2019

HIV Prevalence and Donor Funding in Ethiopia

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This is to certify that the doctoral study by

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Abstract

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MSW, Indira Gandhi National Open University, 2013

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

Many researchers have documented the trend of decreasing financial support from donors for human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) responses in Ethiopia. Less information is available regarding the correlation between trends of HIV prevalence and external funding and ways to address the impact that funding scarcity could cause. The purpose of this study was to examine the trend of HIV prevalence and donor funding levels, analyzing how the 2 are correlated, and opportunities to improve responses. Using the proximate determinant framework, the research questions examined the changes in HIV prevalence in Ethiopia during the past 10 years; the association between the trends of HIV prevalence, funding levels, and services provided; and the effect of different characteristics on the trend of the prevalence. A paired sample *t*-test, time series forecasting, Pearson correlation, chi-square test, and multiple regression were employed using a secondary data of sampled 1,067 people from the Demographic and Health Surveys and data from donors. Results indicated that the change in prevalence was statistically significant (t [10] = 4.59, p = .001), and correlated with the funding levels(r (10) = .635*, p = .027), a significant relationship between funding level and type of services, $\chi 2$ (2, N = 1067) = 1425.7, p <.001 and a significant regression equation to predict HIV prevalence (F (9, 1056) = 12.639, p < .001). The results from this study could be used to inform the Ministry of Health of Ethiopia and HIV project implementers to plan for domestic sustainable financing initiatives, invest based upon evidence-based HIV prevention strategies that could most directly impact quality of life and guide future research.

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Dedication

I dedicate this work to my family for their endurance during the busy time I had during the entire period of this study.

Acknowledgments

First and foremost, I would like to show my gratitude to my advisor Dr. Patrick Jude Dunn, committee chairperson of the Health Sciences faculty of Walden University for his unreserved support and quick turnaround times regarding reviewing any modifications throughout the study period. His advice for my research helped the success of my project. I would also like to pay my regards to Dr. Jeanne L. Connors, committee member of the Health Sciences faculty for her valuable help during my research. Without the support from both of them, my journey at Walden University would not have reached this level.

I would also like to extend my special thanks to all organizations that assisted me to access secondary data for this study from their databases. Without the cooperation of these organizations, my effort would not have been realized. I would also like to thank my friend, Tadesse Girma, who is living in the US for his support to facilitate the transfer of my tuition fee to Walden University using his credit card; otherwise, it was impossible to make a money wire transfer directly from my country to US.

My appreciation and dedication goes to all staff of Walden University for their unreserved support throughout the coursework. I would like to thank those whom I might have overlooked, but contributed to this research in one way or the other.

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Section 1: Foundation of the Study and Literature Review

Substantial improvements have been documented regarding integrated Human Immunodeficiency Virus (HIV)prevention and care services in many countries as huge investments were targeting to provide integrated HIV prevention and treatment services across the HIV care continuum (The Joint United Nations Programme on HIV/AIDS [UNAIDS], 2017). However, because of decreases in funding, the possibility of relapse of HIV pandemic is feared not to cause universal crisis and looming future progress (United Nations General Assembly, 2016). One of the challenges is an ongoing funding gap for HIV/AIDS programs. According to UNAIDS (2017), while $19 billion was estimated to be accessible from domestic and international sources to address the problem of low and middle income countries in the year 2016, this need for additional money will increase to $26.2 billion by 2020 and the funding level to meet UNAIDS's global targets to end AIDS as a global public health threat will be gradually reduced by 9% by 2030(Stover, 2016).

According to PEPFAR (2013), though the total funding (bilateral and multilateral) from the US government addresses the global HIV epidemic, since 2010, PEPFAR funding levels have remained essentially flat or decreasing for some countries in Africa. According to UNAIDS (2017), ending HIV/AIDS depend largely on the funding level and ability of each country to provide HIV treatment to all who need it. Samji (2013) said that defunding the HIV/AIDS program may cause catastrophic phenomena.

Poverty is a barrier for the achievement of HIV prevention (Shelton, 2005). Poverty, underdevelopment, lack of choices for services, and the inability to determine

one's own destiny fuel the HIV epidemic (UNAIDS, 2001). According to Fenton (2004), poverty leads people to high-risk behaviors and reducing poverty is the only viable long-term response to the epidemic.

In Africa, the prevalence of HIV correlates directly with wealth and there is a strong positive correlation between household wealth and national income with HIV infection prevalence across sub-Saharan Africa (PEPFAR, 2005).Since HIV's discovery in 1981, more than 25 million people have died of AIDS. Worldwide, 33 million people are currently HIV positive, leading to a global adult prevalence of 0.8% (UNAIDS, 2008). Sub-Saharan Africa has the highest HIV prevalence at 5%, which makes up two-thirds of the worldwide HIV burden (World Health Organization [WHO], 2016).

In Ethiopia two decades ago, there were 3 million HIV infected people, and an estimated 280,000 people died of AIDS (UNAIDS, 2000). This was the largest infected population worldwide after South Africa and India, and HIV/AIDS was one of the key challenges for overall economic and human resource developments (DHS, 2011). Based on a single point estimate, which is an estimate of unknown population parameter by using sample data to calculate a single value (FMOH, 2007); currently in Ethiopia with a population of 105 million, adult HIV prevalence is estimated to be 1.1%, and the incidence rate is 0.29% (The Ethiopian Public Health Institute [EPHI], 2017). Prevalence and incidence rates also significantly vary between geographical areas and gender (Federal HIV/AIDS Prevention and Control Office [FHAPCO], 2008).The prevalence of AIDS in the Gambella region is 6.6%, while in Addis Ababa it is 5%, and in the Southern Nations, Nationalities and Peoples' region it is 0.7%. Moreover, while urban prevalence

in Ethiopia is 7.7%, rural prevalence is estimated to be 0.9%; in both areas, young women remain at very high risk of HIV infection(Elsevier, B., 2016).The burden of HIV in Ethiopia is decreasing because substantial advances have been made to increase access to testing and treatment of HIV in many high-burden regions, prevent mother-to-child transmission, integrate HIV services with Maternal and Child Health (MCH) services, retention and Antiretroviral Therapy (ART) adherence, reduce stigma and discrimination, increase social support, and mobilize communities (Kendall & Danel, 2014).

In this study, a 10-year trend analysis of HIV prevalence and funding levels from donors for HIV/AIDS prevention and control activities in Ethiopia reviewed the link between funding level and HIV treatment, care, and support services as well as how and where domestic funds or national budgets are to be spent to address the epidemic, reduce new infections, reduce AIDS related deaths, and eliminate stigma and discrimination when funding from donors for HIV/AIDS program was declining. Consequently, the potential positive social change implication of this study is health programmers, policy makers, and researchers will be benefited because the finding of the study articulated where the HIV epidemic is heading, how the trend of the epidemic correlated with the funding levels allotted every year from donors for prevention, care, and support activities; the change in HIV prevalence for different population subgroups, the relationship between the type/number of services being given to control HIV/ADS and the funding levels; and if the prevalence has a similar trend to all Socioeconomic and Demographic Characteristics. After knowing the aforementioned changes, health programmers and

policy makers can strategize the prevention responses and resources accordingly for efficient and effective measures that enable to stop the spread and death of HIV/AIDS.

Problem Statement

In the prevention and control measures of HIV/AIDS, donor funding has a significant role in developing countries (Kates, Lief, & Wexler, 2014). Donors in this study are international grant making foundations providing funding resources and technical assistance to help developing countries as they design and implement their program strategies to fight HIV/AIDS. Sub-Saharan Africa has the greatest number of recipient countries of any region and received the largest share of assistance from donors (57% of global HIV/AIDS funding) and had the largest number of donors (Bendavid, 2012). Ethiopia accounts for 8% of funding from 27 donors in Sub-Saharan Africa and the donor community has made remarkable support in the HIV/AIDS response (Kates, Michaud, & Wexler, 2013).

However, currently, financial support from donors for HIV/AIDS response in low-income countries including Ethiopia is being reduced (Garmaise, 2015). Specifically, funding from PEPFAR, one of the successful anti-HIV/AIDS programs in Ethiopia, is severely declining and likely to affect the availability of HIV drugs and other HIV/AIDS-related assistance. Currently, because of this budget cut, many HIV prevention, care, and support programs are being phased out or scaled back prematurely, which is a problem that triggered this study. To address this problem and achieve the goal of ending HIV as a public health threat by 2030, some priority strategies like intensifying coordinated HIV prevention efforts, undertaking high impact targeted prevention activities, and targeted

HIV counseling and testing are being taken (HAPCO, 2016); however, despite this, shortage of resources is still a problem and affects the development programs of HIV/AIDS, the community conversation initiatives on prevention strategies at the community level, capacity development and policy support at national HIV/AIDS councils support of decentralized HIV/AIDS responses at regional and district levels, the support that civil society organizations (CSOs) had for HIV/AIDS responses, generation of knowledge on HIV through research activities, mainstreaming the integration of HIV/AIDS prevention activities into other programs' activities, the provision of ART for million infected people, support for HIV test laboratories, TB/HIV surveillance, support for orphan and vulnerable children (OVC), infrastructure, and trainings (Kates et al., 2013).

A possible factor contributing to these problems, phasing out of HIV programs and scaled back scopes, is the decrement of global donor support as the result of increasing funding demands such as humanitarian emergencies and refugee crises combined with ongoing fiscal austerity in many countries (UNAIDS & Henry, 2016). For instance, between 2014 and 2015, 13% HIV funding level decrement have been reported globally (UNAIDS, 2017). This study will contribute to the body of knowledge needed and significant to the health discipline to address the problem by analyzing the change in prevalence of HIV in Ethiopia in relation to changes in donors funding levels and recommend high impact activities with available resources to people with different socioeconomic and demographic characteristics.

Background

Ethiopia is the second most populous country in Africa after Nigeria, with a population of 102 million in 2016 (World Bank, 2017). Despite impressive economic growth, Ethiopia remains a low-income country with a real per capita income of $505 and 31%of the population lives below the international poverty line of $1.25/day (World Bank, 2017). According to the UN (2014), Ethiopia ranks 173 out of 187 countries both the overall index and per capita gross national income (GNI), which shows the country's poor economy and general low standard of living. Life expectancy is estimated at just 65.5 years (63.7 for males and 67.3 for females), which gives Ethiopia a world life expectancy ranking of 141 (WHO, 2018). The inflation of 26% remains a problem for most poor people and there are thousands of street children in the capital city, Addis Ababa, alone. It is also one of the least urbanized countries, with 82% of the population living in rural areas (World Bank, 2016).

The HIV/AIDS situation in Ethiopia continues to be a mixed epidemic with significant heterogeneity across geographic areas and population groups (Federal Ministry of Health [FMOH], 2007). The Ethiopia Demographic and Health Survey of 2011 (DHS2011),a nationally-representative household survey that provides data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition, estimated national HIV prevalence at 1.5%, compared to 2.4% . Among the surveyed households, 56% of women and 55% of men have never been tested for HIV (DHS, 2016). This is an indication that the current number of HIV-positive individuals in the country could be a lot more had all the population been tested.

Moreover, despite the existence of 1.2 million people living with HIV/AIDS, 72% are thought to be aware that they are living with the virus; the remaining 28% think they are not infected (DHS, 2016).

In order to address these problems, HIV care and treatment services have been expanded rapidly and this was reflected in the massive scale-up of ART access to people living with HIV from 96,897 in 2006 to 450,000 at the end of 2016 (WHO, 2016). This success was accompanied by an unprecedented increase in resources from the donor community (UNAIDS & Henry, 2016). During the time when the nature of the epidemic and its fueling factors creates a complex challenge to the ability of health and other sectors to meet the targets and control HIV/AIDS in full, the financial supports from dedicated donors and the commitment from the government of Ethiopia had enabled the HIV prevention measures bringing considerable progresses and achieving encouraging results (UNAIDS, 2013).There are numerous aid organizations in Ethiopia that provide development aid and address global health and other social and economic development issues. However, according to UNAIDS (2008), the United States under PEPFAR is now the largest HIV prevention government donor globally, which accounts for 54% of international funding. In its first 5years, PEPFAR prevented more than 740,000 AIDS-related deaths in the African countries in which it worked and had, on average, almost halved general mortality in people living in these countries (Bendavid, 2012). In Ethiopia, during 2011 and 2012, total spending on HIV/AIDS was $405 million, of which 86% ($350 million) came from donors and 64.5% of it was from PEPFAR (UNAIDS, 2013).

While the Ethiopia government is committed to achieving universal access to treatment for those in need, funding for HIV from PEPFAR has begun to flat line, and international contributions from other donors is declining while the fund shortage is increasing exponentially (UNAIDS, 2013). To mitigate this problem, ways of boosting funding have been dealt among stakeholders in the past by calling for more donor coordination, increasing traction of donors' interest by providing empirical evidence that their donations change lives and make desired impact on the lives of people, and undertaking high impact targeted HIV prevention activities. Donors' coordination is imperative to use available funds for interventions that are cost-effective and capable to avert a high number of HIV infections compared with uncoordinated uses of the funds (Kahn & Marseille, 2000).The information recognized on the association between HIV prevalence and funding levels would provide evidences for the rational allocation of resources for the right target groups and increases the likelihood of utilizing new funds efficiently in the future. Otherwise, if funding for HIV remains at its current level or if PEPFAR, the largest supporter, in the global fight against HIV and AIDS makes drastic cuts to its level of support, HIV deaths and new infections can be expected to rise in concentrated, generalized, and hyper endemic settings (Piot, 2015).

As a result of the global response to HIV, 20 million people are now receiving ART and both new infection and mortality rates have been declining (WHO, 2016); this was happening mainly because of the support from PEPFAR (Vogus & Graff, 2015). Conversely, in order to reach the UNAIDS 90-90-90 goals by 2020, which is that 90% of persons with HIV will know their HIV status, 90% of persons with HIV will receive

sustained ART, and 90% of persons receiving ART will achieve viral suppression (UNAIDS, 2017), the available funding for it seems inadequate and threatening the hope of achieving the goal as it is being declining.

In addition to PEPFAR, funding decrements have been noticed among some significant global donors including the U.K. Department for International Development (DFID), the Global Fund to Fight AIDS, Global Fund for Tuberculosis and Malaria, Bill and Melinda Gates Foundation, and Australia's Department of Foreign Affairs and Trade (DFAT; Formerly AusAID) (Kates et al., 2014). The DFID is cutting all of its bilateral HIV funding to middle income countries (Murphy & Podmore, 2014). From 2010 to 2014, PEPFAR began a transition process in 12 countries in the Eastern Caribbean (PEPFAR, 2010; Vogus & Graff, 2015) as well as South Africa, Botswana, and Namibia (Brundage, 2011). The Global Fund for HIV prevention has deemed 11 countries ineligible for further HIV funding based on their income status and disease burden (Garmaise, 2015).

Meanwhile, according to Office of Global AIDS Coordination [OGAC] (2016), even though Ethiopia has focused on efforts that could sustain epidemic control by decreasing the numbers of new infections and AIDS-related deaths, deficiencies or gaps have been observed in terms of consolidating gains achieved to date, continuing program realignment, consolidating implementing partners, and focusing on country ownership. In addition, there was no study showed how HIV prevalence is associated with donor funding levels, and what type or/ number of services or responses the country's strategic plan should focus on to control the HIV/AIDS epidemic during decrements of funds by

applying critical enablers like programming in areas such as human rights, community-based capacity building, targeting, and retention in care.

As a result, at this time, when there is less financial support from external donors, unless the country develops strategies that can maintain the momentum of success, there is no guarantee of avoiding a relapse of the epidemic because of funding level diminishment. Hence, this will be a critical time to target HIV prevention activities with evidence, establish strong coordination between existing donors, strengthen internal financial sources, leverage available financial sources, avoid duplication of efforts, and foster greater transparency to support country ownership. To do this all, analyzing the trend of HIV prevalence and funding from donors for anti-HIV/AIDS activities and their effects on health and social outcomes to all socioeconomic and demographic characteristics is paramount to designate effective measures that could bring desired changes like reducing death rate due to HIV and controlling the transmission of the virus with limited resources. Otherwise, insufficient human resources, feeble supply of management and distribution, and weak midlevel managerial capacity at regional and district levels will continue challenging Ethiopia's response to HIV/AIDS.

Accordingly, this study has shown where the HIV epidemic is currently heading and how this correlated with the funding level allotted every year from the donor community for HIV prevention, care, and support. In addition, it analyzed whether the changes in prevalence was statistical significant; evaluated the relationship between the type/number of services or responses to control HIV/AIDS and the funding levels; and

examined the difference in prevalence among different socioeconomic and demographic characteristics.

Purpose of the Study

The purposes of this secondary data analysis, quantitative study, were to explore if funding level from donors' community is a proximate determinant for prevalence change, analyzing if the funding shortfalls threaten the gains made during the life of the Fund, and also if there is an association between the declining funding level and the change in prevalence of HIV/AIDS. It also compared the dependent and independent variables of each research question. The study focused on how the level of funding from donor communities was changing the quality and quantity of HIV/AID prevention and controlling activities; and what needs to get prior attention in the national HIV/AIDS control program when the budget level is continue declining. The approach, understanding the change in level of funding from donor community, aligns with the prevention and control measures of HIV/AIDS. This quantitative analysis has helped to identify the tendency of funding level, and indicated the type and number of services that need to be provided in high prevalence regions of the country within the available resources. This study recommended effective HIV/AIDS controlling activities that need to be given priority in the national HIV/AIDS control program of Ethiopia in resource constrained settings secondary to the budget reduction or budget cut from the donors' community.

The potential positive social change implication of this study finding is informing the healthcare decision-makers with findings of the four research questions so that they

will place more value on such works in their deliberations and in their interactions with stakeholders for sustainable financing initiatives. It also will help to bring changes in the system of implementation; and find the best solutions to HIV epidemic control and prevention strategies, which is the most burdensome health problems, by meet the long-term needs of people living with problem. In addition, it will have an important role of supporting the transfer of knowledge between the researcher and healthcare decision-makers to bring valuable and positive social changes in social structure and lead a more context sensitive, adaptive, and innovative responses.

The role of donors, especially the PEPFAR, in the Ethiopia HIV epidemic control is significantly high; and because of such supports, the epidemic in the past decade has shown a trend of stabilizing and subsequently declined from 12.4% to 1.1% in between 2001 and 2016 in both urban and rural areas where >85% of the population lives (EPHI, 2017). Such changes in trends are encouraging and represent the commitment of the government and the contribution of collective concerted efforts across the numerous stakeholders involved in the Mutli-Sectoral HIV/AIDS responses (FHAPCO, 2012). However, because of a dip in donor HIV spending from $7.7 billion in 2009 to $6.9 billion in 2010, and $4.9 billion in 2016, it becomes clear that many countries' that heavy reliance on donor funding could not continue (UNAIDS & Henry Family Foundation, 2017).

Likewise, yearly, more than 86% of the total spending on HIV/AIDS in Ethiopia was came from external sources; and PEFPAR was the greatest contributor, forming greater than 50% of total spending on HIV/AIDS (UNAIDS, 2013); however, this

funding level from PEPFAR-Global Fund peaked in 2010, and has decreased by almost 50 percent since 2012 (Office of the United States Global AIDS Coordinator [OGAC], 2016); and this has negatively affected the interventions.

Accordingly, the finding of this study has answered the research questions and contributed an effort to the HIV prevention and control program by proposing new approach on HIV control activities for targeted population groups and better geographic targeting of resources and a greater focus on the highest-impact prevention strategies that need to be addressed with limited resources in the process of transitioning away from reliance on external funding in favor of greater domestic investment for HIV without significant backsliding away from successes. In addition, it outlined the major areas of emphasis for future programming based on the review it made on the trend of HIV/AIDS prevalence among different socioeconomic and demographic characteristics; and donors supported Anti-HIV/AIDS activities and their effect on health and social outcomes. It also showed efficient and effective ways in speeding up progress in achieving the ambitious global targets of zero new infection, zero stigma and discrimination, and zero deaths due to AIDS with limited or local resources in the study area.

Research Questions and Hypotheses

RQ1: How has HIV prevalence changed in Ethiopia during the past 10years?

$H_0$1: HIV prevalence in Ethiopia shows no difference during the past 10years.

H_a1: There is a statistically significant difference between the HIV prevalence of the past 10years in Ethiopia.

RQ2: How does the trend of HIV prevalence associate with funding from donors?

$H_0$2: There is no relationship between funding from donors and the trend of HIV prevalence.

H_a2: There is a relationship between donors' financial support to fight HIV/AIDS in Ethiopia and HIV prevalence trends.

RQ3: What is the relationship between the type/number of services being provided to prevent and control HIV/ADS and funding from donors?

