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Preface

This master thesis was inspired by the global health problem of HIV/AIDS epidemic and describes my final year of studies at Umeå University, Masters of Science in Public Health.

I wish to thank Professor Lars Lindholm who has been tirelessly supervising me throughout the entire writing process. Similarly, my gratitude’s go to teachers of Umeå University, my family and also my best friend Haleema for the inspiration.

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Acknowledgement

It is with my utmost pleasure to acknowledge the admirable support that my family, relatives, friends and Umeå University staff especially my supervisor and my moderator as well as my classmates have bestowed me during my Master’s of Public Health study period. I further owe sincere gratitude to everyone that has in one way or the other directly or indirectly contributed to my academic progress during this entire duration. The success of this paper has been possible through the tireless support I attained from these wonderful people.
Glossary

**AIDS**
-Acquired Immunity Deficiency Syndrome. Acquired refers that the disease is not hereditary but develops after birth and is in contact with a disease causing agent. Immunodeficiency implies that the disease weakens the immune system while syndrome refers to group of symptoms characterizing or indicating a disease.

**DALY**
-Disability Adjusted Life Years. This is a measure of overall disease burden. It was originally developed by the WHO to measure global disease burden.

**ARV**
-ARV is antiretroviral. This is medication used to inhibit the reproduction of HIV in the body. ARV treatment helps body maintain immunity system and the onset of AIDS can be delayed for years. It is recommended that ARV drugs be used in combinations of at least two or three drugs.

**EUROQOL WQ-5D**
-This is a standardized instrument that is used for measuring health outcome. It has single index value that states health status

**HRQoL**
-Health Related Quality of Life, this is used as instrument to screen for psychological, physical, role functioning and also social problems in patients with terminal chronic disease in order to make appropriate intervention.

**HIV**
-Human immunodeficiency Syndrome. This is a type of virus that can lead to acquired immunodeficiency syndrome, AIDS.

**HR**
-Human Resource

**MIS**
-Management Information System

**SHERO**
-A term used to refer to female ‘hero’. It is used similarly as hero for men.
QALY

-Quality Adjusted Life Years. This takes into consideration both the quantity and quality of life that is generated by healthcare interventions. It measures life of product of both expectancy and measure of the remaining life-years quality of life.
Abstract

Background: Despite frantic efforts to contain AIDS epidemics, it is estimated that AIDS has killed over 25 million persons globally since 1981 when it was first recognized making it one of the world worst killer epidemics in history. The total estimate of people living with HIV/AIDS globally is estimated to be over 40.3 million people. The majority of people living with HIV, estimated to be 95% of the global total that are living in developing world and sub-Sahara Africa is the epicentre where over 60% of all people with HIV live. In Kenya it is estimated that 1.4 million adults age 15-64 are infected with HIV/AIDS, with about 1 million rural and 400,000 urban residents infected. Prevention and prompt treatment may save millions from this devastation but so far it is beyond achievement. There is lack of sufficient cost-effective interventions for prevention and treatment of this disease leading to lack of effective intervention program. With millions infected with HIV/AIDS and billions of dollars spent more than 20 years into the AIDS epidemics, certainly adequate solution is needed for better cost-effective way in HIV/AIDS intervention. Reasons that necessitate this study; despite the effort the Kenyan government has been putting to manage the disease through traditionally hospital-based HIV/AIDS intervention since HIV/AIDS was reported in the 80s, the prevalence of HIV/AIDS is still high standing at 6.9%. Secondly, there is lack of research that has been done in Kenya to find out if community-based program could be cost-effective in HIV/AIDS control. The purpose of this paper was therefore to review the literature and assess whether community-based HIV/AIDS program is cost-effective in HIV/AIDS control.

Methods: A systematic identification of relevant scientific publications was conducted through several sources: Internet research on Kenya HIV/AIDS management, electronic databases including Umeå University library database, Ovid, etc, WHO websites and other major agencies concerns with HIV/AIDS funding, journal browsing. Inclusion criteria included community-based HIV/AIDS prevention, hospital-based HIV/AIDS prevention, year for publication (1990-2011), settings include low, middle and developed countries and finally, economic evaluations and published work only.

Results: The findings according to this study indicate that community-based intervention is cost-effective. The high number of HIV/AIDS cases averted supports this and also the high number of target group reached which is important in HIV/AIDS control. Furthermore, this program leads to high impact on behavioral change as well as addressing stigma better and also leads to higher accessibility to HIV/AIDS education. Secondly, diagnosis of HIV, which is crucial in HIV/AIDS control, is successful under community-based program. The findings here indicates that there is high number of people willing to be tested under community settings a factor that is pivotal in controlling HIV/AIDS prevalence; there is also early diagnosis that helps on time start of ART and other HIV/AIDS therapy to the HIV infected persons. Reported in the finding also are that the majority of those who have undergone HIV test under community
settings are willing to know their HIV status. Thirdly, community-based HIV/AIDS management program in this study results shows that it is effective in HIV/AIDS treatment. Factors attributing to this success include high number of HIV/AIDS patients’ survival due to their consistent treatment on ART medication. The community-based cost-effectiveness was also assessed by use of WHO cost categorization of a country's GDP threshold value. The values of QALY, DALY and LYS findings indicate that community-based HIV/AIDS intervention is cost-effective.

Conclusion: Cost-effectiveness analysis is a fundamental instrument in healthcare intervention that helps decision makers in allocative efficiency and priority setting in healthcare budgeting. This paper that aimed to find out if community-based is cost-effective in containing HIV/AIDS epidemic; after analysing results, concisely concludes that community-based HIV/AIDS intervention program is cost-effective. This study therefore is a pointer to the healthcare policy makers to consider more into community-based HIV/AIDS intervention for effective HIV/AIDS management. Further studies are also encouraged on this field.
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1. Background

AIDS is one of the most devastating global epidemic diseases in the recent history. It has lead to over 25 millions of life lose with estimated 42 million persons living with HIV/AIDS worldwide\(^1\). HIV/AIDS has also caused great negative impact on economic development in the sub-Saharan countries\(^1\). The contrast in the prevalence and impact of HIV/AIDS between high-income countries and middle and low-income countries, is striking with the majority of the HIV/AIDS cases come from resource-limited countries especially in Sub-Saharan countries\(^1\). The global HIV/AIDS epidemics are influenced by many factors namely biological, behavioural and cultural\(^2\). Behavioural factors comprises of sex acts, sexual mixing, needle sharing, lack of condom use, as well as substance use among other factors\(^2\). Biological factors include viral load on anatomical compartments, disease and treatment status, sexually transmitted infections and other co infections, state of immune activation as well as viral subtype and phenotype\(^2\). Cultural factors contributing to the HIV/AIDS prevalence include stigma and discrimination, criminalization, poverty, gender inequality, homelessness, migration, imprisonment and lack of education\(^2\). Prevention, diagnosis and prompt treatment may save millions from this devastation but so far it is beyond achievement. There is lack of sufficient evidence on cost-effectiveness of prevention and treatment of this disease causing lack of effective program that can be implemented. Reason for this is partly due to lack of research in the areas of finding a more effective intervention of HIV/AIDS management. Reasons that necessitate this study; despite the effort the Kenyan government has been putting to manage the disease through traditionally hospital-based HIV/AIDS intervention since HIV/AIDS was reported in the 80s, the prevalence of HIV/AIDS is still high standing at 6.9%. Secondly, there is lack of research that has been done in Kenya to find out if community-based program could be cost-effective in HIV/AIDS control. This study reviews the literature and assess whether community-based HIV/AIDS program is cost-effective in resource scarce settings. Cost-effective strategies that are able to control HIV/AIDS epidemics are those that are likely to address factors that promote HIV/AIDS such as cultural practices, stigma, poverty, unprotected sex at community level since it is apparent these contributing factors are present at the individual community level. This study is therefore significant in finding out the better way of HIV/AIDS intervention that can be employed in Kenya to combat the devastation of HIV/AIDS epidemic.

1.1. HIV/AIDS

Human immunodeficiency virus (HIV) is a type of virus called lentivirus which if a member of retrovirus family causing acquired immunodeficiency syndrome (AIDS)\(^3\). AIDS is a condition in the human that that is associated with failing of immune system failure leading
to life threatening opportunistic infections. Infections with these HIV viruses occur through blood, vaginal fluid, semen, pre-ejaculate or breast milk. The main routes of transmission are unsafe sex, contaminated needles, breast milk as well as mother to child transmission at birth called perinatal transmission\textsuperscript{3,4}.

At the start, HIV infects primarily vital cells in the human immune system; the helper T cells called CD4\(^+\) T cells, dendritic cells and macrophages\textsuperscript{4}. Eventually HIV infection leads to low levels of CD4\(^+\) T cells through three main mechanisms: by direct viral killing of infected CD4\(^+\)T cells; secondly through increased rates of apoptosis in the infected cells; and lastly by killing the infected CD4\(^+\)T cells through CD8 cytotoxic lymphocytes that recognize infected cells\textsuperscript{1}. When there is a decline in CD4\(^+\)T cells below a critical level, cell-mediated immunity is lost exposing body to become more susceptible to opportunistic infections \textsuperscript{3,4}. Many infected people who are untreated would eventually develop AIDS. These infected mostly die from opportunistic infections or malignancies linked with the progressive failure of the immune system\textsuperscript{1}. Factors such as viral, host and environment factors leads to varying rates at which HIV progress to AIDS. Most of the infected will progress to ADIS within 10 years of infection while some will progress much longer or sooner \textsuperscript{3,4}.

The figure below describes the phase of HIV infection and the response of CD4\(^+\)T Lymphocyte Count. It indicates initial infection phase, then clinical latency and death comes at late stage. Stage 1, no symptoms presented, difficult to tell there is an infection. Stage 2, no symptom presented but virus remains active. Stage 3, individual feels unwell due to infections from viruses and bacteria. Stage 4, CD4 count <200 and results to TB, HIV-related lymphoma, and other infections occurs \textsuperscript{3,4}. 
1.2 HIV/AIDS global scenario

Despite frantic efforts to contain AIDS epidemics, it is estimated that AIDS has killed over 25 million persons globally since 1981 when it was first recognized making it one of the world worst killer epidemics in history. The total estimate of people living with HIV/AIDS by 2002 is estimated to be over 42 million people according to WHO 2008. The majority of people living with HIV/AIDS, estimated to be 95% of the global total are living in developing world and sub-Sahara Africa is the epicentre where over 60% of all people with HIV live. About 22.5 million to 24.3 million are in Sub-Saharan Africa where the adult infection prevalence is about 6%38. About 14,000 new HIV infections occur every single day globally and over 90% of these cases occur in the developing countries. About 40% infections occur in women, and 15% occurs in individual age 15-25 years of age. One thousand occur in children less than 15 years with perinatal infection accounting to large number of the infection. Breast feeding results to 30-50% of the children infection while a quarter of the babies are born by the infected mothers.

The map below shows similar information about HIV/AIDS epidemic distribution globally as the table above. The sub-Saharan Africa region such as Botswana, South-Africa are deep red indicating high HIV/AIDS prevalence of 15.0% to 39.0%, while some regions such as Greenland, Saudi Arabia indicates minimal or lack of data concerning HIV/AIDS. Kenya falls in the red category of 5.0% to 15.0% HIV/AIDS prevalence.
1.3. HIV/AIDS Management Cost Challenges

Managing both prevention and treatment of HIV/AIDS has been of great challenge to many countries especially the developing countries that depend on funding to sustain this program. Considering the multiple causal channels of disease its prevention has become a challenge, as it requires focus on all issues. Cost of preventing and treating HIV/AIDS involves multiple focuses on all causal channels and also on areas where negative impact of disease affect quality of life of people. UNAIDS highlights the need for paramount need of cost effective alternatives to manage the epidemic. The cost of HIV/AIDS drugs is an issue that drags the fight for containing this disease especially in sub-Saharan countries a major concern according to Kenya Medical Research Institute, KEMRI.

1.4. HIV/AIDS management strategies

HIV/AIDS management strategies have expanded from preventive programs to treatment over the years.

Preventive program: HIV/AIDS was initially managed through preventive measures since its diagnosis in the early eighties. These are measures taken to prevent healthy people from being infected or affected by HIV/AIDS. The measures include health promotion, through
education for example as a mode of public awareness program about modes of infection of HIV/AIDS and how to guard against the disease. Prevention program promotes behavioural changes in sufficient number of individual at high risk of being infected by HIV. Through widespread consistent and sustainable communication channel targeting these risky behaviours such as unsafe sex, unsafe cultural practices, numbers of sex partners, these preventive measures are able to reduce cases of HIV infections.

Initially awareness raising and education of people regarding disease was focus of intervention programs. Then it moved to rapid diagnosis and screening of HIV patients. Attention was specifically given to the causal risky behaviours like unprotected sex, use of unsafe syringes and unsafe blood transfusions. There was no treatment regiment for AIDS and the only way to manage and control the prevalence was through prevention measures.

