, disrupt access to immunization services.

Since Mogadishu experiences incidences of insecurity which interrupted resident's ways of life and livelihoods, with women and children being the most affected. In view of this, caregivers were asked to describe the security situation over the preceding one year period. The results presented in Table 4.4 shows that among those whose children had accessed full immunization, 31.3% were of the view that their community was 'very safe', while 25.4% described the situation as 'not safe'. Among those whose children were under-immunized, 32.7% felt that the security situation was 'very safe', while 22.3% described the situation as 'not safe'. Although the analysis revealed lack of a significant relationship between children's immunization status and the security situation in Mogadishu, participants affirmed that insecurity was still a key challenge, preventing some families from accessing immunization services for their children.

Health facility factors

a. Distance to health facilities and transportation costs

Distance to health facilities was estimated by asking participants to provide an estimation of the duration taken travelling between their homes and nearest public health facilities providing immunization services, using the most accessible means of transport. The results, which are presented in Table 4.5 show that 44.7% of those whose children had accessed full immunization indicated that the journey takes more than 1 hour, while (1.5%) indicated the duration to be less than 15 minutes.

The study also found that among the caregivers whose children were under-immunized, 25.0% travel for more than 1 hour, while 41.2% indicated 15 to 30 minutes. Based on this, the analysis obtained a computed χ^2 value of 8.673, with 3 degrees of freedom and a p-value of 0.034, suggesting up to 95% chance that children's immunization status and the duration taken to health facilities were significantly associated. On the same note, FGD participants noted that long duration of travel to health facilities was a critical factor affecting immunization status of children in the community.

Regarding the cost of transport to the nearest health facility, Table 4.5 shows that 53.8% of the participants whose children had accessed full immunization and 75.8% of those whose children were under-immunized described the cost as 'too high', while 13.4% of those whose children were fully immunized and 10% of those whose children were under-immunized felt that the cost of transport was 'moderate'. The analysis revealed up to 99% chance that children's immunization status and caregivers' perceptions about the cost of transport were significantly associated (computed χ^2 = 10.400, df = 2 and p-value = 0.006).

The study found that participants whose children were fully immunized spent an average of USD 77.4 (95% CI, 74.6-83.6), while those whose children were under-immunized spent an average of USD 95.0 (95% CI, 85.8-114.2). Using one-way analysis of variance, the analysis obtained a computed $F_{(1,323)}$ of 9.678 and a p-value of 0.002; suggesting up to 99% chance that the amount spent by participants whose children were fully immunized and that spent by those whose children were under-immunized were significantly different.

b. Quality of care at the health facilities

The quality of care was assessed in terms of queuing time, providers' attitude towards care seekers and frequency of vaccine stock out. Participants were requested to describe the duration which they took at the health facilities the last time they took children for immunization. As indicated in Figure 4.6, up to 70.3% of those whose children had accessed full immunization and 87.5% of those whose children were under-immunized described the queuing time as 'too long'. Contrastingly, 8.9% of those whose children were fully immunized and none of those whose children were under-immunized hinted that the duration was 'short'. Based on this, the analysis obtained a computed χ^2 value of 8.532, with 2 degrees of freedom and a p-value of 0.014; suggesting up to 95% chance that children's immunization status significantly associated with caregivers' perception about queuing time at the health facilities.

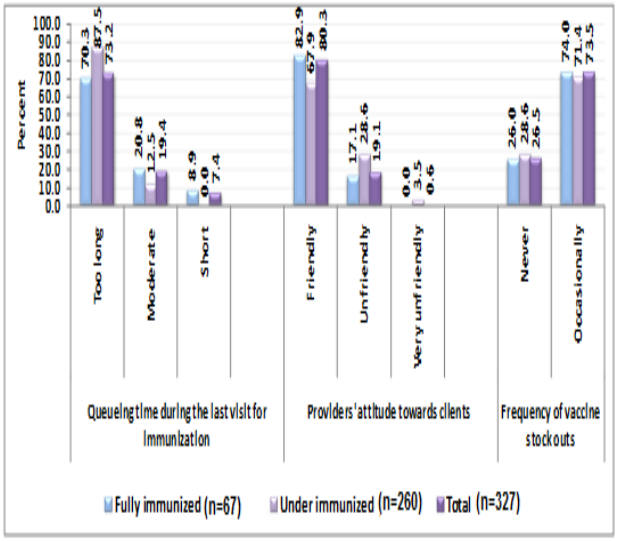

Figure 4.6. Quality of immunization services at the health facilities.

Regarding the attitude of service providers at the health facility visited last, the results in Figure 4.6 show that among the participants whose children were fully immunized, 82.9% indicate that providers were 'friendly', while 17.1% said they were 'unfriendly'. Contrastingly, among those whose children were under-immunized, 67.9% felt that the providers were 'friendly', while 3.6% hinted that they were 'very unfriendly'. Based on this, the analysis indicated up to 99% chance that children's immunization status significantly associated with caregivers' perceptions about providers' attitude towards clients (computed χ^2 = 14.110, df = 2 and p-value = 0.001).

Similarly, some FGD participants expressed dislike with the way some service providers treated caregivers, particularly those failing to honour immunization appointments. In this regard, participants noted that some caregivers were inconsistent with immunization schedules due to various circumstances, including long distance to health facilities, lack of finances for transport, poverty, lack of support from partners and migration, among others, which providers cared less about. Participants indicated that providers' unfriendly approach discouraged some caregivers from taking their children to complete their immunizations.

Participants were further asked to state their views about the frequency of vaccine stock outs at the health facilities providing immunization services. As indicated in Figure 4.6 above, up to 74.0% of participants whose children were fully immunized and 71.4% of those whose children were under-immunized confirmed that vaccine stock outs at the facilities was an occasional event. About one-quarter (26.0%) of those whose children had accessed full immunization and 28.6% of those whose children were under-immunized indicated that the facilities had never run out of vaccines. The analysis revealed lack of significant relationship between children's immunization status and vaccine stocks at the facilities providing immunization services (computed χ^2 = 0.051, df = 1 and p-value = 0.820). FGD sessions revealed that a vaccine stock out was a common challenge in health facilities.

