DETERMINANTS OF FULL IMMUNIZATION AMONGST CHILDREN AGED 12-59 MONTHS BORN TO ADOLESCENT MOTHERS IN KENYA

BY

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DECLARATION

I hereby declare that this is my original proposal and has not been presented in any other learning institution for award of a degree.

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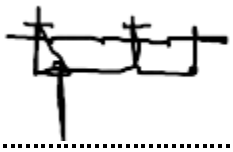
Signature: 

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ABSTRACT

The burden of immunization in third world countries has been a major policy and social issue. For immunization to be completely effective, all the endorsed vaccinations have to be received. In 2018, 19.4 million children below 12 years were not fully immunized**.** Due to this, VPD account for 12% of the mortality among children under 5 years. The burden of VPD in Kenya is high. Cases of measles are most common among children below four years and tuberculosis is the fourth ranking cause of mortality. Children in Kenya who had been fully immunized was set at 74.9% in 2014 and 2% of children under 60 months had not been vaccinated at all. Kenya is yet to achieve the coverage target of 90% set by the WHO. Studies have shown that most children born to adolescent mothers are not fully immunized. This study sought to identify the determinants of immunization coverage for these children. The study used secondary data from the KDHS 2014 survey. Data for children aged 12 to 59 months was extracted from the main dataset and analyzed in Stata version 14. The outcome of interest was children who have received all the recommended vaccinations. Descriptive analysis was done to obtain the immunization levels among the children after which bivariate and multivariate probit regression technique was done to establish the determinants of full immunization. The results were presented in tables. The results showed that full immunization level was at 66.1% for the whole country. Full immunization was also determined by mother's occupation, parity and ANC. Adolescents with higher number of ANC visits had reduced probability of their children being fully vaccinated while children with employed mothers and higher parity had an increased probability of full vaccination. The study also recommended sensitization to be done among adolescent mothers with lower parity on the importance of immunization both at community and clinic level. Conclusions and recommendations for policy makers was done based on the findings.

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LIST OF ABBREVIATIONS

VPD-Vaccine Preventable Disease

DHS-Demographic and Health Survey

KDHS-Kenya Demographic and Health Survey

WHO-World Health Organization

KEPI-Kenya Expanded Programme on Immunization

SDG- Sustainable development goals

SSA-Sub Saharan Africa

TB-Tuberculosis

BCG- Bacillus Calmette-Guerin

DPT- Diphtheria Tetanus and Pertussis

ANC-Antenatal Care

OPV-Oral Polio Vaccine

CHAPTER 1: INTRODUCTION

This chapter introduces the problem being tackled by the study and the strain of Vaccine Preventable Diseases (VPDs) in the global, regional and local context. It also talks about the degree of immunization coverage and objectives and the study justification.

1.0 Background of the study

It is estimated that there are 12 million births and more than 10 million unwanted pregnancies annually among adolescents between 15 and 19 years living in developing regions (Darroch, Woog, Bankole, Ashford, & Points, 2016; WHO, 2020a). Adolescent pregnancies and births are due to several factors for example some girls chose to start families early due to low education and job prospects especially in developing countries (WHO & UNICEF, 2015). There is also the issue of inaccessibility of contraceptives for sexually active adolescents because of country's policies, bias from health workers, inadequate knowledge, financial constraints and sexual assault (Raj & Boehmer, 2013; WHO, 2020a).

Early childbearing poses several risks to the health of the babies as they are at a higher danger of being born underweight, be delivered preterm and are susceptible to a lot neonatal ailments (WHO, 2016). Children are extremely vulnerable, and their survival depends on the people meant to take care of them. Due to young age and inexperience, adolescent mothers require extra attention to ensure that the child's health needs are being met including access to health services. Chances of being malnourished and missing out on important vaccinations are usually higher among children being raised by adolescent mothers (Abdullah, Malek, Faruque, Salam, & Ahmed, 2007). There are situations that curtail the effectiveness of health seeking behavior by adolescent mothers, for instance some health workers don't take into consideration their inexperience and fail to explain health indicators to them (Andrade, Santos, Pina, Furtado, & Mello, 2013). Some adolescents also give reasons like being judged by health workers, fear of humiliation, disrespect and lack of privacy. Understanding and eliminating all reasons why adolescent mothers don't exhibit proper health seeking behavior, including postnatal care, is crucial to child survival since giving birth while still young is often linked to high rates of child mortality and morbidity (Atuyambe et al., 2008).

One of the most effective ways of lowering the rate of under-five mortality and malnutrition among children is ensuring reception of all the recommended vaccines by every child (Zuehlke, 2009). The ten years starting from 2011 to 2020 is labelled as the Decade of Vaccines by the Global Vaccine Action Plan (GVAP) and the goal for this period is to prevent 25.6 to 25.8 million mortality cases that normally result due to non-vaccination (Madhi & Rees, 2018; WHO, 2013).

Immunization saves between two to three million lives every year. In areas where immunization rates are high enough, even the children who did not get vaccinated are protected from the infectious diseases (Vanderslott, 2018). Sadly, 19.4 million children all below the age of 12 months were not given the basic vaccines in 2018 (WHO, 2019b). By 2017, polio was endemic in only 3 countries, that is, Pakistan, Nigeria and Afghanistan (Ochmann & Roser, 2017). Global polio cases in 2018 were 104,000 (WHO, 2019a). However other VPDs still pose major threats in most regions of the world.

The WHO reports 1.5 million deaths worldwide resulting from lack of vaccination each year. According to Vanderslott (2018), the highest proportion of these deaths are due to tuberculosis at over 1 million. Measles was responsible for the deaths of 95, 000 people in 2017, 30,000 from meningococcal meningitis and another 299,000 succumbed to diseases which could have been prevented by the pentavalent vaccine. For best results, all the recommended vaccines have to be received. This means that incomplete vaccination is also a problem (Vanderslott, 2018). At least 12% of global mortality cases of children below the age of five result from vaccine preventable disease. Measles and pertussis account for 2% of the deaths each, tetanus for 1% and sepsis accounts for 7% (Liu et al., 2015). Pneumonia alone causes about 15% of deaths among children worldwide (KEMRI, 2015).

One of the indicators for the SDGs is percentage of children who, according to the national programme was children who achieved full immunization. Coverage levels vary by country with countries like the United States reporting 93% and 94% immunization levels for the third doses of polio and DTP respectively in 2019. Vaccination levels for Brazil in the same year were 79% for Bacillus Calmette-Guerin (BCG), 73% for DTP3 and 85% for polio3. Meanwhile in Indonesia, 90% of the children had been given the BCG vaccine, 85% DTP3 and polio3 (WHO, 2020b).

According to WHO, even though the African region has shown the highest improvement in coverage of DPT since the year 2000, the levels were still the lowest compared to all the other WHO regions at 72% in 2017. Only 26 countries in the African region had adjusted their national immunization schedules to deliver two doses of the measles vaccine and so the region still recorded the lowest coverage levels for the measles vaccine at 25% compared to a global average of 67%. The pneumococcal vaccine had the highest coverage at 68%, a value that was higher than that of 3 other regions and the global average (WHO, 2019d).