**Treatment program:** Now, when the treatment is also available the focus is extended to treatment. Treatment program include availability of drugs, other services medical care and procedures rendered to the HIV/AIDS patients. As more people are living with disease these days, this calls for a need of uniform availability of treatment services. Doctor put patients with HIV infection on ART therapy as appropriate. Presently, WHO recommends that people should start using ART when their CD4 level is <350. HIV/AIDS treatment therapy is continued throughout a patient’s life alongside laboratory test procedures. There is also need for monitoring of treatment at the same time. This include provision of HIV/AIDS related medication such as ART, it also include treatment of opportunistic diseases related to HIV/AIDS. Considering the burden of disease in several millions, the quality of life of these patients must also be considered as part of HIV/AIDS management agenda.

Several programs have been initiated worldwide to contain the epidemic. These programs in some contexts are mainly responsibility of ministries of health while in other a collaborative multi-sectoral approach has been initiated. All these efforts for HIV/AIDS management can be viewed as being operated through two main channels of either independent hospital based programs or comprehensive community based interventions.

**1.5. Description of two alternatives**

**1.5.1. Hospital-based intervention**

Hospital-based HIV/AIDS prevention and treatment program is an approach of managing HIV/AIDS through screening and treatment to those who visit hospital for a medical condition or go voluntarily there to be tested for HIV. Hospital therefore assesses their needs, develop care plans, and coordinate service delivery and monitor results. These activities are
based in healthcare facilities found in national, provincial, districts hospitals as well as in health centres and dispensaries. The workforce under this includes formal health care professionals such as general practitioners, public health consultants, registered nurses, practice nurses as well as pharmacists.

1.5.2. Community-based intervention program (CIP)

Community based program in this paper refers to primary care that include preventive care such as health screening, health promotion against HIV/AIDS as well as treatment of AIDS patients at community level. This community care program is essentially based on five basic components of primary health care as specified by WHO in Alma Ata declaration 1978, namely: active community participation, social relevance, involvement of other sectors, use of appropriate technology for health promotion and service provision. These leads to self-care as well as maintenance of long-term health care services of those living with HIV/AIDS within community. The workforce under this program mostly will comprise of trained personnel in HIV/AIDS management who will be drawn from the local community and trained by medical personnel such as doctors. They will also include those who work within the community dispensary such as practice nurses. It needs delegation of power from central authority to local authorities to the community-level.

In Kenya, both the hospital-based and community-based HIV/AIDS work is interlinked with each other. The hospital-based also have extensive community program policies such as community-focus HIV/AIDS prevention. This community focus under the umbrella of hospital-based HIV/AIDS also does HIV/AIDS community testing in an outreach. However, there is limit of scope to this venture by the Kenyan government. Under community-based HIV/AIDS, there is also referral of HIV/AIDS cases to hospital if need be for further medical attention. In this respect, there is interconnection between the two programs to some levels.
2. HIV/AIDS in Kenyan perspective

2.1. Kenya background

Kenya lies in Eastern Africa and has a geographically diverse land area of 582,646 km², 80% being arid or semi-arid. Some of Kenya’s neighbours have experienced various forms of civil strife, with spill over effects on various socio-economic facets in the country. Kenya borders Indian Ocean to the eastern, and neighbours Uganda, Sudan, Ethiopia, Somalia and Tanzania.

Figure 3. Administrative map of Kenya (Source: Global Literacy Project-Kenya 2009)

2.2. Economic, Social & Health Indicators

According to the 2009 Kenya National Census survey, Kenyan population was 38.6 million people. The highest majority live in the rural over 26 million representing 67.7% while the rest 32.3% equivalent to over 12 million live in urban centres (Kenya National Bureau of Statistics 2009). Average life expectancy is 53 years; the low figure has been contributed by HIV/AIDS epidemic in the country. Other facts include average per capita income that stands at US$ 770, according to world data index, and the gross National Income is US$ 21 billion. Those who live below poverty level are 46% of the total population.

The table below describes the population in Kenya, average life expectancy, and Average per Capita Income; Grow National Income as well as Average annual growth rate and also poverty level in Kenya. The units are shown on the table.
Table 1: Facts about Kenya

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Units</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>38.6 million</td>
<td>2009 Kenya National Census</td>
</tr>
<tr>
<td>Average life expectancy</td>
<td>53 year</td>
<td>WDI 2006, UN statistics</td>
</tr>
<tr>
<td>Average per capita income</td>
<td>770$</td>
<td>WD1 2009</td>
</tr>
<tr>
<td>Gross National Income</td>
<td>21 billion $</td>
<td>WDI 2006</td>
</tr>
<tr>
<td>Average annual growth rate</td>
<td>4%</td>
<td>World Bank Projection 2010</td>
</tr>
<tr>
<td>Living below poverty level</td>
<td>46%</td>
<td>Kenya Integrated Household Budget Survey 2006</td>
</tr>
<tr>
<td>Women dying in childbirth</td>
<td>488/100,000 live births</td>
<td>Kenya Democratic Survey 2007</td>
</tr>
<tr>
<td>Life expectancy at birth m/f (years)</td>
<td>52/55</td>
<td>WHO Statistics 2008</td>
</tr>
<tr>
<td>Percentage of children receiving primary education</td>
<td>86% net enrolment</td>
<td>Ministry of Education 2006</td>
</tr>
<tr>
<td>Percentage of people aged 15.49 living with HIV/AIDS</td>
<td>6.9%</td>
<td>National AIDS Control Council 2008</td>
</tr>
<tr>
<td>Percentage of people with access to safe clean water</td>
<td>61%</td>
<td>WD1 2004</td>
</tr>
<tr>
<td>Total expenditure on health per capita (Intl $, 2006)</td>
<td>105</td>
<td>WHO Statistics 2008</td>
</tr>
<tr>
<td>Total expenditure on health as % of GDP (2006)</td>
<td>4.6</td>
<td>WHO Statistics 2008</td>
</tr>
</tbody>
</table>

2.3. Structure of health sector

The health sector is governed through two ministries, the Ministry of Medical Services and the Ministry of Public Health & Sanitation. The Kenya Health Policy Framework (1994-2010) is the overarching health policy and the National Health Sector Strategic Plan (2004-2010) elaborates strategic imperatives for the sector.

Kenya’s healthcare system consists of a mix of public and private services staffed by more than 4,500 physicians and 37,000 nurses. The system is based on a referral system extending from Kenyatta National Hospital in Nairobi through provincial and district hospitals to rural health centres and dispensaries countrywide. A rapidly growing population within the reproductive age group and the HIV pandemic has put increasing strain on the country’s ability to provide basic health services to its people. The average life expectancy is 53 years of age. The Kenya health sector comprises of major players as Ministry of Health and parastatals or organization, private sector including for profit, NGO, and FBO (faith based organization) facilities. There are over 4,700 healthcare facilities countrywide, and public sector accounts to 51 percent of these. Public sector consists of: national referral hospitals, provincial general hospitals, district hospitals, health centres and dispensaries.
National hospitals: these provide sophisticated diagnostic, therapeutic and rehabilitative services. Main national hospitals are Kenyatta National Hospital in Nairobi and Moi Referral and Teaching Hospital in Eldoret. Provincial hospitals: Acts as referral hospitals to the district hospitals^8. These provide specialized care. They are responsible for health policy implementation at district level, they also coordinate and control all district health activities as well as maintaining quality standards. There are also some similar private hospitals in the country. District hospitals: They deliver healthcare services within the district; plan their own healthcare expenditure and budget requirements based on the provincial headquarters guidelines. Health centres: These provide ambulatory services, preventive and also curative services according to the local needs. Dispensaries: First line contact with patients, though sometimes health centres or hospitals act as first point contact with patients^8.

Kenya healthcare workforce comprises of doctors, dentists, pharmacists, and registered nurses with bachelor degree as well as enrolled nurses. There are also clinical offers, public health officers as well as public health technicians. Kenya has various health facilities including: 227 hospitals comprising of 85 public hospitals, 74 NGO/Mission hospitals and the rest 68 are private hospitals^8.

2.4. HIV/AIDS Epidemiology

Kenya AIDS Indicator Survey (NASCOP) 2009 indicates that the estimate HIV prevalence is 6.3 percent among adults age 15-49 years.^9 Even though the results show a reversal trend on HIV, the prevalence is still very high. The result further indicates that there are more women (8.8 percent) than men (5.5 percent) age 15-49 infected. In total, there are about 1.4 million adults age 15-49 infected with HIV/AIDS with majority coming from rural dwellers 1 million, and adults 400, 000 infected according to NASCOP, 2009^9.

2.5. Economic Impact of HIV/AIDS

HIV/AIDS has been one of the leading causes of high mortality and morbidity in Kenya^10. As the survey shows, the affected population is the very productive in the society 15-49 years leading to a lot of concerns about economic impact to the society^10. HIV/AIDS causes massive premature adult mortality, thereby destroying existing human capital and reducing the labor force on a large scale. The transmission of human capital to future generations is weakened, as children are left orphaned and surviving adults are correspondingly burdened^10. HIV/AIDS has devastating impact on health and demographic indicators such as life expectancy at birth, healthcare assistance, age and sex distribution, economic indicators like
income, work force, and economic growth, education and knowledge acquisition and other indicators like governance, gender inequality and human rights. Consequently, per capita income decreases and communities can less afford to raise and educate children. The level of fertility falls in the immediate aftermath of the outbreak leading to decline in population growth. In a more detailed HIV/AIDS impact on Kenyan economy, HCDWORKFORCE has tried to quantify the economic of this disease including both increasing expenditure towards HIV/AIDS management and reduction in revenues. There is significant increment on healthcare costs as well as funeral arrangement and training and recruitment of new employees for replacement. Also, absenteeism from work due to illness or time spent on funerals and training for the replacements decreases revenues.

Table 2. Economic impact of HIV/AIDS on firms

<table>
<thead>
<tr>
<th>Factors leading to Increased Expenses</th>
<th>Factors Leading to Decreased Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health care costs</td>
<td>Absenteeism from work</td>
</tr>
<tr>
<td>Burial costs</td>
<td>Time spent off to attend funerals</td>
</tr>
<tr>
<td>Training and recruitment</td>
<td>Time spent on training</td>
</tr>
</tbody>
</table>

The costs are tremendous including on industry, transport, and sugar estates, etc. Due to HIV/AIDS likelihood of increasing labour costs and reduces company profits, there is need for HIV/AIDS prevention measures that should be implemented at workplace. In a study to examine the impact of HIV/AIDS related costs on human resources, a research done in Kenya indicated significant increased labour costs attributed to; absenteeism due to HIV/AIDS related and that accounted for 52 percent of the total AIDS-related costs. Other costs include costs per employee that amounted to US $30 per capita in 1994. There is projection that the costs of HIV/AIDS will increase significant globally as more infections continue, those under ARV medications increase as well as dependants due to HIV/AIDS cases. By the year of 1992 and 2005, the cost of HIV/AIDS increased from US $20,339 to US $48,402 within heavy industry, while in transportation from US $67,183 to US $163,685 and from US $285,847 to US $866,217 on sugar estates.

The figure below shows the estimated effect of AIDS on the Kenyan economy, GDP.
Fig 4: Estimated effect of HIV/AIDS on Kenyan economy.

Kenya government spends a total of US dollars $333,753,815 on HIV/AIDS management as of year 2007. This reflects a 1% of the country’s GDP. The distribution of sources of HIV/AIDS funds in Kenya include; public 21%, private 28% and donors 51%.

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>PUBLIC</th>
<th>DONORS</th>
<th>TOTAL</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention</td>
<td>3,782,376</td>
<td>55,926,552</td>
<td>59,708,928</td>
<td>37%</td>
</tr>
<tr>
<td>Treatment</td>
<td>16,188</td>
<td>3,569,544</td>
<td>3,785,732</td>
<td>2%</td>
</tr>
<tr>
<td>Program support</td>
<td>4,398,502</td>
<td>23,125,765</td>
<td>27,524,268</td>
<td>17%</td>
</tr>
<tr>
<td>Incentives-HR</td>
<td>2,487,925</td>
<td>332,201</td>
<td>2,819,126</td>
<td>2%</td>
</tr>
<tr>
<td>Other mitigation</td>
<td>3,598,502</td>
<td>1,600,000</td>
<td>5,198,502</td>
<td>0%</td>
</tr>
<tr>
<td>Community development</td>
<td>4,460,239</td>
<td>4,460,239</td>
<td>8,920,478</td>
<td>3%</td>
</tr>
<tr>
<td>Research</td>
<td>1,600,000</td>
<td>1,600,000</td>
<td>3,200,000</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>8,197,066</td>
<td>154,157,166</td>
<td>162,354,232</td>
<td>100%</td>
</tr>
</tbody>
</table>

2.6. HIV/AIDS management program

In Kenya NASCOP, which is the National AIDS and STIs Control Programme, is an AIDS control Unit under the Ministry of Health and mainly involved with technical co-ordination of HIV/AIDS program in the country\textsuperscript{11}. NASCOP is the most active unit involved in the implementation of the National HIV/AIDS Strategic Plan is Kenya. The major duties of NASCOP include: Anti Retroviral Therapy-ART Programme, Counselling and Testing- CT, Surveillance, monitoring and Evaluation, Blood safety, Reproductive Health HIV integration, Home Based Care-HBC, Prevention of Mother to Child Transmission of HIV-PMCT, Condom
Advocacy, Social and Communication Programme, Opportunistic Infections-OIs, Injecting Drug Users-IDUs, Sexually Transmitted Infections-STIs, Promotion of abstinence and faithfulness to one partner, Treatment of opportunistic infections, Nutrition programme, and Prevention of heterosexual transmissions

The Kenya National AIDS Strategic Plan that was launched for the 2005-2010 is the main unit through which provision of action framework for HIV/AIDS interventions in Kenya takes place. KNASP is mandated with provision with framework under which HIV/AIDS strategies plans and budgets are formulated, coordinated and monitored.