$H_0$3: The type and number of services being provided to prevent and control HIV/ADS in Ethiopia have no relationship with the yearly funding levels from the donor community.

Ha3: There is a relationship between the type and number of services being provided to prevent and control HIV/ADS in Ethiopia and the yearly funding levels from the donor community.

RQ4: What was the effect of different socioeconomic and demographic characteristics on the trend of HIV prevalence in the past 10years?

$H_0$4: HIV prevalence in the past ten 10years show similar trends among all socioeconomic and demographic characteristics.

H_a4: HIV prevalence in the past 10years show different trends among different socioeconomic and demographic characteristics.

Theoretical Foundations for the Study

The proximate determinant is a quantitative framework that was first applied by John Bongaarts, a Dutch demographer, in the 1970s (James, 2006). The framework was used to study the relationship between factors, biological and behavioral, that impact

fertility including economic and environmental variables; and in turn, these external variables influence fertility. Bongaarts established an equation to define the impact of the most important proximate determinants on the outcome. This frame work has been applied broadly in the study of fertility and child survival in developing countries (Boerma & Weir, 2005). The key to the Proximate Determinant framework is recognizing of a group of variables that can be affected by changes in related variables or by interferences that have immediate effects on outcomes. According to James J C. (2006), the proximate-determinants framework can be used in HIV/AIDS study design, risk factors analysis and interpretation of findings. Accordingly, in this study, the proximate-determinants framework has been applied to examine the prevalence of HIV/AIDS and funding level from donors for Anti-HIV/AIDS activities. The rational for choosing this framework was because it examines the association of proximate variables, like funding level for Anti-HIV/AIDS activities, with prevalence and if that has a direct effect on other outcomes and influences the change of other variables. The framework incorporates terms that are easily interprets and has been widely utilized as a theoretical model for HIV prevention and health promotion.

This study was a trend analysis of HIV prevalence using secondary data from demographic and health surveys (DHS) done between 2005 and 2016, and from expenditure analysis data from HIV/AIDS program implementing partners in Ethiopia, and from data base of some health facilities. After considering the complexity of this study, the data were analyzed for each research question independently from different sources. The trend analysis model was useful, from national level perspective, guiding

the understanding to promote for targeting the right persons by examining whether the prevalence changing over time, and whether these trends differ among the predominant age, sex, racial/ethnic groups and be affected disproportionally by the HIV epidemic. It also enhances country ownership, creating a resilient system during budget cut, which ultimately enable to select the right HIV/AIDS responses for the right target groups.

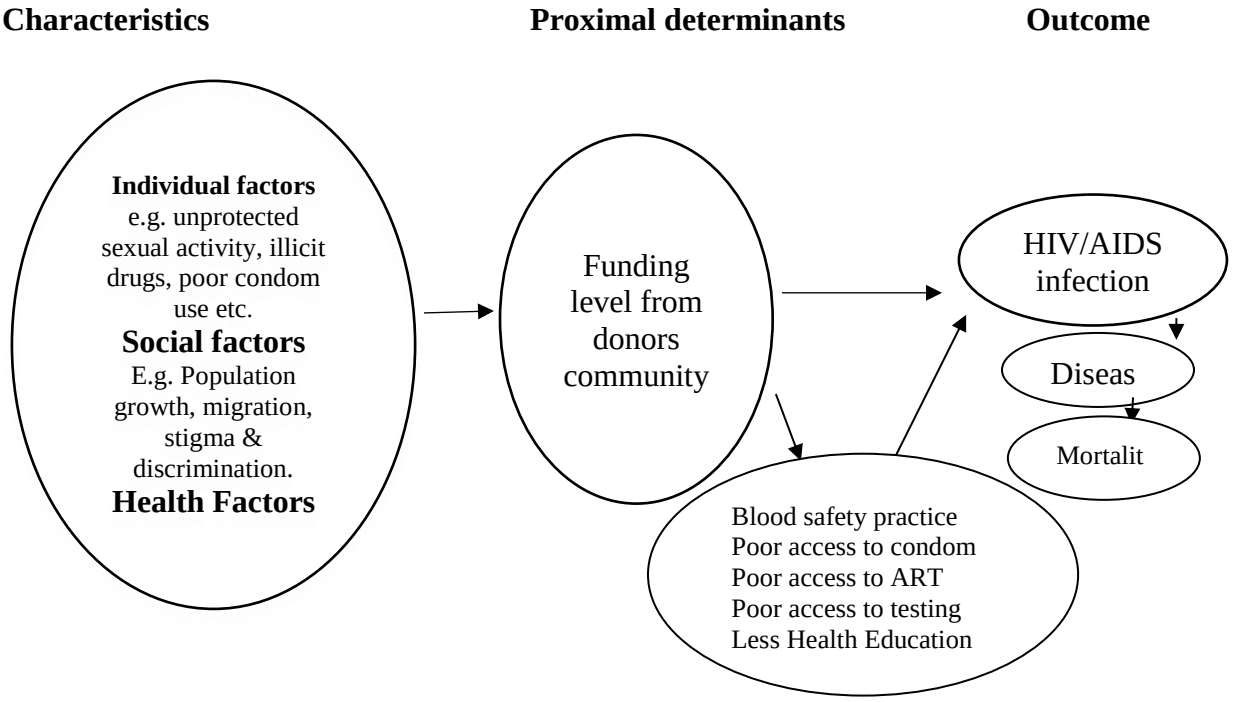


Figure 1.Conceptual framework on the proximate determinants of HIV prevalence trend.

Nature of the Study

This was a descriptive and correlational study that used a quantitative research method for quantitative variables (HIV/AIDS prevalence, PEPFAR Funding level, demographic characteristics, etc.) to determine if there is a relationship between the prevalence of HIV/AIDS in Ethiopia and the declining funding level from donors. Information on different years' funding level from donors to prevent, treat, and control

the HIV/AIDS epidemic in Ethiopia was used from secondary data sources. The data on amount of funding levels from major donors focused on HIV/AIDS in the mentioned period were obtained from the data base of Federal Ministry of Health (FMoH) and FHAPCO. Accordingly, the necessary data collected from these institutions had enabled the researcher to answer the research questions including whether the donors support to fight HIV/AIDS was related to the prevalence or burden of the disease or not. In addition, a ten-year expenditure data from major program implementing partners were analyzed to know if the type and number of services to prevent and control HIV/AIDS were considering the variation of funding levels of each year or whether that was similar in all years by comparing services provided to different population groups.

To see any alteration in the HIV/AIDS prevalence in the past ten years in relation to socioeconomic and demographic characteristics, data collected by Central Statistics Agency (CSA) for Demographic and Health Survey (DHS) 2005, 2011, and 2016 were used. In addition, The records of 1000 pregnant women 15 to 24-Year-Old attending two ANC clinics of public health facilities in Bishoftu and Addis Ababa from January 2006 to June 2016, and screened for HIV antibodies, were analyzed to see the trend of HIV/AIDS prevalence and to triangulate the result from DHS data findings. Equally, the socio-demographic, behavioral and HIV-related data were analyzed using regression and bivariate and multivariable analyses were conducted to determine the factors that are independently associated with HIV-positive status. Data were analyzed using SPSS version 24.

The researcher's rationale behind selecting these design and data sources was that both were readily available, quickly obtainable, and economical. Furthermore, using these secondary data from different sources helped to triangulate findings, improved the understanding of the problems. It also provided a basis for comparison of the data collected in different years so as to answer the research questions well.

Literature Search Strategy

The process of literature review for this study included assessing pertinent peer-reviewed articles from the globe, Africa, and Ethiopia using both manual and electronic exploration methods. Different search engines and databases like: UNAIDS/WHO Global HIV/AIDS Online Database, U.S. Census Bureau HIV/AIDS Surveillance Data Base, MEASURE/ORC MACRO Demographic and Health Surveys, the Ethiopia Demographic and Health Survey [EDHS] database, Medline, PubMed, Google Scholar, and Popline/One Source were used to search and identify appropriate studies. The websites of different organizations and other relevant sources were also explored manually. The search for appropriate studies used terms like *prevalence*, *funding*, *services*, *HIV*, *response*, *socioeconomic*, *demographic*, Spending, *trend*, *donors*, and other combinations: *most-at-risk populations*, *vulnerability*, *HIV/AIDS*, *trend-analysis*, *Anti-HIV/AIDS*, *prevalence –rate*, *AIDS-Spending*, and *PEPFAR-spending*.

Literature Review

Prevalence Changes

HIV continues to be a major global public health issue. In 2016, an estimated 36.7 million people were living with HIV (including 34.5 million adults, 17.8 million women

(15+ years), and 2.1 million children (<15 years) – with a global HIV prevalence of 0.8% among adults (UNAIDS, 2017). Around 30% of these same people do not know that they have the virus (UNAIDS, 2016).

Since the start of the epidemic, an estimated 76.1 million people have become infected with HIV and 35 million people have died of AIDS-related illnesses. In 2016, 1 million people died of AIDS-related illnesses (UNAIDS, 2017), and 1.8 million people became newly infected. There has previously been concern that the annual number of new infections among adults would remain static, as incidence rates failed to shift between 2010 and 2015; while new HIV infections among children globally have halved, from 300,000 in 2010 to 160,000 (47%) in 2016(UNAIDS, 2017). However, a slightly positive trend is emerging as new infections among adults are now estimated to have declined by 11% (1.9 million to 1.7 million) - and 16% for the general population - between 2010 and 2016, whereas there was only an 8% decline between 2010 and 2015.

As of June 2017, 20.9 million (56.9%) people (54% of adults aged 15 years and older and 43% of children aged 0–14 years) were accessing antiretroviral therapy (ART). In 2016, the percentage of pregnant women living with HIV who accessed antiretroviral medicines to prevent transmission of HIV to their babies was 76%. As a result of the improved coverage of ART and other HIV services, death rate due to AIDS has declined globally from 2005 to 2016 by 48% (1 million died in 2016 while it was 1.9 million in 2005) (UNAIDS, 2017).

Almost all countries worldwide are affected by the HIV epidemic. No region of the world has been spared. Although the epidemic is global, there is a remarkable

regional variation in its distribution. Some regions are highly affected by the epidemic as compared to other regions. The vast majority of people living with HIV are located in low- and middle- income countries, with an estimated 25.5 million living in sub-Saharan Africa. Among this group 19.4 million are living in East and Southern Africa which saw 44% of new HIV infections globally in 2016(UNAIDS, 2017).

Sub-Saharan Africa (SSA) is also one of the hot spots where HIV AIDS is widely spread and it is more hard hit by the consequences of epidemic than other parts of the world. It is the region where the highest number of victims of HIV/AIDS is found. Out of the 36.7 million people living with HIV worldwide, 69% live in sub-Saharan Africa (UNAIDS, 2017). There are roughly 23.8 million infected persons in all of Africa (WHO, 2015), and 91% of the world's HIV-positive children are also in this continent. According to the United Nation classification of 'generalized epidemic' about 90% of the countries which are located in Sub-Saharan Africa are severely affected by the epidemic. This epidemic has remained the major cause of death in this region.

Although the Africa accounts only for 16.6% of the world population (Worldmeter, 2018), two-thirds of the total people living with HIV (24.5 million) are Africans, of whom 15 million have already died. Sub-Saharan Africa carries a disproportionate burden of HIV, accounting for more than 70% of the global burden of infection. Of the estimated 1.8 million individuals worldwide who became newly infected with HIV or from the 5,000 new infections per day, two out of three are in sub-Saharan Africa with young women continuing to bear a disproportionate burden (UNAIDS, 2016). The newly infected children (<15 years) with HIV includes 160,000 and most of

these children live in sub-Saharan Africa and were infected by their HIV-positive mothers during pregnancy, childbirth or breastfeeding.

In eastern and southern Africa young women (aged 15–24 years) remain at unacceptably high risk of HIV accounted for 26% of new HIV infections in 2016 (WHO, 2016). Countries in North Africa and the Horn of Africa have significantly lower prevalence, as their populations typically engage in fewer high-risk cultural patterns that have been implicated in the virus's spread in Sub-Saharan Africa (Gray, 2007). Southern Africa is the worst affected region on the continent (UNAIDS, 2012). As of 2011, HIV has infected at least 10 percent of the population in Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe (UNAIDS, 2012).

Meanwhile, with increasing access to ART, the number of AIDS related deaths have steadily declined and in sub-Saharan Africa these decreased by 39% between 2005 and 2013 (UNAIDS, 2015). In South Africa alone the decline was 51% whereas in Ethiopia it was 37% and in Kenya it was 32%. Several empiric studies from South Africa, Uganda, Tanzania, Rwanda and Malawi have demonstrated that the impact of modest ART coverage at CD4 cell counts ranging from <200 to 500 cell per µl resulted in significant declines in mortality with life expectancy increasing by an additional 10 years (Herbst, 2009).These studies provide evidence on the benefits of early ART initiation to HIV positive individuals.

HIV/AIDS was first recognized in Ethiopia in the year 1984 (HAPCO, 2005), and the first hospitalized AIDS patients informed in 1986 (Lester, 1988). During those early

times, the epidemic was restricted only in urban areas and among certain population groups in specific commercial routes. Four years later, high HIV prevalence noticed in commercial sex workers and distance truck drivers, which were 17% and 13%, respectively (Mehret, 1990). A prevalence of 24.7% was also reported among sex workers of some urban areas in 1988 and this number rose rapidly in Addis Ababa to 54.3% in 1990 (Mehret& Khodakevich,1990). Since then, the epidemic has expanded throughout the country both in rural and urban area and by the end of 1999, about 3 million people were infected with the virus and made the population the third largest infected globally next to South Africa and India (UNAIDS 2000).

The mode of transmission of the virus in Ethiopia is largely through heterosexual contact and mother-to child transmission with the highest prevalence of infection in the age group of 20-39. Younger age females are also more affected and susceptible for HIV-1 subtype C virus than males (Abebe, 2001). According to AIDSCAP (2001), exacerbating factors for the rapid spread of HIV are: a) cyclical relocation of workers in hunt of employment, which expose them for extramarital sexual intercourse and multi-partner sexual contacts, b) unrest and instability as a result of civil war, c) high prevalence of sexually transmitted diseases in high-risk susceptible groups, d) early sexual debut among youth, and e) huge unemployment rate in the country.

In 1998, the peak HIV prevalence was in the age group 25–29 years, being 16.3% (Fontanet, 1998). For the age group 15-49, the prevalence had shown a decreasing fashion like 2.2% in 2005, 1.4% in 2010, and 1.1% in 2015 (UNAIDS, 2016). In general,

the HIV prevalence levels for both men age 15-59 and women age 15-49 rise with age, but the peaking among women is in late 30s while for men is early 40s (EDHS, 2016).

In 2011, the overall HIV prevalence was 1.5% with 1.9% among females and 1.0% among males (EDHS, 2011). Five years back, the prevalence of HIV in women was 2%, while for men age 15-49 was 1% (EDHS, 2005). According to the Ministry of Health of Ethiopia, the Spectrum Model estimation of HIV prevalence for the year 2012 showed 1.3% overall, 1.8% for females, and 0.9% for males (FMOH, 2012). The most recent 2016 Ethiopia EDHS reported, the prevalence of HIV in women increases with age, affecting 0.4% of women age 15-19 and 3.0% of women age 40-44, before declining to 1.9% among those age 45-49 (EDHS, 2016).

In 1994, data from 11 urban blood bank centers showed that the prevalence of HIV varied from 5–20%, being 6.6% in Addis Ababa (National Blood Transfusion Service, Ethiopian Red Cross Society, personal communication, 1994). There is also prevalence difference in between urban and rural dwellers for both sexes. The prevalence of HIV for women was decreased from 7.7% in 2005 to 3.6 in 2016. Likewise, the prevalence for men was also decreased from 2.4 to 0.2% in 2005 and 2016, respectively (EDHS, 2005; EDHS, 2016). In the regions of Ethiopia, there is extensive prevalence difference, 6.6% in Gambella, 5.0% in Addis Ababa, and 0.7% in Southern Nations, Nationalities and Peoples' region (SNNPR).

High rates of HIV prevalence were soon detected along the main trading roads of the country, with HIV seroprevalence of 17% among commercial sex workers and 13% among truck drivers working along these roads in 1988. However, by 1998, HIV

prevalence among sex workers attending STD clinics had increased to 73% (Aklilu, 2001). Next to sex workers, long distance truck drivers are known to be at increased risk of HIV infection and their HIV prevalence in 1988 was 13% (Mehret, 1990).

Unsolved Issues about Prevalence Changes in the Literature

According to UNAIDS and WHO (2007), HIV prevalence is the proportion of people living with Human Immunodeficiency Virus (HIV), which is estimated to be about 0.5% of the world's population. To get the national HIV prevalence, a number of approaches are being used including: surveys, sentinel surveillance data in ANC, surveys of particular high-risk groups like sex workers, and using secondary data from national HIV/AIDS registries. Meanwhile, in the literatures reviewed, even though there are a lot evidences showing that the prevalence of HIV in Ethiopia is in a decreasing fashion for different community groups, not adequate evidence obtained to show whether the HIV prevalence changes are valid in a statistical sense. In addition, there is little evidence to show where the epidemic is heading with different socio economic and demographic characteristics. Accordingly, this study has answered if the HIV prevalence changes in the country are valid in a statistical sense so as to show where progress is being made in controlling the epidemic, and where priority in the national HIV/AIDS control program should be made in resource constrained setting.

Funding from Donors

Even though a substantial development has been found in combating HIV/AIDS (UNAIDS, 2017), by allocating a significant amount of resources, the problem still creates very big challenges and remains an international emergency (United Nations

General Assembly, 2016). The continuing resource gap is one of the challenges. According to UNAIDS, even if US$19.1 billion was accessible from both international and domestic sources to address HIV in low- and middle-income countries in 2016 (UNAIDS, 2017), US$26.2 billion will be wanted yearly by 2020 to end AIDS as a public health threat globally by 2030 (Izazola, Loures, & DeLay, 2016).

In low and middle income countries, funding from donors represents the major share of the entire expenses for HIV; however, funding from all sources is very important to attain more progresses. In 2016, the donor funding in low- and middle-income countries for HIV decreased by $511 million (from US$7.5 billion in 2015 to US$7.0 billion), which is a 7% decrement, and made it the lowest level disbursements since 2010. The reasons for the declining funding level were several including the one that accounts for the 50% decline - decreases in both bilateral and multilateral funding, exchange rate variations accounts for the 20% decline, malaria and tuberculosis accounts for 30%, the timing of U.S. contributions to the Global Fund to Fight AIDS, and due to U.S. law that limits its funding to one-third of total contributions to the Global Fund (Jen & Adam, 2017). The 2016 decline is due to several factors: actual decreases in both bilateral and multilateral funding, accounting for an approximate net 50% of the decline; exchange rate fluctuations.

HIV remains the second cause of mortality and morbidity in sub-Saharan Africa (Murray et al., 2012). One of the highest HIV prevalence in the world is in Sub-Saharan Africa, which is 5% and it alone makes up two-thirds of the worldwide HIV burden. About 5.7 million HIV-positive adults are living in South Africa. In 2003, PEPFAR

provided 60% of the bilateral assistance to 15 countries of Africa namely: Botswana, Cote d'Ivoire, Ethiopia, Guyana, Haiti, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Vietnam, and Zambia. In 2007, the adult prevalence in these countries were varied from 0.5 to 23.9% though courageous measures are being taken by most HIV-affected sub-Saharan Africa countries, generating adequate public resources for HIV prevention, care, and support activities couldn't be possible; and hence, substantial international funding remains essential for years to come. On the other hand, increasing the government revenue-raising and mobilizing exceptional resources in relation to the epidemic control is becoming important in low and middle-income countries.

According to UNAIDS (2014), the resource needed by 2015 for the HIV response and reducing the number of new infections and AIDS related deaths is about US$22–24 billion. To significantly decrease the AIDS deaths by 90% and scale up the HIV responses by 2030, US$36 billion is estimated to be secured. So far, international financing serves are the substantial source of funding for HIV expenditure. However, because of enthusiastic economic growth predictions and augmented incomes from natural resources HIV funding from external donors is becoming flat-lining (Vassall et al., 2013); and hence, many international and provincial statements have called for governments to fund their own HIV responses (Buse & Martin, 2012; Galarraga et al., 2013; Resch et al., 2015), which on the other hand inform donors to relocate their funds on countries that most need outside supports (Resch et al., 2015).

The U.S. and Global Fund are the largest donors of HIV programs in Africa accounting for 83% of the total funding. However, U.K., World Bank, and Sweden are among the five top contributors of the continent. According to Avert (2012), most of the HIV and AIDS funding is used for ART, HIV testing and counseling (HTC), Prevention of mothers - to-child transmission (PMTCT), condom use and distribution, voluntary male circumcision (VMMC), HIV education, and HIV awareness.