Almost half of deaths resulting from pneumonia are among children in Africa (KEMRI, 2015). The incidence rate for pneumococcal diseases in Africa is 1603 and the death rate is 92 per 100,000. In 2015 alone, 460,000 African children died from pneumonia and meningitis (Wahl et al., 2018). Measles is considered one of the most transmissible diseases and can also be very severe. 25% of measles cases need to be hospitalized. In 2019, the African WHO region reported a 700% increase in the number of measles cases from the previous year (WHO, 2019c). The incidence rate for tetanus is higher than 10 per 100,000 in only 5 countries and all of them are African (Behrens, Ochmann, & Roser, 2017).

GVAP highlights sub-Saharan Africa (SSA) in its vision because the region has a much higher burden of vaccine preventable mortality and morbidity. The number of births in SSA make up 25% of all births worldwide annually and these children account for at least 50% of all cases worldwide of vaccine-preventable diseases (Organization, 2015). Coverage level for DPT3 has been constant for a while and 8 out of 10 of the children who missed the vaccine are located in ten countries, seven in the SSA (WHO/UNICEF, 2018). Also in SSA, only 16 out of the 47 countries achieved coverage greater than 90% for the measles vaccine in 2017 (WHO/UNICEF, 2018).

Looking at individual countries, there is a big range in levels of immunization within SSA in 2019. Somalia had one of the lowest immunization levels only recording 47% for polio3, 42% for DTP3 and 37% for BCG while in the Central African Republic, the percentages were 47%, 47% and 74 % in the same order. Higher rates were recorded in Ghana which managed 97% polio3 and DTP3 and 96% for BCG while the immunization levels in Seychelles were 96%, 95% and 98% for polio3, DTP3 and BCG respectively (WHO, 2020b).

The burden of VPDs in Kenya is notable. Tetanus cases are reported for 10.6 people for every 100,000 and these result in a mortality rate of 7.24 (Behrens et al., 2017). In 2015, the under-five mortality rate resulting from pneumococcus was 10 to 25 per 100,000 (Wahl et al., 2018). As of June 2019, 396 measles cases had been reported for the year (Organization, 2019). Between 2003 and 2016, two percent of confirmed measles cases resulted in death and the most elevated reported cases were among children below the age of four years old (Kisangau et al., 2018). Kenya is listed among the top 30 high burden countries when it comes to tuberculosis (TB) by the WHO. TB is also number four on the causes of death in the country (KNBS, 2018). The mortality rate in 2017 was 50 cases per 100,000 (KNOEMA, 2017).

The WHO reports that immunization coverage levels of measles and DPT in Kenya were also lower than the global average in 2018. Only 35% of Kenyan infants received the measles containing vaccine by the recommended age while DPT had been received by 85% of the infants who were one year old (WHO, 2019d). The results of the 2014 demographic and health survey revealed that the percentage of fully vaccinated children was 74.9% and 2% had not been vaccinated against any disease (KDHS, 2014).

KEPI recommends that all children are given OPV and BCG at birth; three doses of OPV, Pentavalent vaccine and Pneumococcal vaccine at 6, 10 and 14 weeks of age; and measles vaccine at 9 months (GOK, 2013; KDHS, 2014). The Pentavalent vaccine is used for protection against diphtheria, pertussis, tetanus, hepatitis B and haemophilus influenza type B. BCG protects against tuberculosis and the pneumococcal vaccines provides immunity from various infections including pneumonia and bacterial meningitis.

1.1 Statement of the Problem

Thousands of Kenyan children do not get vaccinated every year which puts them and the whole country in danger of VPDs especially measles and polio (UNICEF, 2017). The age specific mortality rate for children under five in Kenya is fifty two deaths for each thousand live births while the rate of child mortality is set at 39 deaths per a thousand live births, pneumonia and other VPDs are among the topmost causes of the deaths (KDHS, 2014). Non vaccination also affects the family's economic status because of the high cost of medical treatment for resulting medical conditions and lots of time spent taking care of the sick instead of focusing on income generating

activities. The country's economic status is also affected since every one shilling spent on vaccinations saves sixteen shillings that could have been spent on treatment .Vaccinations also promote cognitive and physical development in children which leads to increase in productivity later in life (UNICEF, 2018).

One of the GVAP's objectives is to provide equitable access to vaccines for everyone (WHO, 2013). This goal covers groups who have a higher likelihood to get VPDs like babies who are born preterm, pregnant women and people with medical conditions that weaken the immune system (Doherty et al., 2016). Adolescent mothers have a lower probability of adhering to the guidelines for postnatal care for their babies due to inexperience in reproductive matters and studies show that most of these children are either completely unvaccinated or only received partial vaccination (C. Kumar, Singh, Singh, & Rai, 2016).

By 2014, Kenya had still not met the target it set for the year 2010 despite the government offering free vaccinations at public hospitals (GOK, 2013; KDHS, 2014). The national coverage should have been at 90% in 2010 and sustained through 2015, however, in 2017 the level was still below 70% (MOH, 2019). The WHO has also set a 90% full immunization coverage target for the year 2020 (WHO, 2014).

For Kenya to meet the targets set nationally and internationally for vaccination coverage levels and to reduce the childhood mortality rates, measures have to be put into place to ensure that all children get vaccinated with emphasis put on the groups who are at higher risk of under vaccination or non-vaccination. The demand for immunization by households is driven by various factors that affect the likelihood of a household to take a child for immunization. In order to fully address the bottlenecks that hinder access to full immunization the policy maker should be able to identify these factors that hinder household from accessing immunization and identify the factors that boost the likelihood of a household to immunization children. Attribute of the mother has been highlighted as a key determinant of the health of the child in a household, as the mother make major decision on behave of the child including taking a child for immunization. The decision to fully immunize a child could therefore be affected by the social economics characteristics facing the mother in household. Unlike adult mothers, adolescent mothers are faced with social stigma, poor access to health services, financial instability and less emotional support while some have to

learn to balance their newly acquired roles as wife and mother. According to healthcare workers, these young mothers often have several needs which they are unable to cater for because of inadequate training and a lack of holistic services (M. Kumar et al., 2018). The age of the mother may affect her knowledge and exposure on important child health issues, and this could have an effect on her child's access to immunization. It is against this background that this research was undertaken to investigate the determinants for full immunization among children born to adolescent mothers. With an intention of shedding light on the possible channels for addressing the low access to immunization in the country.

1.2 Research questions

1. What is the level of full immunization among children of adolescent mothers in Kenya?
2. What are the determinants of full immunization among children of adolescent mothers in Kenya?

1.3 Study objectives

1.3.1 General Objective

To explore the level and determinants of full immunization among children of adolescent mothers in Kenya.

1.3.2 Specific Objectives

1. To determine the level of full immunization among children of adolescent mothers in Kenya.
2. To establish the determinants of full immunization among children of adolescent mothers in Kenya.

1.4 Study Justification

The information from the study may help the country to achieve 90% full immunization coverage. This will be a big step towards achieving SDG number three which is “aspire to ensure health and wellbeing for all”, the country’s big four agenda and is a steppingstone towards Kenya’s Vision 2030.