**Key players of HIV/AIDS control in Kenya**

The major key players are: Government of Kenya, National Aids Control Council (NACC) Secretariat, AIDS Control Units, Provincial Aids Control Council (PACCs) and District Aids Control Committee (DACCs). Their roles are described in the table below.

**Table 4: Roles of the Key Players**

<table>
<thead>
<tr>
<th>Key Players</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Kenya (GOK)</td>
<td>- Policy direction</td>
</tr>
<tr>
<td></td>
<td>- Institutional development</td>
</tr>
<tr>
<td></td>
<td>- Resource mobilization</td>
</tr>
<tr>
<td></td>
<td>- Advocacy</td>
</tr>
<tr>
<td>National Aids Control Council (NACC) Secretariat</td>
<td>- Mobilize resources for control and prevention</td>
</tr>
<tr>
<td></td>
<td>- Develop MIS for HIV/AIDS control</td>
</tr>
<tr>
<td></td>
<td>- Provide mechanism and guidelines for implementation</td>
</tr>
<tr>
<td></td>
<td>- Lead in advocacy and PR for HIV/AIDS programmes</td>
</tr>
<tr>
<td></td>
<td>- Monitor and evaluate HIV/AIDS programs</td>
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<tr>
<td></td>
<td>- Develop and coordinate policies and programmes for the infected and affected</td>
</tr>
<tr>
<td></td>
<td>- Coordinate and supervise HIV/AIDS interventions</td>
</tr>
<tr>
<td></td>
<td>- Strengthen other NACC units</td>
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<tr>
<td>AIDS Control Units</td>
<td>- Mainstream HIV/AIDS activities</td>
</tr>
<tr>
<td></td>
<td>- Coordinate intersectoral advocacy in the ministries/departments</td>
</tr>
<tr>
<td></td>
<td>- Develop operational activities and prepare action plans</td>
</tr>
<tr>
<td></td>
<td>- Develop MIS to monitor HIV/AIDS programme in the ministries and departments</td>
</tr>
<tr>
<td>Provincial Aids Control Council (PACCs)</td>
<td>- Develop guidelines for prevention and control of HIV/AIDS in the province</td>
</tr>
<tr>
<td></td>
<td>- Mobilize resources</td>
</tr>
<tr>
<td>District Aids Control Committee (DACCs)</td>
<td>- Mobilize resources</td>
</tr>
<tr>
<td></td>
<td>- Facilitate set up of AIDS programs in the districts</td>
</tr>
<tr>
<td></td>
<td>- Coordinate and supervise implementation of AIDS activities in the district</td>
</tr>
<tr>
<td></td>
<td>- Mobilize other stakeholders towards the fight against HIV/AIDS</td>
</tr>
<tr>
<td></td>
<td>- Develop and implement MIS for AIDS activities</td>
</tr>
<tr>
<td></td>
<td>- Develop strategies to fight HIV/AIDS in the district</td>
</tr>
</tbody>
</table>

Source: Kenya Analysis of HIV Prevention Response and Modes of HIV Transmission
The government came up with comprehensive HIV/AIDS management program that include prevention and treatment program in hospitals. The prevention under this program is focusing on promoting behaviour change among the risk group and it includes emphasizing delayed sexual debut and as reduced sexual partners. Further, the program also promotes condom use, encouraging voluntary medical male circumcision. The target group includes commercial sex workers, truck drivers, and discordant partners among others. The government has over 1000 HIV/AIDS testing centres in healthcare centers. There are also provider-initiated HTC that involves a health professional service offering free HIV test to patients or to the clients in the healthcare facilities. Kenya hospital-based program also has prevention of HIV transmission from mother to child (PMTCT) program by providing safe injection and blood safety. Under the PMTCT, the following programs are covered:

- Integrating PMTCT services into healthcare centres to increase access to PMTCT
- Supporting maternal counselling, infant and child feeding
- Early HIV in infant diagnosis
- Increased male involvement in PMTCT and family health
- Care for HIV positive pregnant women and family members

Treatment of HIV/AIDS in Kenya includes support to health worker training on use of antiretroviral therapy (ART), and antiretroviral drugs (ARV) and also other HIV management commodities. The ARVs are distributed to health facilities throughout Kenya. There are over 380 HIV treatment centres countrywide of which over 70% are operated by Government of Kenya. Currently, there are 300,000 people under ART program in Kenya while the HIV prevalence in Kenya is about 1.8 million.

The hospital-based comprehensive HIV/AIDS program was started in the 80s when HIV/AIDS was first diagnosed in Kenya. The government, donor agencies, non-governmental organizations, private sectors including employer initiated, and also by individual patients fund the HIV/AIDS hospital-based program.

Upon the government effort to contain HIV/AIDS epidemic by introducing aggressive program in patient care and treatment, HIV/AIDS prevention program, a lot has been achieved. The results from these efforts show a decline of prevalence from the peak in the 80s and 90s to now about 6.9 percent. However, a lot could have been achieved than presently is. Factors that hinder this achievement are for example; distance from healthcare facilities, fear and stigmatization, poverty, lack of enough awareness information on HIV/AIDS especially
in rural communities, lack of proper support from family and community, lack of better HIV/AIDS cost-effective intervention, among others. Same-day test which is good for rapid HIV test results, may not always be available in these resource-limited countries, meaning a significant number of those who travel far long distances from home do not follow-up their HIV test results, and even if they do, treatment follow-up remains a problem. These reasons explain why hospital-based intervention program are accessed only when those HIV/AIDS infected people present late-stage disease forcing them to seek medical intervention in hospitals. Therefore, voluntary counselling and testing (VCT), which is important way of controlling HIV/AIDS, is severely limited in HIV/AIDS hospital-based program.
3. Problem statement

Despite the enormous efforts including billions of Kenya shillings the government has been spending to manage the disease since HIV/AIDS was reported in the 80s, the prevalence of HIV/AIDS is still high standing at 6.9%.

Secondly, the HIV/AIDS intervention program currently available in Kenya is mostly based in hospitals rather than within the rural community setting. This causes concern considering that hospitals in Kenya are located mainly in urban centres far away from reach by many; travel costs, lack of proper awareness of the existing HIV/AIDS program in hospital, and poverty. Besides this fact, majority of HIV/AIDS cases are in rural areas accounting to 1 million compared to urban that has about 400,000 HIV/AIDS infection.

Furthermore, hospital-based HIV/AIDS management comes with other limitations such as; those who visit hospital for medical check up or HIV/AIDS screening do so mainly when they are already cases and are very ill making the HIV/AIDS treatment extremely difficult. This way, concentrating preventive and treatment care efforts in hospitals lacks opportunities that are available at community level. The government is yet to actively focus HIV/AIDS intervention based on these factors.

3. Study objective

To review the literature and assess whether community-based HIV/AIDS program is cost-effective in resource scarce settings.
4. Methodology

4.1. Scope of the review

The scope of this review covers the work carried out for prevention or treatment of HIV/AIDS by focusing on cost effectiveness of community based interventions. The available research works in the area, whether economic evaluations or not and but with the ultimate aim of building evidence of effectiveness of community based programs, is part of this review.

4.2. Inclusion Criteria

The main inclusion criteria for the studies included in this review was: Firstly, being focus on community based HIV/AIDS prevention or treatment, secondly the economic evaluations or comparative effectiveness of community based programs, and the third element considered is the published work only.

Literature was mostly taken from various studies done in resource-poor countries, and also some were taken from developed countries that were based on community based HIV/AIDS management. Resource-poor countries are those countries with limited of physical and financial resources to invest on HIV/AIDS management. It also means those settings with limited infrastructure of health, and where the capacity to implement health programs is weak.

4.3. Literature Search Strategy

To review the literature on the community based HIV/AIDS management programs, I carried out a systematic inventory of published research work according to inclusion criteria. I first screened the computerized databases of UNAIDS, Global Fund and WHO for relevant articles, research reports and newsletters describing work in this area. I next searched the internet databases the Science Direct, Medline/PubMed, EconLit (the American Economic Association's electronic bibliography of economic literature) using available access through Umea University Library to find relevant work by using key terms like cost-effectiveness of HIV prevention, community-based HIV prevention, HIV cost-effective program, HIV management in poor communities, HIV/AIDS treatment and prevention, hospital-based, and economic evaluation. Besides I also searched articles cited in the bibliographies of published work found. Finally, to further expand and fortify the literature search process, I used the general search engine Google by using key terms for searching relevant work. This search process spanned almost 8 months.
Fig 5. Methodology for Literature Review

- Total articles n=1000
- Reading Abstracts and Summaries
  - Fulfilling inclusion criteria n=30
    - Economic Evaluations n=7
    - Non-economic evaluations n=23
  - Data extraction and categorization in matrix
- Net fulfilling inclusion criteria: Discarded n=670
4.4. Analytical Framework for Literature Compilation

After identifying the literature to be included in the review, all literature was saved in a computerized inventory. Reading literature again and again and keeping in view the objectives of study encoded an elementary framework encoded into a matrix to fit the available data in this. (Appendix I) The following dimensions were outlined in the matrix: title of study, objectives, country, target population, focus, method, features of program, outcome measure, setting, result and reference. However, this framework remained flexible with more dimensions evolved as the topic was conferred throughout the research process.

The studies were placed in the matrix by focus on prevention, diagnosis and screening, treatment and then any combination of focus. The studies were also segregated on the basis of economic evaluation or non-economic evaluation research.

Extensive analysis of literature was done unfolding the contemporary cost effectiveness of community based HIV/AIDS management programs, the main features and components of interventions, their strengths and limitations to meet public needs, nature and scope of the studies, and most importantly the type of the resulting outcomes used in studies.
5. Literature review

Community-based program is referred to as an intervention program based within community settings to manage HIV/AIDS through health promotion, health screening and treatment of HIV/AIDS patients at community level. In some countries such as South Africa, it is called decentralization, as it is a program that is located throughout the country including rural areas rather than being centralized in urban centres only. The literatures were reviewed, and then were categorized into preventive, diagnostic and treatment based on their focus.

5.1. HIV/AIDS prevention

Even though HIV/AIDS prevalence is stable and the ART has been offered free of charge in government hospitals in Peru, however, there has been concern that ineffective prevention program could lead to high costs of treatment and affect treatment intervention sustainability\(^{12}\). A study was done in Peru to determine cost-effective response to HIV/AIDS prevention intervention method such as voluntary counselling, peer education of youth, condom distribution, STI treatment, and ART therapy among other methods. The potential intervention program was evaluated based on the ability to reduce DALY\(^{12}\). The impact of the program was calculated using the number of HIV infections averted per year and this was then translated to new figure of years of life lost (YLLs) resulting from premature death and equivalent ‘healthy’ years lost due to disability (YLDs)\(^{12}\). The spectrum and survivorship were used to in the study to project HIV incidence and deaths in 5-year interval of ages 15-80+ and was calculated using published Peruvian data respectively\(^{12}\). At the assessment of impact of the program by the ability of the intervention to reduce HIV/AIDS transmission and reduction of cost per DALY averted, the results indicated that cost-effectiveness of the program varied so much between interventions from peer education of female commercial sex workers at US$ 55 up to US$ 5,928 (per DALY averted) for prevention of mother to child transmission\(^{12}\). The peer educated indicated a more positive cost-effective program.

A Community HIV/AIDS prevention approach was established in Tanzania for voluntary counselling and testing. It was a non-governmental approach whose aim was to create ties with rural communities and support people living with HIV/AIDS by focusing on community based care; home-based care, counselling, information about HIV infections, orphans care and assistance\(^{13}\). The community VCT program which was initiated in 2003 comprised of 52% female of medium age of 29 years (13 to 80 years). The Sweat et al stratified by gender and serostatus for HIV infections averted by the VCT among individuals were used for estimation for effectiveness of the program. Without the VCT, there was estimates that over 1 year, 68 HIV infections would prevented at a cost of US$169.69 per infection averted, and
also US$8.72 per DALY gained. With increased daily continuous testing number, the cost-effectiveness of testing afforded by the additional VCT campaign would avert 63 additional HIV infections at a cost of US$105.12 per infection averted thereby leading to the reduction of cost of DALY saved to US$ 5.40, while a model of sustained free VCT would reduce the cost per infection averted further to US$92 at a cost per DALY saved at 4.72. Upon calculating the effects of the community-based intervention, a total of 1381 DALYS were gained at a cost of US$24.52 per DALY without free VCT, while with free VCT campaign DALY gained was 2666 at a cost of US$21.34 of DALY while with sustained free VCT program, 5597 DALYS were gained at a cost per DALY of US$20.6913.

