RELIGION, EDUCATION AND CHILD IMMUNIZATION IN ETHIOPIA

Project Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Population Studies

By

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DECLARATION

I, the undersigned hereby declare that this is my own work and that I have not previously submitted this research project to any other academic institution for a degree. All sources used have been properly acknowledged by means of references.

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ABSTRACT

This study examines the relationship between immunization status of children and religion before and after controlling for other factors such as maternal education in Ethiopia, a country characterized by highest mortality and morbidity rates in the world. Using data from the nationally representative 2000 Demographic and Health Survey, the bivariate results indicated that there are substantial differences in child immunization by maternal religion. More children born to traditional mothers are significantly less likely to receive full immunization coverage than children born to mothers professing Orthodox religion and other religions. The social mechanism that explains this huge disparity is that traditional mothers may be attributable to the traditional spiritual explanation of events, including diseases, and do not believe in the prevention of child-killer diseases. Further, significant variation in receiving complete immunization is observed with mother's level of education, and place of residence (rural/urban). Mothers with secondary and higher education are more likely to have their children vaccinated than mothers without education. Residence in urban areas is associated with high chances of children being vaccinated. To improve child immunization, among children born to mothers professing traditional religion, health policy interventions and information campaigns might be effectively augmented to reach such traditional mothers and their children. Further, policy implications of these results are discussed.

Keywords: Africa, Child mortality, Education, Ethiopia, Health, Immunization, Mortality, Religion, sub-Saharan Africa, Vaccination.

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CHAPTER ONE

1 Introduction

A joint report by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) shows that in 2004 an estimated 1.4 million children under five died from the six major vaccine-preventable diseases. These are measles, pertussis, diphtheria, tuberculosis, tetanus, and poliomyelitis (UNICEF & WHO, 2006). Fourty two percent of these deaths occur in sub-Saharan Africa (SSA) even though this area contains only 10 percent of the world's population (U.S. Coalition for Child Survival, 2006). The infant mortality rate (IMR) and under-five mortality rate (U5MR) in the SSA region is one of the highest in the world, reaching levels of 87 deaths per 1,000 live births and 154 deaths per 1,000 live births respectively (Zlidar et al., 2003). According to the WHO and UNICEF (2006), in Ethiopia, IMR is estimated at 110 deaths per 1,000 live births and U5MR is estimated at 166 deaths per 1,000 live births. The WHO and UNICEF jointly report that:

> Immunization will occupy a critical role in achieving Millennium Development Goal [MDG] 4, to reduce the global [U5MR] by two thirds between 1990 and 2015… (UNICEF & WHO, 2006: ix). Efforts to step up global coverage will require more than just political will or additional resources. They will also need to focus on the countries and territories, districts, communities and social groups where most of the unvaccinated children live. These children must not be ignored or neglected in the drive to expand global immunization coverage and reach internationally agreed goals in the next 10 years (*ibid*, p. xiii).

It is worth mentioning that different studies point out that preventive health measures such as vaccination are very important in reducing child mortality, morbidity, and

disability (Nyarko et al, 2001). It is evident that, in recent years, vaccines have played a major role in either completely eradicating diseases or minimizing its impact to the utmost possible level. A good example in complete eradication of a disease is the case of smallpox, which reportedly no more exists worldwide. Further, within the context of minimizing the impact of a disease through vaccination, polio is an example of a disease, which has been eliminated in North and South America. In Africa, the six child-killer diseases of the Expanded Program of immunization (EPI) continue to seriously affect morbidity and mortality (Feachem and Jamison, 1991), and Ethiopia is not an exception.

Even though numerous studies have been conducted in developed countries on the relationship between religious involvement and social and demographic processes, little is known in developing countries due to the lack of comprehensive research findings (Doctor, 2005). It is an undeniable fact that identifying groups with low vaccination coverage and solve the socio-demographic and socio-economic process of traits with low child immunization is a means to achieve the MDGs. It is also a way to prioritise, allocate and effectively use the scarce public health resources available in Ethiopia.

Religion and education are likely to be implicated in the coverage and success of child immunization. The religious beliefs of mothers and parents' perception of the seriousness of a condition are a determinant of child survival and health seeking behaviour (Addai, 2000; GHEC, 2004).

Despite the fact that child immunization is essential for further improvement of child survival and attainment of MDGs, little is known about the current magnitude of use and factors influencing the use of these services in Ethiopia. This paper therefore aims to fill this gap using data from the 2000 Ethiopia Demographic and Health Survey (DHS).

CHAPTER TWO

2.1 Literature review

Worldwide, implementation of childhood immunization programmes has been a major factor in reducing infant mortality (Park, 2000; Trostle et al., 2003). Serious infectious diseases can be prevented, contained, eliminated and ultimately eradicated (Moreton, 2002). Global eradication of small pox has been achieved. Polio has been eradicated from the North and South America and Europe and its worldwide eradication is now considered to be a realistic target (Moreton, 2002). Diseases such as these, however, remain at present a significant problem in many parts of the developing world, including Ethiopia.

A number of researches and projects have been undertaken in order to address the problem of child immunization in Africa and abroad. The WHO launched the Expanded Programme of Immunization (EPI) in 1974, focusing primarily on diphtheria, pertussis, and tetanus (DPT), oral polio vaccine (OPV), tuberculosis (Bacille Calmette Guerin (BCG)) and measles. The Ministry of Health in Ethiopia in 1980 initiated the EPI, with the objective of reaching 90 percent coverage among children under one year of age by the year 1990 (Berhane, 1995). The objective set in 1980 was not met because of factors such as poor health infrastructure, low number of trained manpower, high turn over of staff and lack of donor funding. The same factors still affect the program today. At this point, the immunisation coverage figures vary largely between regions, from more than

80 percent DPT3 coverage in Tigray to less than 5 percent in Somali and Afar regions, resulting in a national DPT3 coverage of about 50 percent (DPT3 = 3 doses of diptheria, pertussis and tetanus) (WHO, 2007).

Feachem and Jamison (1991) confirmed that the six diseases (measles, pertussis, diphtheria, tuberculosis, tetanus, and poliomyelitis) of the EPI continue to seriously affect morbidity and mortality in Africa and Ethiopia is not an exception. UNICEF estimates that worldwide, these infectious diseases kill 600 children with each passing hour and disable 600 more. In the early 1990s, about 300,000 children died annually in Ethiopia from easily preventable diseases (Lidetu and Okubazgi, 1993), but as some reports (see UNICEF & WHO, 2006; Kiros and White, 2004) show, this trend has not improved yet.

In developing countries, due to incomplete immunization, children face an elevated risk of illness and death, with severe implications for their growth potential and the risk of morbidity and mortality in later years. For example, despite extensive immunization programs, more than a million children die from measles every year, 430,000 from neonatal tetanus, and close to 400,000 from whooping cough (UNICEF, 1990). Consequently, because caring of infants and children remains an almost exclusive domain of women in most societies, numerous researchers unanimously support maternal education as an appropriate tool for improving the overall health and survival of their infants as well as influencing the timing and shape of demographic processes (Caldwell, 1994; World Bank, 1993). Their argument is that a woman's education raises her skills and overall self-confidence, increases her exposure to information, and allows her to

interact effectively with, and feel control over, modern healthcare institutions (Cleland, 1990).

Even though there is no specific research conducted in Ethiopia, the preceding argument, hence, the fact that women's education would strengthen her interaction with modern health care systems – including the possibility of availing oneself of child immunization services - is logically acceptable. Therefore, the assumption that education (as well as the religion) of a mother in Ethiopia has a direct bearing on the immunization of a child is an assumption that could stand scrutiny. In support of this assumption are a number of scholars. Accordingly, numerous studies have shown that maternal education has repeatedly positively associated itself with the utilization of maternity care services (Addai, 2000; Celik and Hotchkiss, 2000; Akin and Munevver, 1996).

In studying the contextual effects of women's education on child immunization in India, Parashar (2003) extends previous research by examining both the individual and contextual effect of women's education on complete and timely immunization of their children against six dangerous, but preventable, diseases in India. Parashar (2003) recognizes that while the importance of context has long been recognized, few studies have examined the contextual effects of maternal schooling on child survival because of an emphasis on other macro-level variables such as region or presence of healthcare facilities. After conducting a multi-level analysis of data from the 1994 Human Development Profile Index (HDPI) and the 1991 district-level Indian Census data, it reveals a positive and significant relationship between the adult female literacy rate in a

district and child immunization within that district even after controlling for mother's own education and district-level socioeconomic development.

In the substance part of the paper (Parashar, 2003) among other things, discusses past research on maternal child education and child immunization as well as the relevance of contextually. Thus, the research shifts the emphasis from an exploration of the relationship between maternal education and child health at the individual level alone to the effect of the larger contextual characteristics of a child's environment on the child's health. Such an inquiry also highlights the richness of social interactions and networks. The paper concludes by discussing the limitations of the study, relevant policy implications, and future avenues of research.