Factors influencing children's immunization status: Multivariate results

Overview

Bivariate results in the preceding sub-sections indicated that children's immunization status significantly associated with independent variables (IVs) such as mothers' age, number of living children (parity), clinic attendance during pregnancy, number of clinic attendance and place of delivery; mothers' income level, place of residence, type of marital union and access to partners' support; awareness of childhood immunization, knowledge of the ideal age of full immunization, as well as knowledge of childhood immunizeable diseases. The results show that children's immunization status also related significantly with the frequency of radio listening, most accessible sources of health information, caregivers' perception of child's vulnerability to immunizeable diseases, caregivers' perception about usefulness of immunization to child's health; peers' perception of immunization, caregivers' perception about providers' support, change of residence frequency, duration taken to the nearest immunization center, as well as perceptions about the cost of transport, queuing time and providers' attitude towards care-seekers, among others.

To determine the influence of each IV on children's immunization status, binary logistic regression was applied, incorporating IVs and intervening variables, using the 'stepwise likelihood ratio' method. The analysis generated two models; with the first block (model), containing IVs only and the second block adjusted to for the effect of intervening variables, including caregivers' perceptions about child's susceptibility to immunizeable diseases, usefulness of immunization to child's health and intention to take child/another child for immunization. The results presented and discussed in this project report focus on the adjusted model.

Table 4.5. Summary results of binary logistic regression model.

Covariates	β	SE	Wald	df	Sig.	Exp(β)	95% C.I. for Exp(β)	
							Lower	Upper
Age			45.299	3	0.000***			
<20 years	0.834	0.342	5.947	1	0.013**	2.303	1.178	4.501
20-29 years	1.231	0.212	33.717	1	0.002***	3.425	2.26	5.189
30-39 years	0.677	0.413	2.687	1	0.114	1.968	0.876	4.422
40-49 years (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
No. of children			37.142	3	0.000***			
<5 children	1.622	0.329	24.306	1	0.000***	5.063	2.657	9.649
5-9 children	1.329	0.373	12.695	1	0.002***	3.777	1.818	7.847
10-14 children	0.856	0.346	6.121	1	0.021**	2.354	1.195	4.637
15 children+ (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
No. of clinic attendances			437.801	3	0.000***			
Once (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Twice	0.965	0.398	5.879	1	0.036**	2.625	1.203	5.726
Thrice	1.854	0.268	47.857	1	0.013**	6.385	3.776	10.797
>Thrice	2.355	0.115	419.359	1	0.000***	10.538	8.412	13.202
Average income			47.795	4	0.051*			
<USD 100 (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
USD 100-499	0.427	0.320	1.781	1	0.273	1.533	0.819	2.870
USD 500-999	1.069	0.274	15.221	1	0.154	2.912	1.702	4.983
USD 1000-1499	1.198	0.311	14.839	1	0.063*	3.313	1.801	6.096
USD 15,000+	1.208	0.204	35.065	1	0.058*	3.347	2.244	4.992
Partner support			324.932	1	0.037**			
Yes	2.105	0.124	288.178	1	0.042**	8.207	6.426	10.465
No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Child immunization awareness			104.287	1	0.002***			
Yes	2.263	0.246	84.625	1	0.005***	9.612	5.935	15.567
No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Radio listening			251.377	2	0.009***			
Always	1.773	0.117	229.639	1	0.010**	5.888	4.682	7.406
Occasionally	1.457	0.136	114.773	1	0.014**	4.293	3.289	5.604
Never (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Knowledge of ideal age for full immunization			81.677	1	0.000***			
Correct	1.852	0.215	74.200	1	0.001***	6.373	4.181	9.712
Incorrect (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Immunization makes children sick			152.309	1	0.008***			
Yes (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
No	1.935	0.163	140.925	1	0.018**	6.924	5.031	9.530
Immunization is a form of FP			27.344	1	0.003***			
Yes (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
No	1.004	0.261	14.797	1	0.011**	2.729	1.636	4.552
Peers' attitude towards immunization			74.667	2	0.055*			
Very important	1.799	0.221	66.264	1	0.071*	6.044	3.919	9.320
Somehow important	0.713	0.298	5.725	1	0.108	2.040	1.138	3.659
Not important (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Frequency of changing residence			112.360	3	0.000***			
Never	1.952	0.202	93.381	1	0.000***	7.043	4.740	10.464
Once	1.636	0.221	54.800	1	0.012**	5.135	3.330	7.918
Twice	-0.251	0.155	2.622	1	0.212	0.778	0.574	1.054
>Twice (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Duration taken to health facility			199.208	3	0.034**			
<15 min	1.552	0.115	182.133	1	0.048**	4.721	3.768	5.914
15-30 min	0.938	0.116	65.387	1	0.239	2.555	2.035	3.207
31min-1 hour	-1.283	0.269	22.748	1	0.258	0.277	0.164	0.470
>1 hour (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Perception about queuing time			54.822	2	0.014**			
Too long (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Moderate	0.868	0.235	13.643	1	0.213	2.382	1.503	3.776
Short	1.125	0.176	40.858	1	0.015**	3.080	2.182	4.349
Providers' attitude towards care-seekers			133.294	2	0.001***			
Friendly	2.084	0.205	103.345	1	0.013**	8.037	5.377	12.011
Unfriendly	1.858	0.231	64.695	1	0.030**	6.411	4.077	10.082
Very unfriendly (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Perceived susceptibility			464.833	2	0.001***			
Very susceptible	2.540	0.120	448.028	1	0.004***	12.680	10.022	16.042
Somehow susceptible	1.512	0.216	49.000	1	0.022**	4.536	2.970	6.927
Not susceptible (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Perceived usefulness of immunization			46.073	2	0.002***			
Very useful	0.852	0.139	37.571	1	0.007***	2.344	1.785	3.078
Somehow useful	0.127	0.074	2.945	1	0.117	1.135	0.982	1.313
Not useful (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Intention to take child/another child for immunization			685.691	1	0.000***			
Yes	2.279	0.090	641.215	1	0.000***	9.767	8.187	11.651
No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Constant	3.270	0.115	808.537	1	0.000***	26.311	21.002	32.963

RC – Reference Category; *,**,*** show significance at ρ=0.1, ρ=0.05 and ρ=0.01 error margins, respectively.