A Meta-analysis to find the cost effectiveness of behavioural intervention against STI among young people was conducted based on economic evaluations of behavioural interventions. The focus of interventions was based on changes on; sexual behaviour, self-efficacy, knowledge, attitudes, behavioural intentions and HIV infection rates14. An economic model was developed to compare costs and consequences of behavioural interventions for the prevention of sexually transmitted diseases such as HIV/AIDS. In the model, the intervention was estimated to last for 1 year for effectiveness. The model estimated lifelong costs and benefits from averted STI cases. The model then estimated that probability of one becoming infected by STI for the intervention and comparator groups according to changes that is in parameters that may be affected by the intervention namely condom use, number of sexual partners as well as number of sexual episodes. The number of cases averted to find the estimates was multiplied by the reduction of STI infection of those who got intervention. Eventually, the total number of STI cases averted, consequent of QALY gained and savings in medical costs was estimated for both males and females for all STIs for one year. At the end of the studies that used mathematical models to extrapolate the changes in sexual behaviour, the interventions were all effective at encouraging safer sexual behaviour at community settings, thus led to cases of HIV averted14.

A study was done in Mexico to assess the community intervention on behavioural intervention in Tijuana and Ciudad Juarez14. The cost-effectiveness of the intervention was assessed afterwards. A life-time Markov model was developed to estimate HIV cases averted, changes in QALE that is quality-adjusted life expectancy, and also costs per additional QALY, comparing (in US$ 2,009) no intervention, to once only intervention and annual intervention. Government healthcare payer perspective was adopted that is relevant for health policy decision-making in low and middle-income countries14. Costs were presented according to 2009 consumer price index and currency exchange rates. The future health benefits and costs were both discounted at annual rate of 3%. Intervention was considered highly cost-effective if it was less than one time the per capita gross domestic product in
Mexico per QALY gained equivalent to US$2,766. The results indicated that there were 33
HIV cases prevented and 5.7 months of QALY gained with 1000 female sex workers receiving
the once only intervention. Then, additional costs per QALY gained were US$183. For those
who received intervention annually, there were 29 additional HIV cases prevented as well as
4.5 additional months of QALE. The additional cost per QALY was US$1,075. The
behavioural intervention proved to be cost-effective in the Mexico and similar intervention
could be applied in other resource-limited settings14.

A randomized controlled trial was done in Kenya and Tanzania to determine both cost and
cost-effectiveness of voluntary HIV counselling and testing in community program15. Both
cost per HIV infection averted and cost per DALY saved were used to measure the cost-
effectiveness of the program outcome15. The cost per HIV infection averted was US$249 and
US$346 in Kenya and Tanzania respectively. The cost per DALY was US$13 and US$18
respectively in the two countries. The interventions proved cost-effective for HIV-infected
people and for those receive voluntary counselling and testing15. In sensitivity analysis,
community-based VCT was found to be cost-effective. The results of analysis showed that
increasing proportion of couples receiving VCT by 70%, it resulted in the cost per DALY
saved to US$11 and US$13 in Kenya and Tanzania respectively and that to target population
with HIV prevalence of 45% decreased the cost per DALY saved to US$8 and US$12 in Kenya
and Tanzania respectively15. Targeting the HIV positive people indicated highly cost-effective
since more disposed to behaviour change than the HIV negative resulting to per-client cost of
VCT to be US$29 in Tanzania and US$27 in Kenya. The figures are estimated could be much
higher than presented here15. Community voluntary counselling and testing is cost effective
this study concludes.

In another study in Kenya and Tanzania, cost-effectiveness of HIV-1 voluntary counselling
and testing was done to find out the effect of the community-based program16. The study
indicates that access to voluntary counselling and testing is severely limited in resource-
limited countries16. A cohort study of 10,000 people was done; outcomes were then modelled
based on the results of the study. The main outcomes were; program cost, number of HIV
averted, costs per HIV cases averted, and cost per DALY saved16. Also modelled were the
impact of the number of target population as well as the clients who received VCT as a couple
compared with as individuals. The results of HIV voluntary counselling and testing averted
1104 HIV infections in Kenya and 895 in Tanzania during the subsequent years. Cost per HIV
averted was US$249 and US$346 respectively and also costs per DALY saved were US$12.77
and US$17.78 respectively16. The cost-effectiveness of VCT was evident with average cost per
DALY saved of US$5.16-27.36 in Kenya; while in Tanzania it was US$6.58-45.03. Increasing
target population for VCT increases cost effectiveness of the program16. With the targeting
population with high HIV prevalence and couples, the results indicate significant increase of cost-effectiveness of VCT\textsuperscript{16}.

5.2. Diagnosis

According to the figure by WHO 2008, worldwide HIV infection has reached 33 million and majority more than two-thirds of this number live in developing countries with limited-resource\textsuperscript{17}. The raise of ART therapy has been rapid in most low-income and middle-income countries with over 4 million people estimated to be on ART at the end of 2008\textsuperscript{17}. Despite the scaled-up efforts to control AIDS prevalence, HIV incidence continues to raise in many parts of the world\textsuperscript{17}. Those who are unaware of their HIV infection is up to 3.5-times higher than those who are aware. To identify those who are infected should be given foremost priority in order to control the escalation of the AIDS pandemic. Use of behavioural interventions and effective treatment programs are better avenues to tackle this. Therefore, the expansion of HIV testing including rural communities is urgently needed as well as mechanism that would ensure that there is early diagnosis of the disease at the early stages of the infection at affordable costs, easier to manage especially for those persons living in resource-limited countries\textsuperscript{17}.

Studies indicate that lack of HIV diagnosis in time leads to either too late intervention when AIDS stage has developed, or leads to higher mortality\textsuperscript{18}. Both the WHO and the Global Programme on AIDS recommends use of testing strategies that are based on combinations of screening tests such as simple and rapid tests for blood screening, surveillance and also diagnosis. The recently developed rapid test make it possible to evaluate the performance as well as cost-effectiveness of HIV testing in settings with limited laboratory facilities such as in rural communities where voluntary counselling testing increases\textsuperscript{18}. The study further substantiate that the point of care (POC) that comprises of HIV rapid testing plays an important role in HIV prevention in both settings; developed and developing countries. Because rural community settings lacks well equipped laboratories, POC is essential in controlling HIV incidents. The results states that the total cost of the POC testing programme was about 40% less than that of DNA-PCR. The rapid POC is cost-effective than the alternative; incremental cost per HIV-infected infant that is correctly diagnosed using DNA-PCR ranges from US$559 (95% CI US$261-US$27012). Furthermore, persons who are aware of their HIV status adopt behaviours that reduces HIV transmission (26-28), so the community based rapid HIV testing is a tool that can effectively be used as a strategy to promote awareness of one’s own and partners HIV status\textsuperscript{18}.

A study was done in Detroit to find out the cost-effectiveness of determining new HIV diagnosis using community-based HIV rapid testing\textsuperscript{19}. The community-based programme ran
from April 2004 through March 2006\textsuperscript{19}. Testing was done both in clinic and in the community centres in Kansas while in Detroit testing was performed only in outreach, community settings. Measures of effectiveness were based on the number of HIV tests that were performed and the number of persons that were notified of the new diagnoses. The program costs were retrospectively collected that included those of personnel, test kits, mobile vans as well as facility space. Other costs included personnel, facilities, equipments and materials. Fixed costs included the costs of programme management such as planning, administration and supervision. Also included were training, travel, purchases and vans, equipments and durable goods\textsuperscript{19}. The variable goods included recruitment, testing and counselling and also nondurable goods and supplies namely test kits used for testing, quality assurance and also confirmatory testing. Cost of rapid test was US$8 per test kit; cost for confirmatory testing was US$37.91 that included test kit and processing time\textsuperscript{19}.

Personnel costs were calculated based on the time community based program staff spent on each of the program activities that included counselling, testing, recruitment, training, travel and also program planning, supervision and administration. The time associated with staff were multiplied by each activity by the wages received by the staff that performed the activities. The recruitment cost comprised of the time spent for recruiting people who were tested and those who declined to be tested\textsuperscript{19}. The results indicated that Kansas City had a mean of 855 people in the clinic and 703 people in outreach settings. While in Detroit the number of people tested in community settings were 976 people per year and the number notified of diagnoses were 15. Costs were varied according to the number of undiagnosed infections among those who were tested as well as the costs of purchasing and operating van. In Detroit the cost per notification was US$13,448 while in Kansas City, the cost was US$3,637 in clinic and US$16,985 in the community settings. The test demonstrates that there were more people who are not tested for HIV in the outreach settings based on the results of the amount of money spent per programs\textsuperscript{19}.

In the need to find out the economic benefit, a critical appraisal research was done to find out the cost-effectiveness of HIV screening and diagnosis. Systematic review was conducted using three search engines ranging from 1993 to 2008 through the use of key search words such HIV, HAART, economic evaluation, mass screening, cost-effectiveness analysis\textsuperscript{20}. HIV transmission in both men and women were analyzed including studies that compare testing protocols and partner notification. Every available intervention for HIV was included namely nonselective and selective opportunistic and population-based screening programs. Studies that were included in reviews were formal economic evaluations such as cost-benefit analyses, cost-effectiveness of HIV-screening, and also other studies that assess the effectiveness of HIV screening. Outcome of the study included cases of HIV infection
detected through screening, deterioration to AIDS status as well secondary transmission, QALY, program costs and also cost-effectiveness of screening. A total of 84 papers were identified, ten were formal economic evaluations; one cost study, three systematic reviews of HIV prevention programs, three effectiveness studies. The baseline assumption was that HIV screening was cost-effective. The Vickerman et al evaluated benefits of population screening for HIV and concluded that HIV screening through the point of care (POC) under community-based setting was cost-effective. By use of Bernulli model, the analyzed economic model revealed that impact of selective screening of HIV was cost-effective presuming that behavioural modification was a consequence of detected HIV incidents.

5.3. Treatment

To determine the effect of community-based HIV/AIDS treatment in rural community in South Africa, a study was carried to compare mortality rate, viral suppression and programme retention within 3 consecutive years of a public sector community-based ART clinic in a rural township. The result of this study indicates that community-based on-treatment virological suppression rates was successful, and sustainable over the 3-year period and is well comparing favourably with other treatment intervention program outcomes elsewhere in Africa, North America and Europe. It was a prospective study comprising of data ranging from establishment of services in October 2002 to the censoring date of September 2005. During the time, both viral load and CD4 counts were monitored at 4-month intervals. The results of that study comprised of 1139 ART naïve patients received ART (161, 280 and 698 during the 1st, 2nd and 3rd years respectively). Community-based counsellors provided both adherence and the program support. After follow-up, the number of counsellors increased from 6 to 28 and the medium numbers of clients that were allocated to counsellors increased from 13 to 33. The results demonstrated that a single community-based dispensary is able to extend care up to over 1000 patients without compromising the program performance. The program was located in Guguletu clinic in a socially deprived location in Nyanga district in South Africa with an unemployment rate of 57%, and 81% living in informal dwellings. The HIV rate in the district is 28%, and TB notification rate is 106/100 000. The district has population of 350 000 and is served by 10 primary care HIV clinics. The Usapho Lwethu, which is translated to Our Family ART programme is dedicated to ART clinic, is located within the Guguletu Community Health Center. International donor funded the pilot study that was started in 2002, subsequently; Global Fund to Fight AIDS, TB and Malaria has provided the support with grant. The program enrolment system was done according to the WHO 2002 recommendation for scaling up ART in resource-poor settings. Patients were put on treatments based on their CD4 level that was supposed to be <200. Local authority maintained the supply of medication to the community-healthcare through
the study period and all the treatment were provided of free of charge. Besides the scheduled appoints patients had, they were also given access to medical problems. During screening visits, patients were allocated to the community-based therapeutic counsellors within the locality. These community counsellors provided counselling support, as well as addressing psychological issues and also reinforcing the need for high levels of treatment adherence. Treatment-readiness group information sessions were carried out twice weekly in the local community-based clinic and it was the counsellors’ responsibility\textsuperscript{21}. Within the 3 years of the programme service, 1510 patients were referred to the ART programme of which 1139 were commenced on treatment. The pre-ART death rate was 34.6/100 patient-years (confidence interval CI: 27-43). Recruitments continued to increase significantly over the period. During the program 33 patients were lost during follow-up, 78 patients died, with 63% deaths during the 90 days of the ART. The medium proportion of viral loads were < 400 copies/ml and < 50 copies/ml viral loads at all the monitoring points. The programme virological treatment results were excellent, were sustained over the 3 years period.\textsuperscript{21}

A study was done to assess the efficiency and cost effectiveness of scaling up HIV treatment in South Africa\textsuperscript{22}. It looked into factors that needed to be considered for setting priorities for HIV treatment program. This cohort study was done in a poor South African settings used a Markov modelling and was used in calculating patient-level lifetime costs and QALY and also population-level total costs and QALY in each intervention and linear programming was also used for assessing efficiency of the program at population level. Costs included variables and fixed costs of direct healthcare costs. Unit costs were in this case defined as the full economic cost per visit per patient day and also per tuberculosis cases treated. The choice of drugs and treatment regimen were in line with the South African ART guidelines. Costs were expressed in 2003 prices and were converted to US$ using the average 2003 exchange rate (US$ 1 \( \frac{1}{4} \) 7.56 South African Rands)\textsuperscript{22}. There was adjustment for inflation using consumer price index excluding mortgage bonds. The results of this study indicate that first-line ART costs US$795 per QALY gained in comparison to non-ART. The ART efficiency depended on the cost of treatment budget, and location. The study indicates that community setting target leads to higher number of HIV risk group. The budget was most efficient when budget was between US$10-12 billion. Cost for undiscounted life-years were 2.9, 8.5 and 12.9 for no-ART while first-line ART costs for discounted per-patient lifetime were US$2743 and US$5779, and US$9435. According to the South African data, 500000 adults will develop AIDS annually over the projection period. If all the patients received no-ART 1.3 million would be in care by 2014 while with first-line ART 2.8 million would be in care while if all patients were on ART 3.3 million patients would be in care\textsuperscript{22}. The study indicates that with all patients covered on ART, about 11million QALY will be gained, while if only first-line ART was given, about 9
million QALY would be gained while without first-line or second-line ART provision, while without ART program, less than 5 million ART can be achieved if other interventions were followed. 