Although Parashar's work has some degree of common ground to share with the study at hand, there are starking differences the two studies don't share. The current study looks at the issue of child immunization not only from maternal education but also from maternal religion. Secondly, the current study focuses on Ethiopia while that of Parashar focuses on India. Needless to say, the socio-demographic as well as cultural settings of the two countries are different. Moreover, Parashar's work pays great emphasis on the individual education of the mother and its implications on the larger contextual characteristics of a child's environment on the child's health - an approach not necessarily adopted by this study.

A review of the literature suggests that the use of modern health care such as maternal and child health services can be influenced by the socio-demographic characteristics of women, the cultural context, and the accessibility of these services in developing countries. Using the 2001 Nepal DHS data, Bhandari, et al. (2006) examined whether a child was left behind due to his/her socio-cultural backgrounds and place of residence. One of the main findings of the study is that children of ethnic minority groups were less likely to be fully immunized compared with those of high caste Hindu. The role gender plays on child immunization is also highlighted. According to the study, after focussing on gender, although significant gaps were not observed in full vaccination, boys were more likely to receive DPT, BCG and measles vaccines than girls. Further, disparities in immunization on the basis of ethnicity were also observed by vaccine types. Geographically, for obvious reasons such as development, infrastructure, and a relatively better degree of education, children living in the eastern region of Nepal were relatively advantaged compared to those living in the western region. However, variation in immunization coverage by ecological regions and rural-urban residence were not prominent. The findings suggest that in order to alleviate low immunization coverage, the child immunization policy in Nepal should also focus on the existing socio-cultural and geographical disparities including parental education, economic status and service provision.

The finding by Bhandari, et al. (2006) study that parental education is one area calling for priority action to alleviate low immunization coverage is a common ground shared by the current study. However, the focus of the current study is not on "parental education" in

general but more focussed on the education of the mother. Another major contrasting factor, among other things, of the current study from the Bhandari et al. study is the due emphasis on religion by the former.

In a study conducted in Ghana, Addai (2000) used the 1993 Ghana DHS to examine the factors that determine the use of maternal-child health services in the rural parts of the country. The analysis, employing bivariate and multivariate techniques, reveals that the use of maternal-child health services tends to be shaped, among other things, by the level of education and religious background.

A number of socio-demographic characteristics of women affect the underlying tendency to seek care (Addai, 2000). In most developing countries, the maternal and child health delivery services coexist with indigenous health care services (Orley, 1980). Women have an option from the modern medical system, herbalists, diviners and spiritualists. A choice has to be made regarding the preferred source of service delivery between existing options. The study by Adetunji (1991) in a Nigerian Yoruba community shows that mothers used alternative sources of health care rather than hospitals, clinics and maternity centres to childhood diseases - that would also have a bearing on the coverage of child immunization.

Another study conducted in India showed that social, cultural and religious factors had an important effect on immunization, in particular religion, and also true of families with illiterate parents (Elliott and Farmer 2006). Elliott and Farmer (2006) have highlighted

that there was the potential importance of literacy, and religious or cultural influences on the success of the EPI. In their conclusion, they indicated that there are important implications for areas with similar cultural demographics.

Maternal religious affiliation, conventional religious distinctions - whether a mother is Catholic, Jewish or Protestant - are found to have significant impact after effects of age and sex of child, parental status and three status by age interactions were controlled (John, 1978). Religion's age contingent effects were also meagre. There is a significant effect of religion on health knowledge even after controlling for the education of the mother (Jens et al, 2003). All these studies show that there is a significant relationship between religion, education and child health. In many studies, immunization coverage in urban areas is higher than in rural areas (Tuma et al, 2002; Al-Sheikh et al, 1999).

Although there is a dearth of research undertaken in the context of child immunization in Ethiopia, there are some that are worthy of mention here. The study by Kiros and White (2004) examines the relationship between parental migration status and child immunization in Southern Ethiopia, a region characterized by high mortality and morbidity. Using the 1997 Community and Family Survey data and a multilevel modelling approach, the study found that children born to rural–rural migrant mothers have significantly less chance of receiving full immunization coverage than children born to non-migrant mothers. According to the study, the social mechanism that explains this huge disparity is that rural–rural migrant women have limited social networks in the host community. In addition, significant variation in receiving complete immunization is

found by age of child (a likely period effect), mother's education, and distance to nearest health centre. The results from the multilevel analysis confirm the persistence of substantial community effects, even after controlling for a standard array of personal and household characteristics. As a way forward, the study suggests that given the low levels of vaccination among children born to migrant women, health policy interventions and information campaigns might be effectively augmented to reach such migrant women and their children. Moreover, community and ethnic group effects suggest that further targeting of health activities could be efficient and effective.

The Kiros and White study is relevant to the current study to the extent that it looks at child immunization as being influenced by a mother's education but not more so as influenced by the age of the child, ethnicity, and distance from health centre. In addition, the current study adds a major dimension to the Kiros and White study as it also looks at the interface between child immunization and a mother's religion. The focus on migration of parents by the Kiros and White study is also another main differentiating factor to the current study.

Kidane and Tekie (2003) indicate that maternal education has a significant effect on the immunization status of children. The study further shows that residence and mother's education were significant predictors of immunization status of children; children from rural areas and whose mothers were literate had higher immunization coverage. The study has also hinted that, where there are strongly functioning social organizations for mobilizing the community, high immunization coverage can be achieved irrespective of

the educational status of the community. As a way forward, the study underlines giving health education, timely mobilisation, identifying mothers not complying with immunization and educating at individual level as some of the major strategies to raise the awareness of mothers on immunization and decrease defaulting among illiterate mothers in urban and rural areas.

2.2 Significance

Reducing U5MR by two-thirds is one of the United Nation's Millennium Development Goals (United Nations, 2005). Estimates show that almost 30,000 children die per day from preventable diseases before their fifth birthday. Most of these children live in developing countries, particularly in SSA. Achieving the millennium goal by 2015, therefore, requires a significant reduction in child mortality in SSA countries, where child mortality from communicable diseases predominates (*ibid*).

Ethiopia has one of the highest levels of infant and child mortality in the world. In 2002, about 166 children under five years of age per 1,000 live births died. Infant mortality is also rather high, 110 deaths per 1,000 live births in 2004 (UNICEF & WHO, 2006). It is well recognized that most child deaths are attributed to easily preventable or treatable causes (United Nations, 2005; Bonanni, 1999). The universal immunization of children under the age of one against six vaccine preventable diseases (tetanus, pertusis, measles, acute respiratory tract infection, polio, tuberculosis and diarrhea) is one of the most cost-effective ways of reducing infant/child mortality in developing countries (Westly, 2003;

Du Lou, Desgress, and Pison, 1996). The 1990 World Summit for Children, therefore, set a goal to achieve full immunization coverage of at least 90 percent of children under the age of one year by 2000. However, none of the countries in SSA that are covered by the DHS have met this target (Westly, 2003).

Therefore, an understanding of the factors contributing to low childhood immunization against vaccine preventable diseases and implementation of policies targeting appropriate groups at the local level is critical to achieve the Millennium Development Goals by 2015. By looking at a mother's religion and educational level, among other things, this study analyses the interface these two factors have in connection with child immunization in Ethiopia. After analysing the role a mother's religion and educational level have on child immunization in Ethiopia, this study recommends concrete steps that need to be undertaken in order to improve child immunization in the country. Finally, as the subject under consideration is of particular pertinence to the current Ethiopian situation, namely to those large numbers of children that die per day from preventable diseases before their fifth birthday. The study is not of academic interest only.

2.3 Research setting

Ethiopia, a country with rich diversity of people and cultures, is landlocked and surrounded by Djibouti to the east, Somalia to the southeast, Kenya to the south, Sudan to the west, and Eritrea to the north and northeast. Ethiopia has a total area of 1,127,127 square kilometers and its topographical diversity encompasses high and rugged

mountains, flat-topped plateaux, and deep gorge with rivers and rolling plains (United Nations, 2000). The Central Statistical Authority (CSA) (2004) estimates the country's population has reached 73.04 million, which makes it the second populous country in SSA. With an annual growth rate of 2.4 percent, the population grows fast and 43.9 percent are below 14 years of age (Central Intelligence Agency (CIA), 2005). The proportion of male and female population is almost the same with 50.1 percent males and 49.9 percent females (CSA, 2004).

According to CSA (2004), in Ethiopia "urban areas" refer to "...all capitals of regions, zones and woredas, and it also includes localities with urban kebeles whose inhabitants are primarily engaged in non-agricultural activities." All the other areas are considered rural. Based on this definition the rural areas consist of 84 percent of the total population.