This study can make some contributions towards areas of Public health and Health economics. It could also serve as a way to assess the how much impact government interventions, like the national immunization campaigns, have had on immunization coverage levels and highlight the areas that may need improvement. Furthermore, it could trigger new ideas on how to roll out and implement health interventions in the future so that they can benefit all members of the society. Once policy makers understand the factors determining full immunization, they can use the information to stop children dying from vaccine preventable diseases. The information provided may also be useful to researchers in their future works on immunization.

CHAPTER 2: LITERATURE REVIEW

2.0 INTRODUCTION

This section shows applicable literature for this research. It probes what other studies have said about studies done elsewhere that are relevant to this study. The chapter consists of three sections. The first one being, the theoretical literature which talks about different theories put forward to understand the demand and utilization for health. The second section examines previous studies related to this one and the findings obtained. Finally, the third section gives a summary of the entire chapter.

2.1 THEORETICAL LITERATURE REVIEW

2.1.1 Andersen's Behavioral Model

Andersen (1968) developed a three-stage model to shed light on the differences in consumption of health services by families while considering the various risk factors, enabling or limiting factors and need factors. Social structure is a predisposing factor and was traditionally measured by education, ethnic background and occupation. The measures of social structure determine status, ability to gather resources to cope with a problem and the state of the physical environment whether healthy or unhealthy. The opinion on whether a service is needed is influenced by attitudes, knowledge and values. Enabling factors are found at both community and individual level and they are necessary for utilization. There must be availability of health facilities and trained personnel where people reside, and the people must have knowledge of how to get the immunization services. Wealth, travel and waiting times are important factors to consider in this category (R. M. Andersen, 1995).

The original model was meant to explain why households consume health interventions, to describe and estimate equitable accessibility of health care and to help in formulating new by laws that enhance fair distribution. The model proposed that uptake of medical services occurs when the family is inclined to receive the care, when the existing conditions make the services available and when a family recognizes need and reacts accordingly. These are the first three components and they result in the fourth component which is use (R. Andersen, 1968).

The theory supports the claim that a person will seek health services depending on the geographical location, resources, position within the society and beliefs. The model was later updated to recognize that the type and purpose of health service are also determinants of use, and that the frequency of use depends on the background of the people and whether health facilities services are available or not. (R. Andersen & Newman, 2005; R. M. Andersen, 1995).

2.1.2 Choice Making Model

The Young (1981) model has four different elements that are believed to have an influence on health seeking decisions. The first element is the attitude of the individual and their community on the gravity or severity of the disease. People tend to seek health services when the situation is considered severe otherwise, they don't. The second element is knowing a home treatment option that is also effective and which in some cases will be considered first due to other factors like treatment cost. The third element of the model is belief in the effectiveness of the treatment and the final element is access. Access considers availability of health services and cost which is inclusive of productive time and transport cost. The transportation cost further factors in how long it would take to get care at the facility which differs depending on the geographical location (Young & Garro, 1982).

2.1.3 Grossman's Demand for Health Model

This model was developed by Grossman (1972) who considered health consumption as an investment. According to Grossman, good health is a stock or commodity one receives at birth that deteriorates over time but can be replenished by investing in care. Investment in health is a necessity because health affects the productivity of an individual. A person in a good state of health has fewer sick days and more time for income generating activities leading to more wealth.

The production of health relies on variables like age, income and health status. He considered education to be the most important because it has a positive effect on the effectiveness of the production activity. The health of an individual depends on the number of resources invested. The cost of health is comprised of the price of receiving medical services and goods combined with the price of all the other variables. Demand for health decreases when the price associated with obtaining it is high (Grossman, 1972). Childhood immunization is one of the first ways to invest in health and the decision to do so depends on various factors like maternal education, income,

wealth and the cost of immunization which is the cumulative total of the cash price and time taken to obtain the vaccinations.

2.2 EMPIRICAL LITERATURE REVIEW

Scholars and researchers have done Several studies to explore the determinants of vaccination uptake and the determinants of full immunization in different parts of the world. This section explores the studies done and summarizes the influence of selected variables on immunization. A study was conducted in East China titled 'the factors that influence the uptake of immunization among the socio-economically disadvantaged'. The likelihood of children being fully immunized was directly proportional to education level. The same conclusion was also drawn for household income (Hu, Li, Chen, Chen, & Qi, 2013).

Another study on the influences of basic vaccination coverage in Myanmar established that wealth and number of ANC visits were significant to children getting a full coverage. The probability of full coverage was almost three times higher for children born to families belonging to middle or high wealth quintile, and double for those whose mothers attended at least four ANCs. The multivariable analysis ruled residence as not significant to being fully immunized (Nozaki, Hachiya, & Kitamura, 2019).

Sarker et al (2019) in their study conducted in Bangladesh titled, 'coverage and determinants of full immunization among children under five. They established that women who went to secondary schools or tertiary institutions had double the likelihood of ensuring their children received all the basic immunizations in contrast to the uneducated mothers (Sarker, Akram, Ali, & Sultana, 2019).

In Sao Paulo, Brazil, a study was conducted on the risk factors leading to incomplete immunization among children below 18 months. It determined that the mother's occupation or employment status was a determinate factor for the immunization status of children (Konstantyner, Taddei, & Rodrigues, 2011).

A survey was conducted in the Lucknow district of India on factors affecting immunization coverage involving 510 children. Nath et al. (2007) used the WHO's thirty-cluster sampling technique to recruit participants into the study and later used the logistic regression to find out the significant factors. They found that illiterate mothers, Muslim women and having a lot of children

had a relationship with partial immunization. High parity and being a Muslim were also significant to complete non-immunization.

A study was undertaken in Indonesia attempted to dig deeper on "determinants of vaccination coverage among children between the ages of one and five years". The study used the regression technique and found that children who had higher birth order were at a much higher risk of incomplete immunization or no immunization at all (Herliana & Douiri, 2017).

A different study in Indonesia designed to assess the determinants of vaccine uptake. According to the study findings, residence was significant to the uptake of vaccine. Those in urban regions had a higher likelihood of being vaccinated against the VPDs. The study also revealed that having a trained birth attendant assist with the delivery doubled the chances of the child being immunized (Fernandez, Awofeso, & Rammohan, 2011).

Still in Indonesia, it was determined that ore educated mothers had a high likelihood of vaccinating their children, and the same went to mothers who were assisted by professional health care givers during delivery. This was from a different study by Shemwell et al. (2017) which analyzed secondary data from the national Socioeconomic survey for the years 2008, 2011 and 2013 using multilevel logistic regression.

Another study also conducted in the rural parts of Bangladesh explored the factors that influence the decision to accept full immunization. Facility distance was shown to be a significant factor. Odds for full immunization was two times higher for women living at least one kilometer to the health facility compared to women living further than one kilometer (Rahman & Obaida-Nasrin, 2010).

In Delhi India, the probability of receiving all the basic immunizations is 50% higher among babies born in hospitals in comparison to those born at home. Distance covered to the closest health facility however was not influential on complete immunization. These findings came from a cross-sectional study among the poor people living in the urban area done with the aim of assessing the factors that determine immunization coverage among children (Devasenapathy et al., 2016).