In the past decade, donors supported Anti-HIV/AIDS programs in Ethiopia has been fueling the rapid scale-up services with significant positive effects like dropping rates of new infections and prevention of millions deaths (UNAIDS 2011). Until 2011, Ethiopia has been supported from PEPFAR by more than $1.4 billion and by Global Fund with total disbursements of $1.16 billion, which made Ethiopia one of countries received more funding. The PEPFAR-Global Fund increased in 2010, but reduced almost by 50% as of 2012. Nowadays, there is a cliff in AIDS spending and the government of Ethiopia is in a free fall. Since 2013, Ethiopia has experienced a 79% HIV/AIDS budget reduction from PEPFAR because of HIV prevalence reduction and due to epidemiological trend changes. In only a year time, from 2012 to 2013, PEPFAR funding decreased by US$191 million.

In 2008, more than 20% expenditure for other health programs was supported from AIDS funds; and almost 84% of it was also externally funded. Taking this all in to consideration, though the government of Ethiopia increased public spending, making significant new public funding to health was becoming unlikely because of the low revenue to GDP ratio and high inflation in the country. Accordingly, in spite of many

steps have been taken to improve the health of the people in the last decade, the people still suffer from different diseases and deaths. About 350,000 children die every year and majority (90%) of these deaths is due to easily preventable diseases viz., HIV/AIDS, pneumonia, malaria, diarrhea, and malnutrition. In addition, more than 90 % of new births are conducted in homes without skilled health professionals.

Unsolved Problems about Funding from Donors in the Literature

Even though there is a progress in relation to HIV prevalence in the country, the per capita income may not be adequate to run the started HIV activities effectively; and there is a fear to face serious health challenges if the external funders are not willing to continue supporting and able to sustain existing AIDS programs. The nearly 800,000 people living with HIV, the second-leading cause of death in the country after respiratory infections, may get shortage of accessing ART. An extraction of donor financing, without a compensating domestic financing response, may damage the stability of care for those on ART, and creates huge opportunity costs by shifting fund from other programs run by domestic expenditures. Unexpectedly, some of the other programs run by domestic expenditures may also critical for the success of HIV responses. Accordingly, this study has tried to answer how the decreasing funding levels from the donors' community is affecting the HIV prevalence and given recommendations on how the country finance its cost effective and efficient responses from domestic sources.

Type/Number of Services or Responses to Prevent and Control HIV/ADS and the Funding Levels from the Donors

In 2016, 19.5 million people living with HIV were receiving antiretroviral treatment (ART) - up from 17million in June 2016 and 7.5 million in 2010. If this level of treatment scale up continues, it is estimated that the world will meet its global target of 30 million people on treatment by 2020 (UNAIDS, 2017). According to WHO (2015), a number of vital performance indicators are being used to assess the attainment of ART programs. These performance indicators are: access, coverage of and equity for ART; timely initiation of ART for eligible; retention in care; and tracing of people with treatment failure and switching them to second-line regimens. In the past decade, these indicators were utilized by Ethiopia to monitor and evaluate the performance of its ART program (Assefa et al., 2010; Federal HIV/AIDS Prevention and Control Office, 2013).

Ethiopia as the second populous country in Africa, the per capita income is $505 and 31% of the people are living below the poverty line, which is $1.25/day; and hence, the country ranks 173 out of 187 countries in per capita Gross National Income (UN Human Development Index, 2014). However, the government of Ethiopia has shown strong commitment in responding to the HIV/AIDS epidemic since the first AIDS case was identified in 1984. The government has led a multi-sectoral response which engages government sectors, development partners, civil societies, and the private sector, for which the required governance structures, policy environment and systems for monitoring and evaluation were established and progressively improved based on lessons learnt from experiences.

The response has also required significant resources which have been invested from government, development partners and civil societies. According to WHO (2013), Ethiopia expends 3 to 5 percent of the Gross Domestic Product (GDP) on health while the foreign sources funding 30 to 50 percent; meanwhile, the annual per capita health spending is less than $25. In 2012, the total money spent for HIV/AIDS in Ethiopia was US$ 405 million; of which, US$ 350 million (86%) obtained from external sources, US$55 million (13%) from public income and US$ 680,000 (0.2%) from the private sectors. The proportion of spending the 2012 budget by regions shows that 43% was expended by federal/central government, 13% in Amhara, 13% Addis Ababa, 11% Oromia, 8% South Regions, and 22% for the remaining seven regions or towns (MOH, 2014).

In Ethiopia, the key sources for HIV/AIDS are public (mainly from federal level) and external sources (NHA, 2011). The MOH's expenditure in 2012 for HIV/AIDS prevention and public health, outpatient and inpatient care, research, training, pharmaceuticals, and health administration was about 47 million. The second source of fund, mainstreaming fund, was contributed 3.5 million from sectoral ministries by saving 2% of their budget. In 2012, Ethiopia had external sources of fund, US$350 million, for HIV/AIDS prevention, care, and support programs from different governments including Canada, Denmark, Finland, Ireland, Italy, Netherlands, Norway, Spain, Sweden, United Kingdom, and USA. In general, from external funds for HIV/AIDS, 59% was from government of USA, 30% from global fund, 7% from non-profit international foundations, and 4% from all other externals. Among the total funds obtained from

external sources for HIV/AIDS, 37% managed by the Government of Ethiopia, 60% by external agents, and 3% by private entities (UNAIDS, 2013). In relation to expenditure of money from all external sources by thematic area, HIV treatment, prevention, national system strengthening and Program coordination, and OVC support share the 30.9%, 19.5%, 29.7%, and 6.8%, respectively (FHAPCO, 2012). On the other hand, 26%, 21%, 26%, and 27% of the PEPFAR fund from 2010 to 2017 was used for prevention, care, treatment, and national system strengthening and governance, respectively.

Nowadays, international assistance is essentially flat and some donor countries are reducing their funding (UNAIDS, 2012). Likewise, though the US federal funding for HIV has increased significantly over the course of the epidemic by $5.7 billion (or 20%) when comparing the FY2017 request (34 billion) to the FY 2011 enacted funding level (28.3 billion), funding to address HIV in Ethiopia from PEPFAR was declined since 2010. In 2010, Ethiopia had $291million annual funding from PEPFAR while this amount decreased to $185 billion in 2012, $160 billion in 2013, $126 billion in 2014, and $100 million in 2018. PEPFAR, the commitment of America, is supporting to save lives and realizing an AIDS-free generation globally. Funding from other donors including the United States was also either deteriorated or continued flat. The type of assistance from the donor community includes cash transfer, technical assistance, or commodities. Meanwhile, for all sort of assistance, US is the largest donor in the globe that covers about 65% of the HIV expenditures by donor governments. The second and third donors are U.K. and France cover 12.9% and 3.7% of the HIV expenses, respectively.

Unsolved Issues about Type/Number of Services and Funding Level

According to HIV domestic priority index of UNAIDS (2010), for middle-income countries, to fund its own HIV responses and curb the HIV epidemic, their domestic spending should be increased sustainably; or the funds from international donors needs to be coordinated. Like any sub-Saharan Africa countries, Ethiopia is highly dependent on donor funding and increases worries about the sustainability of its national HIV response (Haacker, 2009) as funding scarcities will have a contrary impact to what has been achieved so far. In order to address the problem related to funding level decrement, vigorous financial tracking system should be in place to understand the funding trends and its relationship with type/number of services or responses to prevent and control HIV/ADS. Knowing the funding level and the type/number of services is critical so as to evaluate the spending patterns and to scale up high impact and effective interventions without interruptions of antiretroviral treatment (ART) and other amenities.

Accordingly, this study examined if there is an association between the declining funding level and the change in HIV prevalence, and whether the funding shortfalls is potential to threaten the gains obtained so far to control the virus. The study has also recommended further studies to identify some specific high impact interventions to address some targeted groups with low funding level; and show the need of sustainable domestic investments to have robust response to the HIV epidemic.

Prevalence of HIV/AIDS with Different Socioeconomic and Demographic Characteristics

Despite the fact that enormous people living with HIV are living in low- and middle- income countries, no county in the world is free from the impact of HIV/AIDS; and cure and vaccine are still distant hopes. One of the reasons that made the prevention and control measures of HIV much more complex is that factors exacerbating the transmission of virus from one person to another are more private, which can be socioeconomic, socio-cultural and/ or epidemiological (Bonnel, 2000). Knowing these determinant factors is very important so as to design effective responses.

A long-held belief on HIV/AIDS is HIV epidemic is derived by poverty. UNAIDS also stated as poverty and underdevelopment aggravate HIV epidemic (UNAIDS, 2001). According to Fenton L. (2004), people practice high-risk behaviors if they are poor; and hence, reducing poverty is the only long term feasible solution to end the epidemic. As UNDP states, poverty comprises deficiency, controlled choices, and unsatisfied competences, and raises to interconnected features of well-being that influence the quality of life (UNDP, 2020). Poverty doesn't essentially restrict to financial capital, enumerated, and reduced in monetary indices. While money is significant, lack of non-monetary resources also leads to sustains poverty (Shelton, 2005), and many people in Africa are in such poverty lacking assets and skills in addition to money. Accordingly, to have basic needs, they indulge into risky sexual behaviors to earn their breads. In a study done to see the prevalence of HIV in eight African countries (Ghana, Kenya, Lesotho, Burkina Faso, Malawi, Cameroon, Uganda, and the United

Republic of Tanzania) by wealth group, the study finding indicated as there is positive association between household economic status and prevalence (Mishra, 2007). According to Hallman K. (2005), poor people usually undertake particular risky practices like earlier sexual debut.

As the result of insufficient financial and little assets poor households are marginalized socially, politically and excluded; and hence, these people are hard to reach for programs aimed to teach on sexual and other behaviors (Cohen, 1998); and incline to lack sufficient information. Poor people also have poor access to health services and nutrition; and can't get treatment for STIs easily. According to Lurie (1995), health services impacts on HIV/AIDS epidemic is the non-treatment of STIs. They are biologically more vulnerable to HIV infection because of the weaken immune system (Stillwaggon, 2002).

Gender discrimination empowers women and creates unfavorable environment fueling the evolution of HIV pandemic. If there is gender discrimination or inequality, women can't negotiate for safe sexual intercourse even with HIV infected partner. The level of education is also one of the determinants of HIV infection. Though in sub-Saharan Africa, at the beginning of the HIV epidemic, the infection infects and affects regardless of people's educational status, less educated were highly susceptible and severely affected by the virus. Therefore, many study findings have shown that HIV infection goes hand in hand with higher socio-professional group, because they are better informed on preventive measures.

For economic reasons, people move from place to place and migrant workers placed themselves in isolated areas where they can't get adequate information and meet their regular sexual partners for a long time, which expose them to unprotected sexual practices. Commercial sex work is also a common practice in such areas for economic motives. Governance or the attentions of governments that give due attention to HIV/AIDS influence the trend of the epidemic; because to invest in HIV/AIDS prevention and control activities, good governance that incited to invest enough in HIV/AIDS and can make decision is pivotal. If a country has devastating economic situation and corrupted political environment, the epidemic is likely to scale up.

Another factors demonstrated for having impact on HIV transmission include condom use and male circumcision. Condom protects the transmission of virus from a non-protected sexual intercourse between individuals. Male circumcision, prepuce removal for men, also showed positive impact on HIV transmission approximately 60% (WHO, 2015).

Definitions

Bilateral support: Bilateral aid represents flows from official (government) sources directly to official sources in the recipient country (UNAIDS, 2005).

Demographic characteristics: Statistical data about the characteristics of a population, such as the age, gender and income of the people within the population (WHO, 2013)

Demographic variables: Characteristics of the aggregate population that marketers use to segment the market, including age, ethnicity, income, education, gender, and race.

Education status: The status of a citizen of a country or state in relation to education or training defined in governmental law or legislation which could be school education, college education, university education, apprenticeship scheme, training course or another defined and appropriate status definition**.**

HIV/AIDS prevalence: Refers to the percentage of people tested in each group who were found to be infected with HIV (UNAIDS, 2005).

*Household income***:** Household income is a measure of the combined incomes of all people sharing a particular household or place of residence. It includes every form of income, e.g., salaries and wages, retirement income, near cash government transfers like food stamps, and investment gains.

Multilateral support: Represents core contributions from official (government) sources to multilateral agencies where it is then used to fund the multilateral agencies' own programs (UNAIDS, 2005).

PEPFAR funding: The President's Emergency Plan for AIDS Relief is an Emergency Plan a five-year bilateral commitment by the United States Government to support HIV/AIDS prevention, care and treatment programs in developing countries (PEPFAR, 2016).

Prevalence: Prevalence is a term used in epidemiology to describe the proportion of a population identified as having a certain condition (such as HIV). The prevalence figure is determined by comparing the number of people found to have the condition with the total number of people in that population group.

Proximate determinants conceptual framework: A framework provides guiding principles upon which socio-economic and socio-cultural variables affect HIV prevalence through biological behavioral factors.

Single point estimate: An estimate of unknown population parameter by using sample data to calculate a single value.

Socioeconomic: Relating to or involving a combination of social and economic factors. It is related to the differences between groups of people caused mainly by their financial situation (Shelton, 2005).

The 90-90-90 Goal: The UNAIDS target to diagnose 90% of people living with HIV by 2020; put 90% of diagnosed people on antiretroviral treatment by 2020; and to suppress viral load of the 90% of people in treatment with fully by 2020(UNAIDS, 2016).

Assumptions

One of the assumptions of this study was that the proximate determinants framework evaluated if the decrement of funding level from donor community was one of the risk factors of HIV spread and change in prevalence. Though the distribution and determinants of HIV infection comprised a lot of factors like socio-behavioral, epidemiological, and biomedical factors, the importance of the role of underlying socioeconomic and cultural determinants has been increasingly acknowledged (Aral& Holmes, 2006). Therefore, Key to the framework was the identification of a set of variables called proximate determinants that can be influenced by changes in contextual variables or by interventions and that has a direct effect on prevalence. In addition to this,

it was assumed that the findings on HIV prevalence from 2005 to 2016 from the Ethiopia Demographic and Health Survey (EDHS), which was implemented by the Central Statistical Agency (CSA), collected and analyzed the blood specimen as per protocol based on the anonymous linked protocol developed for The DHS Program and data were not manipulated or forged.

Scope and Delimitations

In this study, the major issue addressed was the trend of HIV prevalence and its association with funding levels from donors' community. The reason for choosing this specific focus was to know the potential repercussion of the ongoing financial support reduction for HIV/AIDS response in the country (Garmaise, 2015) and the consequence it may create on the availability of ant-AIDS drugs and related prevention and care supports being given to millions of people.

The scope/ boundary of this study was the inclusion of information of people, adult male and female population ages 15-59 years, participated in EDHS 2005/11 and 2016 from the areas where the PEPFAR programs operates, tested for HIV, and had received HIV results. Meanwhile, this study didn't cover the reason for prevalence changes over the year as well as the change of prevalence in areas where donors' supports were not available from the beginning. Furthermore, as DHS doesn't target children under 15 for HIV test, the trend analysis report in this study don't have connection to this age group. The philosophical framework, proximate determinants, which has been used, also delimited the study as it determines the indirect determinant variables and delineates the population. Therefore, the result of this study could be

generalizable only to the PEPFAR program supported areas of the country and to the population groups from age 15-59 years.

Significance of the Study

The potential contribution of this study is examining the trend of HIV prevalence in the country as well as in each region from 2005 to 2016 vis-à-vis funding levels expended from donors' community for the HIV prevention, care, and treatment services. In addition, the correlational analysis that was operated will inform the healthcare decision-makers whether there is an association between trend of HIV prevalence and funding levels; and if looking for sustainable financing initiatives is required. The findings could also deliver ideas if policy revision or formation is needed to target selected HIV/AIDS controlling activities in the national HIV/AIDS control program of Ethiopia in resource constrained settings secondary to the budget reduction or budget cut from the donors' community; and contribute evidence for strategic advocacy for social change in terms of domestic resource mobilization.

Summary

The first section included a review of the problem statement that build up on previous research findings, the research questions and hypotheses, literature associated with Prevalence changes and trend of funding levels from donors' along with unsolved and unresolved issues in the literature. Concise definitions of variables and assumptions that are critical to the meaningfulness of the study have been included sequentially. Boundaries of the study that identifying populations included and excluded are also illustrated. Furthermore, the application of the proximate-determinants as the theoretical

framework has been justified. Finally, brief summary of the methodology and rational for choosing the design have been discussed. The next section presents the research design and data collection.

Section 2: Research Design and Data Collection

The purpose of this study was to examine HIV/AIDS funding from donors, and analyze if funding shortfalls threaten the gains made regarding HIV prevention strategies and whether there is an association between the prevalence of HIV/AIDS and declining donor funding in Ethiopia using the proximate-determinant framework. In this study, I reviewed and analyzed three national surveys, demographic and health surveys done between 2005 and 2016 with interval of 5 years, secondary data from two ANC clinics of public health facilities, and the expenditure analysis data from HIV/AIDS program implementing partners; and in this section, five main sub-sections have been described: namely, Research Design and Rationale, Secondary Data Analysis Methodology, Measurements for Variables, Data Analysis Plan, and Ethical consideration.

Research Design and Rationale

This is a quantitative study which used secondary data from EDHS, expenditure analysis data from HIV programs implementing partners, and health facility reports on HIV test results to examine the associations between the independent and dependent variables as well as HIV prevalence, funding, and trends. As there were more questions that the study needed to answer, multiple dependent variables were used for multiple measures. Accordingly, for research #1 (RQ1), the hypothesis of difference in prevalence among different regions was calculated, and Patterns were displayed by plotting HIV prevalence against years; for research #2 (RQ2), the dependent variable (the outcome) was funding level from donors whereas the independent variable (explanatory variable) was the HIV/AIDS prevalence; for research #3 (RQ3), the dependent variables were

Types/ number of services while the independent variables were the funding level from donors and HIV/AIDS prevalence; for research #4 (RQ4),the dependent variable was the HIV/AIDS prevalence while the independent variables were the socio economic/demographic characteristics including: age, sex, current marital status, educational status of sampled people, employment status, number of lifetime partners, place of living, wealth quintile, and age at first sexual intercourse. Reasons for studying this were to know how HIV prevention and controlling activities are affected by changes, which is declining, in funding from HIV programs donor communities and indicate what the national HIV/AIDS control program should give prior attention in Ethiopia while external budget support is declining. The rationale for using secondary data in this study to measure HIV prevalence and yield was that its analysis was a more convenient as the data were available, economical, and don't need more time for data collection.

Secondary Data Analysis Methodology

Population

As all women between15 and49 and all men between15 and 59 were the target population for the three DHS conducted in Ethiopia, this study targeted these groups of men and women along with their socioeconomic and demographic characteristics, HIV testing results, and types of HIV prevention services received. In addition, to analyze the trend of HIV/AIDS prevalence among 15 to 24yearsold pregnant women, ANC databases of two public health facilities in Ethiopia were used. Even though the principal objective of the EDHS project is to provide up-to-date estimates of key demographic and health indicators, it also collects data on knowledge and attitudes of people about HIV/AIDS

and evaluates potential exposure to the risk of HIV infection by exploring high risk behaviors and condom use.

Sampling and Sampling Procedure

The Ethiopia Population and Housing Census (PHC) results that were conducted by the Ethiopia Central Statistical Agency (CSA) are the sampling frames for each EDHS implemented since 2000. A complete list of enumeration areas comprises information about scene, type of residence (urban or rural), and estimated number of residential households were included in the frame. When the surveys were conducted, stratified sampling methods were used in two stages. Different sampling strata were yielded by dividing regions in to rural and urban. Accordingly, samples of enumeration areas were selected independently in each stratum in two stages. Meanwhile, for this study, the sampling frames were the list of all adult population ages 15-59 years who participated in the past three surveys and who were tested for HIV and received their test results. By doing this, representativeness and external validity of the study were preserved.

Inclusion Criteria for the Study

For the purpose of this study, a sample of adult male and females between 15 and 59 from the three DHS databases were enrolled. The study procedure had guideline for who can or cannot participate in the study. The inclusion criteria were age between 15 and49 years for women and 15 and 59years for men who were tested for HIV and received HIV results.

Sample Size Calculation and Power Analysis

A minimum power of 0.80 and alpha (significance level) of 0.05 was used to obtain sample means in the critical region 5% of the time when the null hypothesis is true. A power of 80 %(or 0.8) indicates that if a survey is conducted repeatedly, 8 out of 10 results will lead to statistically significant outcomes. The alpha or significance level (0.05) is the likelihood of making a type I error or rejecting the null hypothesis when it is true; and a probability of making a wrong decision (Faul et al., 2007; Trochim, 2006).