The distribution of the population across the regions is as follows: Addis Ababa (3.9 percent); Afar (1.9 percent); Amhara (25.6 percent); Benishangul-gumuz (0.8 percent); Dire Dawa (0.5 percent); Gambella (0.3 percent); Harari (0.3 percent); Oromiya (35.3 percent); Somali (5.8 percent); Southern Nations Nationality and Peoples Region (SNNPR) (19.8 percent) and Tigray (5.8 percent) (World Bank, 2005). The three major regions, i.e., Amhara, Oromiya and SNNPR consist of 80.7 percent of the country's population. In terms of religion, 51 percent of the population are Orthodox Christians, 33 percent are Muslims and 10 percent are Protestants. The remaining adheres to a diversity of other faiths (CSA and ORC Macro, 2001).

Even though, in most SSA countries, Islamic and Christian religions were introduced around the late 19th and early 20th centuries, Ethiopia is an exception. The Kingdom of Aksum was one of the first nations to officially adopt Christianity, when St. Frumentius of Tyre converted King Ezana during the fourth century, and Islam in Ethiopia dates back to the founding of the religion, the seventh century. Many people believe that the Gospel had entered Ethiopia even earlier, with the royal official described as being baptised by Philip the Evangelist in chapter nine of the Acts of the Apostles. Today, the Ethiopian Orthodox Tewahedo Church, part of Oriental Orthodoxy, is by far the largest denomination, though a number of Protestant (Pentay) churches and the Ethiopian Orthodox Tehadeso Church have recently gained ground. Since the eighteenth century there has existed a relatively small Uniate Ethiopian Catholic Church in full communion with Rome, with adherents making up less than 1 percent of the total population (Abegaz, 2005).

Although the history of education in Ethiopia dates as far as back as the introduction of Christianity itself in 330A.D. (Pankhurst, 1955), access was limited to a few people and the country has remained with a high illiteracy rate. As Table 1 shows, in 1999/2000 the over all-adult literacy rate in the country was only 29.4 percent. The literacy rate is high for males (40 percent) than for their female (19.5 percent) counterparts. The stark difference is however between the rural and the urban population. The urban literacy was 70.4 percent while in rural areas it was only 21.8 percent.

Table 1 Literacy rate in Ethiopia in 1999/2000

Sex	Urban	Rural	All
Male	82.1	33.0	40.0
Female	61.2	11.0	19.5
Total	70.4	21.8	29.4

Source: MOFED (2002), **Development and Poverty Profile of Ethiopia**, Addis Ababa; Mega Printing Enterprise p.56

Access to health services is very limited in Ethiopia. Only 51 percent of the population has access to health services. The IMR stands at 117 per 1,000 live births (Population Reference Bureau (PRB), 2003). The maternal mortality ratio is 871 per 100,000 births while the life expectancy at birth is 42 years for the total population, 41 for males and 43 for females (*ibid*).

Access to clean water is limited to 30 percent of the population (Government of Ethiopia, 2001) only. With only 0.3 per cent of households having flush toilets (CSA and ORC Macro, 2001), the availability and use of sanitation facilities are also at very low state in the country in general and rural areas in particular.

The Ethiopian economy is based on agriculture which contributes 47 percent to the Gross National Product (GNP) and more than 80 percent of exports, and employs 85 percent of the population. The major agricultural export crop is coffee, providing 35 percent of Ethiopia's foreign exchange earnings, down from 65 percent a decade ago because of the slump in coffee prices since the mid-1990s. Other traditional major agricultural exports are hides and skins, pulses, oilseeds, and the traditional "khat," a leafy shrub that has psychotropic qualities when chewed. Sugar and gold production has also become important in recent years (United States State Department, 2006).

CHAPTER 3

3.1 Data

The data for this study have been drawn from the 2000 Ethiopia DHS, which was the first of its kind to be conducted in the country. The survey collected information from a nationally representative sample of 15,367 ever-married women aged 15-49 years. This study analyzes the sample of ever-married women who have children aged one year and above and uses religion, education, age, type of place of residence and region to examine their relationship with child immunization.

The study focuses on all children born between September 1995 and September 2000 (aged 12–59 months) this produced a data set comprising about 4,759 children, and restrict analysis to children aged one year and above. The age cut-off corresponding to the first birthday was chosen because the WHO recommends that vaccination coverage be assessed for children of this age group. This also allows a three-month period for children to receive measles immunization, which is recommended at nine months of age. Children who have died are included in the analysis if they were aged twelve months or older at the time of death, thereby ensuring that they had survived until the WHO-recommended age by which they should have been fully vaccinated.

This analysis is restricted on complete immunization of children. The recommended timing of immunization by WHO is presented in Table 2.

Table 2 WHO's recommended timing of immunization for various diseases

Age	Type of immunization
Birth	BCG, POLIO0
6 weeks	DPT1, POLIO1
10 weeks	DPT2, POLIO2
14 weeks	DPT3, POLIO3
9 months	Measles

Source: Trostle, *et al.* (2003).
Notes: BCG, tuberculosis; DPT, diphtheria, pertussis, tetanus; OPV, oral polio vaccine; WHO, World Health Organization

Therefore, to be fully immunized, a child should have received a total of eight vaccinations. During the DHS data collection, a mother was able to present a card on which vaccinations had been recorded and the information on vaccinations was collected from those cards. If the mother was not able to show a card for the child, this information was collected from mothers' verbal reports. In the 2000 DHS, only about 24 percent of mothers were able to show a vaccination card to the interviewer and 29 percent reported that the child is immunized but failed to provide a card to prove it. In this analysis, children with a health card who have received all eight vaccinations or whose mother's reported that they received all the required vaccinations are considered as fully immunized.

The main focus in this study is on a number of specific questions that were asked to women about their children's immunization status in the five years preceding the survey. Women were asked:

1) Whether they have had their children vaccinated for BCG against tuberculosis, Polio vaccine, i.e., drops in the mouth, DPT vaccination, i.e., an injection given in the thigh or buttocks, and an injection to prevent measles in a national immunization day campaign.

2) Whether they ever have had their children vaccinated for any vaccinations to prevent getting any disease and,

3) For those mothers who have had this children vaccinated against polio and DPT, whether they had their children vaccinated the full doses.

3.1.1 Variables

The dependent variable, child immunization, which measures whether a child born 12 to 59 months ago has received eight immunizations: BCG (against tuberculosis) at birth, three doses each of DPT (diphtheria, pertussis, tetanus) and oral polio vaccine at 6, 10, and 14 weeks, and measles immunization at 9 months after birth. The reason for restricting the sample by age (12-59 months) is because the guidelines issued by the WHO require that children receive all eight vaccinations in the first year of life. The issues of concern in the study of child immunization are more than just that a child should be immunized. Rather it is also on completeness and timeliness of immunizations that are also critical aspects of healthcare provision. The dependent variable is binary with "0" representing children who did not receive all eight immunizations and "1" for children who received all eight immunizations. Because of the restricted age group, i.e., children between the ages of 12-59 months, the individual-level sample is limited to a total of 4,743 children. Cases with missing values were dropped from the analysis. Frequency distributions reveal that timely immunization of infants is far from complete.

By the end of their fifth year of life, only 22 percent of all children are fully immunized, while 16 percent have not received any immunization, making them vulnerable to six potentially fatal, though preventable, diseases. Given the binary nature of the outcome variable, logistic regressions were used to explore the relationship between religious affiliation and the other independent variables.

Since the main interest of this study is on the interrelationship between maternal religion, education and child immunization, the key independent variable taps measures of religious affiliation. The DHS categorized religious affiliation into: (1) Orthodox, (2) Catholic, (3) Protestant, (4) Moslem, (5) Traditional, and (6) "Other." For the purposes of this study, it is divided into five categories: (1) Orthodox, (2) Protestant, (3) Moslem, (4) Traditional, and (5) "Other" (comprised Catholic and "Other" this is due to the fact that the percentage composition of both groups is too small). Yet, the DHS categorized highest educational level into: (1) No education, (2) Primary, (3) Secondary and (4) Higher. For the purpose of this study it is also classified into three categories: (1) No education, (2) Primary, and (3) Secondary and above. In addition, three independent variables that may affect child immunization in Ethiopia are included in the models: place of residence (rural/urban), age, and region.

3.2 Methods

The unit of analysis for this study are women who had at least one child aged between 12 and 59 months. The analysis takes two approaches. First, cross tabulations are used to examine the links between religious affiliation and child immunization. Second, logistic regression is employed to examine the impact of religious affiliation on the child immunization since a logistic regression method is appropriate when an outcome of the dependent variable is dichotomous (fully vaccinated, not fully vaccinated). The logistic regression model takes the following form:

$$\text{logit}\,(p_i) = \ln\,(p_i/\,[1\text{-}p_i]) = b_i x_i,$$

Where: p_i is the probability that the child has some vaccination,

x_i's are the independent covariates.

b_i is the corresponding vector of unknown regression coefficients, which is estimated via a maximum likelihood procedure using the SPSS-PC logistic programme (version-14), and

$(p_i/\,[1\text{-}p_i])$ is the odds of children with a given set of characteristics getting vaccination.