In Togo, a study was conducted on incomplete vaccination coverage with a sample size consisting of one year old children focusing on circumstantial and individual factors. This was a prevalence

study conducted using questionnaires. Education was one of the significant factors and mothers who were educated up to a secondary level or higher were shown to have 67% higher odds of adhering to the full immunization routine as opposed to mothers who had no formal education (Ekouevi et al., 2018).

Adebiyi (2013) studied 'determinants of full immunization among children in Nigeria'. Using the country's DHS data from 2008. The study used the regression analysis technique on a sample size of 4520 children. It found that education level was indirectly proportional to full vaccination with mothers who little to no form of education were highly unlikely to be fully vaccinated in contrast to children of mothers who had attended at least eight years of studies. Religion was also one of the significant factors with children born to Christian mothers having a higher likelihood of getting immunized as opposed to with Muslim mothers. Mothers who went for prenatal care more than three times exhibited a higher tendency to make sure their children were completely immunized compared to mothers who did not go for ANC while pregnant.

Children who are at least third in line have a much higher prospects of not being completely vaccinated as opposed to children born first or second. This conclusion was made on a cross-sectional study that was determining the vaccine coverage levels and associated factor among children in Cameroon. The data was collected via questionnaires administered to parents and immunization history obtained through parent recall and vaccination cards (Russo et al., 2015).

A study on the determinants of full immunization among children in Ethiopia analyzed data from the country's DHS. It established that wealthier women were almost one and a half time more likely to provide their children with all the basic vaccinations. (Lakew, Bekele, & Biadgilign, 2015).

Ekouevi et al. (2018) studied incomplete immunization among children in Togo and found that the proportion of unimmunized children decreased as the household's financial status increased. This data was collected from 1261 households using a cross-sectional study design. Multivariate regression techniques were then used to establish the factors significant to incomplete immunization. Children from high and middle socio-economic classes had received more doses of vaccination for different vaccine preventable diseases opposed to those with a lower socio-economic status.

Another study titled ‘factors that are associated with full coverage among children between the ages of one and two years in Zimbabwe’ found that delivering in a health facility and immunization uptake had a positive relationship. Delivery in a health center was associated with a 1.7 higher probability of receiving all the basic vaccines in contrast to a home delivery. The study also reported almost equal coverage in urban and rural areas (Mukungwa, 2015).

A cross-sectional study in Nigeria investigated the how utilizing maternal health services affects immunization coverage. The findings established that women who had a skilled attendant during birth had nearly double the odds of having their children fully vaccinated. Receiving ANC was also positively associated with full immunization and the likelihood increased with the number of ANC visits made while expectant (Anichukwu & Asamoah, 2019).

Legesse & Dechasa (2015) in Southeast Ethiopia found that full immunization was highly dependent on distance to health facility. Those who walked for less than sixty minutes to the facility of choice were three times prone to have their children vaccinated in comparison to those who had to walk for a longer time. The study analyzed data for children between 12 to 23 months using multiple logistic regression technique to get to this conclusion (Legesse & Dechasa, 2015).

Another study done in Nigeria on determinants of vaccination coverage among children 11-23 months established that the mother’s occupation had a significant relationship with the basic immunization coverage. Children with mothers working as civil servants or employed by the government were two times prone to be fully immunized as contrasted to children born to mothers in other professions (Tagbo et al., 2014).

A cross-sectional study involving 280 participants in Ghana conducted by Anokye et al. (2018) proved that divorced women, and women with part-time jobs had a significant relationship with complete immunization. The results showed that the likelihood for full immunization was three times lower among divorcees compared to the widowed and the married. Women working part time also had a lower likelihood compared to those working full time.

Mbengue et al. (2017) from Senegal studying ‘the determinants of complete immunization among children’ found that geographical location, proximity to a health facility and the mother’s characteristics was a determinate factor in the immunization status of the child. A multi-stage

cross-sectional study was used and it focused on DHS data from Senegal. The study applied the logistic regression technique on a sample size of 2199 children.

Tsehay, Worku, and Alemu (2019) recruited 5304 women with children into their cross-sectional study on 'factors influencing the uptake of BCG vaccine in Ethiopia'. Age was established to be one of the significant factors with mother's aged 20-34 years and those between 35-49 years showing a higher tendency to vaccinate compared to the younger mothers below twenty years old. Women staying in urban areas were also more probable to vaccinate contrasted to those from rural areas. The place where the mother delivered was also an important factor with vaccination levels being higher among women who delivered at private clinics and facilities opposed to those who gave birth at home. In addition to that, there were also other significant factors including, mothers' occupation and number of antenatal visits made while expectant, the likelihood for immunization increased with the number of ANC visits.

Shemwell et al. (2017) conducted a study on 'the determinants of full vaccination among children in Milange and Gurue districts of Mozambique'. They showed that the chances of a child receiving all the basic vaccinations decreased with every 10km increase in distance to the nearest health center. Theirs was a cross-sectional survey and they collected data from 1650 women all having children between one and two years old.

Canavan et al (2014) studied the correlates of full childhood immunization across all the countries in East Africa. They extracted and analyzed the data for children aged 12-23 months from each country's DHS using the multivariable logistic regression. In Uganda there was a positive association between education and full inoculation. Mothers who attained secondary education were threefold more probable to fully vaccinate their children compared to mothers who had no form of education at all. Results from Tanzania indicated that children born to families living in urban areas were two and half times higher likelihood to achieve full inoculation compared to children in the remote parts of the country. The factor that drew the same conclusion in Kenya, Tanzania, Rwanda and Uganda was the place of delivery. Children who were delivered at health facilities had higher odds of being fully immunized in comparison those who were born at home. For example, in Rwanda, children born in public facilities were 1.8 times more likely to be fully vaccinated and children born in a private institution were 9 times more likely. In Uganda, the

likelihood was 3.9 for children born in government facilities and 3.1 for children born in private facilities (Canavan, Sipsma, Kassie, & Bradley, 2014).

A study was done in Tanzania on the timing and coverage of vaccines among children younger than 2 years old. One of the risk factors for immunization was distance. This affected children who lived more than five kilometers from the nearest health facility as their probability of being fully vaccinated was much lower than for those who stayed closer to the health facilities (Le Polain de Waroux et al., 2013).

Again, in Tanzania, it was found that the wealth quintile is a determinant of full immunization for children. This was one of the conclusions drawn by a study to determine the trends in vaccination coverage and the associated disparities. Mothers who were categorized as least poor and less poor were almost twice as probable to vaccinate their children as opposed to mothers who were realized to be languishing in poverty. (Semali, 2010).

A cohort study that was designed to investigate the effect of formal education on immunization status in Uganda also looked at other variables including residence, wealth and number of children the woman had. Pregnant women were recruited as study participants and observed until 24 weeks after delivery. After analysis of the data, it was found that parity did not assume a major part in the immunization status of children (Nankabirwa, Tylleskär, Tumwine, & Sommerfelt, 2010).

In Kenya, there was a study focusing on the influence of the mother's education on childhood vaccination and stunting. The result established that the area of residence has no effect on the immunization status of infants (Abuya, Onsomu, Kimani, & Moore, 2011).