This study enrolled the data of 1,067 sampled people from the 2005, 2011, and 2016 EDHS (from Tigray, Amhara, Oromia, Afar, Somali, Benshangul, SNNPR, Gambella, Harari, Dire Dawa, and Addis Ababa regions) by taking in to consideration the total population studied by DHS, which was 26,753, and the 3% allowable error. The people sampled in three surveys were women between the ages of 15 and 49 and men between the ages of 15 and 59. For the 15 to 24-year-old pregnant women, data on HIV test results from ANC clinics of public health facilities in Ethiopia have been analyzed separately after each client record was selected using a convenience sampling method.

Data Sources

This study used multiple secondary data sources, mainly the three EDHS (2005, 2011 and 2016) databases that had sampling frames from the Population and Housing Census conducted in 2007. The sampling frames comprise information about sites and place of residences of people that had equal chances to be selected for the surveys. In addition, the database of health facilities, FHAPCO, and records of HIV program implementing partners donated mainly by United State Aid for International

Development (USAID) and Centers for Disease Control and Prevention (CDC)Ethiopia have been used with each organization's consent to review the trend of HIV prevalence and funding levels from donors.

Measurements for Variables

The EDHS survey codebook was used to detect both the dependent and independent variables of this study. For RQ2, funding levels from donors was dependent variable while HIV/AIDS prevalence was independent variable. Type and number of HIV services were dependent variables while funding levels from donors were independent variables for RQ3. For RQ4, HIV/AIDS prevalence was dependent variable while socio economic/demographic characteristics including: age, sex, current marital status, educational status of sampled people, employment status, number of lifetime partners, place of living, wealth quintile, and age at first sexual intercourse were independent variables. Likewise, to make the analysis plan and the selection of statistical tests simpler, each variable was leveled under Nominal, Ordinal, Interval, or Ratio. As the scale of the variable to be measured is potential to drastically affect the type of analytical techniques that can be used on the data, and what conclusions can be drawn from the data, all the necessary precautions were made.

Data Analysis Plan

Statistical Package for the Social Science (SPSS) Version 24 was used for statistical analysis of data. Using it, tabulated reports have been generated, distributions and trends have been plotted, and descriptive statistics and complex statistical analysis

were operated. To answer the research questions of this study, different analysis were operated as follows:

RQ1: How has HIV prevalence changed in Ethiopia during the past 10 years?

To know if there is a statistically significant change in prevalence of HIV, a trend analysis was made. Temporal patterns displayed by plotting yearly HIV prevalence against year. Accordingly, exponential trend lines were fitted to prevalence data for each regions of the country using the DHS 2005, DHS 2011, and DHS 2016 data to assess whether there have been changes in HIV prevalence over recent years; and to assess if these changes are statistically significant. The analysis was conducted separately for urban and rural sites in each region whenever data are available. For each region, the percentage change in fitted prevalence was calculated between the first and last year. The paired sample T-Test was performed for each five year (2005 against 2011; and 2011 against 2016) as well as for the whole 10 years (2005 versus 2016) to assess whether differences in prevalence were statistically significant at $p<0.05$. In addition, to forecast how the prevalence will be changed until 2025, a time serious forecasting analysis was done.

RQ2: How does the trend of HIV prevalence associate with funding from donors?

In order to assess the relationship or association between the HIV prevalence and level of funding from donors' community, perhaps there is a hypothesis that the funding level affects the accomplishment obtained in decreasing HIV prevalence; correlational analysis was computed to test this hypothesis. For this analysis, data on the total funding level released for each region of the country in the past ten years and the annual

disbursements of PEPFAR investing to HIV prevention, care, and treatment services along with the HIV prevalence trends were correlated to identify the degree of correlation using Pearson Correlation of Coefficient (*r*). In addition, the bivariate plot for the two variables has been made to check the relationship. Once the correlation was computed, two-tailed testing with a significance level of 0.05 was also computed to check the significance level and to determine whether the observed correlation is a real one and not a chance occurrence.

RQ3: What is the relationship between the type/number of services being provided to prevent and control HIV/ADS and funding from donors?

To know if the type and number of HIV service are influenced by the funding level from the donors' community, the relationship between services and their number of beneficiaries for adult treatment, adult care and support, pediatric care and support, ARV drug, HIV testing and counseling, and Orphan and Vulnerable children served (OVC) have been analyzed using Pearson's Chi-square test or Fisher's exact to see if there is a statistically significant difference among them. Accordingly, the analysis exemplified if the service types and beneficiary numbers are subjected to vary according to the level of funding.

RQ4: What was the effect of different socioeconomic and demographic characteristics on the trend of HIV prevalence in the past 10 years?

To know the impact of socioeconomic and demographic characteristics (age, sex, current marital status, educational status of sampled people, employment status, number of lifetime partners, place of living, wealth quintile, and age at first sexual intercourse,

etc.) on the prevalence of HIV to the different segment of the population, a multiple regression model was computed to efficiently estimate the measure of association between the dependent variable (prevalence) and independent variables (socioeconomic and demographic characteristics) while controlling confounding factors.

A pair wise analysis was also employed among funding level and each explanatory variable to get the intercept, the regression coefficient for each of the predictor variable, the t-calculated, and *p*-value. In addition, the full regression model was operated to get the regression sum square (R^2), and the condensed regression model was employed to find variable with most significant *p*-value.

Ethical Consideration

This study used databases from formerly conducted surveys (EDHS: 2005, 2011 and 2016), Federal Ministry of Health (FMoH), and records of HIV program implementing partners donated mainly by USAID and CDC Ethiopia. Therefore, the issue of privacy or confidentiality was not applicable as this was already addressed by the principal data collectors. However, to use the data from each, data use agreements were obtained from both.

Summary

Section 2 mentioned the research design chosen to answer the research equations and the rationale for secondary data analysis methodology. The population enrolled in this study, and sampling and sampling procedures along with inclusion criteria were also illustrated well. Sample size calculation and power analysis have been addressed to get the right sample from demographic and health surveys. Last, the measurement of

variability, data analysis plan, and ethical considerations were discussed. In Section 3, results and findings of the study in line with the four research questions will be presented.

Section 3: Presentation of the Results and Findings

The purpose of this quantitative study was to examine the trend of HIV prevalence among Ethiopians and study funding levels from donors in different years for HIV prevention, care, and treatment; and analyzing if funding shortfalls threaten the gains made like low mortality rate due to AIDS because of the influence it may have on HIV prevention strategies. Accordingly, I examined changes in HIV prevalence among people who were sampled for DHS, funding levels, and type and number of services. Section 3 includes results of statistical analyses including a paired t-test, time series forecasting, Pearson correlation, Chi-square, Analysis of Variance (ANOVA), and multiple linear regression (MLR) on secondary data from DHS of Ethiopia. This section includes the results of the dependent sample t-test or paired sample t-test and time series forecasting (RQ1), Pearson correlation coefficient (RQ2), Chi-square test (RQ3), and multiple linear regression (MLR) (RQ4). At the end of this section, a summary statement has been added to conclude the results.

Data Collection of Secondary Data Set

The data source of this study, Ethiopian DHS for 2005, 2011, and 2016, are national household surveys studying nutrition, health, and population. So far, Ethiopia has conducted four series of DHS in 2000, 2005, 2011, and 2016, and the data from the latter three (2005, 2011, and 2016) have been considered to analyze key demographic and health indicators over time. All the surveys were implemented by the CSA at the request of the FMOH to back health policymakers and health program implementers in planning,

implementing, and evaluating programs and strategies to improve the quality of life of the population of Ethiopia.

Descriptive Demographics of the Sample

Table 1 shows descriptive analyses of the demographic characteristics of the 1,067 people sampled from the three surveys. The variables included in this analysis are sex, age, place of residence, educational level, marital status, and region. According to the results of this analysis, among the sampled individuals who were enrolled in the study, males (49.5%) and females (51.5%) were almost equally represented and this was similar in both surveys. Of the participants, 80% were between the ages of 15 and 39 for both sexes and 78.4% were from the rural part of Ethiopia. In terms of education level, 41.8% have no education, 41.5% completed only primary school, and the remaining 16.7% have secondary school and college diplomas. In relation to marital status, 61.2% were married and live together while 33.6% had never married. The number of widowed and divorced participants constituted the remaining 5.2%. As the sample was designed to represent the national population between the ages 15 to 49 years for women and ages 15 to 59 years for men, the samples were taken from each region's urban and rural areas and the two city administrations (Addis Ababa and Dire Dawa) proportionally in terms of the population that each region and city had. Hence, 35% enrolled people in this study were from Oromiya region followed by 23.9% from Amhara. The remaining were from the other seven regions and two city administrations.

Table 1

Selected Background Characteristics of the Sampled People from Ethiopia DHS 2005, DHS 2011 and DHS 2016.

		Year					
Variable		DHS 2005	%	EDHS2011	%	EDHS2016	%
Sex	Female	527	49.4%	574	53.7%	549	51.4%
	Male	540	50.6%	493	46.3%	518	48.6%
Total		1067	100%	1067	100%	1067	100%
Sex	15-19	241	22.6%	244	22.8%	222	21%
	20-24	184	17.2%	181	16.9%	171	16%
	25-29	158	14.8%	189	17.7%	183	17.2%
	30-34	139	13%	123	11.5%	149	13.9%
	35-39	123	11.5%	125	11.7%	123	11.5%
	40-44	102	9.5%	82	7.7%	96	8.90%
	45-49	75	7%	74	6.9%	76	7.1%
	50-54	45	4.2%	49	4.5%	25	2.3%
	55-59	0	0%	0	0%	22	2%
Total		1067	100%	1067	100%	1067	100%
Place of Residence	Rural	898	84.1%	794	74.4%	819	86.2%
	Urban	169	15.9%	273	25.6%	248	13.8%
Total		1067	100%	1067	100%	1067	100%
Educational Level	Secondary and above	152	14.4%	167	15.6%	211	19.7%
	Primary School	371	34.7%	462	43.2%	497	46.5%
	No education	544	50.9%	438	41.2%	359	33.8%
Total		1067	100%	1067	100%	1067	100%
Marital Status	Widow	50	4.6%	21	2%	0	0.0%
	Divorced	29	2.7%	53	4.9%	14	1.3%
	Married and live together	630	59%	626	58.6%	704	65.9%
	Never Married	358	33.8%	367	34.5%	349	32.8%
Total		1067	100%	1067	100%	1067	100%

(Table continued)

		Year					
Variable		DHS 2005	%	EDHS2011	%	EDHS2016	%
Region	Dire Dawa	30	2.81%	5	0.47%	8	0.75%
	Addis Ababa	67	6.28%	59	5.53%	58	5.44%
	Harari	9	0.84%	5	0.47%	3	0.28%
	Gambella	63	5.90%	4	0.37%	3	0.28%
	SNNPR	244	22.87%	203	19.03%	221	20.71%
	Benishangul-Gumuz	14	1.31%	11	1.03%	11	1.03%
	Somali	38	3.56%	21	1.97%	32	3.00%
	Oromiya	334	31.30%	394	36.93%	393	36.83%
	Amhara	228	21.37%	278	26.05%	260	24.37%
	Afar	6	0.56%	17	1.59%	8	0.75%
	Tigray	34	3.19%	70	6.56%	70	6.56%
Total		1067	100%	1067	100%	1067	100%

Study Results

RQ1

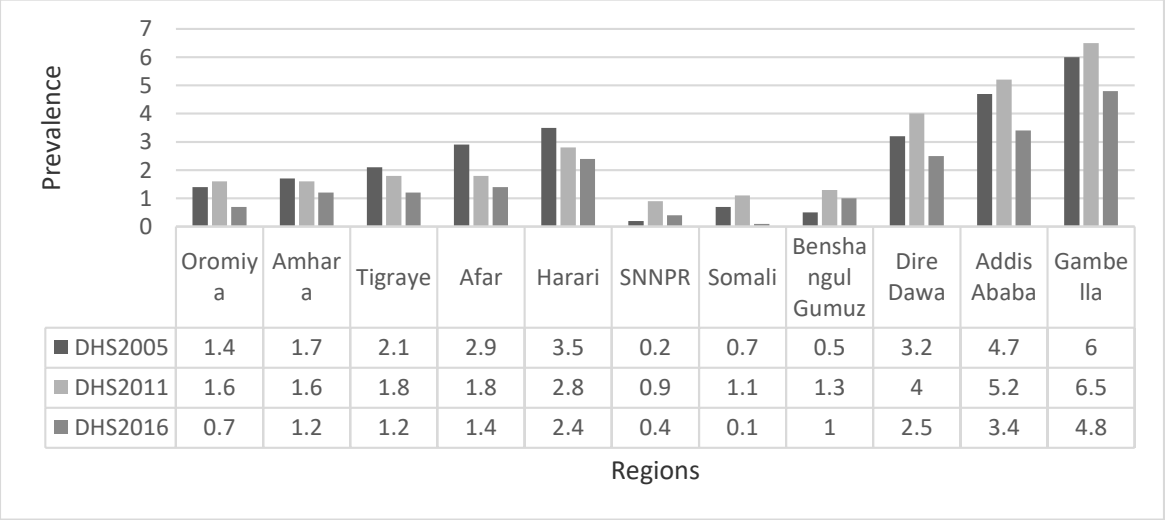
RQ1: How has HIV prevalence changed in Ethiopia during the past 10years?

Statistical assumptions. In order to observe the differences between the two sets of values, before ART treatment officially initiated in the country (2005 prevalence) and 10 years after treatment (2016 prevalence) and assure the quality of the results, a paired sample t-test was computed after evaluating the four main assumptions. According to Busing (2016), the four assumptions that need to be checked to drive a paired sample t-test are that the dependent variable must be continuous, approximately normally distributed, and contain no outliers; in addition, observations are independent of one another. Hence, to operate this parametric procedure, all assumptions were met because the data for prevalence were numeric and continuous and could take any value within a range, the data were inspected for normality by using a histogram, which looked

approximately symmetrical and bell-shaped, and in the visual assessment using a box plot, there were no values that appear far away or outliers from the majority.

In addition to assessing the HIV prevalence changes in Ethiopia during the past 10years, by extrapolating trends and patterns among the past HIV prevalence values, time series forecasting has been operated to predict future values or trends regarding the HIV epidemic using the Autoregressive Integrated Moving Average (ARIMA) (0, 1, 0) model without considering the effect of other variables. Likewise, to run the ARIMA modeling for forecasting time series, assumptions were checked and met. According to Huck (2004), time series analysis is based on the following assumptions: no acknowledged /assumed predictor variables, no seasonal forms, no one time irregularities, and there are dependable correlations between the variable to be forecast and other independent variables.

Trend analysis and paired sample t-test results. National HIV prevalence of Ethiopia was gradually decreasing over the 10-year study period (2005 – 2016). However, regional trends in terms of prevalence density among all ages have varied in all assessment periods. In 2016, the prevalence of HIV in Gambella (4.8%), Harari (2.4%), Addis Ababa (3.4%), and Dire Dawa (4%) regions are far higher than the national prevalence (0.9%) and the global cutoff point for generalized epidemic declarations. Conversely, yearly HIV prevalence rates for Oromia (0.7%), Somali (0.01%), Benishangul Gumuz (1%), and SNNPR (0.4) were less than the average annual national HIV prevalence, as shown in Figure 1.



	Oromiya	Amhara	Tigraye	Afar	Harari	SNNPR	Somali	Benshangul Gumuz	Dire Dawa	Addis Ababa	Gambella
DHS2005	1.4	1.7	2.1	2.9	3.5	0.2	0.7	0.5	3.2	4.7	6
DHS2011	1.6	1.6	1.8	1.8	2.8	0.9	1.1	1.3	4	5.2	6.5
DHS2016	0.7	1.2	1.2	1.4	2.4	0.4	0.1	1	2.5	3.4	4.8

*Figure 2.*HIV prevalence by region of Ethiopia, 2005–2016.

The observed decrement in prevalence during the 10 years intervention time in Gambella was only about 18%. For about seven years from 2005, the prevalence was increasing steadily, but later after 2012, it starts decline even though that prevalence is still more than five folds higher than the national prevalence. In 2016, Gamblella was the first region with highest HIV prevalence.

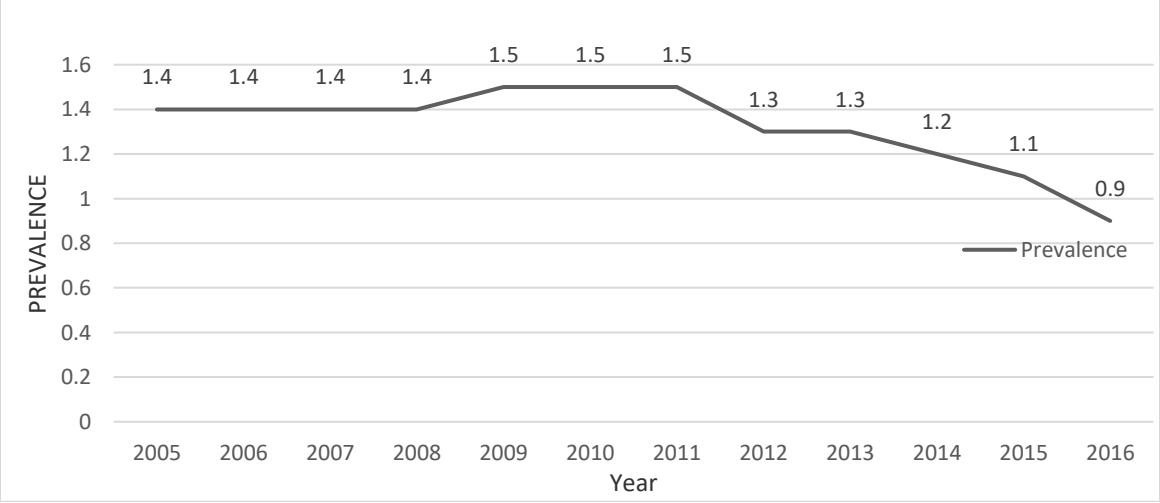


*Figure 3.*The trend of national HIV prevalence of Ethiopia, 2005–2016.

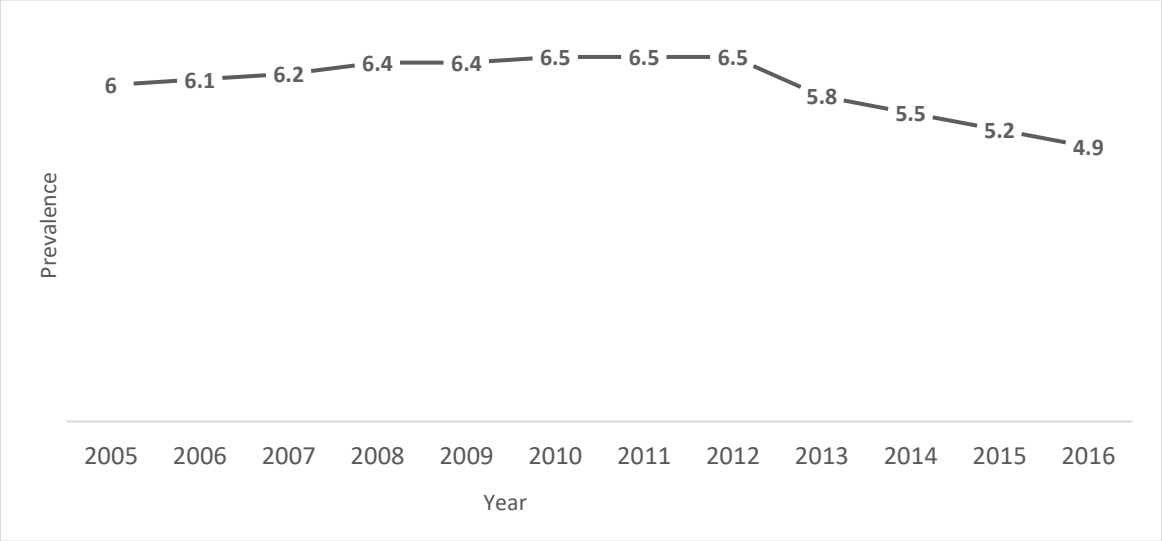


Figure 4.HIV prevalence among all age groups for Gambella region, 2005–2016.

The prevalence of HIV in SNNPR at 2016 was worse than the prevalence that the region had ten years before 2016. In 2005, it was 0.2% while it increased to 0.9% in 2011; and gradually decreased to 0.4% in 2016. Among the 9 regions and 2 city administrations in Ethiopia, the two regions that have higher prevalence of HIV in 2016 comparing their own prevalence data of 2005 are SNNPR and Benshangul Gumuz. Benshangul Gumuz had prevalence of 0.5% in 2005 and 1% in 2016, which was doubled though many prevention and control programs were run in the regions for a decade.