The estimate of b_i for a particular covariate x_i is interpreted as the difference in the predicted log odds between those who fall within the reference or omitted category for that characteristic. The result of each estimated exponent of b_i (exp $[b_i]$), were interpreted as the relative odds of getting vaccination for individuals with certain characteristics x_i relative to the odds of getting vaccination in a reference (or baseline) group of individuals, that is, as relative odds or odds ratios.

Confidence intervals (CIs) are presented for the odds ratios in addition to p-values since the CI contains more information than p-values. A CI covering 1 implies that there is no effect of the factor under consideration. Otherwise, there is an effect of that variable. A narrow CI implies a large sample size, while a large CI implies a small sample size (Mekonnen and Asnaketch, 2002).

CHAPTER FOUR

4.1 Results

4.1.1 Bivariate analysis

Tables 3a through 3i (see table 3b-3i on the appendices) present the percentage distribution of child immunization by type and background characteristics of mothers. The results corroborate previous studies that Ethiopia has a low level of vaccination coverage. While 62 percent of one to five-year-old children received at least one type of vaccination; only 22 percent received all the WHO-recommended vaccinations, and the low levels of coverage for measles and DPT3 probably being a major factor in the failure to achieve full immunization.

Table 3a shows that the distribution of women by the age group of children who completed immunization is statistically significant (X^2 = 18.710, df = 6, p = 0.005).An exception, however, is the age group 45-49 (15 percent fully immunized) almost there is no difference relatively to the other background characteristics. For instance, 25 percent of children born to women in the age groups 15-19 and 25-29, 20 percent of children born to women in the age groups 20-24 and 40-44, and 23 percent and 21 percent of children born to women in the age group 35-39 and 30-34 respectively are fully immunized. As expected, the proportion of full immunization among the education level of women, that is, those born to women with secondary and above education level, is

higher (59 percent) than reported among other education level: 33 percent for those born to the women with primary education level, and 16 percent for those born to women with no education.

The most important issue to address in this paper is how women fair in fully immunizing their children when we look at their religious background. As the results show, a difference in vaccination coverage among children significantly varies by their maternal religious affiliation. The percentage distribution of completed immunization coverage is presented in Table 3a.

The bivariate result in Table 3a shows a significant variation in the complete child immunization by region. The percentage distribution shows that children who have been fully immunized born to women from Addis Ababa is the highest at 73 percent followed by Tigray region at 47 percent, Harari at 45 percent and Dire Dawa at 35 percent, and the fully immunized children born to the women who reside in the rest of the regions were far less than the country's coverage of average complete immunization. For example, Amhara 18 percent, Oromiya and Gambella 12 percent, SNNP 11 percent, Somali 10 percent, Ben-Gumuz 8 percent. Worth mentioning is the fact that less than one percent of children who were born to women in Affar region were fully immunized. The low levels of coverage for DPT2 and DPT3 might probably be a major factor in the failure to achieve full immunization. Furthermore, children born to the women in Affar region represents the least in all types of vaccinations except for polio1 87 percent (Table 3f) and polio2 55 percent (Table 3g).

Table 3a. Percentage distribution of children who were fully immunized or not by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Fully immunized		Chi-square test
		No	Yes	
Age group	15-19	75.40	24.60	X^2=18.710[a]
	20-24	80.46	19.54	df = 6
	25-29	74.64	25.36	p = 0.005
	30-34	78.86	21.14	
	35-39	77.41	22.59	
	40-44	79.57	20.43	
	45-49	85.05	14.95	
Region	Tigray	52.82	47.18	X^2=937.596[b]
	Affar	99.29	0.71	df= 10
	Amhara	81.52	18.48	p=0.000
	Oromiya	88.30	11.70	
	Somali	89.68	10.32	
	Ben-Gumz	92.36	7.64	
	SNNP	89.16	10.84	
	Gambela	87.93	12.07	
	Harari	55.46	44.54	
	Addis	27.50	72.50	
	Dire Dawa	65.12	34.88	
Type of place of residence	Urban	47.14	52.86	X^2=569.938[c]
	Rural	84.96	15.04	df= 1
				p=0.000
Highest education level	No education	83.61	16.39	X^2=403.571[d]
	Primary	67.29	32.71	df=2
	Secondary+	41.11	58.89	p=0.000
Religion	Orthodox	69.22	30.78	X^2=181.816[e]
	Protestant	87.33	12.67	df=4
	Moslem	83.39	16.61	p=0.000
	Traditional	96.71	3.29	
	Other	79.55	20.45	
Total		77.97	22.03	N= 4743

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 41.02.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 47.37.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 185.08.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 83.07.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.69.

A comparison of children's access to full immunization coverage across religious groups in Ethiopia indicates that coverage is high among children whose mothers belong to Orthodox, with about nine of ten such children having at least one immunization (e.g., polio1 – see Table 3f). In addition to this, and the range of completed immunization is 28 percentage points, 3 percent among children born to traditional women to 31 percent among children born to the Orthodox women are experiencing complete immunization. Unexpectedly, children of Protestant women report low coverage (13 percent) of complete immunization compared to children born to Orthodox women. In addition, 20 percent and 17 percent of children were fully immunized who were born to other and Moslem women respectively.

The data reveal considerable variations in the child immunization by place of residence (rural/urban). For instance, the proportion of completed immunization for children born to women in the urban areas is higher at 53 percent compared with children born to rural women 15 percent. Looking at the information on women's religious affiliation and receiving child immunization in Ethiopia by type of immunization (BCG, DPT, *etc*) reveals that (as discussed earlier) in all cases the Orthodox mothers' report higher proportion of child immunization than others. Furthermore, the proportion of children born to mothers who belong to the other religions is less than the country's average coverage, except for "Other" in cases of BCG (Table 3b), DPT1 (Table 3c), and DPT2 (Table 3d), and Moslem women report less than 'Other' women except in cases of polio1 (Table 3f) and polio3 (Table 3h). Overall, 52 percent have received the BCG vaccination, 37 percent have been vaccinated against measles, 50 percent received the

first dose of DPT, 40 percent received the second dose of DPT, 30 percent received the third dose of DPT, 83 percent received the first dose of polio, 71 percent received the second dose of polio, and 48 percent received the third dose of polio. The distribution of women by age group is not significant at 0.05 significance level for polio2 (p=0.313; Table 3g) and polio3 (p=0.477; Table 3h).

The bivariate analysis shows that the pattern is highly differentiated. That is, the proportion of children immunized varies appreciably by maternal religious group and it is not simply the case that only one religious group varies from the others. This differentiation is manifested among the different religious group.

4.1.2 Multivariate analysis

Simple, two-way cross-tabulations of immunization by various backgrounds characteristic variables can sometimes be misleading. The reason is that the apparent effect of one variable may be confounded by the effects of one or more other variables correlated with the characteristic considered. Therefore, the logistic regression technique is used to control such potentially confounding variables for their effects (Partha and Bhattacharya, 2002), and by using binary logistic regression analysis this paper attempts to investigate the extent to which child immunization is related to their maternal religious background. Tables 4a through 4i report the stepwise results of the multi-level analysis. Model 1 estimates the effect of religion for women above age 15 on the dependent variable: child immunization.

In Model 2, maternal education level controls are taken into account to investigate if the relationship observed in Model 1 remains consistent and robust, and then control for other variables (place of residence, region, and age group) in Model 3.

Model 1 in all cases highlights the positive and significant relationship among maternal religion and a child's immunization status against six potentially fatal, but preventable, diseases. Table 4a shows that without any control variables, children born to Orthodox women (Model1) are more likely (odds ratio [OR] =13.07) to report being fully immunized when compared to the reference category (traditional). Compared with children born to traditional counterparts, being a child to a woman belonging to other religion increase the odds of having complete immunization (OR=7.56). Being a child to Moslem and Protestant women reduces the odds of reporting on complete immunization, but they are still positive compared to those children born to traditional women at 5.86 and 4.26, respectively.

Model 2 controls the educational level of women. Despite a decline in the odds for the various religious categories in the main coefficient, the significant relationship between children's immunization status and women educational level, lends support to the hypothesis that a significant positive relationship exists among women educational level and the immunization status of children. Education continues to exert a strong and independent impact on complete child immunization in Ethiopia. Compared with children born to women with no education, those children born to women with primary education were nearly 2.5 times more likely to receive complete immunization.