A study assessing "The immunization coverage and determinants in peri-urban Kenya among children between 12-23 months" found that parity had a negative relationship with immunization. Families with less than three children had a 2 and a half times more probability of immunizing their children compared to families with more than four children. It was also established that children born in a health center were twice as likely to be immunized compared to children born at home (Maina, Karanja, & Kombich, 2013).

In Western Kenya, a cross-sectional study was undertaken to probe on the factors determining the vaccine coverage among children. A multivariate logistic regression model was used to establish

the significant factors. It was established that maternal education was positively associated with coverage and children born to mothers with little or no education were 0.35 times less likely to be immunized versus children of mother with at least 8 years of formal education (Calhoun et al., 2014).

Mothers who are not involved in any income generating activity are less likely to pursue all the recommended vaccines for their children compared to mothers who are working. This conclusion was arrived upon in a study on immunization inequality carried out in the informal settlements in Nairobi, Kenya (Egondi, Oyolola, Mutua, & Elung'ata, 2015).

Awino (2016) used probit regression model on the KDHS 2014 data to investigate determinants of vaccination among children aged 12-23 months in Kenya. The study showed that antenatal visits had a positive influence on immunization. Mothers who went to ANC were more disposed to immunize their kids (AWINO, 2016). These findings did not agree with those of another study that found there was no significant association between the mother receiving antenatal care and childhood immunizations (Mutua, Kimani-Murage, & Ettarh, 2011).

In Nyanza, it was found that the wealthiest members of the population had a higher chance of vaccinating their children according to the recommended guidelines. The multivariable regression gave an odds ratio was 2.49 which implies they were at least twice as liable to vaccinate their children (Kawakatsu, Tanaka, Ogawa, Ogendo, & Honda, 2015).

Another study done in Kenya on factors determining vaccination completion used systematic random sampling to select cases and control from the health facility registry. Cases were children who were not fully vaccinated, and he controls were fully immunized. The selected participants were located, and questionnaires administered to the caregivers. Study results established that the distance to the health facility was not significant to children being fully immunized (Emmanuel, Samuel, & Helen, 2015).

2.3 OVERVIEW OF LITERATURE

This study followed the guidelines of three different models which all state that the choice to utilize health is determined by various factors. According to the Grossman model, consumption of health, in this case immunizations services is influenced by age, income and education status. Young (1981) and Andersen (1968) agree that availability of resources encourage health seeking practices. In the case of adolescent mothers, these resources may not be available because they most likely quit school and have less chances of earning a salary (Ikamari, Izugbara, & Ochako, 2013). Andersen's model also states that the ability to recognize need for health services is crucial and in the case of inexperienced and less educated adolescent mothers, this is a skill that may be lacking.

Children of adolescent mothers are at a disadvantage since their mothers were less probable to take them for subsequent vaccine shots (Atuyambe et al., 2008). On exploring the socio-demographic characteristics of the mothers further, some studies found that maternal education, place of residence and place where the child was delivered each had a significant association with immunization (Canavan et al., 2014). Attending ANC and having a skilled attendant assisting with the birth were positively associated with fully vaccinating the child (Anichukwu & Asamoah, 2019). Parity and occupation and distance were negatively associated with fully immunizing a child while wealth had a significant and positive relationship with immunization uptake (Egondi et al., 2015; Kawakatsu et al., 2015; Le Polain de Waroux et al., 2013; Maina et al., 2013).

CHAPTER 3: METHODOLOGY.

3.0 INTRODUCTION

This chapter talks about the conceptual framework, model specification, data sources, diagnostic test and analysis plan.

3.1 CONCEPTUAL FRAMEWORK

This study adopted the framework shown in figure 1 below and it tested the effect of the exposure variables on the outcome variable.

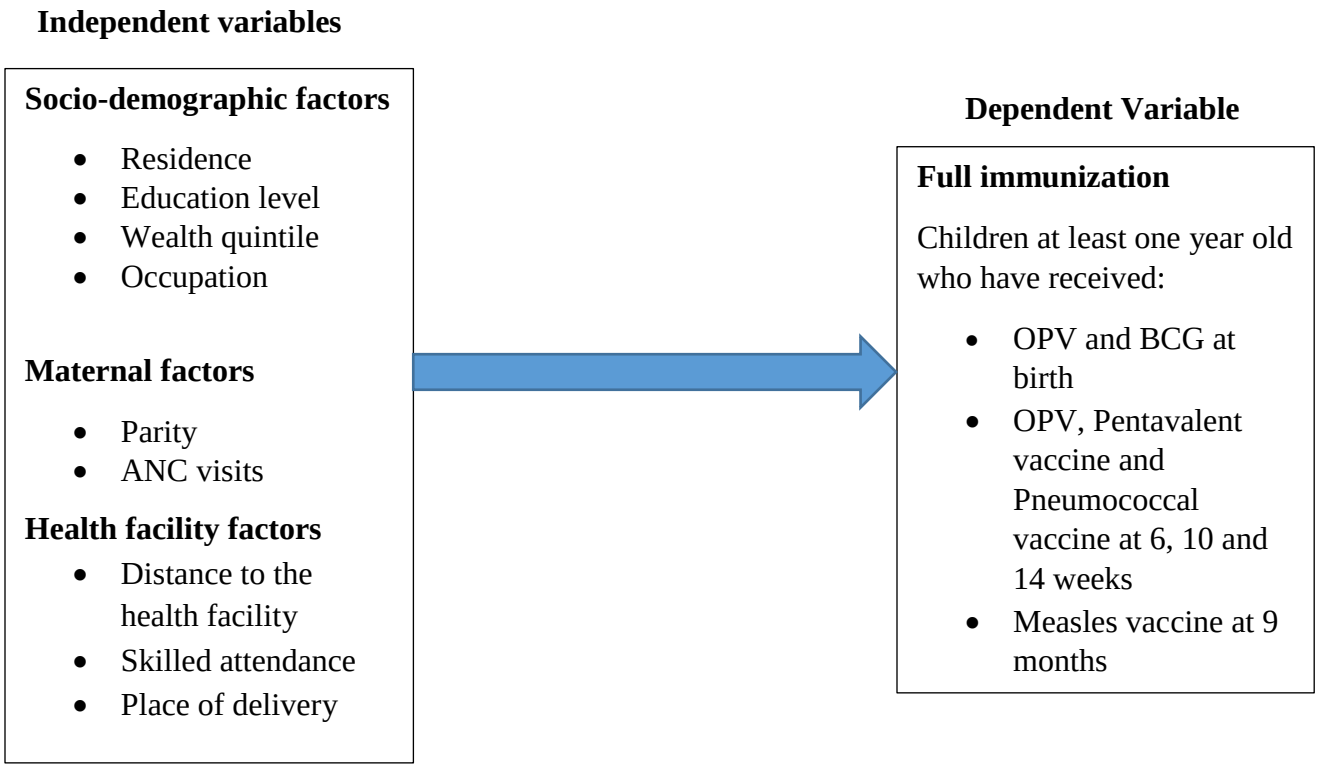

Figure 1 Conceptual framework

Source: author

3.2 EMPIRICAL MODEL

This study applied the maximum likelihood technique of binary probit regression to analyze determinants of full vaccination among children 12-59 months born to adolescent mothers. Probit regression is used when there is a binary dependent variable and assumes that the error term is normally distributed.

