



COST EFFECTIVENESS ON HIV TESTING AND COUNSELLING SERVICE DELIVERY STRATEGIES IN NAMIBIA

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ABSTRACT

HIV Testing and Counselling (HTC) remains an important entry point to HIV prevention, treatment, care and support services. Despite the expansion of HTC service delivery strategies over the years no systematic cost and effectiveness analysis has been conducted in Namibia to inform the efficient use of the available limited resources. The study aimed to determining the costs and effectiveness of delivering different HCT service delivery strategies in Namibia to inform program implementation and efficient resource utilization. The study design was quantitative retrospective as well as descriptive. The results have shown that 72% of the HIV tests reported to the Ministry of Health and Social Services were conducted at Public Health Facilities (PHF). The highest HIV positivity rate of 21% was identified at work places, followed by PHF with 9%, and 5% for National Testing Day (NTD). The cost analysis show that the main cost drivers for Standalones and workplaces are salaries and fringe benefits for staff with 52% and 58% respectively. Whereas for Public Health facilities and National Testing days cost drivers are recurrent goods expenditures with 41% and 74% respectively. Public Health facilities present the best strategy to reach more clientele and were effective in identifying HIV infected people at a lower cost however there is a need to complement or strengthen this strategy with other service delivery strategies whose efficiency needs to be strengthened.

KEYWORDS: Cost effectiveness, HIV testing, Counseling, Service Delivery Strategies.

1. INTRODUCTION AND BACKGROUND

Namibia has a population of 2.2 million people and covers approximately 840.000 square kilometers (MOHSS 2011) and is also described as having the lowest population density in the world (2,5 inhabitants per square kilometer) which poses significant challenges in delivering health services. The Namibian Population and Housing Census (2011) states that 43% of the population is under the age of 15 and (60%) live in the Northern Central and Northeastern parts of the country with two thirds of the population living in rural areas. Namibia is also described as one of the countries with the highest income inequalities in the world based on evidence by a Gini Coefficient of 0.6 whilst classified by World Bank as a upper middle country with Gross national income per capita of USD 8.800 for (2008) with 37% unemployment (MOHSS 2010).

1.1 HIV: Epidemic Global and National Perspective

HIV remains one of the biggest challenges globally and especially in sub-Saharan Africa whereby Namibia is not an exception. The UNAIDS (2014) fact sheets on global statistics states that to date 15 million people are accessing Antiretroviral Therapy (ART) by March 2015

and about 36.9 million people are globally living with HIV, 2 million became newly infected with HIV and 1.2 million people died of Acquired Immune Deficiency Syndrome (AIDS) related illnesses. Sub-Saharan Africa has 22.8 million people living with HIV of which women account for more than half the total number of people living with HIV (UNAIDS 2014). The statistics are escalating daily and are frightening. According to MOHSS (2012/2013) Namibia has achieved high treatment coverage of 86% with a CD4 count of 350 which has contributed to the dramatic reductions in new HIV infections (50%) and AIDS related deaths (50%).

According to UNAIDS, Namibia remains one of the Sub-Saharan countries hardest hit by the HIV epidemic. Furthermore, the 2013 Demographic Health survey shows that HIV prevalence stands at 14.0% with higher prevalence among females aged 15-49 at 16,9% and for males at 10.9%. In fact, HIV prevalence in Namibia peaks in the age groups 35-49 for both females (30.9%) and males (22.6%). The MOHSS (2014) Sentinel surveillance among pregnant women estimates the national HIV prevalence of 16.9% with geographic variations with the highest HIV prevalence recorded in Katima Mulilo (36%) and Rundu (24.1%) with Opuwo

recording the lowest HIV prevalence at (3.9%). Namibia's HIV epidemic is characterized as a generalized, mature epidemic throughout the society primarily transmitted through heterosexual means (MOHSS 2012).

The UNAIDS (2013) report showed that the Namibian Government during the financial year 2008/2009 funded 45.5% of the Nations HIV response amidst external donors' slow withdrawal from funding the remaining 54.5% in the same years however, according to MOHSS (2014), Namibia AIDS Spending Assessment (NASA) report, dramatic increases in domestic funding have been observed in 2013/2014 financial year standing at 64%. This report indicates that the spending by government was the highest in the two periods 2012/2013 and 2013/2014. In 2012/2013 fiscal year spending by government was \$111,050,386 and \$136,620,606 in 2013/2014 making up 55% and 64% respectively of total expenditures in both financial periods. The increase in domestic funding clearly demonstrates the Namibian Government's Commitment to finance the HIV response. Although domestic funding levels have increased, the MOHSS (2014) NASA emphasized that there is need for more in-depth studies on spending and cost benefit analysis that would enable the Government and development partners to invest in programs that yield the highest impact and inform future decisions on resource allocation and spending.