In this regard, Table 4.6 provides summary of variables in the adjusted block, showing partial regression coefficients (β), Standard Error (SE), the Wald statistic, degrees of freedom (df), ρ-values, odds ratios [Exp(β)] and Confidence Intervals (CI) associated with the odds ratios, at 95% confidence level.

Collinearity diagnostics

Collinearity diagnostics help a researcher to determine whether two or more IVs are correlated before they are entered into a regression model. When two or more related IVs are entered into a regression model, they are likely to affect its accuracy. Collinearity is indicated by the SE associated with each IV. Where SE is greater than 2.0, it is a sign that some IVs could be correlated. This is tested by adding each IV in the model at a time, while noting changes in the SE. In the event that two IVs are correlated, one must be excluded from analysis, based on the accuracy indicated by SE and the size of Wald statistic.

In this study, the default outlier value of 2.0 was used as a basis upon which SE associated with regression coefficients (β) were examined; SEs larger than 2.0 indicated the existence of Collinearity effects. In this regard, Collinearity was detected between the following variables, clinic attendance during pregnancy and the number of clinic attendance; type of marital union, partner's support and partners' opinion about immunization; knowledge of the ideal age for full immunization and knowledge of childhood immunizeable diseases; frequency of radio listening and most accessible sources of health information; as well as cost of transport to immunization centers and perception about total cost of accessing immunization services.

Odds ratios

In Table 4.6, the Odds Ratios (OR) are indicated in the 7th column as exponentials of regression co-efficients associated with each IV and each intervening variable [Exp(β)]. The results summarized in the Table show that children of participants aged 20 to 29 years had about 3 times the odds of being fully immunized as those whose caregivers were aged 40 to 49 years (OR = 3.425; CI = 2.260-5.189). Again, children of participants aged below 20 years were about 2 times as likely to be fully immunized as those of mothers aged 40 to 49 years (OR = 2.303; CI = 1.178-4.501). The results suggest that children of younger caregivers were more likely to be fully immunized than children of older caregivers, suggesting that the younger the caregiver, the higher the odds of children being taken for all necessary immunizations. This may further suggest that younger caregivers have been more responsive to health education provided to the community by the Ministry of Health and development agencies about the importance of childhood immunizations.

The results show that children having less than 5 siblings had about 5 times the odds of being fully immunized as those having 15 or more siblings (OR = 5.063; CI = 2.657-9.649). Besides, those having 5-9 siblings were about 4 times as likely to be fully immunized as those having 15 or more siblings (OR = 3.777; CI = 1.818-7.847). These findings suggest that the lower the number of children in a family, the greater the chance of all accessing full immunization by the first birthday; contrastingly, the higher the number of children, the greater the chance of some not accessing full immunization by the first birthday.

The study found that children whose caregivers attended clinic more than thrice during pregnancy had about 11 times the odds of being fully immunized as those whose caregivers attended clinic once (OR = 10.538; CI = 8.412-13.202). Besides, children whose caregivers attended clinic thrice during pregnancy had about 6 times the odds of being fully immunized as those whose caregivers attended clinic once (OR = 6.385; CI = 3.776-10.797). The results suggest that the higher the frequency of clinic attendance during pregnancy, the better the odds of children accessing full immunization and vice versa.

Children whose caregivers reported incomes of USD 1500 or more had about 3 times the odds of accessing full immunization as their colleagues whose caregivers indicated income of less than USD 100. Similarly, those whose caregivers stated incomes ranging between USD 1000 to USD 1499 were about 3 times as likely to be fully immunized as their counterparts whose caregivers earned less than USD 100 (OR = 3.313; CI = 1.801-6.096). These findings suggest there exists a significant and direct relationship between the odds of children accessing full immunization status and caregivers' average monthly income. More specifically, the results suggest that the odds of children accessing full immunization

by the first birthday increases with the increment in caregiver's income.

The results show that children whose caregivers received support from their husbands/partners to seek care were about 8 times as likely to access full immunization as those whose caregivers never received such support (OR = 8.207, CI = 6.426-10.465). The results reemphasize the importance of men's involvement in children's immunization through financial support, encouragement, child care and performance of domestic chores, as identified by FGD participants. Hence, partner/husband support added value by increasing the odds of children accessing full immunization.

Table 4.6 further show that children whose caregivers indicated awareness of childhood immunization had about 10 times the odds of accessing full immunization as those whose caregivers reported lack of awareness (OR = 9.612; CI = 5.935-15.567). Awareness is an important antecedent for health behaviour change; thus, caregivers who are aware that children should be immunized by the first birthday are likely to seek care in time and consistently than those lacking awareness about the same. More still, children whose caregivers listen to radio 'always' were about 6 times as likely to be fully immunized as those whose caregivers 'never' listen to radio (OR = 5.888; CI = 4.682-7.406). The results suggest that frequency of radio listening by mothers has the potential of influencing the immunization status among children. FGD participants identified radio as an important source of health information in the community, which may have played a key role of enhancing awareness and knowledge about childhood immunization.

Regarding knowledge of the ideal age for full immunization, children whose caregivers provided correct responses had about 6 times the odds of accessing full immunization as those whose caregivers provided incorrect responses (OR = 6.373; CI = 4.181-9.712). The results suggest that the odds of full immunization among children increase proportionality with improvement in caregivers' knowledge about the ideal age of full immunization. Besides, children whose caregivers believed that 'immunization does not make children sick' were about 7 times as likely to access full immunization as those whose caregivers believed that 'immunization makes children sick' (OR = 6.924; CI = 5.031-9.530). Similarly, children whose caregivers indicated the belief that 'immunization is not a form of family planning' were about 3 times as likely to access full immunization as those whose caregivers affirmed the belief (OR = 2.729; CI = 1.636-4.552). The findings suggest that the odds of children accessing full immunization were higher among those whose caregivers did not hold negative perceptions about immunization.