Table 4a Regression results (odds ratios) of effect of women religion on the immunization status of children, Ethiopia 2000 DHS

Characteristics	Odds ratios (C.I. 95%) Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	13.07(5.34-32.04)***	9.25(3.76-22.75)***	3.45(1.36-8.80)**
Protestant	4.26(1.69-10.73)**	2.85 (1.13-7.23)**	2.62(1.01-6.79)**
Moslem	5.86(2.38-14.41)***	5.23(2.12-12.91)***	4.21(1.65-10.73)**
Other	7.56(2.38-23.96)**	5.24(1.62-17.00)**	4.56(1.31-15.91)**
Educational level			
None (r)		1.00	1.00
Primary		2.42(1.99-2.96)***	1.78(1.40-2.27)***
Secondary+		6.49(5.15-8.19)***	2.91(2.13-3.97)***
Type of place of residence			
Rural (r)			1.00
Urban			2.44(1.89-3.14)***
Region			
Affar (r)			1.00
Tigray			151.51(36.69-625.69)***
Amhara			36.76(8.94-151.11)***
Oromiya			19.92(4.85-81.77)***
Somali			15.10(3.55-64.17)***
Ben-Gumz			13.04(3.04-56.01)***
SNNP			21.45(5.13-89.67)***
Gambela			22.89(5.34-98.09)***
Harari			66.62(16.06-76.30)***
Addis			115.50(27.47-485.56)***
Dire Dawa			40.18(9.63-167.57)***
Age group			
15-19 (r)			1.00
20-24			0.85(0.55-1.30)
25-29			1.18(0.78-1.78)
30-34			1.14(0.74-1.75)
35-39			1.29(0.83-1.99)
40-44			1.35(0.84-2.16)
45-49			0.93(0.52-1.66)
Log likelihood	4597.277	4308.674	3713.890
LR chi square	194.104	482.707	1077.491
Prob.> chi square	0.000	0.000	0.000
Number	4743	4589	4407

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Interestingly, the corresponding odds of children completed immunization were about 6.5 times higher if these women attained at least secondary education. An interesting issue that also emerges from Model 2 is for Measles; the children born to women with secondary and above education level are 10 times (see Table 4i) more likely to receive Measles vaccination than children born to women with no education. Undoubtedly, this positive effect of more education on child immunization can be largely attributed to the fact that educated women tend to be more informed and have a better understanding of the advantages of child immunization, and even immunized their children at the ninth month against measles.

Finally, in order to test the robustness of the religious affiliation as well as the proportion of the variance that is explained by educational level, controls for the place of residence, region and age group are introduced in Model 3. These variables are not only significant but also reduce the odds for religion and educational level in the same direction though there is slight change among religious groups. Children born to women in the urban areas were about 2.5 times more likely to be fully vaccinated (in the case of BCG, and Measles four times more likely, see Tables 4b and 4i) than children born to rural counterparts. The analysis shows that region plays a vital role in the child immunization in Ethiopia. The children born to women in Tigray, Addis Ababa Harari regions are 152, 116, and 67 times more likely to be fully immunized than children born to women in Affar region (reference category) respectively. Children born to women in the rest of regions are 13 (Ben-Gumuz) to 40 (Dire Dawa) times more likely to receive complete immunization

than children born in Affar counterparts. This analysis work for each type of child immunization and the tables are attached on the appendices.

CHAPTER FIVE

5.1 Conclusion and Recommendations

This study has examined the impact of maternal religion on immunization of children in a country where war, famine, and economic deterioration have negatively affected health resources and population distribution in the last three decades. A multilevel approach has been used to examine determinants of immunization among children born between 1995 and 2000 and of ages between 12 and 59 months. There have been repeated international and national exhortations to improve child immunization, yet success has been elusive. When the Ethiopian Government established the EPI in 1980, the goal was to reach 90 percent coverage by the year 1990 (Lidetu and Okubazgi, 1993).

Similarly, the WHO and UNICEF (the Alma Ata Declaration) have called for expanding child immunization in the developing world. Nevertheless, the low level of vaccination coverage among children in Ethiopia persists. In this study, only 22 percent of children between 1 and 5 years old received full immunization. This raises serious concerns about the effectiveness of policies whose major objective is the enhancement of child health. Maternal religion and education experience does influence child immunization patterns in Ethiopia. In the multivariate analysis, it has been found that children born to traditional women are significantly less likely to get immunization compared to children born to Orthodox women, even after adjusting for different explanatory variables. This may be attributable to the traditional faith's magical explanation of diseases in life, which may tie

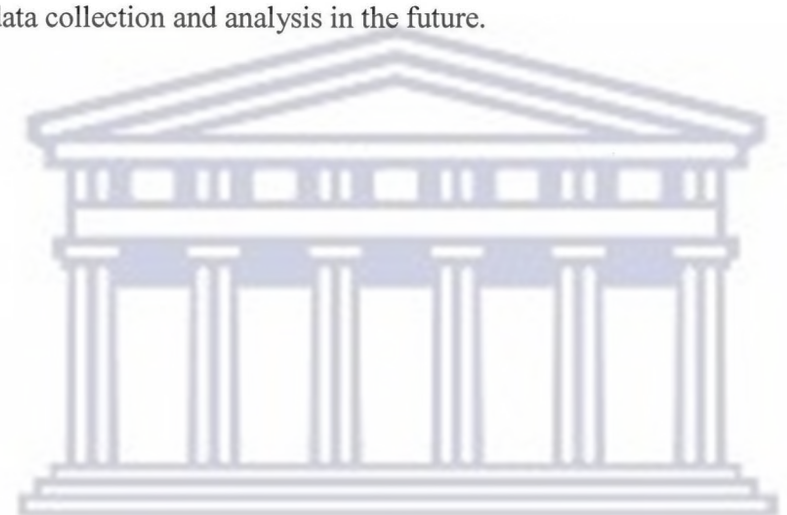
followers to the use of traditional maternal services as opposed to available modern health services (Lambo, 1963). Given the extremely low immunization rates in Ethiopia, general improvements in vaccination coverage could have considerable impact. Such programs are needed even more so within rural areas. Within this context, the current results suggest that programs, policies, and immunization campaigns and outreaches should give special emphasis to reaching children born to traditional women.

The present analysis strongly supports the view that increasing women's education is an effective way of increasing child immunization. In this regard, improving female education is an important policy strategy. The statistical findings suggest that even in the presence of controls for a number of observed background characteristics, unobserved (unmeasured) family and village attributes remain strong determinants of a child's receipt of full immunization. One could argue, education raises women's health-seeking consciousness, enables them to mobilize community resources and public services, improves their ability to access information, skills, services, and technologies, and increases their political participation (Caldwell, 1994). This result suggests the value of further efforts, on the one hand, to discern the ultimate source of this community variation, and on the other hand, to be alert the public health consequences of appreciable variation beyond standard observable family and community traits. Thus, policy interventions should aim to enable people to deal more effectively with their own health care through formal education, by disseminating information on health care through a wide variety of sources such as the mass media, as well as by encouraging and initiating the creation of social associations, clubs, and networks.

This research extends previous research on the interrelationship of religion and health with both methodological and substantive contributions. First, unlike previous studies, which focused on Christian and Moslem, the current study considered almost all religion groups in Ethiopia, and women's traditional religion is found to have significantly negative impact on child immunization. Our second contribution lies in illuminating the pathways through which women's traditional religion impact child immunization. Limited knowledge about modern preventable health is a likely social mechanism explaining this huge differential in child immunization. The present results point to policies—interventions attentive to the disruptive effects of traditional religion that could improve child immunization coverage. Ensuring the well being of children, the next generation of citizens, is of critical concern for both parents and states (Hobcraft, 1993). Consequently, broader socioeconomic and contextual changes are necessary to conscientize women and improve child health and survival since this arena of inquiry has exposed the damaging consequences of women's powerlessness. Only then can women be agents of their own, as well as their children's, health-seeking negotiations. Deceptively simple yet overwhelmingly important, issues pertaining to child health are not just the basis of sociological inquiry, but of human existence itself (Parashar, 2003). The success of such a scheme will depend on political accountability and commitment, which are yet to be seen in Ethiopia.

Limitations of the current study need to be acknowledged. The first limitation is that this study lacks several important health provision variables such as frequency of immunization sessions, outreaches, campaigns, distance from health center, quality of

health services provision in the community, etc. Therefore, the researcher is unable to address the contribution of some other factors that affect child immunization. The second limitation is that the data do not have direct information about the knowledge of women on the preventive health. Hence, it is impossible to accurately measure the extent of knowledge levels in the community. These considerations, in combination with the substance and methodological advances the researcher offer, suggest routes for improved primary data collection and analysis in the future.