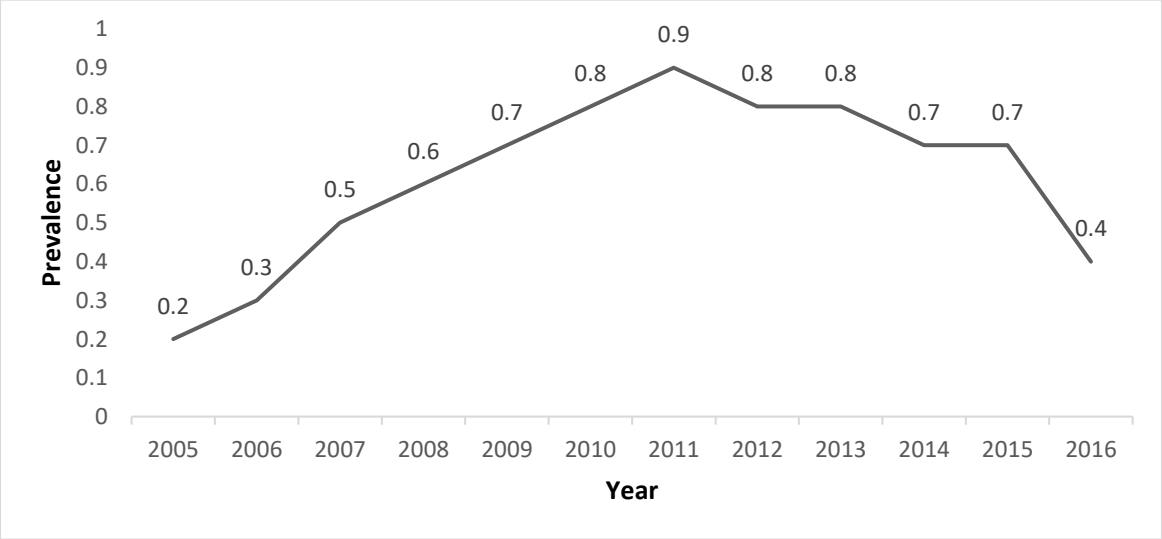


Figure 5.HIV prevalence among all age groups for SNNPR, 2005–2016.

The changes in prevalence among the national urban and national rural dwellers of Ethiopians seem following the same decreasing fashion. There is a 53 % and a 57 % decrement of prevalence in urban and rural areas, respectively. However, at 2016, the HIV prevalence in urban areas was seven times higher than the rural prevalence.

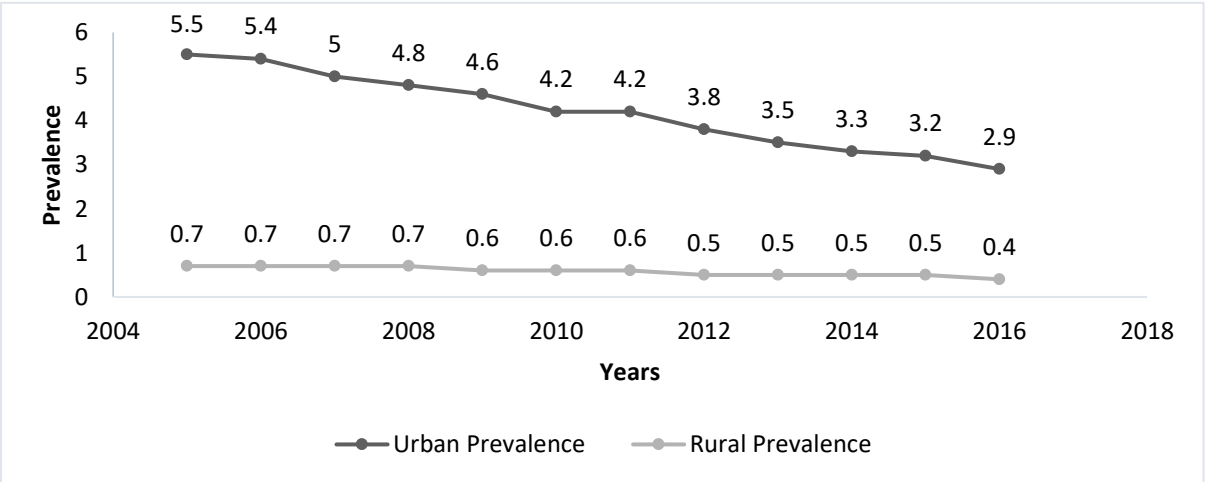


Figure 6.HIV prevalence among all age groups for urban and rural dwellers, 2005–2016.

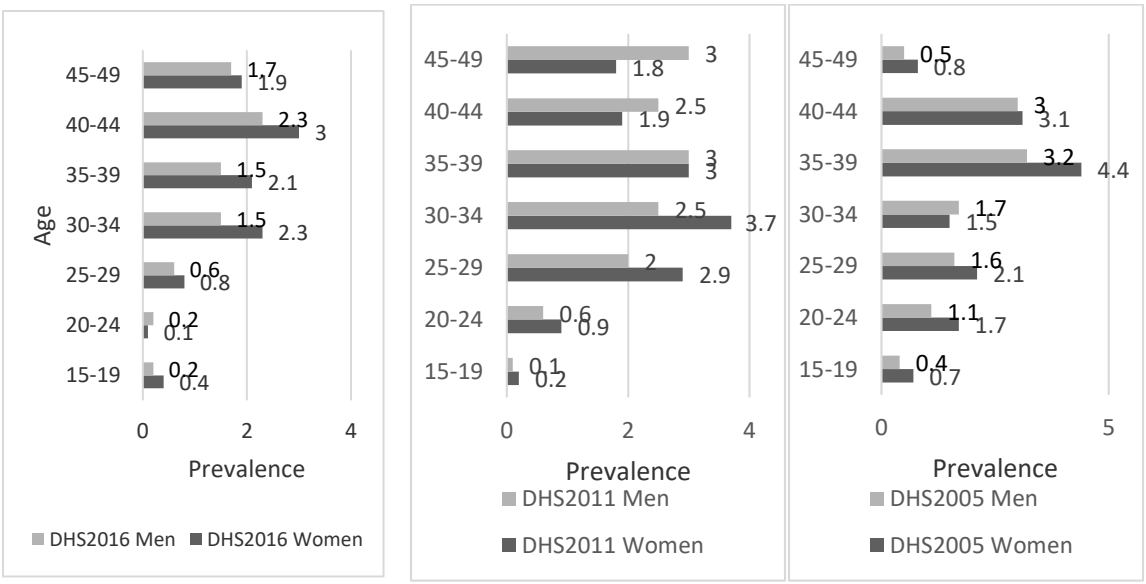


*Figure 7.*HIV prevalence by age, EDHS2005, EDHS 2011, and EDHS2016.

A paired t-test was used to compare the changes in HIV prevalence rates between the nine regions and two city administrations before and after the intervention of HIV prevention, care and support activities. Running a paired t-test allowed to see the effect of interventions in spite of effects unique to certain regions. Table 2 shows for the statistical analysis output obtained from a paired sample t-test, which represents regions' beginning prevalence (2005) and their 2016 prevalence.

Table 2

Paired Sample T-Test among the HIV Prevalence in 2005, 2011, and 2016

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Prevalence in 2005 to 2016	.71727	.61130	.18431	.30660	1.12795	3.892	10	.003
Pair 1	Prevalence in 2005 to 2011	.10000	.65422	.19725	-.53951	.33951	-.507	10	.623
Pair 1	Prevalence in 2011 to 2016	.81727	.59083	.17814	.42035	1.21420	4.588	10	.001

The results from the outputs (Table 2) shows that the prevalence in 2005 (M = .10, SD = .65) and the prevalence in 2016 (M = .71, SD = .61), demonstrated a significant difference in for the general ten years national HIV prevalence (t (10) = 3.89, p = .003). Likewise, the prevalence in the first and second five years was found to be different. In addition, the t-value of the three analyses (3.89, -.51, and 4.59) shows the size of the difference between the mean HIV prevalence rates of the three periods being compared. Accordingly, the large t-value with in 2011 and 2016 indicates a correspondingly large difference between the mean HIV prevalence rates in those years. In addition, the analysis from the records of the 1000 pregnant women 15 to 24- Years-Old attending two ANC clinics of public health facilities in Bishoftu and Addis Ababa from January 2006 to June 2016 depicted as the HIV among pregnant women has notable decline (Figure 9).

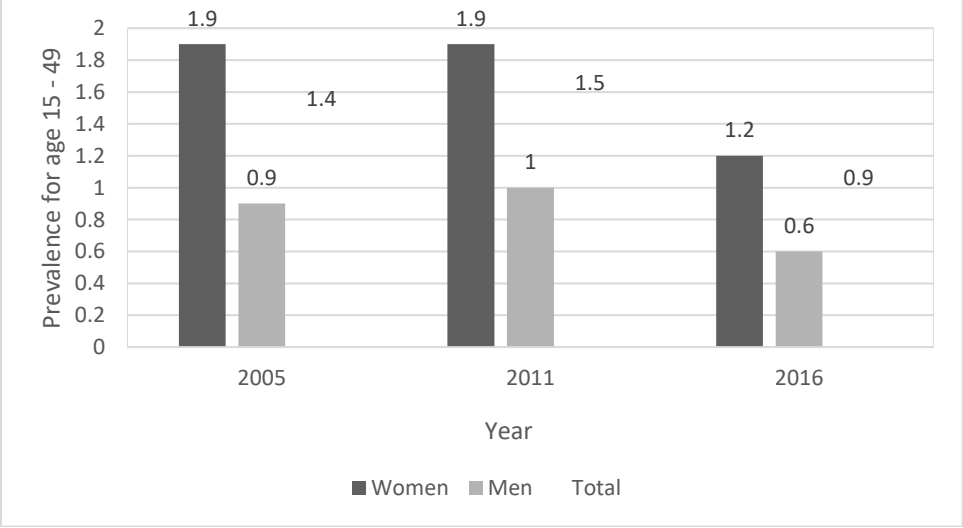


Figure 8.HIV prevalence by sex in 2005, 2011, and 2016.

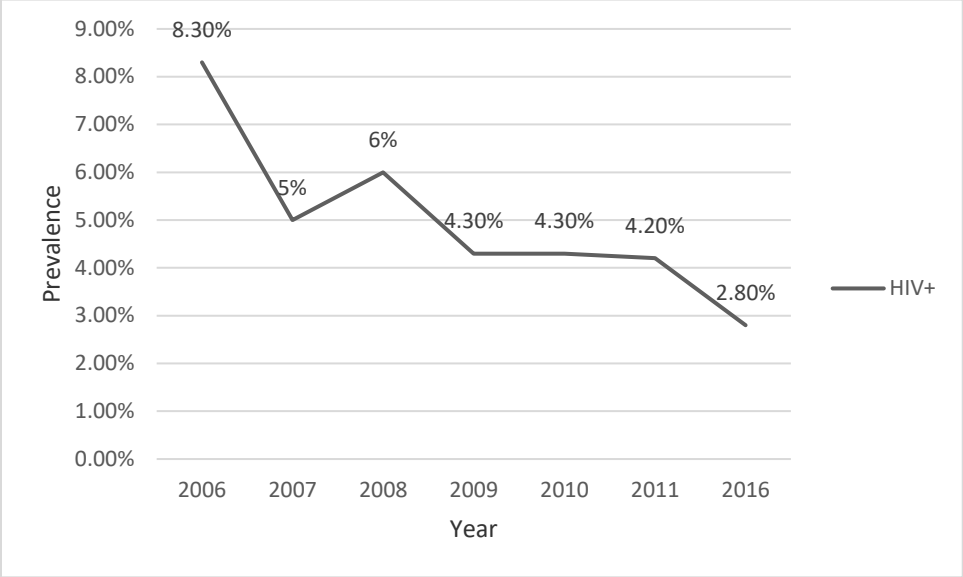


Figure 9.HIV among pregnant women attending ANC by year.

Time series forecasting result. In this time series analysis that was conducted for the national, urban, and rural HIV prevalence of Ethiopia between the year 2017 and 2025, the forecasting demonstrated that there is likelihood for the HIV prevalence trend continue decreasing beyond the year 2017 both for national, urban, and rural Ethiopia. The HIV Prevalence will decline from 2.7% (95% CI 2.9 – 2.4%) in 2017 to 0.7% (95% CI 1.5 – 0.0%) in 2025, 0.4% (95% CI 0.5 – 0.3%) in 2017 to 0.2% (95% CI 0.4 – 0.1%) in 2025, and 0.9% (95% CI 1.0 – 0.7%) in 2017 to 0.5% (95% CI 1.0 – 0.1%) in 2025 for urban, rural, and national, respectively.

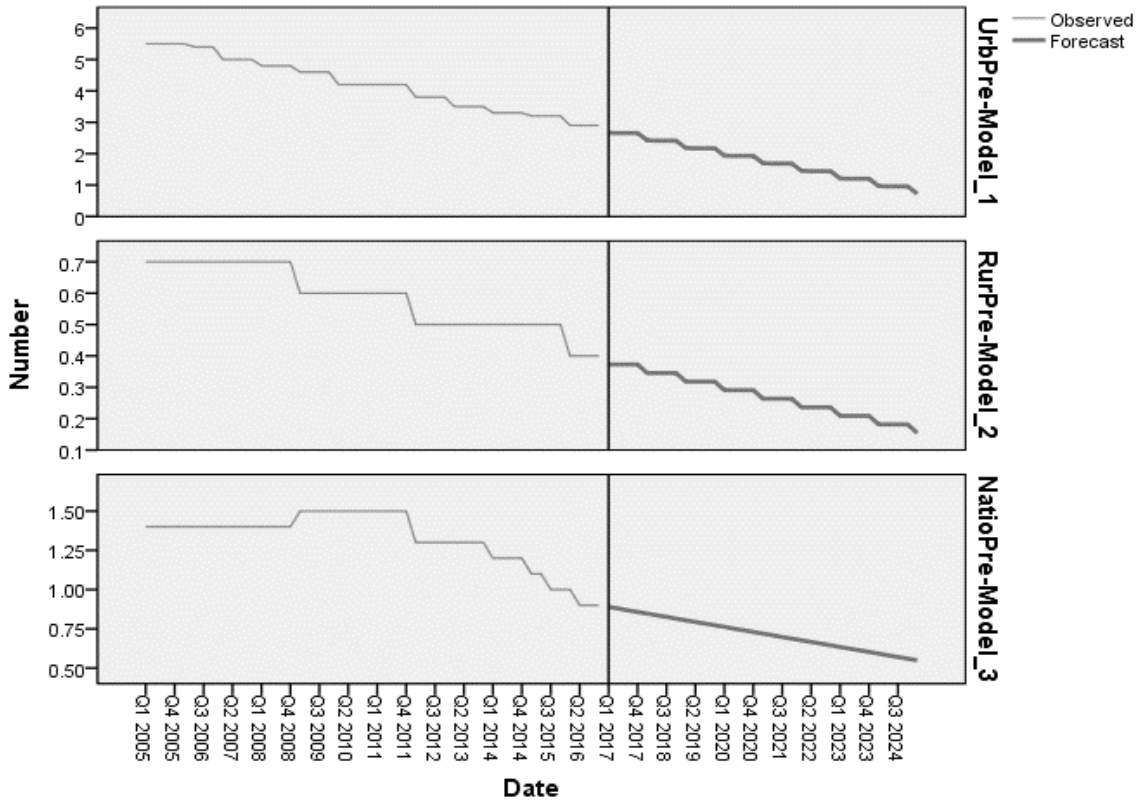


Figure 10. Time series forecasting of national, urban, and rural HIV prevalence rates using ARIMA model

Table 3

Forecasted HIV Prevalence Value for the Period between 2017 and 2025.

		Forecast								
Model		2017	2018	2019	2020	2021	2022	2023	2024	2025
Urban HIV Prevalence-Model_1	Forecast	2.7	2.4	2.2	1.9	1.7	1.5	1.2	1.0	.7
	UCL	2.9	2.7	2.6	2.4	2.2	2.0	1.9	1.7	1.5
	LCL	2.4	2.1	1.8	1.5	1.2	.9	.6	.3	.0
Rural HIV Prevalence-Model_2	Forecast	.4	.3	.3	.3	.3	.2	.2	.2	.2
	UCL	.5	.4	.5	.5	.4	.4	.4	.4	.4
	LCL	.3	.2	.2	.1	.1	.0	.0	-.1	-.1
National HIV Prevalence-Model_3	Forecast	.9	.8	.8	.8	.7	.7	.6	.6	.5
	UCL	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0
	LCL	.7	.7	.5	.5	.4	.3	.2	.1	.1

Hypothesis test result. The hypothesis being tested here is whether the HIV prevalence in the ten years, 2005 – 2016, are the same or statistically different. In this t-

test, the prevalence of the same regions was used to see the change in prevalence between 2005 and 2010, 2005 and 2016, and 2010 and 2016 separately. As the p-value helps to decide whether to accept or reject the null hypothesis, it was imperative to compare the p-values at the significance level of 0.05. The 95 percent confidence interval of the difference provides an estimate of the boundaries between which the true mean difference lies in 95 percent of all possible random samples of regions participating in this study.

As illustrated in Table 2, the t-statistic was obtained by dividing the mean difference by its standard error to give the t-values of 3.89, -.51, and 4.59. The Sig. (2-tailed) column for the period from 2005 to 2010 shows that the probability of obtaining a *t* statistic whose absolute value is equal to or greater than the obtained t statistic is .62. Since the significance value for the difference in HIV prevalence rates between those years is greater than 0.05 (p =.623), it can be concluded that the average difference in HIV prevalence rate of -.100 is due to chance variation. This means, the change in prevalence of HIV in the first five years (2005 – 2010) was not statistically significant. However, from 2011 to 2016, there was a gradual decrease in the HIV prevalence rate and this change was statistical significant (t [10] = 4.59, p = .001), which led to reject the null hypothesis.

Answers to RQ1. The results of the hypothesis tests, trend analyses and Paired Sample T –Test, showed as the national HIV prevalence change in Ethiopia during the past ten years was statistically significant because there was a significant difference in scores for DHS 2005 (M = .10, SD = .65) and DHS 2016 (M = .72, SD = .61) conditions; t (10) = 3.892, p = 0.003. However, while comparing the changes in prevalence between

the first five years (2005 – 2011) and the second five years (2011 – 2016), the HIV prevalence change from 2005 to 2011 was not statistically significant with t (10) = -.51, *p* = .623.

RQ2

RQ2: How does the trend of HIV prevalence associate with funding from donors?

Statistical assumptions. Prior to conducting correlation analysis between the national HIV prevalence and the annual budget, the two variables have been plotted to visually inspect the linear relationship they have and the data follows. The bivariate plot below (Figure 6) shows how the two variables are related or changed together without addressing the question of causality. According to Busing FM (2016), to compute the Pearson's Coefficient, the data set should be normally distributed, a scatter plot should show a linear relationship among data, no outliers, and variables should be continuous. Accordingly, in this analysis all the assumptions were met.

The Pearson correlation result. Pearson correlation product – moment correlations, or *r*, has been calculated for the national and some specific regions' funding level and prevalence to measure the linear relationship between the donors' financial support to fight HIV/AIDS and the HIV prevalence trends. Accordingly, the output (Table 4) gives a correlation matrix for the two correlations and the correlation coefficient show as there is a positive correlation between funding level from donors' community for HIV prevention, care, and support, and national HIV prevalence. This positive correlation coefficient (.635) indicates that there is a statistical significant (*p* = .027) linear relationship between these two variables such that the less prevalence level the country has nationally, the smaller the funding level from donors is. This analysis was

also supported by the Bivariate plot (Figure 6) with regression line and $R^2 = 0.52$, which tells 52% of the variability in national prevalence rate of HIV is accounted for budget level from donors like PEPFAR. However, in a separate analysis that has been computed for all regions to see whether the allocation of funds that obtained from donors for HIV prevention, care, and support have a similar positive correlation with their prevalence or not, the result in two regions shows no relationship between the prevalence of HIV and the budget obtained from donors. The Pearson Correlation and Sig. (2-tailed) for Tigray (r = .375, p =.229), and Gambella (r = .281, p =.376). This indicates the investment to HIV prevention, care, and treatment along with the HIV prevalence trends hasn't been correlated in those two regions.