The results in Table 4.6 reveal the significant role of peer influence on childhood immunization. The analysis show that children whose caregivers described peers' opinion towards immunization as 'very important' were about 6 times as likely to be fully immunized as those whose caregivers described peers' opinion as 'not important' (OR = 6.044; CI = 3.919-9.320). The results confirm that peers' opinion about childhood immunization is a significant factor influencing the health seeking behavior among caregivers. Where most women hold negative opinions about immunization, children are less likely to complete their immunization, and if they do, it may not be within the first year of life.

Children whose families had never changed residence (migrated) over the preceding one year period indicated about 7 times the odds of being fully immunized as those whose families migrated more than twice (OR = 7.043; CI = 4.740-10.464). Besides, those whose families changed residence once were about 5 times as likely to be fully immunized as those whose families never changed residence (OR = 5.135; CI = 3.330-7.918)..

The results show that distance to health facilities providing immunization services (immunization centers) is also an important factor influencing full immunization status. In this regard, children whose caregivers take less than 15 minutes to reach immunization centers had about 5 times the odds of accessing full immunization as those whose caregivers travel for more than 1 hour to reach the centers (OR = 4.721; CI = 3.768-5.914). Those whose caregivers take 15 to 30 minutes to reach immunization centers were about 3 times as likely to attain full immunization as those whose caregivers travel for more than 1 hour (OR = 2.555; CI = 2.035-3.207). The results emphasize the importance of geographical accessibility of immunization centers in Mogadishu to improve children's immunization status.

The study found that caregivers' perceptions about queuing time at the immunization centers significantly influenced children's immunization status. More specifically, children whose caregivers perceived queuing time at the immunization centers as 'short' had about 3 times the odds of being fully immunized as those whose caregivers perceived queuing time as 'too long' (OR = 3.080; CI = 2.182-4.349). The results suggest that the shorter the queuing time, the greater the odds of caregivers turning up for immunization appointments and the higher the chance of children accessing full immunization.

The results also reveal a significant relationship between providers' attitude towards care-seekers and children's immunization status. In this regard, children whose caregivers perceived providers' attitude as 'friendly' had about 8 times the odds of accessing full immunization as those whose caregivers described providers' attitude as 'very unfriendly' (OR = 8.037; CI = 5.377-12.011). The results suggest that where providers are perceived to be friendly, the odds of caregivers turning up for immunization appointments become higher. However, where providers are perceived to be unfriendly, few community members are likely to complete immunization schedules.

Children perceived to be 'very susceptible' to childhood immunizeable diseases, including tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles, had about 13 times the odds of being fully immunized as those whose caregivers felt were 'not susceptible' to the diseases (OR = 12.680; CI = 10.022-16.042). Notably, the higher the perception of infection risk, the better the odds of caregivers taking some action to enable children access full immunization, and vice versa. Perception about susceptibility to infections is largely a function of the level of exposure to health information, particularly about immunization through radio, health facilities and peers among others.

More still, the results in Table 4.6 show that children whose caregivers perceived childhood immunization to be 'very useful' were about 2 times as likely to be fully immunized as those whose caregivers felt that childhood immunization was 'not useful' (OR = 2.344; CI = 1.785-3.078). Perceptions about the usefulness of childhood immunization are also influenced by access to information. Thus, children whose caregivers perceive immunization as useful had better odds of accessing full immunization within

the first birthday, unlike those whose caregivers failed to perceive the value of immunization. Better still, the stronger the caregivers' perception about usefulness of immunization to children, the higher the chances of children accessing full immunization.

The analysis reveals that caregivers' intention to take child/another child for immunization was also an important factor with significant influence on children's immunization status. Children whose caregivers expressed the intention to take child/another child for immunization had about 4 times the odds of being fully immunized as those whose caregivers indicated no such intention (OR = 3.593; CI = 2.840-4.546). FGD participants indicated that the intention to honour revisit appointments for immunization or to take another child to immunization centers for services was influenced by factors such as caregivers' knowledge of the importance of immunization, caregivers' financial status, male involvement as well as perceptions about the quality of care at the health facilities. Participants noted that children, whose caregivers had positive intentions for immunization, often had better odds of completing their immunizations.

5. Discussions of the Results

The main objective of this study was to determine barriers to full immunization status among the under five years children in Benadir region, Somalia. More specifically, the study was expected to: establish caregivers' demographic, socio-economic; psychosocial attributes, as well as environmental factors influencing children's immunization status. In the following sub-sections, the findings have been discussed in line with objectives of the study.

Demographic factors influencing children's immunization status

Age is an important demographic factor in health behavior change; it determines an individual's ability to internalize new information and adopt new health behaviors. Whereas in some communities, youthful women accept health information faster than relatively older women; while in others, the opposite is usually the case. In Benadir region, children of caregivers aged 20 to 29 years had about 3 times the odds of being fully immunized as those whose caregivers were aged 40 to 49 years; while those whose caregivers indicated below 20 years were about 2 times as likely to be fully immunized as those of caregivers aged 40 to 49 years. These findings suggest that relatively younger caregivers had higher odds of taking children for full immunizations than those in upper age-brackets.

Similar findings were reported by studies conducted in various contexts. For instance, Rahman, M. and Obaida-Nasrin, S. (2007) reported a significant relationship between immunization coverage and mother's age, among other factors. More specifically, the study indicated that children of mothers aged 20-34 years were more likely to be fully immunized than children of younger (<20 years) and older (≥35 years) mothers. Such findings logically imply that interventions aimed at improving full immunization coverage should be skewed in favor of older women. However, it is important to note that youthful age brackets provide suitable opportunities for learning. In this regard, it's relatively easier for youths to accept and adopt new health behaviors than older people. As stakeholders design and implement programs to improve children's immunization status among older women aged 40 to 49 years, they shouldn't lose sight of the important window of opportunity for influencing awareness, knowledge and uptake of immunization services, which youthful age brackets provide.