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APPENDICES

Table 3b Percentage distribution of children who received BCG by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received BCG		Chi-square test
		No	Yes	
Age 5-year groups	15-19	44.72	55.28	X^2=13.297[a]
	20-24	47.21	52.79	df=6
	25-29	45.63	54.37	p=0.039
	30-34	49.95	50.05	
	35-39	49.35	50.65	
	40-44	52.44	47.56	
	45-49	55.17	44.83	
Region	Tigray	19.53	80.47	X^2=857.334[b]
	Affar	85.96	14.04	df=10
	Amhara	56.39	43.61	p=0.000
	Oromiya	72.28	27.72	
	Somali	65.05	34.95	
	Ben-Gumz	58.36	41.64	
	SNNP	60.20	39.80	
	Gambela	15.38	84.62	
	Harari	6.46	93.54	
	Addis	26.32	73.68	
	Dire Dawa	48.90	51.10	
Types of place of residence	Urban	13.53	86.47	X^2=530.296[c]
	Rural	56.37	43.63	df=1
				p=0.000
Highest educational level	No education	55.24	44.76	X^2=374.922[d]
	Primary	32.81	67.19	df=2
	Secondary+	9.63	90.37	p=0.000
Religion	Orthodox	37.90	62.10	X^2=223.866[e]
	Protestant	57.98	42.02	df=4
	Moslem	54.52	45.48	p=0.000
	Other	44.44	55.56	
	Traditional	83.65	16.35	
Total		48.38	51.62	N=4758

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 96.28.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 110.31.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 429.15.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 195.95.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.77.

Table 3c Percentage distribution of children who received DPT1 by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received DPT1		Chi-square test
		No	Yes	
Age 5-year groups	15-19	46.73	53.27	X^2=21.898[a]
	20-24	49.23	50.77	df=6
	25-29	46.17	53.83	p=0.001
	30-34	53.10	46.90	
	35-39	51.17	48.83	
	40-44	53.83	46.17	
	45-49	59.11	40.89	
Region	Tigray	18.55	81.45	X^2=950.790[b]
	Affar	89.44	10.56	df=10
	Amhara	58.38	41.62	p=0.000
	Oromiya	70.28	29.72	
	Somali	71.73	28.27	
	Ben-Gumz	62.23	37.77	
	SNNP	63.49	36.51	
	Gambela	16.26	83.74	
	Harari	8.50	91.50	
	Addis	23.68	76.32	
	Dire Dawa	50.45	49.55	
Types of place of residence	Urban	17.68	82.32	X^2=462.451[c]
	Rural	57.69	42.31	df=1
				p=0.000
Highest educational level	No education	56.60	43.40	X^2=322.847[d]
	Primary	35.66	64.34	df=2
	Secondary+	14.32	85.68	p=0.000
Religion	Orthodox	39.81	60.19	X^2=211.205[e]
	Protestant	61.14	38.86	df=4
	Moslem	56.12	43.88	p=0.000
	Other	46.67	53.33	
	Traditional	81.76	18.24	
Total		50.22	49.78	N=4757

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 99.06.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 113.50.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 442.04.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 201.61.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 22.40.

Table 3d Percentage distribution of children who received DPT2 by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received DPT2		Chi-square test
		No	Yes	
Age 5-year groups	15-19	56.28	43.72	X^2=17.875[a]
	20-24	60.11	39.89	df=6
	25-29	55.45	44.55	p=0.007
	30-34	62.01	37.99	
	35-39	60.78	39.22	
	40-44	63.57	36.43	
	45-49	64.53	35.47	
Region	Tigray	26.37	73.63	X^2=993.879[b]
	Affar	94.01	5.99	df=10
	Amhara	69.99	30.01	p=0.000
	Oromiya	76.92	23.08	
	Somali	80.24	19.76	
	Ben-Gumz	72.29	27.71	
	SNNP	73.36	26.64	
	Gambela	30.08	69.92	
	Harari	13.65	86.35	
	Addis	31.86	68.14	
	Dire Dawa	61.68	38.32	
Types of place of residence	Urban	25.88	74.12	X^2=516.277[c]
	Rural	67.41	32.59	df=1
				p=0.000
Highest educational level	No education	65.76	34.24	X^2=318.791[d]
	Primary	46.83	53.17	df=2
	Secondary+	23.57	76.43	p=0.000
Religion	Orthodox	49.56	50.44	X^2=201.258[e]
	Protestant	70.93	29.07	df=4
	Moslem	65.34	34.66	p=0.000
	Other	57.78	42.22	
	Traditional	88.05	11.95	
Total		59.68	40.32	N=4754

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 80.24.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 91.13.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 356.87.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 162.51.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18.15.

Table 3e Percentage distribution of children who received DPT3 by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received DPT3		Chi-square test
		No	Yes	
Age 5-year groups	15-19	66.33	33.67	X^2=21.266[a]
	20-24	71.65	28.35	df=6
	25-29	66.05	33.95	p=0.002
	30-34	71.35	28.65	
	35-39	70.07	29.93	
	40-44	72.85	27.15	
	45-49	78.33	21.67	
Region	Tigray	39.84	60.16	X^2=1078.218[b]
	Affar	98.59	1.41	df=10
	Amhara	81.71	18.29	p=0.000
	Oromiya	85.31	14.69	
	Somali	86.02	13.98	
	Ben-Gumz	83.59	16.41	
	SNNP	85.86	14.14	
	Gambela	41.06	58.94	
	Harari	18.77	81.23	
	Addis	46.46	53.54	
	Dire Dawa	71.87	28.13	
Types of place of residence	Urban	35.37	64.63	X^2=620.294[c]
	Rural	77.90	22.10	df=1
				p=0.000
Highest educational level	No education	76.35	23.65	X^2=416.410[d]
	Primary	57.62	42.38	df=2
	Secondary+	30.52	69.48	p=0.000
Religion	Orthodox	60.51	39.49	X^2=200.070[e]
	Protestant	81.52	18.48	df=4
	Moslem	75.00	25.00	p=0.000
	Other	71.11	28.89	
	Traditional	94.97	5.03	
Total		69.98	30.02	N=4754

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 59.73.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 67.84.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 265.65.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 120.97.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.51.

Table 3f Percentage distribution of children who received POLIO1 by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received POLIO1		Chi-square test
		No	Yes	
Age 5-year groups	15-19	15.58	84.42	X^2=16.256[a]
	20-24	16.96	83.04	df=6
	25-29	14.18	85.82	p=0.012
	30-34	18.40	81.60	
	35-39	20.10	79.90	
	40-44	15.58	84.42	
	45-49	20.20	79.80	
Region	Tigray	5.86	94.14	X^2=435.489[b]
	Affar	12.63	87.37	df=10
	Amhara	16.41	83.59	p=0.000
	Oromiya	44.06	55.94	
	Somali	25.30	74.70	
	Ben-Gumz	31.42	68.58	
	SNNP	24.01	75.99	
	Gambela	3.64	96.36	
	Harari	2.74	97.26	
	Addis	4.87	95.13	
	Dire Dawa	11.23	88.77	
Types of place of residence	Urban	5.20	94.80	X^2=106.493[c]
	Rural	19.64	80.36	df=1
				p=0.000
Highest educational level	No education	19.40	80.60	X^2=78.189[d]
	Primary	10.32	89.68	df=2
	Secondary+	4.73	95.27	p=0.000
Religion	Orthodox	11.52	88.48	X^2=166.052[e]
	Protestant	26.38	73.62	df=4
	Moslem	17.57	82.43	p=0.000
	Other	24.44	75.56	
	Traditional	43.40	56.60	
Total		16.95	83.05	N=4754

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 33.74.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 38.32.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 149.87.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 68.16.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.63.

Table 3g Percentage distribution of children who received POLIO2 by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received POLIO2		Chi-square test
		No	Yes	
Age 5-year groups	15-19	32.16	67.84	X^2=7.086[a]
	20-24	29.46	70.54	df=6
	25-29	26.92	73.08	p=0.313
	30-34	31.19	68.81	
	35-39	30.14	69.86	
	40-44	27.21	72.79	
	45-49	29.06	70.94	
Region	Tigray	9.96	90.04	X^2=581.696[b]
	Affar	44.56	55.44	df=10
	Amhara	32.24	67.76	p=0.000
	Oromiya	61.19	38.81	
	Somali	35.47	64.53	
	Ben-Gumz	48.76	51.24	
	SNNP	29.61	70.39	
	Gambela	7.72	92.28	
	Harari	5.15	94.85	
	Addis	12.39	87.61	
	Dire Dawa	22.21	77.79	
Types of place of residence	Urban	9.99	90.01	X^2=191.824[c]
	Rural	33.48	66.52	df=1
				p=0.000
Highest educational level	No education	32.99	67.01	X^2=138.592[d]
	Primary	19.40	80.60	df=2
	Secondary+	8.48	91.52	p=0.000
Religion	Orthodox	20.52	79.48	X^2=188.133[e]
	Protestant	41.71	58.29	df=4
	Moslem	32.49	67.51	p=0.000
	Other	33.33	66.67	
	Traditional	55.35	44.65	
Total		29.12	70.88	N=4746

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 57.95.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 65.81.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 256.54.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 116.77.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.10.