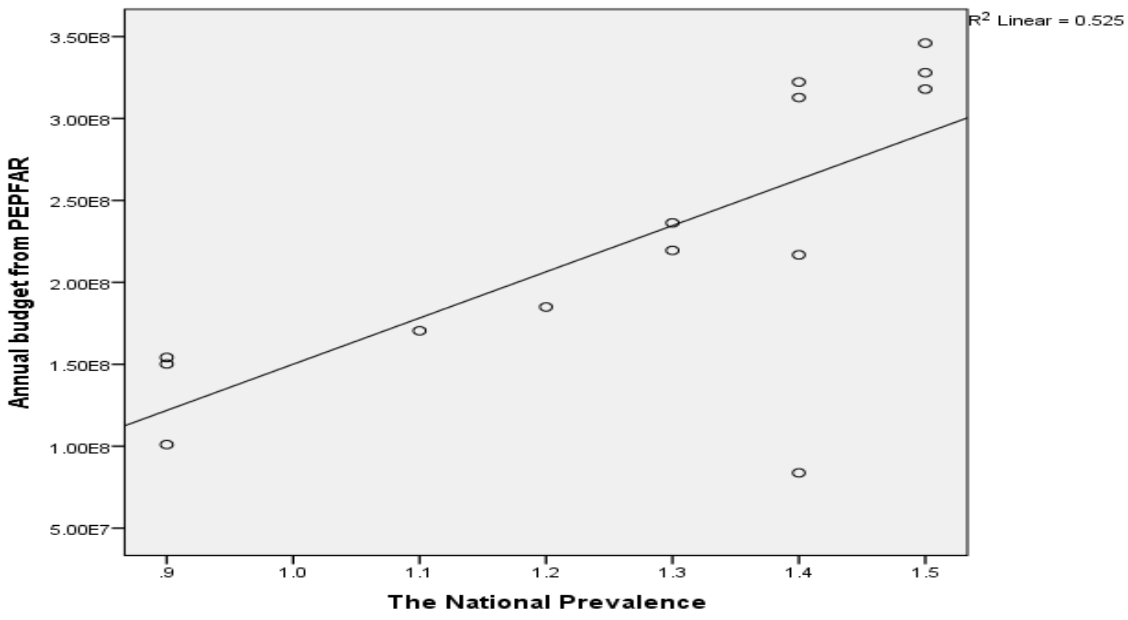


Figure 11. Bivariate plot showing the relationship between the changes in the national prevalence rate and funding level from 2005 to 2016.

Table 4

Correlation between Funding levels from Donors and the Trend of HIV Prevalence.

Correlations			
		National Funding Level from Donors	National Prevalence
National Funding Level from Donors	Pearson Correlation	1	.635*
	Sig. (2-tailed)		.027
	N	10	10
National Prevalence	Pearson Correlation	.635*	1
	Sig. (2-tailed)	.027	
	N	10	10

*. Correlation is significant at the 0.05 level (2-tailed).

Hypothesis test result. There was a statistically significant (r (10) = .635*, p = .027) association between the two variables; and hence, the null hypothesis stated - the level of donors' financial support to fight HIV/AIDS has no relationship with the epidemiological or national HIV prevalence trends – will be now rejected and the alternative hypothesis accepted.

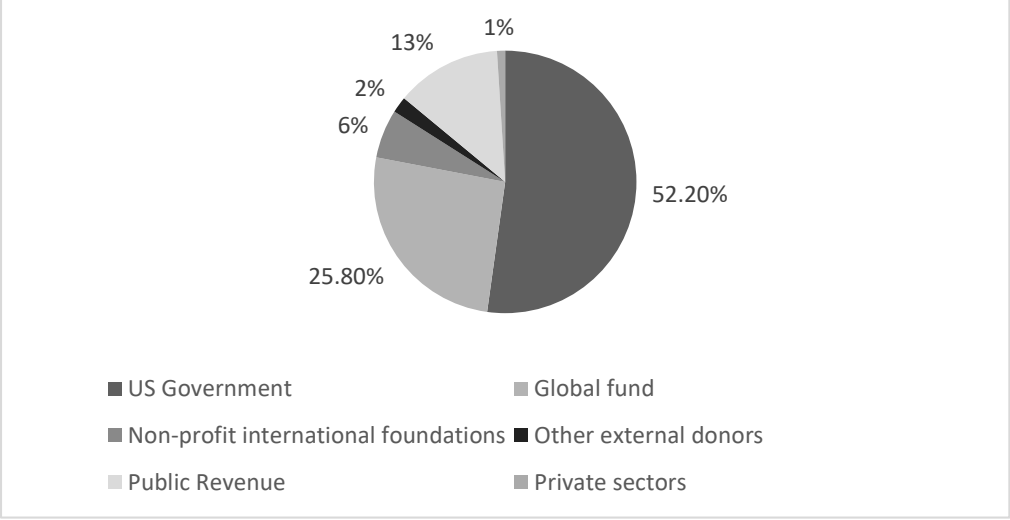


Figure 12.Sources of funds for HIV/AIDS (2005 - 2016).

Answers to RQ2. As correlation measures the linear relationship between two variables, the correlation coefficient between HIV prevalence and funding levels from donors' community has a value of .635* (Table 4) indicates that the association between the two variables is statistically significant (p = .027) and have a positive linear relationship such that the less prevalence the country has, the smaller that country's funding level from donors community is.

RQ3

RQ3: What is the relationship between the type and number of services or responses to prevent and control HIV/ADS and funding from donors?

Statistical assumptions. This research question was analyzed by using crosstabs and Pearson's chi-square. The assumptions to apply a chi-square test include (a) datasets are large enough, (b) not be used on correlated data/ independence, (c) nominal or ordinal categories, and (d) more than 80% of the contingency cells having expected values greater than five (Busing, Weaver, &Dubois , 2015), have been checked for all and confirmed for meeting the assumptions.

The Chi-square test result. The frequency cross tabulated result (Table 5) indicates that there is a highly significant relationship between the different HIV prevention, care, and support services and funding level. The sample included the information of 1067 people served in different years, 37.7% who were served for adult treatment, 64.7% who were provided adult care and support, 12.3% who obtained pediatric care and support, 37.5% who were put on ARV drugs, and 59.4% who were counseled and tested for HIV. The budget allotted for different service areas was also

different in different years (Figure 7 and 8). Accordingly, the Pearson Chi-Square Values for all service areas indicate as there is a highly significant relationship between: funding level and adult treatment, $\chi 2$ (2, N = 1067) = 1425.7, $p < .001$, funding level and adult care and support, $\chi 2$ (2, N = 1067) = 268.7, $p < .001$, funding level and pediatrics care and support, $\chi 2$ (2, N = 1067) = 12.5, $p = .002$, funding level and ARV drug, $\chi 2$ (2, N = 1067) = 38.5, $p < .001$, and funding level and HIV testing and counseling, $\chi 2$ (2, N = 1067) = 181.2, $p < .001$.

Table 5

Type and Number of HIV Services and Funding Levels for 2005, 2011, and 2016.

			Funding Level for each year			Total	Pearson Chi-Square Value	df	Asymptotic Significance (2-sided
			50,000,001-100,000,000	100,000,001 - 150,000,000	250,000,001-300,000,000				
Adult Treatment	NO	Count	1067	224	702	1993	1425.776a	0	0.000
		% within Funding Level for each year	100.00%	21.00%	65.80%	62.3%			
	YES	Count	0	843	365	1208			
		% within Funding Level for each year	0.00%	79.00%	34.20%	37.7%			
	Total	Count	1067	1067	1067	3201			
		% within Funding Level for each year	100.00%	100.00%	100.00%	100%			
Adult Care and Support	No	Count	577	225	328	1130	268.795a	2	0.000
		% within Funding Level for each year	54.08%	21.09%	30.74%	35.3%			
	Yes	Count	490	842	739	2071			
		% within Funding Level for each year	45.92%	78.91%	69.26%	64.7%			
	Total	Count	1067	1067	1067	3201			
		% within Funding Level for each year	100.00%	100.00%	100.00%	100%			
Pediatric Care and Support	NO	Count	946	906	957	2809	12.564a	2	0.002
		% within Funding Level for each year	88.66%	84.91%	89.69%	87.7%			
	YES	Count	121	161	110	392			
		% within Funding Level for each year	11.34%	15.09%	10.31%	12.2%			
	Total	Count	1067	1067	1067	3201			
		% within Funding Level for each year	100.00%	100.00%	100.00%	100%			
ARV Drugs	NO	Count	607	651	743	2001	38.521a	2	0.000
		% within Funding Level for each year	56.89%	61.01%	69.63%	62.5%			
	YES	Count	460	416	324	1200			
		% within Funding Level for each year	43.11%	38.99%	30.37%	37.4%			
	Total	Count	1067	1067	1067	3201			
		% within Funding Level for each year	100.00%	100.00%	100.00%	100%			
HIV Testing and Counseling	NO	Count	267	567	467	1301	181.294a	2	0.000
		% within Funding Level for each year	25.02%	53.14%	43.77%	40.6%			
	YES	Count	800	500	600	1900			
		% within Funding Level for each year	74.98%	46.86%	56.23%	59.4%			
	Total	Count	1067	1067	1067	3201			
		% within Funding Level for each year	100.00%	100.00%	100.00%	100%			

Hypothesis test results. As there was a statistically significant ($p < 0.05$) association between the number and type of HIV related services and funding level, null

hypotheses, which states the type and number of services being provided to prevent and control HIV/ADS in Ethiopia have no relationship with the yearly funding levels from the donor community, will be rejected secondary to comparing the p-value, which is less than the significance level (0.05). In addition, the population proportions in each category are not consistent with the specified values in each category; and hence, the observed values of samples in relation to service areas given in different years with different funding levels and expected values from the specified distribution are statistically different.

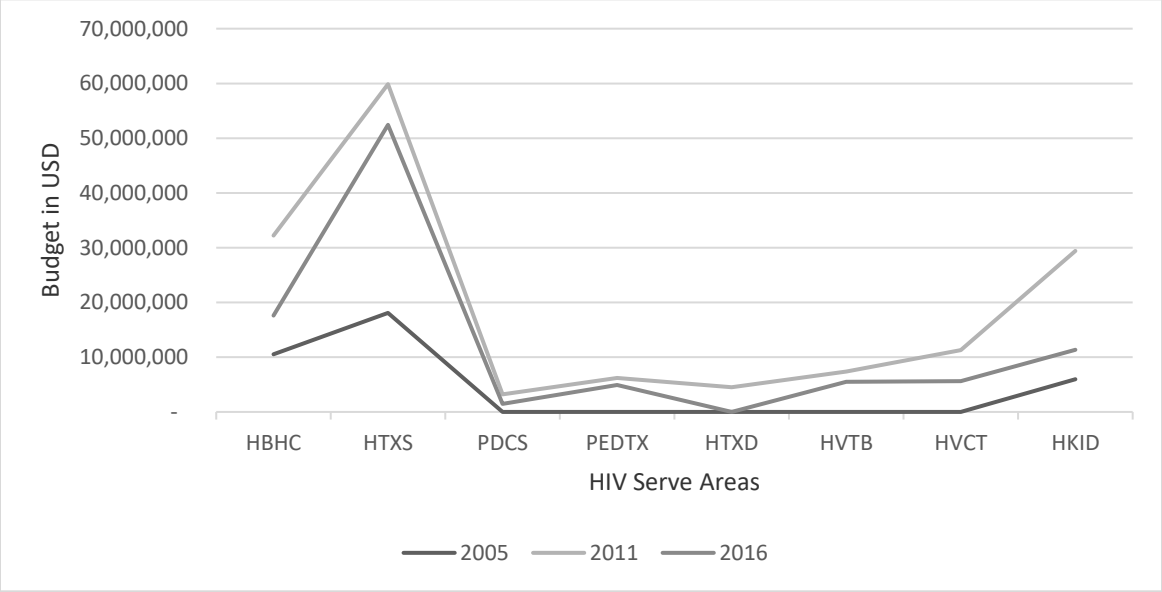


Figure 13. The budget amount allotted for different service areas in different years.

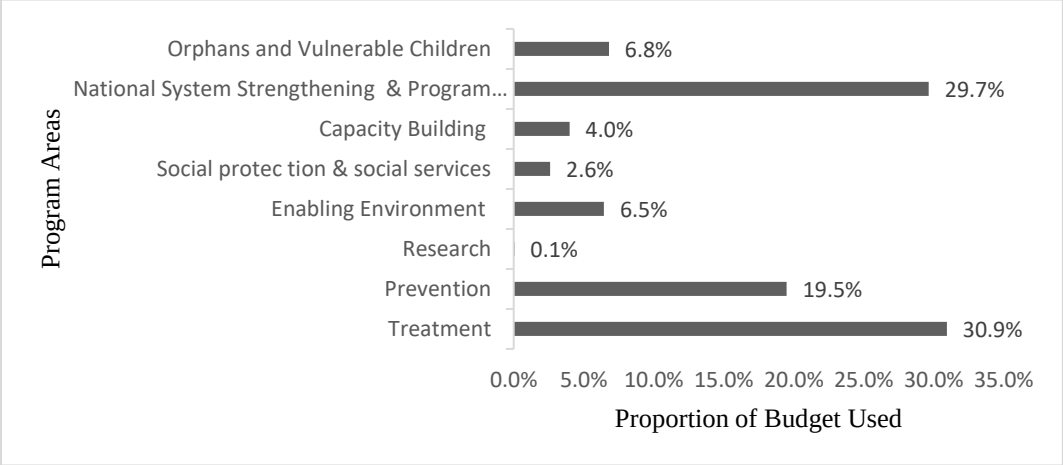


Figure 14. The proportion of budget utilized in different service areas from 2005 – 2016

Answers to RQ3. Results of the hypothesis tests using a chi-square test of independence showed a significant associations and meaningful effect of funding level on each of the dependent selected variable. The large chi-square statistics and small significant level (P< .005) for each indicates that it is very unlikely that these variables are independent of each other. Hence, funding level matters who gets what services and the frequency.

RQ4

RQ4: What was the effect of different socioeconomic and demographic characteristics on the trend of HIV prevalence in the past 10years?

Statistical assumptions. To carry out this multiple regression, all the required assumptions have been checked to make sure that the data used could actually be analyzed using multiple regression. Some of the assumptions checked were whether the dependent variable is measurable in a continuous scale, if there are two or more independent variables, if there are no significant outliers, and if there is a linear

relationship between the outcome variable and the independent, which was checked by using a scatter plot. As most of the multiple regression assumptions were met, this investigation has been computed to see the variables that are good predictors of the current HIV status.

The regression test result. To investigate the effect of predictor variables, age at first sexual intercourse, place of living, number of lifetime partners, educational status, current marital status, sex, employment (in the last 12 months), wealth quintile, and age at the time of study, on an outcome variable – HIV Positive Status, a multiple linear regression, an extension of a linear regression, was computed using SPSS statistics. Consequently, a significant regression equation was found ($F (9, 1056) = 12.639$, $p < .001$) with an R^2 of = .375. The R, R-Square (R^2), adjusted R^2, and the standard error of the estimate were used to determine how well the regression model fit the data. Hence, the R – value (the "R" Column of Table 6) is .612, which represents the multiple correlation coefficient between the predictors and the dependent variable and indicating a good degree of association with fair quality of prediction. The R^2 value (the "R Square" column of Table 6) is .375; and this represents the coefficient of determination that is the proportion of variance in the dependent variable, HIV prevalence, can be explained by the independent variable. This means, according to this analysis the dependent variables explained 37.5% of the variability of the dependent variable, HIV status, which of course not too much.

Table 6

Model Summary Table for Predictors

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.612[a]	.375	.590	4.112

Table 7

F-ratio in the ANOVA Table

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.438	9	.160	12.639	.000[b]
	Residual	13.351	1056	.013		
	Total	14.789	1065			

a. Dependent Variable: HIV Status

b. Predictors: (Constant), Age at first sexual intercourse, PLACE OF LIVING, Number of lifetime partners, Educational Status of sampled People , Current marital status, Sex of Sampled people, Employment (last 12 months), Wealth quintile, Age of sampled people

Table 8

Information about the Effect of Individual Predictor Values

Coefficients[a]							
	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	-.012	.027		-.443	.658	-.064	.041
Age of sampled people	-.005	.009	-.038	-.586	.558	-.022	.012
Sex of Sampled people	.007	.011	.029	.613	.540	-.015	.029
Current marital status	.065	.009	.344	6.966	.000	.047	.084
Educational Status of sampled People	.009	.006	.067	1.511	.131	-.003	.021
Employment (last 12 months)	.038	.013	.148	2.951	.003	.013	.063
Number of lifetime partners	.015	.006	.087	2.534	.011	.003	.026
PLACE OF LIVING	-.087	.011	-.348	-7.765	.000	-.109	-.065
Wealth quintile	5.886E-5	.005	.001	.012	.991	-.010	.010
Age at first sexual intercourse	-.018	.007	-.186	-2.626	.009	-.032	-.005

a. Dependent Variable: HIV Status

Table 8 provided the necessary information to predict HIV status from socioeconomic and demographic characteristics, as well as determine whether HIV status contributes statistically significantly to the model by looking at the Sig. column. The unstandardized coefficients indicates as the value of dependent variable or the likelihood of getting HIV increases based on the increase in each unit changes in predictor value of current marital status, employment (last 12 months), number of lifetime partners, place of living, and age at first sexual intercourse. Meanwhile, the Beta coefficient for current marital status (whether never married, or married and living together, or divorced, or widowed) is found to be the better predictor for the current HIV status ($\beta = .344$, $p < .001$). The significant test for each of the independent variables in the model was also indicated under *p*-value. The *p*-value for the variables: current marital status ($p = .047$), employment in the last 12 months ($p = .013$), number of lifetime partners ($p = .003$), place of living ($p < .001$), and age at first sexual intercourse ($p = .009$) indicate strong evidence against the null hypothesis. In addition, the coefficient for current marital status is .344. So, for every unit increase in marital status, a 0.34 unit increase in prevalence is predicted, holding all the variables constant. Likewise, for every unit increase in number of lifetime partners, a .087 unit increase in prevalence is also predicted.

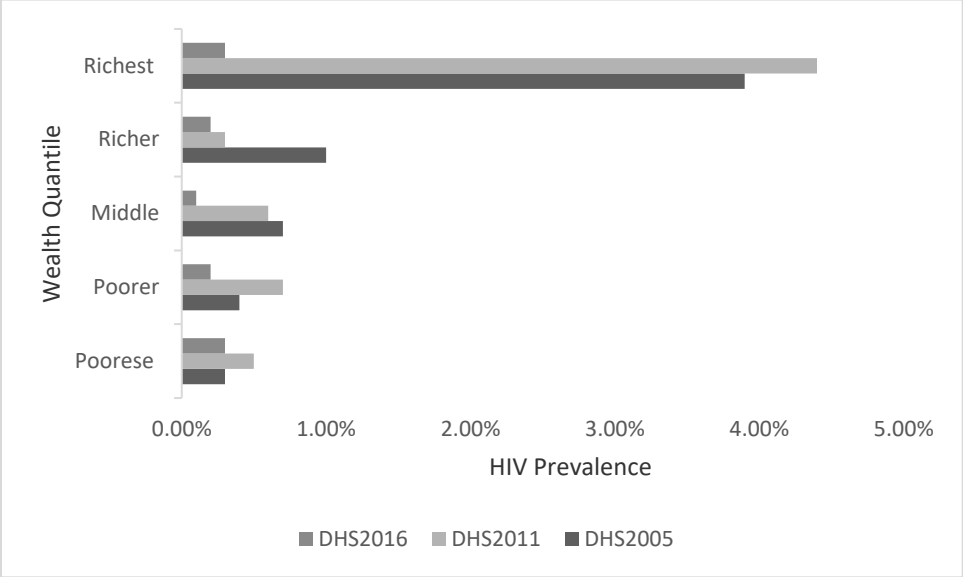


Figure 15.HIV prevalence by wealth quintile.

Hypothesis test result. The F-ratio in the ANOVA (Table 7) shows the overall variance accounted for in the model and the overall regression model fit to the data and some of the independent variables statistically significantly predict the dependent variable, (F (9, 1056) = 12.639, $p < .001$), indicating the null hypothesis, that states The HIV prevalence, in the past ten years, show similar trends to all Socioeconomic and Demographic Characteristics is rejected. The remaining variables, age ($p = .558$), sex ($p = .540$), educational status ($p = .131$), and wealth or economic status ($p = .991$) were not statistically significantly to the predictors.

Answers to RQ4. As per the multiple linear regression model summary and overall fit statistics, the adjusted R^2 of the model is .590 with the $R^2 = .375$. This means that the linear regression indicated 5 of the 9 predictors explain 37.5% of the variance, which shows how well the regression equation fits the data to predict the dependent variable

significantly. Hence, the prevalence of HIV was not the same for all socioeconomic and demographic characteristics in the past 10years, 2005 – 2016.