The outcome variable will be y_i as shown

$$y_i = \begin{cases} 1 \; for \; fully \; immunized \\ 0 \; otherwise \end{cases} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

The outcome of y_i was influenced by the set of regressors x (dependent variables). The model took the following form;

$$\Pr(Y = 1|X) = \Phi(X'\beta) \quad \ldots\ldots\ldots\ldots (2)$$

Where; Pr =Probability

Φ=Cumulative Distribution Function of the standard normal distribution.

The parameter β was estimated.

3.3 MODEL SPECIFICATION

A multivariable probit model with the following specifications was used.

$Y_i = B_1M_i + ƵE_i + \gamma HS_i + \varepsilon$

Where;

Y_i= Full immunization

M_i=Vector of socio-economic factors

E_i=Vector of maternal factors

HS_i = Vector of health facility factors

B, Ƶ and γ= coefficients of the predictors

ε = stochastic error term

The dummy outcome variable was not an issue since probit model is used when the outcome is binary. Marginal effects for the dummy independent variables is defined as difference in probability when the regressor changes values from zero to 1 and is estimated as follows:

Let X be the k^{th} regressor with coefficient b, and let a change in the value of the regressor be indicated as

x_k=x to x_k=x+Δx.

A shift in the value of the estimator leads to a shift in the estimated probability of success. Suppose the estimated probabilities of success before and after the change in value were

$$P1 = p = \frac{e^{A+bx}}{1 + e^{A+bx}}$$

$$P2 = p + \Delta p = \frac{e^{A+bx+b\Delta x}}{1 + e^{A+bx+b\Delta x}}$$

Using continuous derivative to approximate Δp we get

$$\frac{\delta p}{\delta xj} \times \Delta x = p(1-p)b\Delta x \approx \Delta p$$

3.4 DEFINITION AND MEASUREMENT OF VARIABLES

The outcome and explanatory variables are explained in table 1 below. The variable for full immunization indicates the immunization status of a child born to an adolescent mother. The remaining variables describe the maternal and socio-economic status of the adolescent mothers

and the health facility factors that they encountered (figure 1). The expected sign shows the relationship between the independent variables and the dependent variable in respect to existing literature.

Variables	**Measurement of variables**	**Expected sign and literature**
Full immunization	Coded: 1 =If a child was fully immunized and received all the recommended vaccinations 0 = child was not fully immunized did not receive any or all of the vaccinations.	
Residence- The respondent's area of residence	Urban Rural	*Indeterminate* (Mukungwa, 2015)
Education level – Mother's highest education level	This refers to the mother's level of education None Primary Secondary Tertiary	*Positive* (Sarker, Akram, Ali, & Sultana, 2019)
Wealth quintile- Mother's wealth index	The wealth quintile was categorized into Poor Middle	*Positive* (Lakew et al., 2015)

	Rich	
Occupation- mother's employment status	Employed Unemployed	*Positive* (Hu et al., 2013)
Parity-Total number of children ever born	Continuous	*Negative* (Herliana & Douiri, 2017; Rahman & Obaida-Nasrin, 2010)
ANC- Number of ANC visits during pregnancy	Continuous	*Positive* (Nozaki et al., 2019)
Distance to health facility	Big problem Not a big problem	*Negative* (Rahman & Obaida-Nasrin, 2010)
Skilled attendance	Attended to by doctor, nurse or midwife during delivery Yes=1 No=0	*Positive* (Anichukwu & Asamoah, 2019)
Place of delivery	Public health facility Private health facility Home	*Positive* (Acharya, Kismul, Mapatano, & Hatløy, 2018)

Table 1 Definition and measurement of variables

3.5 DATA SOURCE

This study utilized data from the 2014 KDHS survey. The sampling for the survey was done in two stages. In the first stage, 617 urban and 995 rural clusters were randomly selected from the NASSEP V frame giving a total of 1612 clusters. This is a master sampling frame that is used in national surveys. In stage 2, 25 households were picked at random from every cluster. The target population for this study will be mothers aged 15-19 years having children between 12 and 59 months. This is because children below the age of one year are still in the process of receiving the basic immunizations. The resulting sample size was 526 women.

The data was collected using a cross-sectional household survey across the entire country. Data collection was through administration of structured quantitative questionnaires by trained enumerators and data entry done using CS pro software. The women's questionnaire was administered to all women of reproductive age in the selected households. The data provided estimates for health and demographic indicators in each county. Information on immunization was obtained from mothers' recall and written records including mother and child health booklets and other health cards.

The required data was extracted from the main dataset and analyzed using Stata version 14. Descriptive and regression analysis was conducted and the results presented in tables. A p-value less than 0.05 was considered statistically significant.

3.6 DATA ISSUES

Data issues refer to the situation whereby the data lacks validity, consistency and accuracy and if used can lead to misleading results.

3.6.1 Multicollinearity

This occurs when explanatory variables in multivariate regression model are highly related and don't provide any unique information. Multicollinearity in a model leads to unreliable regression coefficients and misleading findings when testing for significance. It is detected using the Variance

Inflation Indicator (VIF) and its reciprocal called tolerance. The VIF=1/tolerance where tolerance=1-R_i^2 and R_i^2 is the proportion of variance in a predictor that is related to other predictors in the model. Tolerance less than 0.1 or VIF greater than 10 is considered problematic. This study used a tolerance level of 0.1 and if multicollinearity was detected, one of the variables causing it was dropped.

3.6.2 Heteroscedasticity

Heteroscedasticity is whereby the error terms has different sizes for the values of the explanatory variables. This poses a problem because the ordinary least squares (OLS) regression assumes that all error terms are drawn from a homoscedastic population. (homoscedasticity). This study checked for heteroscedasticity by calculating squared residuals and plotting them against the explanatory variables. If the graph has a cone shape that means, there is heteroscedasticity and the findings will not be reliable. The consequences of heteroscedasticity are that the regression will not give estimators with the smallest variance (they will not be useful), the test statistics and confidence intervals will be biased, and the significance tests will be either too high or too low. The results may be shown as significant when that is not the case.

3.6.3 Endogeneity

Occurs when an explanatory variable and the error term in a model are correlated. The most common causes of this is when some of the important variables are not included in the model, a situation known as omitted variable bias or when the dependent variable predicts the explanatory variable and is not just an outcome to it, also referred to as simultaneity bias. Ignoring endogeneity results in inconsistent and biased coefficients in a regression model and misleading hypothesis tests. Endogeneity is detected using the Hausman test with the null hypothesis being that the estimator is efficient and consistent. The situation can be rectified using the instrumental variables estimation whereby an instrument is a variable which is strongly correlated to the endogenous variable but not the error term

CHAPTER 4:DATA ANALYSIS INTERPRETATION AND DISCUSSION.

4.0 Introduction

This section presents the descriptive and inferential results of this study, interpretation of the findings and discussion of findings in relation to other studies.

4.1 Descriptive Statistics

Summary statistics are presented in table 2 below. Findings are presented in terms of total observation, mean, standard deviation, minimum and maximum. Results show that an average of 66.1% of children aged 12-59 months born to adolescent mothers were fully immunized.