A study was carried out in Kenya to find out cost-effectiveness of HIV/AIDS prevention and treatment in resource scarce countries. The study explored methods to analyze the budget allocation in efficient way. Cost per life year saved was used as the outcome measure of the program cost-effectiveness. Five prevention intervention programmes were compared; i) voluntary counselling and testing ii) prevention of mother-to-child transmission iii) STD mass treatment of general population iv) STD management for sex workers v) blood screening. Blood screening and STD management program were cost-effective at US$ 3.35 and US$3.95 per life years saved (LYS) while ARV treatment was least cost-effective at US$1,317.20 at LYS. According to this study, a person who is infected without treatment would live normally for up to 10 years while the person who is tested and put on ART would live another 29 years more that is almost 40 years. Cost effectiveness of the program was based on cases of new HIV averted. The costs were estimates based on direct provider costs and were discounted at 3%. All the costs were adjusted to the US 2000 dollars estimates. Cost-per LYS for each intervention were based on i) mean survival time frame from infection to death for HIV positive infants was 3.5 years ii) mean age of HIV diagnosis was 27 years old iii) mean survival time from infection to death for HIV positive adults was 10 years and iv) life expectancy at birth was 52 years based on Kenya life expectancy. All the five prevention intervention could avert 8,855 HIV incidences at a cost of US$1,806,931 representing 90% of the total US$2 million AIDS budget. The voluntary counselling and testing was largest budget averting 2,360 HIV cases taking up to 34% of the AIDS budget, while STD control and management for sex workers could prevent 4,798 HIV infections representing 21% of the AIDS budget.

A Community-based study was done in Kenya, Thika district to assess the effect of the community-based organization on HIV/AIDS prevention, treatment and support. The study was completed in July 23rd 2006. Teachers, counsellors, as well as local implementing CDO partners conducted the interviews. The targets of visits were ECD centres, primary school, and vocational training centre programs. Thika district has a population of 171,569 households (Kenya Central Bureau of Statistics 1999) and include urban and peri-urban areas. The percentage of residents living below poverty line in this area is 34.9% (Kenya Central Bureau of Statistics 2005). In 1994, Thika had the highest HIV prevalence in Kenya standing at 39% Thika still has high number of HIV cases estimated to be 40,781 by 2008. The community-based project was initiated for the response to the needs of families who were affected by HIV/AIDS. Main focus was community level by working with local
partners including faith organizations and community-based organizations as well as AIDS support organizations. The program aims included building capacity for the local organizations in order to both implement and manage HIV/AIDS prevention, care and support services. Other aim was to strengthen community capacity and ability to effectively identify both needs and support and implement activities that focus on HIV/AIDS care, prevention and support.

A study was carried out in order to assess the cost-effectiveness of providing ART in different settings in a South African rural township setting. Main aims of the study were to describe the costs of providing ART at primary care clinics, as well as to describe costs that are associated with provision of HIV care in absence of ART at primary care clinics. Other aims were to determine costs associated with healthcare for patients that are referred to other levels of care; and to describe the cost-effectiveness of ART provision and no-ART provision in this community setting. Markov modelling was used to calculate the probability of surviving and the effectiveness of the program. The modelling was used to calculate each Markov stage of HIV till progression to death stage. The costs included on-going clinical consultations. Costs were categorized into overhead costs; condoms, office supplies, nutritional, utilities; Non-clinical staff that included counsellors, office staff, pharmacists, cleaners and monitoring data enterers; Clinical staff comprising of nurses and doctors; as well as medicines prescribed for opportunistic infections; Capital costs including electronic equipments, buildings and furniture.

The data on the related Health Related Quality of Life (HRQoL) was assessed by use of EUROQOL WQ-5D instrument at base 1, 3, 6 and 12 months on ART in the same setting. The study used EQ-5D to provide measure of overall health-related quality of life based on 5 questions with three levels of answers and rating scale. The value units' ranges from 0 (death) and 1 (full health.) The results indicated that the mean survival of patients from the time being initiated on ART to death was 8.33 years (6.79 QALYs) while mean survival for patients off ART in the same CD4 count as those on same strata as those on ART was 2.27 years (1.59 QALYs). The lifelong cost of ART therapy was R 93000 while the average cost for off-ART was approximately R23000. The result further indicates that if there is no hospital stay, the costs of ART therapy and no-ART therapy remains the same. In 14 OUT OF 20 sensitivity analysis, indicate that ART is more cost-effective than no-ART. The results further indicates that even though personnel costs are not the main cost bulk, recruiting and training of human resources to deliver ART still remains a challenge. The results conclude that there is a clear indication of the benefit of ART intervention that is also based on the settings of the program.
6. Main Findings

In total, there were 30 articles reviewed. Out of these, 14 were economic evaluation studies. The researches were done in 7 countries, 5 resource-limited countries that included: Kenya, Mexico, Peru, South Africa and Tanzania. The other tests were done in developed countries: USA, and UK. The main focus of this study was the cost-effectiveness of the community-based HIV/AIDS prevention and treatment. The focus of the current study was to review the economic evaluation literature on prevention and treatment of HIV/AIDS to come up with some findings that can be used in Kenya to manage the situation cost effectively. I have given a detailed account of all this literature based on their focus on prevention, diagnosis or treatment in the literature review part. Now I want to report the main findings for this purpose I will continue to use the same focus on three areas of prevention, diagnosis, and treatment. The main focus of the studies reviewed were cost-effectiveness of Rapid POC Diagnostic Test for the Control of HIV, Rapid testing of HIV, HIV treatment interventions, Prevention of sexually transmission, Prevention of HIV through condom use, cost-effectiveness of HIV interventions, use of ART (antiretroviral) therapy, cost-effectiveness to improve well being, cost-effectiveness of antiretroviral treatment, economic evaluation of HIV screening and voluntary counselling and testing. Outcome measures of these studies were QALY, DALY, LY gained, cost per QALY averted, cost per DALY averted, HIV cases averted, deaths averted, secondary HIV infection averted. This study focused on the prevention, diagnostic and treatment. Under the prevention, the focus was on peer counselling, condom use. The effectiveness on this level was: diagnostic level, the focus was on number of diagnoses made. On the treatment, the effectiveness was on the ART provision.

The results were categorized into prevention, diagnosis and treatment. The techniques that were used under this community-based interventions were: interactive group-based intervention, door-to-door testing strategy, peer education, point-of-care testing, mobile testing, focus group discussions, lay counselors, family centered approach, integrated approach. The cost-effectiveness calculations used here were based according WHO Categorization of cost-effectiveness threshold values as recommended by the Commission on Macroeconomics and Health, CHOICE was used to the cost-effectiveness of the interventions. The gross domestic product GDP is used to categorize the effectiveness of the intervention: Highly cost-effective (indicating less than GDP/capita; Cost-effective (falling between 1-3 times GDP/capita; and Not cost-effective (that is more than 3 times the country GDP/capita.
Table 5. WHO categorization of cost-effectiveness threshold values

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost-effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very cost-effective</td>
<td>&lt;GDP per capita</td>
</tr>
<tr>
<td>Cost-effective</td>
<td>1-3x GDP per capita</td>
</tr>
<tr>
<td>Not cost-effective</td>
<td>&gt;3xGDP per capita</td>
</tr>
</tbody>
</table>

WHO 2010: Kenya GDP: $1600, 3 x 1600 = $4800

6.1. Prevention:

Table 6. Prevention intervention variables’ cost-effectiveness level

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Education about HIV/AIDS</td>
<td>0.64/QALY</td>
</tr>
<tr>
<td>Condom use</td>
<td>2436/QALY</td>
</tr>
<tr>
<td>Voluntary counselling</td>
<td>45.03/DALY</td>
</tr>
<tr>
<td>Behavioural intervention</td>
<td>0.35/QALY</td>
</tr>
</tbody>
</table>

Based on the WHO categorization, the results according to the table indicates that peer education about HIV/AIDS accounted for 0.64 per QALY gained, making it very cost-effective against the Kenyan GDP threshold value of 1600$. Condom use was 2436 per QALY making it cost-effective, and voluntary counselling had a 45.03 per DALY. Behavioural intervention was the most cost-effective of the prevention interventions with a value of 0.35/QALY.

6.1.1. Higher number of HIV/AIDS cases averted

The study that was done in Tanzania and in Kenya indicated that when voluntary counselling and testing is done in community-based settings, cases of HIV/AIDS averted would be much higher\textsuperscript{20,26}. The VCT that was offered to 10,000 Tanzanians averted 895 HIV infections at the cost of $346 per each infection averted and also $17.78 per DALY saved. Another study was also done in Peru to assess the impact of the community-based program on the HIV/AIDS indicates that the intervention managed to reduce HIV/AIDS and reduce the cost per DALY averted. The results indicated that cost-effectiveness of the program varied so much between interventions from peer education of female commercial sex workers at US$ 55 up to US$ 5,928 (per DALY averted) for prevention of mother to child transmission\textsuperscript{20,26}. The peer educated indicated a more positive cost-effective program. When the assessment was made to determine the impact of new diagnosis under community-based program, the results conclude that the program could reduce HIV/AIDS transmission as well as reduction of cost per DALY averted\textsuperscript{20,26}. 

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6.1.2. Higher target group

According to the finding of the study that was done in Detroit and Kansa City to determine the cost-effectiveness of the urban based and outreach setting, the overall costs of the of the two programs differed. The findings concluded that the outreach settings cost was US$79,757 while that of the clinic based was US$68,318. The differences according to the results were due to higher number of those untested living in community outreach. Accordingly, more people who had not been tested were tested. However, the cost of the program was lower in the clinics attributed to already existing healthcare facilities in the hospitals, no need of training of the healthcare workforce. Furthermore, the findings conclude that the variability of the cost per person notified of a new HIV diagnosis in large part attributes to differences in the proportions of tested people whose results were positive. To reach as many target group as possible, and to see the impact of education on HIV/AIDS prevalence, a community-based program was launched in India and succeeded in reaching over 30,000 people. Another study that was used to test whether programs that aim at reducing HIV and STI among high-risk group to the general population are cost-effective was carried out in Tijuana. The results indicate that over 40% of HIV and STI cases were averted.

6.1.3. Better impact on behavioral change

In order to reduce the cases of STI and HIV/AIDS prevalence, targeting behaviors that promote HIV/AIDS incidences such as lack of condom use, needle sharing, drug use, bad cultural practices, etc is important. A cohort of 1000 boys and 1000 girls age 15 were studied in the US. The results model indicated that behavioral interventions at community settings would avert 3 cases of STI and save 0.5 of a QALY. Community-based HIV/AIDS program succeeds in this because such behaviors need time to change, patience to deal with and as well as they are understood more better under community level and can be targeted and changed better than in hospital settings. In another study done in developing countries under community settings to test the effect of behavior on HIV, had successful results. The meta-analysis that was done indicated that behavioral intervention in community settings had strong impact on condom use among the HIV+ people (odds ratio OR: 3.61; 95% confidence interval, CI: 2.61-4.99 than among HIV-negative individuals (OR: 1.32; 95%CI:0.77-2.26).