Summary

Section 3 illustrated major findings of the four research questions of this study. In this section, the purpose of using quantitative study, the data sources, the result of descriptive analyses to the demographic characteristics of sampled people, statistical assumptions for each statistical tests, test results, and answers to research questions have included. This doctoral study examined the data collected for the three (2005, 2011, and 2016) Demographic and Health Surveys conducted in Ethiopia. The target populations for these surveys were all women ages 15 to 49 years and all men ages 15 to 59 years.

The result of this study has demonstrated as the national HIV prevalence changed in the country during the past ten years was statistically significant because there was a difference in scores for prevalence in 2005 ($M = .65$, $SD = .61$) and the prevalence in 2016 ($M = .71$, $SD = .61$) conditions; ($t(10) = 3.89$, $p = .003$). The national trend of HIV prevalence was also found associated with funding levels from donors' community, $r = .635$, p .027, and funding level matters who gets what service areas, $P < .005$. Last, the result depicted as the prevalence of HIV in the study periods was not the same for all socioeconomic and demographic characteristics, $F(9, 1056) = 12.639$, $p = .00001$.

In the next chapter, chapter 4, the detail interpretation and analysis will be presented along with its application to Professional Practice and Implications for Social Change. Likewise, section 4 will encompass comparison of findings to literature, limitations, recommendation, and conclusions that are pertinent to this doctoral study.

Section 4: Application to Professional Practice and Implications for Social Change

The purpose of this quantitative secondary data analysis was to examine the trends of HIV prevalence in Ethiopia from 2005 to 2016 and funding levels from donors for HIV prevention, care, and support services during those years. In addition, the study explored if funding from donors is a proximate determinant for prevalence change, funding shortfalls threaten the gains like reduction of mortality rate due to HIV/AIDS, and there is an association between declining funding levels and the change in prevalence of HIV/AIDS. The reasons for conducting this study were to understand how HIV prevalence is being changed in Ethiopia, how the change in HIV prevalence is associated with funding levels from donors, how the change in funding level influence the type and number of services, and the effect of different socioeconomic and demographic characteristics on the trend of HIV prevalence.

This study illustrated that the national HIV prevalence change in Ethiopia during the time from 2005 to 2016 was statistically significant (t (10) = 3.892, p = 0.003).HIV prevalence and funding levels from donors have a linear relationship (r (10) = .635, p = .027), and there are significant associations and a meaningful effect of funding level on number and type of services (P< .005), and the regression test computed to investigate the effect of predictor variables showed that current marital status, employment status(last 12 months), number of lifetime partners, place of living, and age of first instance of sexual intercourse are better predictors for current HIV status (β = .344, p< .001).

Interpretation of the Findings

My analyses of the DHS and facility-based data to answer the four research questions indicated significant relationships between the trend of HIV prevalence, funding level, and the number and type of services. In the following subsection, I compared findings to the literatures and the proximate determinant framework. The comparison follows the research questions' series.

Comparison of Prevalence Findings with Literature

National prevalence. According to Tadele, Abebaw, and Abdulsemed(2016), even though there were 160,000 new HIV infections annually in Ethiopia, this number gradually declined by 81% in 2016. The number of newly infected people has also declined by 0.1352 per 1000 people since 1990 and reached 0.33 per 1000 among all ages in 2016. Kendall and Danel (2014) said that the burden of HIV in Ethiopia shows a decreasing trend because of the substantial advances that have been made to increase access to services, reduce stigma and discrimination, increase social support, and mobilize communities. Likewise, the findings of this study confirm that HIV prevalence in Ethiopia declined from 1.4% in 2005 to 0.9% in 2016 for all groups and this change was valid in a statistical sense. However, between 2006 and2011, the prevalence was unchanged despite many prevention and control measures were undertaken.

Regional prevalence. UNAIDS (2013) showed Ethiopia has a generalized and heterogeneous type of epidemic with regional variations. EDHS (2011) had also illustrated variations in HIV prevalence among regions ranges from 0.9%, 1%, 5.2%, to 6.5% for SNNPR, Oromiya, Addis Ababa, and Gambella regions, respectively. This

variation was also observed in this analysis. Gambella had the highest prevalence in the past 10years (6% in 2005, 6.5% in 2011, and 4.8% in2016) followed by Addis Ababa (4.7% in2005, 5.2% in2011, and 3.4 % in2016). There were also some regions that had lower HIV prevalence before ten years and in 2016 their HIV prevalence increased noticeably. Regions with the lowest prevalence at the beginning and increased later include SNNPR (0.2% in 2005 and 0.4% in 2016) and Benshangul Gumuz (0.5% in 2005 and 1% in 2016).

HIV Prevalence by Urban and Rural Areas of Ethiopia. Ethiopia had a prevalence reduction of 55%in between 2000 to 2008, $p<0.00$. However, at the beginning of 2005, the difference between urban and rural HIV prevalence had a large width ranging from 0.7% for rural areas to 5.7% for urban areas, but this variation reached 0.6% in 2011 and 0.4% in 2016 for rural areas and 4.2% in 2011 and 2.9% in 2016 for urban areas. In this study, 78.4% of sampled people enrolled were from rural parts of Ethiopia while 21.6% were from urban areas. The reduction in prevalence in the mentioned period was also observed in many African countries by 25% both in urban and rural areas, which was a statistically significant change. While Ethiopia had a prevalence reduction of 55% during 2000 to 2008, Kenya had a reduction of60% in rural and urban areas ($p<0.01$). Likewise, studies show that HIV prevalence had exhibited a dropping trend in greater than 80% of African countries both in urban and rural areas.

Prevalence by sex and age group. In many countries, there is evidence indicating that HIV prevalence among young people is declining due to changes in risky sexual behavior including early sexual debut, multiple sexual partners, and unprotected

sexual intercourse. The largest decrease (42%) has been observed in African American women since 2005; and in the time from 2011 to 2016, in US, there was a 25% decline in prevalence while the prevalence for men has declined by 11% since 2005 (CDC, 2016). Similarly, the decreasing prevalence trend has also been observed in Ethiopia both for women and men between the ages of 15 and 49. In the period between 2005 and2016, prevalence declined for women (statistically significant at $p<0.05$) and was higher for men (1.9% versus 0.9% in 2005, 1.9% versus 1.0% in 2011, and 1.9% versus 0.6% in 2016). As age of women increases, HIV prevalence also increased from 0.4% to 3% for the 15-19 and 40-44 age groups, respectively. The increase in men for 15-19 age group was 0.1%, and for the 40-49 age groups, it increased by 1.6%. Meanwhile, even though the HIV prevalence trend for men age 15-49 declined, the change was not statistically significant for the period between 2005 and2011.

HIV prevalence in the future. Hailay, Paul, Kifle, and Lillian (2017) showed the likelihood of increasing or relapsing of HIV prevalence in Ethiopia after 2016 because of high ART defaulters' rates (22.3%); however, the time series analysis result of this study shows, unless unforeseen internal and external factors affect the trend, the HIV prevalence will continue to downfall from 2.7% in 2017 to 0.7% in 2025 for urban, from 0.4% in 2017 to 0.2% in 2025 for rural, and from 0.9% in 2017 to 0.5% in 2025 for the country, Ethiopia. The justification given by Hailay, Paul, Kifle, and Lillian for the likelihood of increasing of HIV prevalence to the future was linked to the decreased trend of adhering to ART. According to this study, one out of five Ethiopian dropped from taking ART and those who withdraw from the treatment (usually women and

HIV/tuberculosis co-infected people) are more likely to contribute for further transmission of HIV.

Comparison of Funding Level Findings with Literature

Ethiopia spends 3 to 5% of their GDP on health, which makes annual per capita health spending less than $25, while foreign funding covers 30 to 50%. In 2012, the total money spent for HIV/AIDS in Ethiopia was $ 405 million, of which $350 million (86%) was obtained from external sources, $55 million (13%) from public income, and $680,000 (0.2%) from the private sector (WHO, 2013). Though health spending in Ethiopia had similar trends for many years, since 2008, funding from external donors is flat lining or decreasing (Vassall et al., 2013).The reasons for declining funding levels were decreases in both bilateral and multilateral funding, which accounts for a 50% drop of funding levels, exchange rate variations, which accounts for a20% drop of funding levels, and U.S. contributions to the Global Fund to Fight AIDS, Malaria, and Tuberculosis, due to the law that limits its funding to one-third of total contributions to the Global Fund (Jen & Adam, 2017). Therefore, one of the objectives of this study was to know if this funding decrement is correlated with HIV infection rates or prevalence trends. Accordingly, the results of this analysis showed that there is a positive correlation between funding from donors in terms of HIV prevention, care, and support, and national HIV prevalence. The positive correlation coefficient (.635) indicates that there is a statistically significant (p = .027) linear relationship between these two variables such that the lower HIV prevalence level the country has nationally, the smaller the funding level from donors is. An empirical research finding that was conducted by Azuine et al.

(2014) on the impact of international humanitarian assistance on combating HIV/AIDS had also showed that the decrease of donor assistance in developing countries followed an overall reduction of HIV infection rates.

According to the finding of this study, while the prevalence of HIV decreased from 1.4% to 1.1% between the years 2011 to 2016, the PEPFAR fund was decreased by 57%. Though this decrement follows the descent of prevalence, it doesn't seem proportional and may cause shortage of fund to carryover started programs appropriately. As Samji (2013) illustrated that defunding the HIV/AIDS program disproportionately may cause catastrophic phenomenon like flaring up the disease again as HIV drugs are not curing AIDS and should be taken life-long. This was also supported by UNAIDS (2017) because ending HIV/AIDS depend largely on the funding level and ability to provide HIV treatment to all who need it. In the meantime, nowadays, Ethiopia adopted the global 90–90-90 HIV prevention targets by 2020 which is part of strategies designed to eliminate HIV/AIDS epidemics by 2030; and to attain these targets funding level will remain to be a critical area.

Last, according to MoH (2014), the proportion of spending HIV budget by regions shows that 43% was expended by federal/central government, 13% in Amhara, 13% Addis Ababa, 11% Oromia, 8% South Regions, and 22% for the remaining seven regions or towns and this distribution considers the prevalence and total population in each region. This spending proportion was in concurrence with the finding of this analysis except the deviation observed in two regions, Gambella and Tigraye. The

investment to HIV prevention, care, and treatment along with the HIV prevalence trends hasn't been correlated in those two regions, r = .375, *p* =.229.

Comparison of Findings Regarding Service Areas and Funding

According to FHAPCO (2012), the expenditure of money from all external sources disperse as 30.9% for HIV treatment, 19.5% for prevention, 29.7% for national system strengthening and program coordination, and 6.8% for OVC support. This distribution of funds was also similar to the finding of this analysis for the remaining years. The two main external sources of fund for HIV prevention, care, and treatment are PEFPAR and Global Fund. While 31% of PEPFAR's support goes to national systems strengthening and program management, 27% and 17% go to treatment and care, and prevention, respectively. On the other hand, 51% Global Fund share goes primarily to treatment; and the remaining 28% and 9% go to systems strengthening and program management and prevention, respectively. In relation to the finding of this study, the type and number of HIV service in the study period were influenced by the funding level from the donors' community. The number of people served for different service areas were varied with the total funding level, but proportional. Adjusting the number and type of services with the level of funding could be applicable for some services; however, it will not be always applicable as some service areas are sensitive. For instance, while this analysis is done, there are 460,564 people on ART and they need to get their treatment for their life time unless cure is possible in the future. This activity, unlike other activities, can't be discontinued because funding level is decreasing. Therefore, even though there is a statistically significant ($p < 0.05$) association between the number and

type of HIV related services and funding level, some activities like ART need to get due attention. In general, to know whether the funding breakdown by thematic area is a cost-effective way of investment or not, further studies shall be considered in the future.

HIV Prevalence by Socio-demographic Characteristics

One of the aims of this analysis was to determine the important factors that fuel the HIV prevalence among variable that were used in the three EDHSs. Therefore, the effect of different Socioeconomic and Demographic Characteristics on trend of HIV prevalence in the past ten years was analyzed using a multiple regression. The analyses discovered that the odds of HIV infection were generally elevated among widowed and divorced women. When the current marital status of sampled people assessed, 77% and 93% widowed were women in EDHS2005 and EDHS 2011, respectively. The number of divorced women was also found high in both surveys. Among the divorced sampled people, 91% were women in EDHS 2005, 77% in EDHS 2011, and 83% in DHS2016, which has a good degree of association with fair quality of prediction or the likelihood of getting HIV increases based on the current marital status. This finding was confirmed with a number of studies. A study conducted by (Rand & Daniel, 2004) in Kampala and Lusaka on HIV within behavioral risk groups identified a significant rate of infection among divorced and widowed women followed by singles. This was also consistent with another study conducted by (Mmbaga et al., 2007) in Arusha, Tanzania, revealed that the HIV prevalence is higher in divorced and separated individuals compared to cohabiting and married couples. Another analysis from 13 sub-Saharan Africa countries also has discovered that separated and widowed individuals are at higher risk of acquiring HIV

than single or married, especially if they are females. For example in Cote d'ivoire13% versus 6%, Kenya 17% versus 8%, Lesotho 46% versus 26%, Ethiopia 6% versus 1%, Rwanda 12% versus 2%, and Zimbabwe 46% versus 17% the prevalence of HIV was higher in divorced and remarried women than others (de Walque & Kline,2012).

Age at first sexual intercourse was also one of the important variables found to have strong association with HIV prevalence. Accordingly, this study has recognized a significant rate of infection among women with early sexual debut. For both sexes who first had sex after the age of 20, the HIV prevalence was low. However, women who first had sexual intercourse at the age 18 or below had a prevalence of 1.9% while men who reported first sexual intercourse at age 16 had a prevalence of 1.4%. Similar studies have discovered that higher level of infection among girls than boys of same age because of a number of facts. According to Hallett et al. (2007), during young age, girls usually make sex with older men while boys have sex with girls having relatively similar ages. Poverty usually motivates many girls to have sexual intercourse with older men or 'sugar daddies' and 90 percent of HIV infections contributed by 15 – 24 years old women (Jewkes, 1999). For both sexes, HIV prevalence increases with increases number of sexual partners. The prevalence of HIV among women increases from 0.8% to 7% while the number of lifetime sexual partners increase from one to 10 or more. However, this level of exposure is lower for men, and hence, it grows from 0.3% to 2.9% with 10 or more lifetime sexual partners. This finding was also confirmed by another study conducted by Hallett et al. (2007) that shows how age at first sex is associated with HIV infection. According to this study that was conducted in Zimbabwe, women who started sex at the

earlier age are more likely to be infected by HIV as they will have many lifetime sexual partners than those who stayed abstain from sex in their teenage.

Place of living or place of residence was also identified as a potential factor affecting the prevalence of the epidemic because of the socio-economic and socio-cultural variation in between rural and urban areas. Among sampled people for this study, 34% were from the urban areas. In the meantime, the finding depicted that people living in urban areas are at higher risk of acquiring the disease than rural dwellers. In rural areas as there is high influence of traditional values and limited sexual network, the prevalence is low. Therefore, in urban areas, HIV prevalence is seven times higher (2.9% versus 0.4%) than in rural areas for both sexes. While we see separately for women and men, urban HIV prevalence for women is 3.6% and the rural prevalence is 0.6% while the matching percentages for men are 2.0% and 0.2%, correspondingly.

In many study findings, educational status mentioned as one of the important socio-economic factors affecting the AIDS epidemic all over the world. Accordingly, in this study even though the impact of education on prevalence of HIV was not found statistically significant (p =.132), the result showed that people who completed primary school are at higher risk of getting the disease than illiterate or no education. As it is believed, education improves the awareness of individuals to access different information about the epidemic and get services in addition to improving personal income in the long run. According to Fylkesness et al. (1998), getting HIV infection is growing significantly with increasing educational status or accomplishment in rural and urban inhabitants of Zambia. Another study done in Zimbabwe had also showed that educated persons have

higher risk getting HIV infection in Africa because of the fact that people have possibility of changing sexual partners frequently (Mmbaga et al., 2007).

Another socio-economic factor that was assessed for its effect on prevalence of HIV epidemic was wealth quintile. Like the educational attainment, despite the fact that wealth of individuals was not a statistically significant determinant factor for HIV prevalence in this study finding (p = .991), there is a trend showing that people in the highest wealth quintile have a higher HIV prevalence. For instance, among women sampled in EDHS 2016 and with highest wealth quintile, the HIV prevalence was 3.0% while women in lower wealth quintiles (poor) had 1.0% prevalence. Nevertheless, the discriminatory attitudes and knowledge of prevention methods were increased with increased wealth quintile for both women and men. Other studies have also showed the impact of poverty in limiting media exposure, cause for migration of people, lessen access to health education and nutrition, and increase sexual exploitation (Casale & Whiteside, 2006). Meanwhile, the available study findings on the relationship between poverty and HIV/AIDS are inconsistent. Casale and Whiteside (2006) showed that HIV infection doesn't disproportionately affect the poorer in sub-Saharan Africa; and people in the wealthiest quintile have a higher HIV prevalence than those in the lower wealth quintiles (poorer quintiles). According to Mmbaga et al. (2007), this finding was supported by stating that wealthier people tend to have higher HIV prevalence than poorer people. To the reverse, a study done by Bloom et al. (2002) revealed that poverty is a key factor for HIV transmission because it increases people exposure to the virus.

Findings in the Context of the Theoretical Framework

I applied the proximate determinant framework to examine the association of proximate variables, like funding level for Anti-HIV/AIDS activities, socio-demographic characteristic, and service areas to learn if these have a direct effect on the outcome variable and influence the change of it. Accordingly, the five most important proximate determinants for men and women were current marital status, employment (last 12 months), number of lifetime partners, place of Living, and age at first sexual intercourse, which are potential to change or affect or interfere and have immediate effects on the outcome, HIV prevalence. In addition, the linear relationships between the donors' financial support and prevalence have been measured.

Based on the guiding principles of the proximate determinants conceptual framework, the marital status found to be one of the variables that affect the HIV prevalence. Women and men reported ever having been married had higher probability of acquiring HIV than those who have never married. Meanwhile, the highest HIV prevalence noticed among the widowed and divorced people. According to this conceptual framework, married people have higher risk level than unmarried; and hence, while the HIV prevalence for never married women and men in 2005 and 2011 were 0.7% and 0.2%, respectively; divorced and widowed were positive by 8.1% and 5.6%, respectively, in 2005; and 5.9% and 14.5%, respectively, in 2011. This shows that married are six times more likely (OR = 6.51 95% CI = 3.49–5.44%), and widowed are twenty times more likely (OR = 19.94, 95% CI = 16.04–24.79%) than unmarried to acquire HIV.

HIV prevalence also differs remarkably by employment status. The risk of unemployed for the epidemic is lower than employed people because of a number of reasons including movement to other places for work and income, which is highly correlated with wealth. Wealthy individuals usually have wider social and sexual network and are at higher risk of getting the infection. The conceptual framework has also showed as the number of lifetime sexual partners has a huge impact to raise the likelihood to be infected in both sexes though the risk is much higher for females. This was illustrated in both the three EDHS findings. While the prevalence of HIV in people with one lifetime sexual partner is less than 1 percent, it may go up to the level of 7 percent for those who have multiple lifetime sexual partners. In addition, this theoretical framework has highlighted the prevalence difference in place of living. In the rural community where the overwhelming majority of Ethiopians are living, the prevalence of HIV has been noted very low in the study periods because of the strong traditional values and less sexual networking. According to EDHS (2011), the urban areas in Ethiopia are seven times more affected with the prevalence than rural areas.

Limitations of the Study

This study was based on data that were collected in the previous three Demographic and Health Surveys (DHS) of Ethiopia. Those surveys, like any other DHS, were nationally-representative household surveys and contain a wide range of indicators about health, nutrition, and population. Accordingly, generalizability was not an issue. However, to provide estimates for small regions, DHS samples were not large enough and, in some extent, it was affecting the generalizability; otherwise, the findings and

conclusions from DHS were generalizable and trustworthy. Getting the actual spending amount for HIV related services had limitation because some partners' accounting information systems do not contain specific budgetary and expenditure lines and comprehensive expenditure records. Because of this, under-estimation or overestimation was not ruled out. In addition, all predictors of HIV: demographic – ethnicity, country by birth, and sexuality; behavioral – condom use, unsafe sex, alcohol use, substance use, male sex with male, and multiple sexual partners; clinical – weight loss, fever and chills, cough, diarrhea, respiratory tract infection, oncology, and hematology were not included as they were not in EDHS data; and hence, internal validity, estimate truth about inferences concerning causal relationship, could be affected. The other limitation for working with survey datasets was that datasets are compressed .ZIP files contains multiple working files along with data definition files but getting the instruction file to work with ZIP files was challenging.