Table 3h Percentage distribution of children who received POLIO3 by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received POLIO3		Chi-square test
		No	Yes	
Age 5-year groups	15-19	52.76	47.24	X^2=5.540[a]
	20-24	53.67	46.33	df=6
	25-29	49.50	50.50	p=0.477
	30-34	53.42	46.58	
	35-39	53.08	46.92	
	40-44	51.40	48.60	
	45-49	51.23	48.77	
Region	Tigray	28.52	71.48	X^2=777.264[b]
	Affar	84.21	15.79	df=10
	Amhara	60.38	39.62	p=0.000
	Oromiya	81.82	18.18	
	Somali	59.63	40.37	
	Ben-Gumz	71.21	28.79	
	SNNP	57.57	42.43	
	Gambela	24.80	75.20	
	Harari	17.87	82.13	
	Addis	20.80	79.20	
	Dire Dawa	44.81	55.19	
Types of place of residence	Urban	25.09	74.91	X^2=315.020[c]
	Rural	58.19	41.81	df=1
				p=0.000
Highest educational level	No education	57.19	42.81	X^2=213.476[d]
	Primary	40.54	59.46	df=2
	Secondary+	22.44	77.56	p=0.000
Religion	Orthodox	40.94	59.06	X^2=246.829[e]
	Protestant	68.25	31.75	df=4
	Moslem	56.66	43.34	p=0.000
	Other	60.00	40.00	
	Traditional	82.39	17.61	
Total		52.04	47.96	N=4746

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 95.43.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 108.38.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 422.49.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 192.30.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.58.

Table 3i Percentage distribution of children who received MEASLES by background characteristics of mothers, Ethiopia 2000 DHS.

Characteristics of mother		Received MEASLES		Chi-square test
		No	Yes	
Age 5-year groups	15-19	58.08	41.92	X^2=18.560[a]
	20-24	64.66	35.34	df=6
	25-29	58.81	41.19	p=0.005
	30-34	64.74	35.26	
	35-39	64.01	35.99	
	40-44	66.59	33.41	
	45-49	67.49	32.51	
Region	Tigray	29.22	70.78	X^2=1003.332[b]
	Affar	91.58	8.42	df=10
	Amhara	77.26	22.74	p=0.000
	Oromiya	81.12	18.88	
	Somali	78.12	21.88	
	Ben-Gumz	74.92	25.08	
	SNNP	75.91	24.09	
	Gambela	34.01	65.99	
	Harari	11.64	88.36	
	Addis	46.67	53.33	
	Dire Dawa	64.29	35.71	
Types of place of residence	Urban	23.78	76.22	X^2=715.799[c]
	Rural	71.96	28.04	df=1
				p=0.000
Highest educational level	No education	70.61	29.39	X^2=512.256[d]
	Primary	46.90	53.10	df=2
	Secondary+	18.07	81.93	p=0.000
Religion	Orthodox	51.27	48.73	X^2=247.894[e]
	Protestant	73.58	26.42	df=4
	Moslem	70.88	29.12	p=0.000
	Other	71.11	28.89	
	Traditional	88.05	11.95	
Total		63.00	37.00	N=4749

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 73.25.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 83.24.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 326.69.
d. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 149.47.
e. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.65.

Table 4b Regression results (odds ratios) of effect of women religion on the BCG immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	8.38(5.46-12.88)***	6.42(4.16-9.91)***	3.15(2.00-4.98)***
Protestant	3.71(2.37-5.81)***	2.69(1.70-4.25)***	2.56(1.60-4.08)***
Moslem	4.27(2.77-6.56)***	3.94(2.55-6.08)***	4.08(2.58-6.44)***
Other	6.39(3.10-13.17)***	4.93(2.34-10.40)***	4.69(2.19-10.04)***
Education level			
No education (r)		1.00	1.00
Primary		2.48(2.07-2.98)***	1.86(1.51-2.29)***
Secondary		10.28(7.31-14.45)***	4.13(2.79-6.13)***
Region			
Affar (r)			1.00
Tigray			34.68(22.29-53.97)***
Amhara			8.42(5.65-12.54)***
Oromiya			5.80(3.97-8.48)***
Somali			2.23(1.44-3.46)***
Ben-Gumz			4.14(2.71-6.33)***
SNNP			6.34(4.19-9.58)***
Gambela			5.10(3.24-8.02)***
Harari			21.89(13.30-36.03)***
Addis			17.66(9.40-33.19)***
Dire Dawa			9.49(5.92-15.20)***
Type of place of residence			
Rural (r)			1.00
Urban			3.88(2.97-5.05)***
Age group			
15-19 (r)			1.00
20-24			1.00(0.70-1.43)
25-29			1.04(0.73-1.47)
30-34			1.07(0.75-1.53)
35-39			1.08(0.75-1.56)
40-44			1.05(0.71-1.55)
45-49			0.96(0.61-1.50)
Log likelihood	6359.271	6005.636	5288.644
LR chi square	231.732	585.367	1302.360
Prob.> chi square	0.000	0.000	0.000
Number	4758.000	4520.000	4235.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Table 4c Regression results (odds ratios) of effect of women religion on the DPT1 immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	6.78(4.49-10.23)***	5.26(3.47-7.96)***	2.38(1.54-3.70)***
Protestant	2.85(1.85-4.39)***	2.10(1.36-3.27)***	2.02(1.29-3.17)**
Moslem	3.50(2.32-5.30)***	3.23(2.13-4.90)***	2.98(1.92-4.62)***
Other	5.12(2.52-10.43)***	4.00(1.93-8.30)***	3.82(1.81-8.07)***
Education level			
No education (r)		1.00	1.00
Primary		2.33(1.94-2.78)***	1.79(1.46-2.20)***
Secondary		6.95(5.20-9.30)***	2.90(2.05-4.12)***
Region			
Affar (r)			1.00
Tigray			47.80(29.73-76.86)***
Amhara			10.30(6.68-15.86)***
Oromiya			7.00(4.62-10.60)***
Somali			3.47(2.18-5.51)***
Ben-Gumz			3.94(2.48-6.25)***
SNNP			6.77(4.34-10.59)***
Gambela			5.68(3.51-9.22)***
Harari			29.24(17.39-49.17)***
Addis			25.78(14.03-47.34)***
Dire Dawa			16.82(10.18-27.79)***
Type of place of residence			
Rural (r)			1.00
Urban			2.77(2.16-3.55)***
Age group			
15-19 (r)			1.00
20-24			1.00(0.70-1.42)
25-29			1.11(0.78-1.57)
30-34			0.99(0.69-1.41)
35-39			1.07(0.75-1.54)
40-44			1.05(0.71-1.55)
45-49			0.85(0.54-1.33)
Log likelihood	6377.137	6085.734	5307.600658
LR chi square	217.372	508.775	1286.909
Prob.> chi square	0.000	0.000	0.000
Number	4757.000	4207.000	3953.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Table 4d Regression results (odds ratios) of effect of women religion on the DPT2 immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	7.50(4.61-12.20)***	5.79(3.55-9.46)***	2.39(1.43-4.00)***
Protestant	3.02(1.82-5.02)***	2.23(1.33-3.73)**	2.10(1.24-3.55)**
Moslem	3.91(2.40-6.37)***	3.60(2.20-5.88)***	3.08(1.84-5.15)***
Other	5.38(2.51-11.53)***	4.18(1.92-9.12)***	3.90(1.75-8.71)***
Education level			
No education (r)		1.00	1.00
Primary		2.16(1.81-2.57)***	1.64(1.34-2.02)***
Secondary		5.58(4.36-7.13)***	2.26(1.66-3.10)***
Region			
Affar (r)			1.00
Tigray			56.98(32.59-99.64)***
Amhara			12.10(7.10-20.63)***
Oromiya			7.73(4.59-13.03)***
Somali			4.50(2.55-7.94)***
Ben-Gumz			4.56(2.58-8.08)***
SNNP			7.84(4.53-13.59)***
Gambela			6.66(3.71-11.95)***
Harari			23.89(13.49-42.33)***
Addis			32.22(17.11-60.68)***
Dire Dawa			20.83(11.70-37.11)***
Type of place of residence			
Rural (r)			1.00
Urban			2.72(2.15-3.44)***
Age group			
15-19 (r)			1.00
20-24			0.94(0.66-1.35)
25-29			1.11(0.79-1.58)
30-34			0.99(0.69-1.42)
35-39			1.05(0.72-1.51)
40-44			1.02(0.69-1.52)
45-49			1.04(0.66-1.65)
Log likelihood	6200.480	5934.370	5149.178
LR chi square	210.795	476.906	1262.097
Prob.> chi square	0.000	0.000	0.000
Number	4754.000	4393.000	4079.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Table 4e Regression results (odds ratios) of effect of women religion on the DPT3 immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	12.32(6.02-25.22)***	8.97(4.37-18.44)***	2.98(1.41-6.32)***
Protestant	4.28(2.04-8.96)***	2.91(1.38-6.13)***	2.77(1.29-5.96)**
Moslem	6.29(3.07-12.91)***	5.69(2.76-11.71)***	4.23(2.00-8.96)***
Other	7.67(2.94-20.02)***	5.55(2.08-14.84)***	5.05(1.80-14.16)***
Education level			
No education (r)		1.00	1.00
Primary		2.38(1.99-2.85)***	1.83(1.47-2.28)***
Secondary		6.73(5.33-8.49)***	2.85(2.10-3.87)***
Region			
Affar (r)			1.00
Tigray			151.77(54.60-421.89)***
Amhara			36.51(13.26-100.49)***
Oromiya			18.18(6.63-49.82)***
Somali			11.41(4.02-32.44)***
Ben-Gumz			13.83(4.88-39.20)***
SNNP			18.25(6.53-51.03)***
Gambela			13.40(4.64-38.71)***
Harari			63.04(22.57-176.04)***
Addis			98.17(34.22-281.68)***
Dire Dawa			46.36(16.54-129.92)***
Type of place of residence			
Rural (r)			1.00
Urban			2.68(2.11-3.40)***
Age group			
15-19 (r)			1.00
20-24			0.85(0.58-1.24)
25-29			1.08(0.74-1.57)
30-34			1.01(0.69-1.49)
35-39			1.10(0.75-1.63)
40-44			1.11(0.72-1.69)
45-49			0.83(0.50-1.38)
Log likelihood	5592.870	5261.839	4480.697
LR chi square	216.583	547.614	1328.756
Prob.> chi square	0.000	0.000	0.000
Number	4754.000	4397.000	4226.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Table 4f Regression results (odds ratios) of effect of women religion on the POLIO1 immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	5.89(4.19-8.28)***	4.92(3.49-6.93)***	2.67(1.84-3.88)***
Protestant	2.14(1.49-3.07)***	1.76(1.22-2.53)**	2.09(1.43-3.05)***
Moslem	3.60(2.57-5.03)***	3.41(2.43-4.77)***	3.12(2.15-4.55)***
Other	2.37(1.12-5.01)**	1.96(0.92-4.19)*	2.64(1.21-5.75)**
Education level			
No education (r)		1.00	1.00
Primary		2.11(1.60-2.77)***	1.69(1.26-2.26)***
Secondary		4.34(2.70-6.96)***	1.93(1.13-3.28)**
Region			
Affar (r)			1.00
Tigray			2.59(1.48-4.52)***
Amhara			1.28(0.81-2.03)
Oromiya			0.85(0.56-1.28)
Somali			0.17(0.11-0.26)***
Ben-Gumz			0.51(0.32-0.79)**
SNNP			0.40(0.26-0.63)***
Gambela			0.58(0.35-0.95)**
Harari			2.68(1.25-5.73)**
Addis			1.82(0.76-4.38)
Dire Dawa			1.87(0.92-3.80)*
Type of place of residence			
Rural (r)			1.00
Urban			2.27(1.55-3.32)***
Age group			
15-19 (r)			1.00
20-24			1.15(0.74-1.80)
25-29			1.51(0.97-2.34)
30-34			1.25(0.80-1.95)
35-39			1.08(0.69-1.69)
40-44			1.52(0.93-2.49)
45-49			1.14(0.66-1.97)
Log likelihood	4179.995	4100.873	3785.033
LR chi square	147.651	226.772	542.613
Prob.> chi square	0.000	0.000	0.000
Number	4754.000	3946.000	3946.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category*