6.1.4. Factors that promote HIV/AIDS such as stigma, attitudes addressed better

Issues that promote HIV/AIDS such as stigma, attitudes, cultural practices such as widow-inheritance etc are mostly practiced within rural communities and are understood better at the community-level. This means that when dealing with these HIV/AIDS promoting behaviors, community-based approach should be the best alternative. To test the use of lay
counsellors under community setting could be more effective in HIV testing and control, as the study results that was done in Kassena-Nankana district in a rural community in northern Ghana indicates\textsuperscript{30}. The results indicated that the respondents agreed that they feel secure, trust the community-based lay counsellors based on the fact that they understand more and address the stigma that inhibits people willingness to be tested. Hospital settings though well equipped and have highly trained personnel, but lack opportunity to deal properly with these issues such as cultural practices that have highly contributed to HIV/AIDS prevalence.

6.1.5. **Higher accessibility to HIV/AIDS education**

It is easy to reach so many target group at ago because of community-based program being located within easy reach and within locality of the target group. Education being one important key way of passing HIV/AIDS information, it makes community-based HIV/AIDS program be very essential and most effective alternative. Because of closer proximity to the population or target group that do not need long distance travelling, organizing HIV/AIDS education program within the community dispensary for the local community is advantageous more than in hospital settings. Besides higher number that would be targeted, community-based educational program understand factors that may inhibit success of the educational program such as educational level of the community, cultures or stigma within the community. The educational organizers within the community-based settings will therefore have higher more impact on the target group.

6.2. **Diagnostics**

**Table 7. Diagnosis intervention variables’ cost-effectiveness level**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Cost-effectiveness variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid testing</td>
<td>559 Cases averted</td>
</tr>
<tr>
<td>Point of care testing</td>
<td>10660/QALY</td>
</tr>
<tr>
<td>Screening</td>
<td>12.77/QALY</td>
</tr>
</tbody>
</table>

Under diagnosis, the cost-effectiveness measures were done using cases averted, and QALY. According to the results on the table, and based on the WHO threshold value, point of care testing had 10660/QALY and screening had 12.77/QALY making the interventions cost-effective and very cost-effective respectively. Rapid testing averted 559 HIV cases making it cost-effective.

6.2.1. **Early diagnosis**

A study was done to determine cost-effectiveness of early diagnosis under community-based program\textsuperscript{19}. The goal of this program was to reduce the barriers that prevent early diagnosis of
HIV infection through offering rapid HIV test under setting out of hospitals. The tests were done in community-based organizations through community-based clinics and other outreach settings such as health fairs, public parks and also homeless shelters. The results indicated higher number of HIV testing done among the HIV risk group, who at the same time had very limited access to testing in medical settings such as hospitals\textsuperscript{19}. The testing also increased the number of those tested receiving their test results.

6.2.2. High willingness to get tested

People mainly fear being tested due to unpredicted results and stigma that are associated with HIV/AIDS. In a study that was done in Ghana, the majority of those studied (88.1\%) of the 403 respondents indicated their desire to be tested in areas under community settings than in hospitals facilities\textsuperscript{30}. Factors such as stigma featured prominently as reasons why people would prefer community-based testing for HIV testing than hospital. In the study that consisted of 403 respondents, 91.1\% of them indicated their need for the HIV test results under community-based program. Use of lay counsellors rather than doctors in hospital was also indicated as another key factor deciding willingness to be tested. Majority trusts the lay counsellors more to relay their test results. Reason being that lay counsellors within community settings have time and patience to explain, listen and comfort those people tested for HIV\textsuperscript{30}.

6.2.3. Higher need to know diagnosis status

Accessibility of HIV/AIDS test, diagnosis and treatment is key in accessing treatment and sustaining it. To know the test results of HIV status forms the basis of HIV/AIDS control. Findings from study done in Ghana indicate that community-based HIV/AIDS program is more acceptable as a way of handling voluntary HIV testing and treatment\textsuperscript{30}. Socio-cultural familiarity of those doing testing, and also where the testing is being done play important reason on willingness to be tested and so effectiveness of the program in controlling HIV/AIDS prevalence. Finding from another study done in USA, the test that was done in the Boston, Chicago, Detroit, and other five cities in USA in community-based settings indicated that the respondents of 96\% agreed that by working with community gatekeepers, their HIV testing was effective under community-based program\textsuperscript{19}. The use of those familiar with the community, within community testing had a positive view since that there will be greater commitment on part of those doing testing under community-based settings than health workers in hospitals.
6.3. Treatment

Table 8. Treatment intervention variables’ cost-effectiveness level

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Cost-effectiveness variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of ART</td>
<td>2088 QALY</td>
</tr>
</tbody>
</table>

Under treatment, community-based HIV/AIDS management had 2088 QALY.

6.3.1. Cheaper to manage

For HIV/AIDS control success to happen, costs should be considered. In the example of the study that was done in South Africa, the results indicates that the average cost per inpatient at the hospital-based was US$ 267 while that at the district hospital was less US$ 119\(^{25}\). The costs include program management for example employees, ARV treatment and the costs that include patients and the patient’s family such as transport\(^{25}\). In the research that used Markov model to find out the patient-level lifetime costs and QALY in South Africa found out that HIV/AIDS treatment using ART was beneficial, gaining up to US$795 per QALY. Efficiency of ART according to this study depended on the amount of treatment budget as well as the location of the health facility.

6.3.2. Higher survival rate

The ART treatment aims to sustain and prolong HIV/AIDS patients’ life. The transition probability of moving between Markov model states that is between CD4 levels to death is reduced with patients who consistently take ART\(^{25}\). With complete compliancy with ART therapy, that includes consistent ART take, regular health and treatment procedure monitoring, the HIV/AIDS patient’s morbidity and mortality is controlled. The accessibility of these ART treatment services play important role in ensuring effectiveness of the HIV/AIDS intervention\(^{25}\). HIV/AIDS treatment consistency is key to reducing viral load, prolongs life span as well as life quality. With consistent treatment regiment, CD4 level will be maintained meaning that patients will be well kept from opportunistic infections, and also from degenerating to AIDS status.

6.3.3. Better treatment compliancy

The family support for the HIV/AIDS patients is important. Support during HIV/AIDS treatment is fundamental for physical, mental and psychological strength of the HIV/AIDS patients. HIV/AIDS disease has immense effect on patient’s mental balance\(^{17}\). Availability of
such support from family and community play important role in patients’ recovery and productivity during HIV/AIDS treatment.

6.3.4. Reduced nosocomial infections

Nosocomial infections that are infections as a result of treatment in hospital are reduced under community-based HIV/AIDS management program. Exposure to common opportunistic infections such as TB, which is one of the most aggressive opportunistic infection for those with low immunity level due to low CD4 level, is very high in hospital-based care. Community-based program with its simple and special design, not as large as hospital units that have many kinds of patients suffering from infectious diseases, highly limits this nosocomial infection.
7. The proposed Community based program

7.1. Justification for the proposed program

There are numerous benefits associated with the community-based HIV/AIDS program. Some of these benefits will be discussed later in details in other parts of the study. Costs that are associated with travelling long distances to and from hospital by patient and the caretakers are removed. Consistency in treatment regimen will be assured of under community-based rather than hospital based where lack of transportation can interrupt treatment. Also, time the patient and the caregivers would travel long distances to hospital can be used to do some work, and look after other family members. This is advantage of community-based care. Hospital-based has disadvantage also due to hospital-based infectious diseases that the HIV patients are very vulnerable to due to their low immunity level. This is eliminated under community-based program. Besides, at the community-level patients are surrounded by their family members who give them care and love. Fear of stigmatization and discrimination that is a problem at hospital facilities is reduced in community-based program as the family and society once are informed will definitely be a safe environment for the HIV/AIDS patients.

7.2. Description of the Proposed program

This HIV/AIDS program will be integrated within community dispensaries that normally provide basic care for common diseases such as malaria, cholera, and typhoid as well as delivery services. The idea is to incorporate HIV/AIDS management within these local community dispensaries that will include testing and counselling of HIV positive, advocacy, prevention program and treatment of HIV/AIDS. The dispensary-based health workers including enrolled and registered nurses as well as medical workers will be trained on HIV/AIDS care and management. Laboratory in these community dispensaries will be equipped with HIV/AIDS tests kits; HIV/AIDS medication will also be available at these dispensaries for easy accessibility. Within these same facilities, a room will be used for testing and counselling for HIV/AIDS. The Ministry of Health of Kenya and other donor agencies including non-governmental organizations that will be eager for this community-based HIV/AIDS program will fund it. The funds that would normally be incurred in caring for patients in hospital-based program such as HIV/AIDS medication, HIV/AIDS testing kits, workers, and similar costs will be diverted to cater for the community-based management as necessary.
The reforms will include local-decision-making authority, guided policy and how the community-based program will be developed. In South Africa for example, a study shows that over 60% of HIV/AIDS cases can be treated safely at local dispensaries.

The community-based program will operate as follows:

- The community-based program will be incorporated within the local dispensaries in the communities.
- Closer corporation with the Ministry of Health of Kenya in each level of the program run such as management, financing, etc.
- Liaising more closely with other ministries that include education, as well as local governments, finance concerning issues of training, salaries and regarding other established changes within the dispensaries.
- Closer corporation with other government and also non-governmental organizations such as local and international funding agencies for financing and sustainability of the community-based program.
- To ensure smooth transition of locus of HIV/AIDS management control, the management of the community-based program will work closely with the Ministry of health to ensure flawless organizational structure and staffing levels from a human resource perspective is maintained.
8. Issues and Challenges

This review has limitations. All the articles reviewed were 30, while the number of the economic review articles were only seven. Not any single country had all the interventions assessed posing difficulty in ascertaining biasness in comparison. Cost of the data were not very comprehensive and few for concluding a standardized effectiveness analysis. The effect of some of the interventions on HIV/AIDS could have been either been underestimated or overestimated based on the fact that some potential effects such as reduced stigma are difficult to measure, and were not accounted for. The use of ART could have been overestimated since its use may increase risky behavior from its use based on the fact that HIV-positive people have improved life expectancy. VCT were mostly based on smaller scale, arising the question of how the same intervention cost-effectiveness would fair on a large scale. Some interventions may compliment each other, a fact that is missed for analysis here. Though evidence shows that community-based HIV/AIDS is cost-effective, there is no research has been done that compares cost-effectiveness of community-based HIV/AIDS management program against hospital-based program. Non-uniformity of outcome measures variables: some articles measured QALY, LYS, and DALY causing difficulties in cost-effectiveness comparisons. Most of the research articles found were NGO independently initiated not governmental run HIV/AIDS program, leading to question on how these same programs would perform if government ran them. Based on these limitations, generalization and application should be treated with caution, leaving a window of opportunity for further studies.

9. Discussion

Effective HIV/AIDS prevention and treatment intervention depends on accessibility of HIV/AIDS testing facilities, care and support for those infected and affected with HIV/AIDS, targeted prevention modalities for all HIV risk groups. For a HIV/AIDS program to be cost-effective, the results should reflect benefit of its implementation based on QALY gained as well as life years saved as a result of the intervention. Access to HIV testing as well as eventual treatment of HIV/AIDS is a measure of knowing capacity of effective HIV/AIDS intervention program. In Kenya the total number of people living with HIV/AIDS is 1.3 millions age 15-49 years adults based on NASCOP 2009 survey. Kenya has over 38 million population. Majority of these are in the 15-45 years age bracket. Under the present existing HIV/AIDS program in Kenya, those who access and receive counselling and testing are 3,412,000. By the year 2009 those who have been tested account to 40.4 percent and 56.5 percent men and women respectively based on USAID 2009. Of all the testing sites in Kenya,
only 15% that is about 112 (15% of 749) are located within community settings according to NASCOP 2009\(^6\). According to WHO 2007, Unwards Universal Access, those who access ART treatment by 2007 estimates were 38\% (297,800) leaving out over 60\% of the infected out of treatment program. The number of health facilities countrywide providing ART treatment is 943 reflecting only 14 percent of all the healthcare facilities in Kenya.

Kenya has 6736 health facilities; including hospitals, sub-district hospitals, nursing homes, health centres\(^8\). Majority of these health facilities are health centres and dispensaries that are spread countrywide in Kenya and are easily accessible than hospitals. According to study by Crepaz, 2006 and Bunnell, 2008, HIV testing carried among HIV infected people has been associated with 60\% reduction in transmission in various settings. Based on these findings, if community-based HIV/AIDS program will be implemented in Kenya, it will have more effect on prevention, diagnosis and treatment of HIV/AIDS. Considering that dispensaries countrywide are numbering close to 3000 reflecting almost half the health faculties in Kenya, if all the dispensaries were to have HIV testing facilities and treatment under the community-based program, very high number will be tested, diagnosed and treated. There will be higher community coverage instead of the 15\% existing currently. It means that the effect of HIV testing under community will highly increase from the current level. These findings are great pointer to the fact that there is great chance being missed by the Kenyan Ministry of Health in HIV/AIDS management. This translates that; focus of HIV/AIDS intervention under community-based program will most likely have more and better impact in HIV/AIDS control than the hospital-based focus, as is the case currently in Kenya.