The findings show that children having less than five siblings had about 5 times the odds of being fully immunized as those having fifteen or more siblings; suggesting that the lower the number of children in a family, the better the chance of each child accessing full immunization by the first birthday. A study conducted in Bangladesh found a significant relationship between immunization coverage and the number of children ever born (Rahman, M. and Obaida-Nasrin, S., 2007). Four years earlier, similar findings were reported by a study conducted in Uganda by Odiit, A. and Amuge, B. (2003).

From the studies, it is notable that the number of children in a family is likely to influence access to healthcare services, depending on the strength of other interacting factors, the main ones being income and education levels, as well as utilization of family planning (FP) methods. In this regard, the number of children in a family is likely to become a bigger challenge to caregivers in lower income brackets, as well as those with no formal education. Families with low or no income may find the costs related to accessing immunization services a bigger challenge than those in upper income scales. Similarly, caregivers with no formal education are less likely to appreciate the importance of immunization to children.

The analysis indicated that children whose caregivers attended clinic more than thrice during pregnancy had about 11 times the odds of being fully immunized as those whose caregivers attended clinic once. Besides, children whose caregivers attended clinic thrice during pregnancy had about 6 times the odds of being fully immunized as those whose caregivers reported one clinic visit. Access to antenatal care (ANC) has been found to be among the factors significantly influencing children's immunization status. This is evident in a study conducted by Rahman, M. and Obaida-Nasrin, S., (2007), which reported that children whose mothers visited ANC clinics at least four times were more likely to be fully immunized than those whose mothers attended clinic less than four times or none. The results suggest that the higher the frequency of clinic attendance during pregnancy, the better the odds of children accessing full immunization and vice versa.

The findings reveal the important role of ANC attendance on children's immunization status. As indicated by World Health Organization (WHO), ANC attendance is particularly an important window of interventions for achieving maternal, newborn and child health (MNCH). During clinic visits, mothers are educated on various aspects of MNCH, including childhood immunization, which go a long way in influencing awareness, knowledge and perceptions (WHO, 2002). On the same note, Rahman, M. and Obaida-Nasrin, S., (2007) indicates that the information sourced during antenatal clinics contributes to changes in health seeking behaviour among caregivers.

Socio-economic attributes determining children's immunization status

The study shows that the likelihood of children accessing full immunization improves directly with caregiver's income. More specifically, children whose caregivers reported incomes of USD1500 or more had about 3 times the odds of accessing full immunization as their colleagues whose caregivers indicated incomes of less than USD 100. Caregiver's economic status determines their ability to meet costs associated with accessing immunization services, including transport to health facilities. Various studies, including

Michail, K. et al. (2000); Nath, B. et al. (2007) as well as Rahman, M. and Obaida-Nasrin, S. (2007) have reported significant relationship between women's income level and children's immunization status. For instance, Nath, B. et al. (2007) cited lack of money for transport as a key factor influencing children's immunization status in India. Similarly, Rahman, M. and Obaida-Nasrin, S. (2007) noted that high travel and incidental costs prevented women with no regular income from taking their children to health facilities.

The study suggests that men have an important role to play in the realization of childhood immunization program targets. In this regard, children whose caregivers received support from their husbands/partners were about 8 times as likely to access full immunization as those whose caregivers never received such support. In view of this, caregivers cited various forms of support, which they received from their partners, including financial resources, encouragement, as well as taking up child care and domestic chores, when wives go to immunization centers.

Cognitive and psychosocial attributes and children's immunization status

Children whose caregivers indicated awareness of childhood immunization had about 10 times the odds of accessing full immunization as those whose caregivers reported lack of awareness. Besides, those whose caregivers correctly indicated the ideal age for full immunization had about 6 times the odds of accessing all the necessary immunizations as those whose caregivers provided incorrect responses. The findings suggest that awareness and knowledge of basic facts about childhood immunization are crucial antecedents to children's immunization status. The linkage between caregivers' knowledge and children's immunization status, features in the works of Rahman, M. and Obaida-Nasrin, S. (2007) and Ibnouf, A.H. et al. (2007).

The findings show that children whose caregivers believed that 'immunization does not make children sick' were about 7 times as likely to access full immunization as those whose caregivers held a contrary belief; while those whose caregivers negated the belief that 'immunization is a form of family planning' were about 3 times as likely to access full immunization as those whose caregivers affirmed the belief. Similar findings feature in the works of Tugumisirize, F. et al. (2002), Anah, M.U. et al. (2006) and Maekawa, M. et al. (2007), who indicated that immunization coverage was constrained by rumors that *vaccines weaken children*, *vaccines make children sick* as well as perception that *immunization is a form of family planning*.

Health education requires a multi-media approach. However, the role of radio in passing information on childhood immunization should never be overlooked due to its influence on health behaviour change. The findings show that children whose caregivers listen to radio 'always' were about 6 times as likely to be fully immunized as those whose caregivers 'never' listen to radio. The use of radio to disseminate health education is particularly important in communities where most members of the targeted audience lack formal education; thus, have low literacy abilities. Improving knowledge and dispelling myths associated with immunization are likely to improve caregiver's opinion about childhood immunization.

The duration of taken in the queues before receiving health services is a crucial element of quality of care that influences children's immunization status. In the Benadir region, children whose caregivers perceived queuing time at the immunization centers as 'short' had about 3 times the odds of being fully immunized as those whose caregivers perceived queuing time as 'too long'. In view of this, the shorter the queuing time, the greater the odds of caregivers and their children turning up for immunization services. This factor connects to a number of human resource issues, including staffing levels, remuneration, frequency of supervisory visits by health authorities, and lack of appropriate motivation programs.