Findings show that adolescent mothers from rural areas had the highest proportion of fully immunized children at 72.4% while those from urban areas had the lowest proportion of children who were fully immunized at 27.6%. In terms of education level, children with mothers who had completed primary education only accounted for 75.0% of those who were fully immunized while children with mothers who had achieved tertiary education had the least proportion (0.4%) of full immunization. Full immunization was high among children with poor adolescent mothers (47.9%) and least among children with middle income mothers (24.2%). Findings also show that unemployed adolescent mothers had the highest proportion (57.9%) of fully immunized children compared to only 42.1% of children of employed adolescent mothers. Full immunization was high among adolescent mothers with an average of 2 living children and who had attended 4 ANC visits. Mothers who had skilled birth attendant at birth and who gave birth at a public health facility had the highest percentage of fully vaccinated children at 66.9% and 55.0% respectively.

Table 4. 1: Summary Statistics

Variables	Obs	Mean	Std.dev	Min	Max
Full immunization	348	0.6611	0.4738	0	1
Residence					
Urban	348	0.2763	0.4478	0	1
Rural	348	0.7237	0.4478	0	1
Mother's education level					
None	348	0.0323	0.1772	0	1
Primary	348	0.7496	0.4339	0	1
Secondary	348	0.2145	0.4111	0	1
Tertiary	348	0.0036	0.0598	0	1

Wealth Quintile					
Poor	348	0.4789	0.5003	0	1
Middle	348	0.2418	0.4288	0	1
Rich	348	0.2792	0.4493	0	1
Occupation					
Employed	156	0.4211	0.4953	0	1
Unemployed	156	0.5789	0.4953	0	1
Parity	348	1.3923	0.5647	1	4
ANC	261	3.6263	1.5787	0	8
Distance to health facility					
Big problem	156	0.2738	0.4473	0	1
Not a big problem	156	0.7262	0.4473	0	1
Skilled attendance					
Yes	341	0.6693	0.4712	0	1
No	341	0.3307	0.4712	0	1
Place of delivery					
Public health facility	347	0.5504	0.4982	0	1
Private health facility	347	0.1100	0.3134	0	1
Home	347	0.3396	0.4743	0	1

4.2 Data Issues

4.2.1 Correlation Analysis

The study did an analysis of the correlation coefficient to determine the pairs of variables that were correlated. The correlation coefficient shows the strength and direction of the relationship (regardless of a positive or negative relationship). High correlation results in reduced accuracy of estimated coefficient and therefore reducing statistical power of the regression model. Findings show a strong negative correlation between skilled attendant and place of delivery. Overall, there is presence of very low correlation since most of the correlation coefficients are below 0.5

Table 4. 2: Correlation Analysis

Variables	Residence	Mother's education level	Wealth quintile	Occupation	Parity	ANC	Distance to facility	Skilled attendance	Place of delivery
Residence	1.0000								
Mother's education level	-0.0454	1.0000							
Wealth quintile	-0.4117	0.3347	1.0000						
Occupation	0.0200	0.0622	-0.0581	1.0000					
Parity	0.0780	-0.2117	-0.0428	0.0387	1.0000				
ANC	-0.1251	0.1656	0.1715	0.0477	-0.0287	1.0000			
Distance to health facility	-0.1825	0.0979	0.2123	-0.2276	-0.0582	0.0600	1.0000		
Skilled attendance	-0.1659	0.3040	0.2540	0.0759	-0.1845	0.3006	0.1030	1.0000	
Place of delivery	0.1354	-0.2594	-0.2060	-0.0524	0.1369	-0.3194	-0.1012	-0.9365	1.0000

4.2.2 Multicollinearity Test

Variance Inflation Factor was used to test for multicollinearity. Our findings show an overall VIF of 9.22. This is lower than the recommended threshold of 10 therefore indicating no presence of multicollinearity. Place of delivery was excluded from the regression since it was highly collinear.

Table 4. 3: VIF Test

Variables	VIF	1/VIF
Urban	1.29	0.7736
Primary	3.19	0.3140
Tertiary	1.11	0.9031
Poor	1.96	0.5089
Rich	1.91	0.5229
Unemployed	1.13	0.8888
Parity	1.11	0.8995
ANC	1.17	0.8527
Big problem	1.15	0.8708

No skilled birth attendant	47.84	0.0209
Home	51.26	0.0195
Public health facility	3.24	0.3088
Mean VIF	9.22	

4.2.3 Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity

Breusch-Pagan test was used to test for heteroscedasticity. A null hypothesis of constant error variance(homoscedasticity) was assumed. Results show a chi2 value of 2.62 and a P-value of 0.1055. Since the p-value is greater than 0.05, we fail to reject the null hypothesis and conclude there is presence of homoscedasticity.

Table 4. 4: Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity

Fixed effect	Chi2	Prob>chi2
Panel mode 1	2.62	0.1055

H0:Constant error variance(homoscedasticity)

4.3: Inferential Statistics

4.3.1 Binary Probit Regression Results on Determinants of Full Immunization among children 12-59 months born to adolescent mothers in Kenya

Results from the binary probit regression show a likelihood ratio of 25.31 with a p-value of 0.0048. This shows that the model is of good fit as compared to a model with only the intercept term. A pseudo R2 value of 0.1315 was also reported which means that only 13.2% of the variation in full immunization is explained by the independent variables. In this analysis, only marginal effects will be interpreted unlike in probit estimation where odds ratio are estimated.

Table 4. 5: Binary Probit Regression Results on Determinants of Full Immunization among children 12-59 months born to adolescent mothers in Kenya

Variables	Coef.	Std error	z	P>z
Residence				
Rural	-0.2433	0.2679	-0.91	0.364
Education Level				
Primary	0.8922	0.4617	1.93	0.053
Secondary	1.0408	0.5328	1.95	0.051
Wealth Quintile				
Poor	-0.3138	0.3312	-0.95	0.343

Middle	-0.0908	0.3520	-0.26	0.796
Occupation				
Employed	0.5869	0.2446	2.40	**0.016**
Parity	0.7963	0.3493	2.28	**0.023**
ANC	-0.1825	0.0701	-2.60	**0.009**
Distance to health facility				
Big problem	0.4083	0.3021	1.35	0.176
Skilled attendance				
No	-0.1152	0.3021	1.35	0.176
Constant	-0.3630	0.7377	-0.49	0.623

4.3.2: Marginal effects on the predictors of Full Immunization among children 12-59 months born to adolescent mothers

Results show that being employed, parity and ANC were significant factors associated with full immunization. Being employed increased the probability of full immunization by 16.4%. An increase in parity resulted in an increase of 21.9% in the probability of a child being fully immunized. In terms of ANC visits, a unit increase in the number of ANC visits resulted in a decrease of 5.0% in the probability of a child being fully immunized.

Residence, education level, wealth quintile, distance to health facility and skilled attendance were not significantly associated with full immunization.