Diagnostic will increase from the present condition too. Findings from this study indicate that diagnosis depends on the accessibility of the health facility, and also the distance where the health facility is located from the target group. Higher diagnosis according to the findings is achieved by the ability of those being tested to know their test results. Most of the health facilities in Kenya as stated are health centres and communities, and these are within community reach. The study findings indicate that community-based program will enable more people to know their test results. Hospital location in Kenya play key factors why many people tested do not get their test results. Other factors mentioned in the findings include stigma as a huddle that causes fear for people to know their test results. Stigma that maybe a hindrance, the findings indicate that will be better dealt with under community-based program. According to the study findings done in Ghana, stigma came out strongly as one reason why people shy away from getting their test results. Lack of creating safe counselling environment, lack of enough time to counsel and understanding of stigma among some hospital health workers contribute to reasons why people do not receive their results. Community-based program is favoured in the findings since people feel that those who work
under community-based settings understand the stigma that exist within the community and so are in better position to relay test results better to those tested than the case of hospital.

HIV/AIDS treatment coverage as of now is about 38% in Kenya. Factors leading to this are the location where these services are. As indicated, majority of Kenyan population live in communities not in urban areas. Many of the health facilities in Kenya are located within communities such as dispensaries, but ironically, HIV/AIDS management facilities are located in urban centers in hospitals. This causes setback on HIV/AIDS fight. As of now, HIV/AIDS treatment coverage is so low, and everybody who has been tested should actually be put on treatment if the fight on HIV/AIDS is to be won in Kenya. The 38% HIV/AIDS treatment coverage currently in Kenya means that many HIV/AIDS cases that could be treated and their morbidity and mortality rate reduced do not access this ART service. The treatment should be based under community dispensaries in order to maximize treatment effect as the findings indicate. The results in this study points that if healthcare facility is easily accessible, HIV/AIDS treatment will be easy to monitor, treatment will be consistent as is required in HIV/AIDS treatment to be effective. Majority of Kenyan population live below poverty level, and the cases of poverty is even higher in rural communities. This means that people are unable to get money for transportation to and from health facilities as needed to access ART treatment. Community-based program will offer this treatment opportunity to these people because there will be no concerns about transportation costs that limits hospital-based care.

![Fig 6. Summary of cost-effectiveness data for HIV prevention intervention by type of intervention (Source: BMC Public Health)](image-url)
If community-based are effectively launched in rural communities, Kenya will be in a better chance of winning this devastation of HIV/AIDS that has caused untold suffering in lives of Kenyans, as well as to the health sector and to the economy at large.

This research even though found out convincing results that community-based program could be the most cost-effective alternative to manage HIV/AIDS, however, it is not conclusive; more research focusing in the same field should be done to ascertain the facts.

**10. Implications for Kenya**

In Kenya according to NASCOP 2009, the total number of people living with HIV/AIDS is 1.3 millions age 15-49 years adults. Under the present existing HIV/AIDS program in Kenya, those who receive counselling and testing are 3,412,000. By the year 2009 those who have been tested account to 40.4 percent and 56.5 percent men and women respectively (USAID 2009). Of all the testing sites in Kenya, only 15% are located within community settings according to NASCOP 2009. According to the WHO 2007, Unwards Universal Access, those who access ART treatment by 2007 estimates were 38% (297,800) leaving out over 60% of the infected out of treatment program. The number of health facilities countrywide providing ART treatment is 943 reflecting only 14 percent of all the healthcare facilities in Kenya.

Kenya has 6736 healthcare facilities. Out of these facilities, almost half of them, 3000 are community based dispensaries and healthcare centres. The hospital that consists of National hospitals, provincial hospitals as well as district hospitals managing HIV/AIDS care are located in urban centres. Since majority of Kenyan population live in rural communities, many of them therefore access healthcare service from these dispensaries. Hospital health service is much expensive than these dispensaries. The cost of treatment compounded with transportation makes them expensive for the majority of Kenyans to access them. Over 86% of Kenyans ages between 15 to 29 years are aware that condom use prevents HIV/AIDS. The age set of 46 and older has 62 percent agreeing that condom use prevents HIV/AIDS. According to NASCOP, education plays important role in HIV/AIDS awareness with over 90% of those who have at least secondary education know that HIV/AIDS treatment exists compared to 57% awareness level of those with that level of formal education. Over 95% of Kenyans know HIV/AIDS treatment exists while 16% of correspondents believe that there is no ART treatment. Majority of Kenyans know that HIV testing is important, but few numbers of these are willing to be tested based on fear, stigma, and testing facility locations.
In Kenya HIV/AIDS prevention and treatment program has been mainly hospital based. Kenya researchers and much of the funding towards HIV/AIDS have mainly been similarly hospital focused. There has not been much attention towards community-based HIV/AIDS prevention. Problem such as lack of access to testing services, fear of stigma and discrimination, fear the test will be positive, and lack of access to treatment and distance from home to health facilities is some of the major contributors of HIV/AIDS high prevalence in Kenya. These facts mean thousands of opportunities for increased access to treatment, care, support and prevention have been, and are being missed. Other factors include low HIV awareness and high stigma, fuelled by low literacy, seasonal migration, gender inequity, spatial dispersion, and cultural taboos, pose extra challenges to implementing much-needed HIV education programs in rural areas. There are cultural practices such as unsafe circumcision through crude methods, poverty, widow inheritance, and other socio-cultural practices that play an influential role in the vulnerability of Kenyan rural communities to the contraction and transmission of HIV/AIDS. These are issues that are better dealt with at the community level. The activities that are currently based under rural-based community program in Kenya though are ineffectively implemented include:

i. Disseminate national policies and
ii. Provide HBC utilizing c guidelines at district, community, and volunteers CBO level
iii. Implement package of
iv. Train paralegal advisors, educate
v. Services including psychological support to guardians, caregivers, and foster parents
vi. Support, school fees and mobilize communities around rights
vii. Clothing, food, linkages
viii. Train health care facility staff in paediatric HIV treatment, care, and linkages to HBC
ix. Train CHW in HBC
x. Sensitize community and religious leaders on HIV impact and OVC needs
xi. Train CBO managers in HBC and OV program management
xii. Train school teachers, ECD staff, and other key adults in child counselling and support
xiii. Provide ongoing technical assistance and block grants to CBOs material support provision
xiv. Business training and IGA for household adults, micro-credit loans vocational or life skills to older youth, and food se caregivers
xv. Perform advocacy active community
xvi. Facilitate support group parents, guardians
Majority of Kenyans live in rural areas, and access healthcare service from healthcare facilities that are located in rural areas such as dispensaries and healthcare centres. If most of these community-based facilities would be incorporated into HIV/AIDS management, there will be great impact on HIV/AIDS intervention in Kenya. The total healthcare facilities in Kenya currently providing HIV/AIDS services to the HIV/AIDS patients is only 943, translating to 14% of all the available healthcare facilities in countrywide, while only 15% of these are community-based healthcare facilities providing HIV/AIDS management. According to WHO 2008, majority of HIV/AIDS prevalence in Kenya live in rural areas accounting to 1 million of the 1.4 millions infected. This implies that if the HIV/AIDS intervention were targeted in rural areas, the number of people who will access the HIV/AIDS services will be much higher than the present 297,800 representing only 38% of the infected people under the HIV/AIDS program. The current HIV/AIDS program that is largely hospital-based coverage leaves out 60% infected people out of the HIV/AIDS management program according to NASCOP 2009.

Based on these facts and the findings (tables 5, 6, and 7), if the Kenyan government implemented community-based HIV/AIDS intervention program, the program would be cost-effective in prevention, diagnosis and treatment of HIV/AIDS. It is fundamental that the Kenyan government through all the HIV/AIDS stockholders such as policy implementers, decision makers on healthcare budget allocation and HIV/AIDS management program to evaluate the existing HIV/AIDS intervention programs against this convincingly cost-effective community-based HIV/AIDS intervention.

11. Conclusion

Community-based HIV/AIDS interventions based on the findings is cost-effective through prevention, diagnosis and treatment. Based on HIV/AIDS prevention, community-based HIV/AIDS is cost-effective due to; higher number of HIV/AIDS cases averted; higher number of target group is reached which is important in HIV/AIDS control; higher impact on behavioural change; addresses stigma better and also leads to higher accessibility to HIV/AIDS education. These findings formidably puts community-based HIV/AIDS program in a better position to prevent HIV/AIDS incidences. Secondly, diagnosis of HIV, which is crucial in HIV/AIDS control, is successful under community-based program. The results here indicate that through community settings intervention, there is higher willingness of people to be tested a factor that is pivotal in controlling HIV/AIDS prevalence; there is also early diagnosis that helps on time start of ART and other HIV/AIDS therapy to the HIV infected person; and also, there is higher need by those who have undergone HIV test to know their HIV status. Thirdly, community-based HIV/AIDS management program according to this
study results shows that HIV/AIDS treatment is successful under community-based intervention. Factors attributing to this success include; higher HIV/AIDS patients survival due to their consistent treatment on ART medication. These findings translate to the community-based cost-effectiveness and have been reported in many studies. However, there is lack of solid data regarding comparison of community and hospital based programs though community based programs success has been reported in many wider outreach and better impact.

The findings clearly challenge and compounds the needs for the government of Kenya and HIV/AIDS stakeholders need to consider their focus on HIV/AIDS management policy that is at present mainly in hospitals focus despite limitations. To succeed in HIV/AIDS intervention, certainly, factors such as low accessibility, low number of HIV testing, low diagnosis, low and inconsistent ART treatment that compromises HIV/AIDS treatment and may result in HIV resistance, as well as higher costs associated with the management in hospitals should be thoroughly addressed. The community-based HIV/AIDS program has convincing impact on HIV/AIDS intervention in a cost-effective way based on the results; hence, the Kenyan government should consider its implementation towards HIV/AIDS management.
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Appendix

1. Economic evaluation table
<p>| Sr# | Title of study                                                                 | Objectives                                                                                                                                                                                                 | Country        | Target population                                                                 | Focus                                                                                                                                  | Method                                                                                                                                         | Features of program                                                                 | Outcome measure | Setting                                                                                   | Result                                                                                      |
|-----|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------|
| 1   | Behavioral interventions for HIV positive prevention in developing countries: a systematic review and meta-analysis | To assess evidence for varied effect of positive prevention interventions among persons infected and not infected with HIV in developing countries, and also to assess the effectiveness of interventions that are targeted specifically at people living with HIV. | Developing countries | HIV+ individuals, heterosexual adults or HIV-serodiscordant couples | P: HIV counselling and testing interventions, including condom distribution. | Systematic review and meta-analysis                                                                                                       | Studies conducted in a clinic setting, participants’ homes, in both clinic and home         | Condom use                  | clinic setting, participant’s homes, in both clinic and home                                  | Behavioral intervention has stronger impact on condom use among HIV-positive (HIV+) individuals more than among HIV-negative individuals |
| 2   | A quasi-experimental evaluation of a community-based HIV prevention intervention for Mexican American female adolescents: The Shero’s program | To evaluate a community-based, culturally and ecologically adapted HIV prevention intervention for Mexican American female adolescents | U.S.A | Adolescents                                                             | P: Behavioral change                                                                                                                | Quasi experimental                                                                                                                       | Nine-session interactive group-based HIV prevention intervention, interactive games, group discussion, role-plays, and mini-lectures. | Self-esteem, condom attitudes, beliefs regarding a woman’s control of her sexuality, beliefs regarding | Community based | Findings support the development of community-based adolescent HIV prevention intervention that address... |</p>
<table>
<thead>
<tr>
<th></th>
<th>The costs and effectiveness of four HIV counseling and testing strategies in Uganda</th>
<th>To test whether HIV counseling and testing (HCT) as intervention for HIV/AIDS control, are better way of managing HIV/AIDS.</th>
<th>Retrospective cohort of 84323 individuals were given HCT at one of four Ugandan HCT programs between June 2003 and September 2005</th>
<th>Household-member and door-to-door HCT strategies, Hospital-based HCT</th>
<th>Household-member and door-to-door HCT strategies were better in reaching the untested persons. While, Hospital-based HCT provided higher HIV-infected individuals, followed by stand-alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Determining a cost effective intervention response to Peru</td>
<td>To estimate level of prevalence of HIV/AIDS risk groups</td>
<td>HIV/AIDS prevalence levels for risk groups peer education of sex workers</td>
<td>There was varying cost effectiveness between</td>
<td></td>
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</tbody>
</table>
### HIV/AIDS in Peru

Among risk groups with sufficient sentinel survey data. Also, there were calculations on unit costs for a series of interventions against HIV/AIDS that subsequently, inputted into a model to assess their ability and to reduce infection transmission rates.