It is important to note that of all resources in an institution, human resource is the most critical, because it plans and manages the utilization of other resources to achieve institutional objectives. Consequently, health authorities should consider recruiting and deploying more providers to improve staffing level and staff motivation for quicker and better services to care seekers. Improving staffing and staff welfare as well as supervisory systems is likely to influence the duration of queuing at the immunization centers; thus, contribute to the improvement of children's immunization status in the host community.

Service providers' attitude towards care-seekers is also an element of quality of care. In the Benadir community, children whose caregivers perceived providers' attitude as 'friendly' had about 8 times the odds of accessing full immunization as those whose caregivers described providers' attitude as 'very unfriendly'. In view of this, improving children's immunization status in the community will require investments in health system strengthening, particularly targeting providers' attitude towards clients and customer care skills. Negative attitudes arise from the human resource issues highlighted in the preceding paragraph, as well as lack of training in the practice of customer care.

Many studies have recommended the need for staff training and retraining in customer care practices to improve attitudes. However, inadequate budgetary allocation to the health sector constrains implementation. Although training providers in public health facilities may be a costly undertaking, bearing in mind other recurrent costs, the Government should encourage more collaboration and partnership initiatives with the development agencies targeting health system strengthening to train providers in appropriate communication and customer care skills; thus, improve the quality of care.

Environmental and geographical factors influencing children's immunization status

Frequent change of residence due to environmental or economic reasons is one of the factors influencing access and uptake of health services. In Benadir, children whose families never changed residence over the preceding one year period had about 7 times the odds of being fully immunized as those whose families migrated more than twice. The study showed that the higher the frequency of residence change over the reference period the lower the odds of children accessing full immunization. Similar findings were reported by Ibnouf, A.H. et al (2007), as well as Anah, M.U. et al. (2006); who found a significant relationship between children's immunization coverage and migration patterns, as well as migration frequency.

Distance and time to the health facilities providing immunization services may have significant influence on the uptake of health services. In the Benadir region, distance to health facilities providing immunization services was one of the factors having a significant influence on children's immunization status. In this regard, children whose caregivers

indicated taking less than 15 minutes to reach immunization centers had about 5 times the odds of accessing full immunization as those whose caregivers travel for more than 1 hour to reach the centers.

6. Recommendations

a. Demographic factors

1. Provide more information to the community on childhood immunization, targeting women of all ages. The information should be designed to improve awareness, knowledge and to stimulate health-seeking behavior. The information should be delivered through appropriate modes such as MCH health education, health talks during medical outreaches, radio, community theatre, as well as Information, Education and Communication materials that are adapted to suit a population where the majority have no formal education.
2. Promote family planning methods, emphasizing the need for couples to space births and achieve family sizes that are within their economic means. This will enable community members access immunization services for all children within recommended time frames. Again, information on family planning should be packaged in the local language and integrated in MCH health education, or delivered through radio, community theatre as well as religious and political leaders.
3. Encourage more women to attend antenatal care clinics, where they can access correct information about childhood immunization. This may be achieved by improving staffing level, quality of information provided to care-seekers, equipment and medical supplies. The idea is to make antenatal care clinics more appealing to the community.

b. Socio-economic factors

1. Promote women's economic status to enable them afford costs associated with accessing immunization services for their children. This may be realized by organizing women into formal self-help groups, training them in business management skills and resource mobilization.
2. Promote girl-child education as a long-term measure for enhancing women's capacity to learn more about childhood immunization, as well as improve immunization coverage in the host community. This may be achieved by setting aside budgets to support needy girls through their education, and linking such students with decentralized educational bursary funds.
3. Improve male involvement in childhood immunization by creating an information package targeting men of all ages. The package should be designed to: improve awareness and knowledge; clear misconceptions associated with childhood immunization and support to their wives through logistics, accompaniment to health facilities, as well as taking up domestic chores and child care when wives visit immunization centres. The information should be delivered using the most appropriate language and methods such as radio, community theatre, as well as religious and political leaders.

c. Cognitive-psychosocial factors

1. Reduce the duration that care-seekers stay in queues before accessing immunization services. This will require health authorities to recruit and deploy more service providers as well as improve staff motivation and supervisory systems for quicker services.
2. Train or retrain service providers in customer care practices to improve attitudes and quality of services provided to care-seekers. Although training providers in public health facilities may be a costly undertaking, health authorities should encourage more collaboration and partnership initiatives with the development agencies to support the training of providers in appropriate communication and customer care skills.

d. Environmental and geographical factors

1. Establish maternal and child health clinics in rural village to reach communities that are far from health facilities with primary healthcare services, including immunization and information. Rural health centers are particularly necessitated by periodical migration necessitated by environmental and economic challenges. Rural villages health clinics may also serve as important channels for passing information to improve awareness, knowledge and uptake of immunization services.
2. Train community members on advocacy skills to enable them have non-confrontational engagement forums with their leaders as often as possible on healthcare matters, including childhood immunization. This should enable community members to appropriate skills for discussing with their leaders on how best they can improve quality of care.

Contribution of the study

Childhood immunization is an area that has received a lot of programmatic attention at all levels of the health system and attracted empirical investigations in various contexts. This study is among the first ones conducted in Benadir region, Somalia. Unlike most of its predecessors, the study applied HBM to deepen the understanding of factors influencing immunization coverage among children of under five years. Again, unlike previous studies such as Ndiritu, M. et al., (2006), the study fitted a regression model, using odds ratios, to determine factors influencing children's immunization status in the Somali community. Based on this, development agencies working in Benadir region, Somalia have an independent source of information, upon which they can benchmark their performance, regarding immunization coverage and underlying factors.

7. Recommendations for Further Research

This study focused on Somali community in Benadir region an insecure place; hence, may be having unique socio-economic dynamics compared to other regions across the country. In view of this, there is need for the study to be replicated in other Somali communities to confirm the findings in this report. Furthermore, the study has identified factors influencing children's immunization status, among them being long duration in health facilities. Consequently, it recommends the need for more health facilities and mobile clinics to take health services closer to community members. However, it fails to provide a comprehensive mapping of health facilities in Benadir region and population distribution. There is need for future studies to consider mapping out health facilities and population distribution to support advocacy for more facilities and to help development agencies and ministry of health authorities to distribute resources equitably.