Table 4. 6: Marginal effects on the predictors of Full Immunization among children 12-59 months born to adolescent mothers

Variables	dy/dx	Std error	z	P>z
Residence				
Rural	-0.065	0.0693	-0.94	0.348
Education Level				
Primary	0.2917	0.1567	1.86	0.063
Secondary	0.3313	0.1732	1.91	0.056
Wealth Quintile				
Poor	-0.0864	0.0891	-0.97	0.332
Middle	-0.0234	0.0907	-0.26	0.797
Occupation				
Employed	0.1644	0.0716	2.30	**0.022**
Parity	0.2185	0.0960	2.28	**0.023**
ANC	-0.0500	0.0192	-2.61	**0.009**

Distance to health facility				
Big problem	0.1042	0.0716	1.46	0.146
Skilled attendance				
No	-0.0321	0.0760	-0.42	0.673

4.4 Discussion

Findings from this study show that 66.1% of children born to adolescent mothers were fully vaccinated. In Nigeria the case is slightly higher where 73.3% were able to achieve full immunization (Uwaibi, 2020). In Mozambique, 64% of children were fully immunized (Shemwell et al., 2017). This is a 2% difference as compared to our study. In Ethiopia, the difference is very large. Only 27.7% were fully vaccinated although 96% of mothers had heard of vaccination (Etana & Deressa, 2012). The case in Somalia is not any different from that in Ethiopia where there was a 20% full vaccination coverage (Jama, 2020).

Findings showed that adolescent mothers who were employed had an increased probability of 16.4% of their children being fully immunized. This is contrary to a study in Ethiopia which found out that a mothers occupation was not likely to determine whether a child would be fully vaccinated (Etana & Deressa, 2012). In Nigeria, a mother's employment status was found to also be a determinant of full immunization. Employed mothers were more likely to fully vaccinate their children as compared to unemployed mothers (Uwaibi, 2020). In Somalia, employment status was found not to be a determinant of vaccination as there was no significant difference between employed and unemployed mothers (Jama, 2020).

Parity was found to be a significant determinant of full vaccination. An increase in parity resulted in an increase of 21.9% in the probability of a child being fully immunized This case is the same in Ethiopia where parity was found to determine whether children would be fully vaccinated. Cases of full vaccination were able to rise with an increase in number of children (Asmamaw et al., 2016). In Burkina Faso, parity was also a determinant of full vaccination with an increase in children causing an increase in demand for full vaccination (Schoeps et al., 2013). In Zimbabwe, the results are the same with parity being a determinant of full vaccination. Fourth to fifth children were more likely to be fully vaccinated as compared to first children (Mukungwa, 2015).

ANC visits were also determinants of full vaccination. A unit increase in the number of ANC visits resulted in a decrease of 5.0% in the probability of a child being fully immunized. This is contrary

to results from a study in Senegal where a higher number of ANC visits was synonymous with full vaccination (Sarker, Akram, Ali, Chowdhury, & Sultana, 2019). In Nigeria, 84% mothers who attended ANC visits fully vaccinated their children as compared to 35.8% for those who did not attend all ANC visits (Uwaibi, 2020). The findings also differ with findings from a study in Zimbabwe where mothers who attended ANC were two times more likely to fully vaccinate their children as compared to those who did not attend ANC (Mukungwa, 2015).

The results were however non-significant for distance to health facility. This means that it was not a determinant of full vaccination among adolescent mothers. This is however different from a study in Senegal which found out that distance to the medical center was a determinant of full vaccination (Sarker, Akram, Ali, Chowdhury, et al., 2019). In Bangladesh, studies carried out there also showed that those who stayed far away from health facilities were less likely to receive full vaccination (Rahman & Obaida-Nasrin, 2010). A study from Kenya also confirmed our findings. It showed that distance to health facility was not a determinant of full vaccination (Emmanuel et al., 2015).

Wealth was also not a determinant of full vaccination from this study. This is contrary to a study done in Zimbabwe which found out that rich people were more likely to achieve full vaccination as compared to the poor (Mukungwa, 2015). In Afghanistan, the results are also different. Vaccination coverage was high among well off families and lower in the poorer families. The difference was however not very large as the government had put in place measures to ensure vaccination was affordable and available for all (Farzad, Reyer, Yamamoto, & Hamajima, 2017). In India, wealth was also a determinant of full vaccination with middle income families and well off families exhibiting higher rates of vaccination as compared to poor families (Kim, 2021).

Residence was also not a determinant of full immunization among children 12-59 months with adolescent mothers in our study. Contrary to that, a study from Ghana found out that people in urban areas were more likely to achieve full vaccination as compared to their rural counterparts (Budu, Darteh, Ahinkorah, Seidu, & Dickson, 2020). In Afghanistan people from remote areas were more likely to vaccinate their children as compared to those from urban areas (Farzad et al., 2017). Another study from Kenya however had the same results showing that residence was not a determinant of full immunization (Emmanuel et al., 2015). A study from Ethiopia also

corroborated our findings clearly showing that residence was not a factor determining full vaccination (Etana & Deressa, 2012).

Skilled attendant at birth was also not a determinant of full immunization This result was different from a study carried out among Kenyans of Somali origin which showed that skilled attendant at birth was a determinant of full immunization where children delivered by non-skilled attendants were more likely not to receive full vaccination (Masters et al., 2019).

CHAPTER 5: SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

5.0 Introduction

This section sums up the study findings, conclusion and policy recommendations dependent on the results. It additionally covers perspectives that future studies can zero in on.

5.1 Summary of Findings

Vaccination is the most cost-effective way of preventing under-five deaths. This study sought to find the prevalence and determinants of full immunization among children aged 12-59 months with adolescent mothers in Kenya.

Results showed that 66.1% of children aged 12-59 months with adolescent mothers were fully vaccinated. In the rural regions, 72.4% were completely vaccinated when contrasted with 27.6% in the urban regions. In terms of education level, mothers who finished primary education (75.0%) had the largest proportion of fully vaccinated children. Most of the children who were fully vaccinated had mothers who were poor(47.9%), unemployed(57.9%), had an average of 2 living children, had attended 4 ANC visits, had no problem with distance to health facility(72.6%), had a skilled attendant at birth(66.9%) and had delivered in a public health facility(55.0%).

Determinants of full immunization included occupation, parity and ANC visits

5.2 Conclusion

In conclusion, this study found that children with mothers who were employed and from a higher parity had an increased chance of being fully vaccinated. Children whose mothers had attended an increased number of ANC visits had a reduced probability of being fully vaccinated.

5.3 Policy Recommendations

According to WHO, approximately two million children lose their lives as a result of VPDs. Children regardless of the age of their mothers should be able to get vaccination and secure their lives without difficulty.

Based on the study findings, adolescent mothers should be empowered through educational programs to enlighten them on importance of immunization this in turn improve the uptake of vaccines among children born to adolescent mothers thus mitigating the prevalence of VPDs. Since

the findings of this study shows that higher parity is associated with uptake of immunization, sensitization should be done among adolescent mothers with lower parity on the importance of immunization both at community and clinic level. The government should also engage Community Health Volunteers (CHVs) in order to warrant that all living children (parity) born to an adolescent mother are fully vaccinated.

5.4 Study Limitation and Areas of Further Research

The study may be subject to recall bias since mothers without vaccination cards were asked to try and recall the child's vaccination history. Since our study was only limited to socio-demographic and socio-economic determinants of full immunization, future studies should investigate health system factors that are associated with full immunization among children with adolescent mothers.

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