Recommendations

There are several recommendations that might advance findings in progressing the curve of HIV prevalence, enhancing financial sustainability, targeting effective responses, and work on specific and to the right predictors. First, although there is an advancement in relation to HIV prevalence in the country, which remains to be categorized by a low-intensity, mixed epidemic with significant heterogeneity, it is meaningfully differ in between geographical areas (6.6% in Gambella, 5.0% in Addis Ababa, and 0.7% in Southern Nations, Nationalities and Peoples' (SNNPR) region. Therefore, it is advisable to sort out and categorize regions as per their HIV burden and

prioritize them to address the greatest unmet needs first. In those geographic areas with greatest unmet needs or high prevalence, community and facility-based testing services and HIV Self-Testing shall be strengthened, access to treatment services shall be improved to accelerate ART linkage and the Test and Start, and make stronger the active disclosure support and targeted demand creation for testing. Second, to have constant and expanded funding mechanisms in place to fund the AIDS responses, there should be a thought of alternative sources of public revenue and domestic investment to transition from donor support to a sustainable domestic response; collaboration with all donors, civil society organizations and private sectors; and finding innovative ways of funding the responses by self. More countries have been stated for considering innovative financing mechanisms to raised resources for HIV like Zimbabwe, a 3% tax on all formally employed individuals; Rwanda and Uganda taxes on mobile phone usage; Congo, Madagascar, Mali, Mauritius, and Niger from an airline tax (African Union, 2013). Third, in order to address the problem related to funding level decrement, vigorous financial tracking system should be in place to understand the funding trends and its relationship with type or number of responses to prevent and control HIV/ADS. Knowing the type or number of services that are critical and effective will enable to use the scarce resource appropriately and bring the desired impact shortly. Meanwhile, since this study had some limitation to get adequate service related data, I propose to conduct a mixed method research to identify which service is more contributing to end the epidemic. Fourth, findings of this study recommend to give due attention for following segment of population with highest HIV transmission: widowed and divorced men and women,

unemployed men and women, people who have less than three life time sexual partners, children who practiced their first sexual intercourse before the age 16, urban inhabitants, and people with highest wealth quintile. However, as stated on the limitation of this study section, as many other important predictors of HIV were not in EDHS data, I suggest the need for further investigation to know the drivers of the epidemic in a better way.

Implications for Professional Practice and Social Change

Professional Practice

This section provides recommendations to professional practice and positive social change implications relevant to knowing the association between HIV prevalence and funding level and identifying the socio-economic and demographic factors that fuel the epidemic. I am managing this study to be a good examiner and provide clues on how to ensure the HIV response is sustainable. If the response becomes sustainable, it empowers to have an enabled environment, appropriate services, conducive system, and resources essential to effectively and efficiently control the HIV epidemic. Accordingly, in the following subsections, I am describing methodological, theoretical, and empirical implications to professional practice.

Methodology. This analysis could be improved by using mixed method research. The secondary data can still provide a supporting role in the study, but to assess the socio-economic and demographic factors that driving the epidemic, both qualitative and quantitative design could give a better result to answer the research questions. According to Creswell and Plano Clark (2007), mixed method is more than merely gathering and examining both types of data; likewise, it includes the use of both methods in the process so that the general strength of a study is better than either of the two designs.

Theory. In this study, I attempted to combine demographic, behavioral and epidemiological approaches to develop a conceptual framework for the study of the main factors determining the HIV epidemic in the population. However, this framework initially has been used comprehensively in the study of fertility and child survival to measure the association between biological, personal, cultural, environmental, and behavioral factors and their influence on human fertility (Boerma & Weir, 2005). Accordingly, while this framework was used in this study, the objective was to recognize a set of variables, called "proximate determinants," that can be influenced by changes in circumstantial variables or by interventions that have a direct effect on the outcomes; and to tease-out factors affecting HIV vulnerability. Thus, even though extensive literature review has been made on the application of the framework, fine-tuning and modifying this framework may be needed to make it pertinent to capture the predominant situation in the particular study area and to quantify these situations within the variables at each stage of the framework.

Empiricism. I propose that the empirical implication for this trend analysis may help to promote the way how HIV prevalence and funding levels are correlated and affect the scope of the response. Information obtained through trend analysis would tell what was happening in the past, being going on now, and forecasting future patterns of the health-related issues, which in turn is significant in fine-tuning public health policy and interventions (Rothman, 1998). In addition, systematically reviewing the effect of predictor variables will use to be more selective in the process of implementation and to be focused on the target while investing on HIV with limited resource as international assistance from donors is either declined or remained flat. A systematic review is

indispensable to perceive lifestyle, clinical, demographic, and laboratory characteristics of patients which might be connected with HIV infection in primary care; and analytically assess and understand available evidences to act with the right measure (Norman &Griffiths, 2014).

Positive Social Change

The findings support Walden's mission by providing recommendations to professional practice and positive social change implications relevant to knowing the association between HIV prevalence and funding level and identifying the socio-economic and demographic factors that fuel the epidemic. The aim is to examine the trend of HIV prevalence and funding levels and analyzing those data if the funding shortfalls are subjected to threaten the gains made on HIV prevention strategies in the future. This study suggests at the individual and family level that cognitive, social, and technical competencies and skills associated with safer sex and drug use practices need to be improved and be supportive for HIV preventive practices. At the organizational level, there is a need to critically analyze and synthesize HIV/AIDS studies to establish critical issues and indicators that may explain the driving forces of the epidemic and trends, and inform the healthcare decision-makers with findings of the four research questions so that they will place more value on such works in their deliberations and in their interactions with stakeholders for sustainable financing initiatives. At societal or policy level, it will help to bring changes in the system of implementation; and find the best solutions to HIV epidemic control and prevention strategies, which is the most burdensome health problems, by meet the long-term needs of people living with the problem.

Conclusion

The objective of this study was to examine the trend of HIV prevalence and funding levels from donors' and analyzing how these variables are correlated and affected the scope of the response. Accordingly, the results were important because it illustrated the trends in HIV prevalence over time and concluded: a) even though the trend in changing prevalence in the first and second five years was found to be different; in general, the national HIV prevalence was declining significantly over the ten-year study period, b) there was a regional variation in prevalence density among all ages, c) the association between HIV prevalence and funding levels from donors is statistically significant and have a positive linear relationship, c) a significant associations and meaningful effect of funding on who gets what services, on what frequency, and how responses are highly depend on the amount of fund available, and d) the prevalence of HIV was not the same for all socioeconomic and demographic characteristics and presented population subgroups that are with higher risk of HIV-infection. However, as the source of data for this study was DHS, the limitations of using secondary data could apply here and definitive conclusions about the relationships between HIV prevalence and funding level cannot be made via correlation analysis alone. Therefore, additional national rigorous analysis are needed to comprehend the associations between programmatic efforts, funding level, reported behavioral change, and changes in prevalence of HIV.

References

Abebe, A., Lukashov, V.V., Wit, T.F., Fisseha, B., Tegbaru, B., Kliphuis, A., Tesfaye, G., Negassa, H., Fontanet, A., Goudsmit, J., & Pollakis, G.P. (2001). Timing of the introduction into Ethiopia of subcluster C' of HIV type 1 subtype C. AIDS research and human retroviruses, 17 7, 657-61.

Adam, W. & Jen, K. (2017). Financing the response to HIV in low- and middle-income countries. *The Henry J. Kaiser Family Foundation, Vol.* 7347(12), p. 2-14

African Union (2013). African Union roadmap: Progress in the first year: *Update on progress to implement the African Union Roadmap on Shared Responsibility and Global Solidarity for AIDS, TB and Malaria Response in Africa* (pp. 2012–2015). Geneva, UNAIDS.

Aklilu, M., Messele, T., & Tsegaye, A. (2001). Factors associated with HIV-1 infection among sex workers of Addis Ababa, Ethiopia. *AIDS* (London, England), *Vol. 15* (1), p. 87-96.

Assefa Y, Van Damme W, Mariam DH, et al. Toward universal access to HIV counseling and testing and antiretroviral treatment in Ethiopia: looking beyond HIV testing and ART initiation. AIDS Patient Care STDS. 2010; 24:521–525 [PubMed]

Azuine R, Singh G, Ekejiuba S, Ashu E, Azuine A. Global health donor presence, variations in HIV/AIDS prevalence, and external resources for health in developing countries in Africa and Asia. International Journal of MCH and AIDS. 2014; 2(2):190–199. [PMC free article] [PubMed]

Herbst AJ, Cooke GS, Bärnighausen T, KanyKany A, Tanser F, Newell ML. Adult mortality and antiretroviral treatment roll-out in rural KwaZulu-Natal, South Africa. Bull World Health Organ. 2009; 87:754–762. [PubMed]

Boerma, J. T., & Weir, S. S. (2005). Integrating demographic and epidemiological approaches to research on HIV/AIDS: *the proximate-determinants framework*. J Infect Dis. 2005 Feb 1; 191 Suppl 1:S61-7.

Bendavid, E., Bhattacharya, J., Holmes, CB. & Miller, G. (2012).*HIV Development Assistance and Adult Mortality in Africa.* JAMA 307(19):2060-2067.

Bonnel, R. (2000). "HIV/AIDS and economic growth: A global perspective", *Journal of South African Economics*, vol. 68.

Bloom, D.E., River Path Associates, &Sevilla, J. (2002)."Health, Wealth, AIDS, and Poverty." Paper presented at the Asia-Pacific Ministerial Meeting, 9-10 October 2001, Melbourne, Australia.

Brundage, S. (2011).How to achieve a Successful PEPFAR Transition in South Africa. Pretoria. *Center for Strategic and International Studies* (CSIS).

Casale, M. & Whiteside, A. (2006).The Impact of HIV/AIDS on Poverty, Inequality and Economic Growth, Working Paper 3, IDRC Globalization, Growth and Poverty Working Paper Series. Ottawa: International Development Research Centre.

Central Statistical Agency (CSA) of Ethiopia & ICF. (2016). *Ethiopia Demographic and Health Survey*. Addis Ababa and Rockville, Maryland, USA: CSA and ICF.

Clarke-Steffen, L., Hinds, P.S., & Vogel, R.J. (1997). 'The possibilities and pitfalls of doing a secondary analysis of a qualitative data set', *Qualitative Health Research*, 7 (3): 408-24.

Chou, D., Dieleman, J., Leach-Kemon, K., Matthew, T., Schneider, M., & Tardif, A. (2011). The Global Financial Crisis Has Led to A Slowdown In Growth Of Funding To Improve Health In Many Developing Countries. Health AffairsVOL.31, NO. 1.

Creswell, J. W. & Plano Clark. V. L. (2007). *Designing and conducting mixed methods research.* Thousand Oaks. CA: Sage.

De Walque, D., & Kline, R. (2012). The association between remarriage and HIV infection in 13 sub-Saharan African countries. *Studies in Family Planning, 43,* 1–10.

Elsevier, B. (2016). HIV on the Fast-Track to Sustainability. The Lancet HIV, 3(1), e1.

Ethiopian Public Health Institute [EPHI] (2017). HIV Related Estimates and Projections for Ethiopia. Addis Ababa.

Ethiopian Demographic and Health Survey [EDHS] (2011). Addis Ababa, Central Statistics Agency; Calverton Maryland, ICF Macro.

Fenton, L. (2004). Preventing HIV/AIDS through poverty reduction: the only sustainable solution? Lancet; South Africa.

FHAPCO (2008).An epidemiological synthesis. World Bank Global HIV/AIDS Program.

FHAPCO (2012). Multi-sectoral HIV/AIDS Response Monitoring & Evaluation Report for 2012. Addis Ababa.

FMOH (2007).Single Point HIV Prevalence Estimate. Addis Ababa, Ethiopia.

Fontanet & Arnaud, L. (1998). Age and sex specific HIV-1 prevalence in the urban community setting of Addis Ababa, Ethiopia.

Fylkesness, K., Ndhlovu, Z., Kasumba, K., Mubanga, M. R. and Sichone, M. (1998). Studying dynamics of the HIV epidemic: Population-based data compared with sentinel surveillance in Zambia.

Garmaise, D. (2015). CSOs call for transition planning in countries facing declines in Global Fund support. Global Fund Observer, Issue 258. Aidspan.

Gray, R.H. (2007). Male circumcision for HIV prevention in men in Rakai, Uganda: a randomized trial. Lancet; 369(9562):657–666.

Haacker, M. (2009).Financing HIV/AIDS programs in sub-Saharan Africa. Health Aff, 28 (6): 1606-10.1377/hlthaff.28.6.1606.

Hailay, A., Paul, W., Kifle, W., & Lillian, M. (2017).*Prevalence, trend and risk factors for antiretroviral therapy discontinuation among HIV-infected adults in Ethiopia in 2003-2015.*PLoS ONE 12(6):e0179533.

Hallman, K. (2005). Gendered socioeconomic conditions and HIV risk behaviors among young people in South Africa. AJAR 2005; 4: 37-50.

Health Sector Development Plan IV [HSDP IV] (2010). Annual performance report. Addis Ababa, Government of Ethiopia, Ministry of Health.

Izazola, J.A., Loures, L., & DeLay, P. (2016). "What is required to End the AIDS Epidemic as a Public Health Threat by 2030? *The Cost and Impact of the Fast-Track Approach*". *PLoS ONE* 11(5):e0154893

James, J C. (2006).Evaluating the proximate determinants framework for HIV infection in rural Zimbabwe.Published by group.bmj.com.

Joint United Nations Programme on HIV/AIDS [UNAIDS] (2001). The global strategy framework on HIV/AIDS. Geneva.

Joint United Nations Programme on HIV/AIDS [UNAIDS] (2015). The Gap Report. ISBN: 978-92-9253-062-4.

Kahn, JG., & Marseille, E. (2000).Fighting global AIDS: *the value of cost-effectiveness analysis*.*AIDS*.Africa North.

Kahn, JG. &Sanstad, KC. (1997).The role of cost-effectiveness analysis in assessing HIV-prevention interventions.*AIDS Public Policy* J.12 (1):21-30 [PubMed ID: 10915254]

Kates, J., Wexler, A., &Lief, E. (2014) "Financing the Response to AIDS in Low- and Middle-Income Countries: International Assistance from Donor Governments in 2010." Kaiser Family Foundation Report.

Kates, J., Michaud, J., & Wexler, A. (2013).Mapping the donor landscape to global health: HIV/AIDS.The Henery J. Kaiser Family Foundation.

Kendall, T. &Danel, I. (2014). Research and Evaluation Agenda for HIV and Maternal Health in sub-Saharan Africa: *Women and Health Initiative*, Harvard School of Public Health: Boston.

Lester, F.T., Ayehunie, S., &Zewdie, D. (1988).Acquired immunodeficiency syndrome: seven cases in an Addis Ababa hospital. Ethiop Med J. 1988 Jul; 26(3):139-45.

Mehret, M., Khodakevich, L., &Zewdie, D. (1990).HIV-1 Infection among Employees of the Ethiopia Freight Transport Corporation. Ethiopian Journal of Health Development, 4(2, Suppl.): 17–82.

Mishra, V, Assche, SB., Greener, R., Vaessen, M., Hong, R., &Ghys, PD., (2017). HIV infection does not disproportionately affect the poorer in sub-Saharan Africa. *AIDS* 2007; 21: S17-28.

Mmbaga et al., (2007). The impact of education on sexual behavior in sub-Saharan Africa: A review of the evidence. Taylor & Francis (Routledge).

MOH (2014). National Health Accounts (EFY 2003): Preliminary Results.

Murray et al., (2012). C.J. Murray, T., Vos, R., Lozano, M., Naghavi, A.D., Flaxman, C., Michaud et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: *a systematic analysis for the Global Burden of Disease Study 2010*. Lancet, 380 (2012), pp. 2197-2223

Murphy, F. &Podmore, M. (2014). Fulfilling the promise to 'make AIDS history': Why the UK Government should continue to support the HIV response in Middle-Income countries. *International HIV/AIDS Alliance Policy Brief.*

Norman, I., & Griffiths, P. (2014).*The rise and rise of the systematic review.Int J Nurs Stud. 2014 Jan; 51(1):1-3.*

Office of the United States Global AIDS Coordinator [OGAC] (2016).Congressional Budget Justification Supplement. Washington, DC 20522.

PempelaniMufune (2015). Poverty and HIV/AIDS in Africa: Specifying the connections Social Theory & Health, 2015, Volume 13, Number 1.

PEPFAR (2016).Sustainable HIV Epidemic Control.US.

Piot, P., Karim, S., Hecht, R., Legido-Quigley, H., Buse, K., Stover, J., &Møgedal, S. (2015). A UNAIDS–Lancet Commission on Defeating AIDS—Advancing Global Health Defeating AIDS—advancing global health. Lancet, 386, 171-218.

Rand, L. & Daniel, L. (2004).Population-Level HIV Declines and Behavioral Risk Avoidance in Uganda. DOI: 10.1126/science.1093166 · Source: PubMed

Rothman, KJ. & Greenland, S. (1998).*Modern Epidemiology*.2nd Edition, Lippincott Williams & Wilkins, Philadelphia.

Samji, H., Cescon, A., & Hogg, RS. (2013). Closing the Gap: *Increases in life expectancy among treated HIV-positive individuals in the United States and Canada*.

Shelton, JD.,Cassell, MM., & Adetunji, J. (2005). Is poverty or wealth at the root of HIV? *Lancet* 2005; 366: 1057-8 doi: 10.1016/S0140-6736(05)67401-6 pmid: 16182881

Stover, J., Bollinger, L., Izazola, J., Loures, L., DeLay, P., &Ghys, PD. (2016). What is required to End the AIDS Epidemic as a Public Health Threat by 2030? *PLoS ONE* 11(5):e0154893.

UNAIDS (2000). Report on Global HIV/AIDS activities. Geneva.

UNAIDS (2008). Report on the Global AIDS Epidemic, Geneva.

UNAIDS (2008).Changed its methodology for estimating adult HIV prevalence. Geneva.

UNAIDS (2012). Global Fact Sheet

UNAIDS (2013).Ethiopian National AIDS Spending Assessment (NASA) Report.

UNAIDS (2013). Global Report: UNAIDS Report on the Global AIDS Epidemic 2013. ISBN 978-92-9253-032-7.

UNAIDS (2013).Ethiopian National AIDS Spending Assessment [NASA] report. Addis Ababa.

UNIAIDS & Henry, J. (2016).Financing the response to HIV in Low – and Middle-Income countries: *International assistance from donor governments in 2015*.

United Nations General Assembly (2016). Political Declaration on HIV and AIDS: On the Fast Track to Accelerating the Fight against HIV and to Ending the AIDS Epidemic by 2030. United Nations.

UNAIDS (2017).Ending AIDS-Progress towards 90-90-90 targets. Available at http://www.unaids.org/sites/default/files/media_asset/Global_AIDS_update_2017_en.pdf

UNAIDS (2017). 'Ending AIDS: Progress towards the 90-90-90 targets'

UNAIDS & WHO (2007). AIDS Epidemic Update: December 2007. Geneva, Switzerland.

UNAIDS (2017).Ending AIDS-Progress towards 90-90-90 targets. Available at http://www.unaids.org/sites/default/files/media_asset/Global_AIDS_update_2017_en.pdf

UNDP (2002). Conceptual shifts for sound planning: towards an integrated approach to HIV/AIDS and poverty. Pretoria: UNDP; 2002.

Vogus, A., & Graff, K. (2015). PEPFAR Transitions to Country Ownership: Review of Past Donor Transitions and Application of Lessons Learned to the Eastern Caribbean. *Global Health: Science and Practice*, 3(2), 274-286.

World Health Organization [WHO] (2016). Antiretroviral Medicines in Low- and Middle- Income Countries: Forecasts of Global and Regional Demand. WHO.ISBN 978-92- 4150-546-8.

WHO, UNICEF & UNAIDS (2013). Global update on HIV treatment 2013: results, impact and opportunities. Progress report 2011. Geneva, World Health Organization, 2011 (http: //www. who.int/hiv/pub/progressreports/en/index.html, accessed 3 June 2013).

WHO (2016). Global health estimates 2015: *deaths by cause, age, sex, by country and by region*, 2000–2015. Geneva.

WHO (2013).National Health Accounts Database of World Maps.

World Health Organization [WHO] (2015). Policy brief: consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: *what's new?* Geneva, Switzerland.

World Bank (2017).World Development Indicators database. The World Bank.

World Bank (2016). Ethiopia Poverty Assessment: Poverty Global Practice Africa Region. Report No. AUS6744. Addis Ababa

Worldometers [www.Worldometers.info] (2018).World Population by continents and countries.*Nations Online Project*.

Xenia, W. (2017). America's International Role under Donald Trump. *Chatham House Report*.The Royal Institute of International Affairs. USA.