8. References

Aldrich, S.T. and Nelson, P.D., 1984, *Advanced quantitative techniques for social sciences*,.2nd Edition, New York, Routledge.

Ali, N.S., 2002, "*Prediction of coronary heart disease preventive behaviors in women: a test of the Health Belief Model*" Women and Health, Vol. 35, No. 1, pp 83-96.

American Statistical Association, 1999, "*Survey research methods section information*" http://www.stat.ncsu.edu/info/srms/srms.html Accessed on 11/7/2010.

Anah, M.U., Etuk, I.S., and Udo, J.J., 2006, "*Opportunistic immunization with in-patient program: eliminating a missed*

opportunity in Calabar, Nigeria" Annals of African Medicine, Vol. 5, No. 4, pp 188-191.

Babbie, E. R., 1973, *Survey research methods*, Belmont, CA, Wadsworth Publishing Company.

Bandura, A., 1977, *Social learning theory*, Englewood Cliffs, New Jersey, Prentice-Hall Inc.

Bataringaya, C.K., 2010, "*Immunization coverage and factors associated with failure to complet childhood immunization in Kawempe Division, Uganda*"A mini-thesis submitted in partial fulfillment of the requirements for the degree of Masters in Public Health at the School of Public Health, University of the Western Cape.

Becker, A. and Rosenstock, R., 1984, "*Social learning theory and the health belief* model"Health Education Quarterly, Vol. 15, No. 1, pp 175-183.

Belcher, L., Sternberg, M.R., Wolotski, R.J., Halkitis, P. and Hoff, C., 2005, "*Condom use andperceived risk of HIV transmission among sexually-active HIV positive men who have sex with men*" AIDS Education and Prevention, Vol. 17, No. 1, pp 79-89.

Best, J.W. and Khan, J.V., 2004, Research in Education, 7th Edition, New Delhi, Prentice Hall of India.

Borus, P.K., 2004, "*Missed opportunities and inappropriately given vaccines reduce* Journal, *immunization coverage in facilities that serve slum areas of Nairobi*" East African Medical Vol. 81, No. 3, pp 124-129.

Bryman, A. and Cramer, D., 1997, *Quantitative Data Analysis with SPSS for Windows: a guide for Social Scientists*, London, Routledge.

Centers for Disease Control, 2006, "Basic and common questions: the importance of childhood immunization" Accessed on 16/12/2013 from http://www.cdc.gov/vaccines/vac-gen/importance.htm

Centers for Disease Control (2011). "*Global routine vaccination coverage*, 2010", MMWR 2011, Vol. 60, pp 1520 - 1522.

Cheyne, J., 1994, "*Immunization in urban areas: issues and strategic*" Bull World Health.Organ, Vol. 72, No. 2, pp 183-194

Chhabra, P., Nair, P., Gupta, A., Sandhir, M. and Kannan, A.T., 2007, "*Immunization in urbanized villages of Delhi*" Indian Journal of Pediatrics, Vol. 74, pp131-134.

Datar, A., Mukherji, A., and Sood, N., 2005, "*Health infrastructure and immunization coverage in rural India*" Indian Journal of Medicine, Vol.125, pp 31-42.

Edmunds, W.J., Brisson, M., Melegaro, A. and Gay, N.J., 2002, "*The potential cost effectiveness of a cellular pertussis booster vaccination in England and Wales*" Vaccine, Vol. 20, pp 1316-1330.

Fink, A., 1995, *The Survey Kit: How to Sample in Surveys*, Thousand Oaks, CA, Sage Publications.

Fowler, F., 1993, *Survey Research Methods*, Beverly Hills, CA, Sage.

Glanz, K., Lewis, E.M. and Rimer, B.K., 2002, *Health Behaviour and Health Education: Theory, Research and Practic*e, San Francisco, Jossey-Bass Publishers.

Hochbaum, G.M., 1958, *Public Participation in Medical Screening Programs: A Socio- Psychological Study*, Washington DC, Government Printing Office.

Ibnouf, A.H., Van den Borne, H.W., and Maarse, J.A.M., 2007, "*Factors influencing immunization coverage among children under five years of age in Khartoum State*, Sudan"Electronic Publishing, Vol. 49, No. 8, pp 14-23.

Jaeger, R., 1984, *Sampling for Education and the Social Sciences*, White Plains, New York, Longman.

Janz, N.K. and Becker, M.H., 1984, "*The health belief model: a decade later*" Health Education Quarterly, Vol. 11, No. 1, pp 1-47.

Kenya National Bureau of Statistics and ICF Macro, 2010, *Kenya Demographic and Health Survey* 2008-2009, Calverton, Maryland, KNBS and ICF Macro.

Kidane, T. and Tekie, M., 2000, "*Factors influencing child immunization coverage in a rural district of Ethiopia*" Ethiopian Journal of Health Development, Vol. 18, No. 3, pp 105 111.

Kothari, C. (2004). *Research Methodology Methods and Techniques.* jaipur India: New Age International Publisher.

Maekawa, M., Douangmala, S., Sakisaka, K., and Takahashi, K., 2007, "*Factors affecting routine immunization coverage among children aged 12-59 months in Lao PDR after regional polio eradication in Western Pacific Region*" BioScience Trends, Vol. 1, No. 1, pp 43-51.

McCormick-Brown, K., 1999, *Health belief model*, http://hsc.usf.ed/Health_Belief_Model_Overview.htm

Michail, K., Tsiftis, G., Ioannidou, C., Tsoumakas, K., Samoli, E., and Pavlopoulou, I.D., 2000, "*Immunization coverage and predictive factors for complete and age- appropriate vaccination among preschoolers in Athens, Greece*" Tropical Medicine and International Health, Vol. 16, No. 1, pp 158-169.