Table 4g Regression results (odds ratios) of effect of women religion on the POLIO2 immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	4.80(3.45-6.68)***	3.96(2.84-5.52)***	2.23(1.55-3.19)***
Protestant	1.73(1.22-2.46)**	1.39(0.97-1.98)*	1.65(1.14-2.38)*
Moslem	2.58(1.86-3.58)***	2.42(1.74-3.37)***	2.63(1.84-3.77)***
Other	2.48(1.24-4.96)**	2.03(1.00-4.11)**	2.79(1.34-5.78)*
Education level			
No education (r)		1.00	1.00
Primary		2.06(1.66-2.55)***	1.68(1.33-2.11)***
Secondary		4.74(3.29-6.81)***	2.38(1.57-3.61)***
Region			
Affar (r)			1.00
Tigray			8.36(5.51-12.67)***
Amhara			3.23(2.32-4.50)***
Oromiya			1.91(1.43-2.56)***
Somali			0.48(0.34-0.68)***
Ben-Gumz			1.71(1.22-2.41)**
SNNP			1.06(0.76-1.48)
Gambela			2.53(1.71-3.73)***
Harari			6.71(3.94-11.44)***
Addis			5.24(2.76-9.97)***
Dire Dawa			3.78(2.35-6.07)***
Type of place of residence			
Rural (r)			1.00
Urban			2.21(1.64-2.98)***
Age group			
15-19 (r)			1.00
20-24			1.47(1.02-2.10)
25-29			1.72(1.21-2.44)
30-34			1.63(1.14-2.33)
35-39			1.68(1.17-2.43)
40-44			2.12(1.42-3.15)
45-49			2.03(1.28-3.21)
Log likelihood	5541.124	5407.403	4961.168
LR chi square	184.603	318.324	764.559
Prob.> chi square	0.000	0.000	0.000
Number	4746.000	4536.000	4395.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Table 4h Regression results (odds ratios) of effect of women religion on the POLIO3 immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	6.75(4.45-10.24)***	5.47(3.59-8.32)***	3.09(1.99-4.80)***
Protestant	2.18(1.40-3.38)***	1.69(1.08-2.64)**	1.82(1.15-2.86)**
Moslem	3.58(2.35-5.44)***	3.35(2.20-5.09)***	3.53(2.27-5.49)***
Other	3.12(1.51-6.42)**	2.48(1.19-5.18)**	2.91(1.36-6.26)**
Education level			
No education (r)		1.00	1.00
Primary		2.06(1.66-2.55)***	1.62(1.33-1.98)***
Secondary		4.74(3.29-6.81)***	2.18(1.60-2.97)***
Region			
Affar (r)			1.00
Tigray			15.11(10.06-22.70)***
Amhara			7.39(5.08-10.76)***
Oromiya			4.02(2.81-5.75)***
Somali			1.13(0.73-1.76)
Ben-Gumz			4.29(2.88-6.40)***
SNNP			3.01(2.02-4.46)***
Gambela			5.81(3.77-8.94)***
Harari			11.50(7.39-17.87)***
Addis			9.81(5.99-16.07)***
Dire Dawa			14.10(8.87-22.43)***
Type of place of residence			
Rural (r)			1.00
Urban			2.05(1.62-2.60)***
Age group			
15-19 (r)			1.00
20-24			1.16(0.83-1.64)
25-29			1.39(1.00-1.94)
30-34			1.41(1.00-1.99)
35-39			1.40(0.99-1.98)
40-44			1.68(1.15-2.44)
45-49			1.77(1.15-2.74)
Log likelihood	6316.843	6133.805	5564.445
LR chi square	254.578	437.616	1006.976
Prob.> chi square	0.000	0.000	0.000
Number	4746.000	4439.000	4193.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*

Table 4i Regression results (odds ratios) of effect of women religion on the MEASLES immunization of child, Ethiopia 2000 DHS

		Odds ratios (95% C.I.)	
Characteristics	Model 1	Model 2	Model 3
Religion			
Traditional (r)	1.00	1.00	1.00
Orthodox	7.00(4.31-11.40)***	5.07(3.10-8.30)***	1.83(1.08-3.08)**
Protestant	2.65(1.59-4.41)***	1.74(1.03-2.93)**	1.55(0.91-2.66)
Moslem	3.03(1.85-4.94)***	2.70(1.65-4.43)***	2.23(1.32-3.75)**
Other	2.99(1.34-6.68)**	2.03(0.87-4.70)*	1.68(0.69-4.08)
Education level			
No education (r)		1.00	1.00
Primary		2.71(2.27-3.24)***	2.17(1.76-2.68)***
Secondary		9.74(7.44-12.76)***	4.21(3.03-5.85)***
Region			
Affar (r)			1.00
Tigray			35.14(21.23-58.15)***
Amhara			7.51(4.66-12.11)***
Oromiya			3.46(2.1-5.52)***
Somali			2.38(1.40-4.05)***
Ben-Gumz			3.61(2.16-6.03)***
SNNP			4.64(2.82-7.63)***
Gambela			3.61(2.10-6.22)***
Harari			12.23(7.28-20.56)***
Addis			15.39(8.43-28.07)***
Dire Dawa			5.69(3.36-9.65)***
Type of place of residence			
Rural (r)			1.00
Urban			3.84(3.03-4.88)***
Age group			
15-19 (r)			1.00
20-24			0.83(0.58-1.21)
25-29			1.07(0.75-1.54)
30-34			1.03(0.71-1.49)
35-39			1.07(0.73-1.56)
40-44			1.12(0.74-1.68)
45-49			1.12(0.70-1.80)
Log likelihood	6003.530	5571.897	4822.829
LR chi square	255.092	686.726	1435.794
Prob.> chi square	0.000	0.000	0.000
Number	4749.000	4507.000	4260.000

*Notes: *p<0.1; **p<0.05; ***p<0.001; "r" – reference category.*