### Cost-effectiveness of HIV/AIDS interventions in Africa: a systematic review of the evidence


A case of HIV/AIDS can be prevented for $11, and a DALY gained for $1, by selective blood safety measures.
<table>
<thead>
<tr>
<th>7</th>
<th>Economic evaluation of point-of-care diagnostic technologies for infectious diseases</th>
<th>To find out if individual point of care (POC) rapid tests can be cost-effective</th>
<th>Resource-limited countries</th>
<th>CE: Rapid POC Diagnostic Tests for the Control of HIV</th>
<th>Literature review</th>
<th>New diagnosis, life years gained, QALY, DALY, deaths averted,</th>
<th>Using simple or rapid tests (for blood screening, surveillanc e, and diagnosis), instead of enzyme immunoass ay and western blot techniques</th>
<th>Individual point-of-care (POC) tests for diagnosis of infectious diseases in resource-limited is cost effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Cost-Effectiveness of Finding New HIV Diagnoses Using Rapid HIV Testing in Community-Based Organizations</td>
<td>To find out the cost-effectiveness of diagnosing new HIV through rapid testing done by community-based organization in U.S.A cities</td>
<td>Any: voluntary</td>
<td>CE: rapid testing of HIV</td>
<td>Cost effective analysis</td>
<td>Rapid HIV testing was performed in a clinic and in outreach settings through use of mobile testing vans.</td>
<td>The number of HIV tests performed and the number of people notified of new HIV diagnoses, and costs</td>
<td>Clinic and in outreach settings; health fairs, public parks, homeless shelters, substance-abuse</td>
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<tr>
<td>9</td>
<td>Implementation of Rapid HIV Testing Programs in Community and Outreach Settings: Perspectives from Staff at Eight Community-Based Organizations in Seven U.S. Cities</td>
<td>To evaluate perceptions of staff concerning the effectiveness of methods used by community-based organizations (CBOs) to influence HIV/AIDS counseling and rapid testing in community and outreach settings in some U.S. cities.</td>
<td>U.S.A</td>
<td>Program staff</td>
<td>A: HIV/AIDS counseling and rapid testing</td>
<td>A staff survey Using a Likert scale, using .</td>
<td>mobile testing units</td>
<td>Finding effective HIV test method, mobile testing units (MTUs), rapid HIV test kits, community and outreach settings</td>
</tr>
<tr>
<td>10</td>
<td>Using lay counselors to promote community-based voluntary</td>
<td>To assess approval for the use of lay counselors in promoting</td>
<td>Ghana</td>
<td>HIV/AIDS patients</td>
<td>A: Voluntary counseling and HIV testing</td>
<td>Cross-sectional questionnaire survey, Focus group discussions, lay counselors</td>
<td>Community-based VCT, lay counselors</td>
<td>Community</td>
</tr>
</tbody>
</table>
counseling and HIV testing in rural northern Ghana: A baseline survey on community acceptance and stigma  

community-based voluntary counseling and testing for HIV and the extent of HIV/AIDS-related stigma in rural northern Ghana.

<p>| 11 | Engaging Community-based Organizations in TB/HIV Collaborative Activities | To address how communities can be engaged in a better and effective ways in TB/HIV collaborative activities | Nigeria | Effectiveness of CBOs: HIV/AIDS prevention, care, and treatment | Case Study Semi-structured interviews and the use of a questionnaires with 56 variables. | support groups; home-based care; and referrals between tertiary, primary healthcare facilities, and community support services. recruit and manage volunteers who may accompany clients and facilitate and follow-up | core competencies | Community based over 80 percent of the organization shared three core competencies: support groups for PLWHA; home-based care; and referrals between tertiary refer-ence centers, primary healthcare facilities, and community support services. | considered locations outside of the health facility as preferred places for VCT. The majority approved the use of lay counsellors |
|   | A national survey of home-based care kits for palliative HIV/AIDS care in South Africa | To evaluate the feasibility of scaling up kit production and distribution through assessment of home-based care (HBC) kits and programs in South Africa. | South Africa | feasibility of scaling up: systems for production, distribution and supply of HBC kits. | A structured questionnaire; key informant interviews, literature review | study team distributed questionnaires to 466 organizations and conducted interviews with representatives from 45 organizations, the Provincial Department of Health (DoH) and manufacturers of kits. | Improvemnt of supply chain management of HBC kits, is needed |
|---|---|---|---|---|---|---|
| 13 | A package of primary health care services for comprehensive family-centred HIV/AIDS care and treatment programs in low-income settings | To present availability of evidence-based service packages that will help program designers prioritize available human and materiel resources toward those interventions that improve patients’ health and well being. | Poor settings | HIV-infected population | | | Improvemnt of supply chain management of HBC kits, is needed |
| 14 | Short term estimates of adult HIV incidence by mode of transmission: Kenya and Thailand as examples | To understand the behaviors that put people at risk of infection and how new infections are distributed among risk groups. | Kenya, Thailand | Heterosexual men and women, people with sexually transmitted infections and uncircumcised men from developed and undeveloped countries | Identify Mode of HIV transmission | Use of model, descriptive | Incidence of HIV infections by mode of transmission | New infections in Kenya mainly transmit through heterosexual contact (90%), injecting drug use (4.8%) and men who have sex with men (4.5%). |
| 15 | Community-based intervention for AIDS prevention. | To find out if community-based interventions for HIV/AIDS prevention is cost effective | China, Mexico, India, Nigeria, Brazil, Uganda, Burkina Faso, Tanzania, Zimbabwe, South Africa, Thailand | Injecting drug users (IDUs), Female Sexual Partners Of IDUs, Female Sex Workers in the Entertainment Industry, Males In Rural Communities | Behavior Change Programs in Special Groups | HIV/AIDS awareness | Peer education in rural areas can be effective in HIV/AIDS prevention, by positively influencing knowledge and behavior. |
| 16 | Integrated community-based care support to orphans and other children and their families made vulnerable | Multi-sectoral approach to address impacts of HIV epidemic Research review on integration. | South Africa | orphans and other children and their families | ??? | ??? | Home visits Psychosocial support - Family support - HIV and AIDS training - | Community Strengthening community responses e.g. community-based |</p>
<table>
<thead>
<tr>
<th>17</th>
<th>The role of HIV testing, counseling, and treatment in coping with HIV/AIDS in Uganda: a qualitative analysis</th>
<th>To investigate the role of HIV voluntary counseling and testing (VCT) and treatment in enabling HIV-positive Ugandans to cope with this disease</th>
<th>Uganda</th>
<th>Six men and six women. Half of the men and women’s groups were receiving antiretroviral therapy (ART) and half were not coping with HIV/AIDS</th>
<th>Qualitative research, focus group discussions (FGDs)</th>
<th>Holistic care training - Food parcel - HIV testing - Treatment Support &amp; Traditional medicine - Income generating activities - Child Care forums - Social Security support &amp; material support</th>
<th>Ensuring the provision of quality assured and gender conscious VCT and ART delivery services will enhance positive living and enforce compliance to ART programs.</th>
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<tbody>
<tr>
<td>18</td>
<td>Providing universal access</td>
<td>To describe how district-wide</td>
<td>Malawi</td>
<td>access to HIV / AIDS care</td>
<td></td>
<td></td>
<td>There is need</td>
</tr>
</tbody>
</table>
| 19 | The impact of HIV/AIDS on human development in African countries | To stress the necessity of multidisciplinary approaches that model, estimate and predict the real impact of HIV/AIDS on human development of African countries so as to optimize the strategies that is proposed by African countries: such as Kenya, Malawi, Tanzania, etc. | Secondary information | HIV/AIDS affects the global human development of African countries through its devastating impact on health and demographi c indicators | shifting responsibility for antiretroviral therapy (ART) initiations to non-physician clinicians almost doubled ART enrolment, with a majority of initiations performed in peripheral health centers

<p>| to antiretroviral therapy in Thyolo, Malawi through task shifting and decentralization of HIV/AIDS care | access to HIV/AIDS care was attained and sustained in Thyolo District, Malawi. |  |  |  |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Study Title</th>
<th>Study Objective</th>
<th>Country</th>
<th>Analysis Type</th>
<th>Healthcare Utilisation</th>
<th>Cost-Effectiveness</th>
<th>Site Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Assessing efficiency and costs of scaling up HIV treatment</td>
<td>To propose approach that simultaneously assesses both factors when setting priorities for HIV treatment.</td>
<td>South Africa</td>
<td>costs of scaling up HIV treatment</td>
<td>Cohort</td>
<td></td>
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<td></td>
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<td></td>
<td>Cost effectiveness analysis</td>
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<td></td>
<td></td>
<td></td>
<td>Patient-level lifetime costs, quality-adjusted life-years (QALY) population-level total costs QALY</td>
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<td></td>
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<tr>
<td>21</td>
<td>The cost-effectiveness of Antiretroviral Treatment in Khayelitsha, South Africa – a primary data analysis</td>
<td>to estimate HIV healthcare utilisation, the unit costs of HIV services and the cost per life year (LY) and quality adjusted life year (QALY) gained of HIV treatment interventions from a provider’s perspective</td>
<td>South Africa</td>
<td>HIV treatment interventions</td>
<td>Before and after study design.</td>
<td></td>
<td>HIV healthcare utilisation, the unit costs of HIV services, the cost per life year (LY) and quality adjusted life year (QALY) gained of HIV treatment</td>
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<tr>
<td>22</td>
<td>Cost-Effectiveness of Free HIV Voluntary</td>
<td>To evaluate the cost-effectiveness of fee-based and Tanzania persons living with HIV/AIDS</td>
<td>Tanzania</td>
<td>cost-effectiveness of limited and sustained free</td>
<td>Analyzed the number of clients testing per</td>
<td>Costs per infection averted, costs per</td>
<td>The provision of free VCT enhances</td>
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<tr>
<td>Study Number</td>
<td>Title</td>
<td>Country</td>
<td>Study Population</td>
<td>Intervention</td>
<td>Outcomes</td>
<td>Study Type</td>
<td>Outcomes Measured</td>
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<td>24</td>
<td>Cost-Effectiveness of an Intervention to Reduce</td>
<td>Mexico</td>
<td>female sex workers (FSWs)</td>
<td>CE: preventing HIV by Condom use</td>
<td>Markov model was developed to estimate</td>
<td>Mexico</td>
<td>female sex workers (FSWs)</td>
</tr>
<tr>
<td>25</td>
<td>Cost-Effectiveness of HIV Interventions for Resource Scarce Countries: Setting Priorities for HIV/AIDS</td>
<td>To explore one method to analyze the allocation of limited budgets.</td>
<td>Kenya</td>
<td>Cost-Effectiveness of HIV Interventions: HIV prevention and ARV</td>
<td>Literature review</td>
<td>Voluntary counseling and testing; prevention of mother-to-child transmission; STD mass treatment for general population; STD management for sex workers; and blood screening</td>
<td>Both the cost-effectiveness analysis and the budgetary analysis suggest that HIV prevention interventions are much more cost-effective than ARV treatment</td>
</tr>
<tr>
<td>26</td>
<td>Cost-Effectiveness of HIV Prevention in Developing Countries</td>
<td>To find out if HIV prevention interventions in developing countries can be effective</td>
<td>Developing Countries</td>
<td>HIV prevention interventions</td>
<td>Cost-effectiveness</td>
<td>incidence of HIV/AIDS infection</td>
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<tr>
<td>No.</td>
<td>Program Name</td>
<td>Country</td>
<td>Target Population</td>
<td>Methodology</td>
<td>Inclusion</td>
<td>Outcome Measure</td>
<td>Funding Source</td>
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<td>27</td>
<td>Community-Based HIV/AIDS Prevention, Care, and Support Program</td>
<td>Kenya</td>
<td>Orphans and vulnerable children (OVC)</td>
<td>cost-effective way to improve the well being</td>
<td>Case studies</td>
<td>Impact assessment and costing activity of the programs.</td>
<td>Agency for International Developmen t (USAID) the U.S. President's Emergency Plan for AIDS Relief (Emergenc y Plan), COPHIA</td>
</tr>
<tr>
<td>28</td>
<td>Cost-effectiveness of antiretroviral treatment for HIV+ adults in South African township</td>
<td>South Africa</td>
<td>HIV+ adults</td>
<td>Cost-effectiveness of antiretroviral treatment</td>
<td>QALY, cost utility analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Cost-effectiveness of voluntary HIV-1 counseling and testing in reducing sexual transmission of HIV-1 in Kenya</td>
<td>Kenya, Tanzania</td>
<td>Any: voluntarily</td>
<td>CE: HIV-1 VCT</td>
<td>Cohort study, randomized control trial, VCT vs Video based education program</td>
<td>Program cost, number of HIV-1 infections averted, cost per HIV-1</td>
<td>Targeting of VCT to populations with high HIV-1 prevalence and couples the cost-</td>
</tr>
<tr>
<td>30</td>
<td>Economic evaluation, human immunodeficiency virus infection and screening: A review and critical appraisal of economic studies</td>
<td>To review systematically and critically, evidence that are used to derive estimates of cost-effectiveness of HIV screening.</td>
<td>Individuals of both sexes at risk of exposure to the HIV</td>
<td>CE: Economic evaluation of HIV screening</td>
<td>Systematic review</td>
<td>All available interventions for screening for HIV, including both nonselective and selective opportunistic and population-based screening programs.</td>
<td>Cases of HIV infection detected, deterioration to the AIDS state, secondary transmission of HIV, the quality-adjusted life-years/survival, costs, and cost-effectiveness of HIV screening.</td>
</tr>
</tbody>
</table>