Mugenda, O.M. and Mugenda, A.G., 1999, *Research Methods: Quantitative and Qualitative Approaches*, Nairobi, Acts Press.

Mwanje, J.I., 2001, *Qualitative Research Process: Social Science Research Methodology Series*, Module II, Addis Ababa, OSSREA.

Nachmias, C.F and Nachmias, D., 1996, *Research Methods in the Social Sciences*, 5thEdition, London, Arnold.

Nath, B., Singh, J.V., Awasthi, S., Bhushan, V., Kumar, V., and Singh, S.K., 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 Science, Vol. 61, pp 598 606.

Ndiritu, M., Cowgill, K.D., Ismail, A., Chiphatsi, S., Kamau, T., Fegan, G., Felkin, D.R., Newton, C.R.J.C., and Scott, J.A.G., 2006, "*Immunization coverage and risk factors forfailure to immunize with expanded program on immunization in Kenya after introduction of new Haemophillus Influenzae type 6 virus and Hepatitis 6 virus antigens*"BMC Public Health, Vol. 6, No. 132, pp 128-137.

Nuwaha, F., Mulindwa, G. and Balenzi, J., 2001, "*Causes of low attendance at national immunization days for polio eradication in Bushenyi District, Uganda*" Tropical Medicineand International Health, Vol. 5, No. 5, pp 364-369.

Obure, M.J., 2002, *Data Analysis Using SPSS for Windows*, Nairobi, MODE Experts.

Odiit, A., and Amuge, B., 2003, *"Comparison of vaccination status of children born in health units and those born at home*" East African Medical Journal, Vol. 80, No. 1.

Ogunlana, S., 2005, "*The Importance of Immunization*", Accessed on 10/12/2013, from http://ezinearticles.com/

Piotrow, P.T., Kincaid, D.L., Rimon, J.G. and Rinehart, W., 1997, *Health communication: lessons from family planning and reproductive health*, Baltimore, Maryland: Center for Communication Programmes, Johns Hopkins School of Public Health.

Rafiqul, I., Mahfuzar, R. and Mosfequr, R., 2007, "*Immunization coverage among slum children: a case study of Rajshahi City Corporation*" The Middle East Journal of Family Medicine, Vol. 5, No. 6, pp 233-240.

Rahman, M., and Obaida-Nasrin, S., 2010, "*Factors affecting acceptance of complete immunization coverage of children under five years in rural Bangladesh*"Salud pública de México, Vol. 52, No. 2, pp 134-140.

Rindfleisch, A., Malter, A.J., Ganesan, S. and Moorman, C., 2008, *"Cross-Sectional Versus Longitudinal Survey Research*" Journal of Marketing Research, Vol. 45, No. 3, pp 1-23.

Rosenstock, I.M., Strecher, V.J. and Becker, M.H., 1988, *"Social Learning Theory and the Health Belief Model*" Health Education Quarterly, Vol. 15, No. 2, pp 175-183.

Sanford R.K, Ilene T.B., Robert M.W and RICHARD K.Z., 2007 "Addressing immunization barriers, benefits, and risks" The Journal of Family Practice VOL. 56 , NO . 2 S61

Sebahat, D.T. and Nadi, B., 2006, Vaccination coverage and reasons for non-vaccination in a district of Istanbul, Marmara University Medical Faculty, Department of Public Health, Istanbul, Turkey.

Singh, A., 2007, "*Record-based immunization coverage assessment in rural North India*" The Internet Journal of Third World Medicine, Vol. 4, No. 1, pp 105-117.

Stretcher, V. and Rosenstock, I.M., 1997, "*The health belief model*", in Glanz, K., F.M.

Lewis, and B.K. Rimer, Health Behaviour and Health Education: Theory, Research and Practice, San Francisco, Jossey-Bass.

Tugumisirize, F., Tumwine, J.K., and Mworoza, P., 2002, "*Missed opportunities and caretaker constraints to childhood vaccination in rural areas of Uganda*" *East* African Medical Journal, Vol. 79, No. 7, pp 347-354.

UNDP, 1997 "*population statistics of Somalia*" accessed on 18/12/2014 from www.somali-jna.org/downloads/ACFA9.pdf

UNICEF, 2010 "*immunization coverage statistical summary* " Accessed on 12/02/2015 from www.unicef.org/immunization/files/EN-ImmSumm-2013.pdf

United Nations, 2006, *the millennium development goals report* New York, United Nations United Nations Children's Fund, 2009, *Child survival and development situation in Kenya, Nairobi*, UNICEF.

Vaahtera, M., Kulmala, T., Maleta, K., Cullinan. T., Salin, M.L. and Ashorn, P., 2000, "*Childhood immunization in rural Malawi: time of administration and predictors of non-compliance*" Annals of Tropical Pediatrics: International Child Health, Vol. 20, No. 4, pp 305-312.

Waisbord, S., 2004, *Assessment of Communication Programs In Support of Polio Eradication: Global Trends and Case Studies*, Washington, DC, Academy for Educational Development.

World Health Organization, 2005, WHO vaccine-preventable disease: monitoring system, 2005 global summary, WHO/IVB/2005.

World Health Organization, 2010, "*Full immunization profile – Somalia*. WHO vaccine-Preventive diseases: monitoring system 2010 global summary", Accessed on 20/12/2014 from:http://apps.who.int/full immunization _monitoring/en/globalsummary/countryprofileresult.cfm?C='Som

World Health Organization, 2013, *Global routine vaccination coverage* - 2012 Bulletin, Volume 62, No. 43, pp 858-861WHO, Geneva

World Health Organization/United Nations Children's Fund, 2008, "*Global Immunization Data*", Accessed on 16/12/2013 from http://www.who.int/immunizationmonitoring/data/en

Wuensch, K.L., 2006,"Logistic Regression with SPSS" http://core.ecu.edu/psyc/wuenschk/spss/logistic.sav, Accessed on 10/12/2013.