1.2 National HIV Response

The National response to date has seen significant decreases in the number of AIDS related deaths and HIV incidence reductions (Spectrum 2014). The national response is well articulated in the National Strategic Framework (NSF) 2010-2017 for HIV and AIDS outlining all the key strategies including HIV testing. The NSF guides the implementation, coordination, management, monitoring and evaluation of the National Multi-sectoral and decentralized HIV and AIDS response. The overall objective of the NSF is to facilitate improvement of the quality of life, prevent new infections and reduce AIDS related deaths. The NSF articulates a combination of interventions targeting behavioral, biomedical and structural drivers of the epidemic including the rapid scale up of HIV Testing and Counselling services (HTC).

Namibia currently delivers HIV Testing and Counseling services utilizing mixed HTC strategies. This is done within the context of limited available financial resources to sustain the HIV response as donor funding declines. It is increasingly challenging for the HIV Counselling testing programme to budget effectively. Given the expansion of HTC service delivery strategies over the years no systematic cost and effectiveness analysis has been conducted in Namibia to inform the efficient use of the available limited resources. It is therefore not known which strategies are currently the most effective service delivery in terms of uptake cost and programme outputs

such as reaching out to couples, first time testers and in identifying HIV infected people. It is assumed that if that information is known it would help the HTC programme in particular and the MOHSS in general to budget accordingly. Therefore, this study seeks to fill that gap to inform policymakers in provision of cost effective HTC services in Namibia.

1.3 National HIV Testing and Counseling Programme Description

The National Demographic Health survey (DHS) results of 2013 revealed that 61% of males were ever tested and 84% of females were ever tested, which shows a dramatic increase in uptake against the DHS results of 2006/7 with 32% males and 51% females ever been tested for HIV. According to the MoHSS (2012) Annual Report HTC geographical coverage is high with 95% of Public Health Facilities offering HIV Rapid Testing services in all 13 regions of the country. The report also indicate that testing services are also offered in the community at Standalone VCT centers, workplace testing offered through mobile testing means as well as National Testing campaigns and recently introduced Home based Door to Door testing. Testing is also offered in the private sector however no data is reported to Ministry of Health and Social Services at this time. The Namibia HIV HTC programme operates within a legal framework of the Government of the Republic of Namibia and have several policy documents MoHSS (2011) National HTC Guidelines and HIV Rapid Testing SOP, March (2008) with standardized training curricula and Monitoring and evaluation tools. Namibia approved the task shifting of HTC services delivery to Lay Counselors since 2005. Namibia utilizes a parallel HIV Rapid Testing algorithm (MoHSS, 2012).

Namibia's goal for the HIV testing and counseling programme is to reach out to more people between the ages of 15- 49 years particularly those with undiagnosed HIV infection and aims to successfully link them to treatment, care and support services as per the National HIV Testing and Counseling Strategy 2013/14-2016/17. Namibia subscribes to delivering mixed HIV Testing and Counseling service delivery strategies ranging from facility based and community based strategies to reach various target populations. Pietersen et al (2013) concluded that implementation of a mixed HTC service delivery strategies allows for HTC service delivery to different segments of the population in Namibia but also calls for additional research to establish the cost effectiveness of such approaches such as:-

Facility Based HIV Testing Services

Facility Based Testing Approaches implemented in Namibia includes PITC and Standalone VCT centers. PITC have been implemented in Namibia in particular for pregnant women attending antenatal care services (ANC) as well patients diagnosed with tuberculosis (TB) as part of the services offered at Public Health Facilities. According to the MoHSS (2013) report Namibia continues to see high uptake of HIV testing services by pregnant women attending ANC services with 90%

reported for the period 2013/14 and 84% TB patients tested. PITC services are currently offered at all public health facilities especially at clinics for pregnant women attending ANC. Davyduke *et al.* (2015) investigated enablers and barriers to the uptake of provider-initiated testing and counseling for HIV (PITC) in Namibia and found that PITC in Namibia was largely delivered by lay counselors operating in designated rapid testing rooms located in health facilities and found a large number of missed opportunities for HIV testing through this model. They also found that nurses did not see it as PITC as an integral part of their role. Nurses also indicated that they were not aware of HIV testing and counseling policy and felt inadequately trained and supported amidst staffing shortages. Therefore the study recommends wider dissemination and implementation of policy, increasing privacy of consultation spaces and community sensitization are simple measures that represent opportunities for strengthening this response and ensuring that symptomatic individuals who are unaware of their HIV status do not fall through the net. VCT standalone centers have been introduced in 2004 with the New Start Centers franchise model. Given the Rapid expansion of testing services in public health facilities, the number of New Start Centers has been decreased to only five Centers, strategically placed in high burden regions. These New Start centers are implemented by various Faith Based Organizations and NGO's and are funded mainly by the Presidents Emergency Plan for AIDS relief (PEPFAR) through USAID. Since 2010 standalone facilities get HTC testing kits from MoHSS.

1.3.2 Community Based HTC Service Delivery Strategies

WHO (2012) indicates that Community-based strategies offer “**great potential**” to reach people and places not previously served as well as identify infections earlier. These approaches would include Home Based HTC, Mobile/Outreach, Testing Campaigns and School Based HTC.

1.3.3 Home based Door to Door Testing

WHO (2012) defines Home-based HIV testing and Counseling (HBHTC) as HIV testing and counseling (HTC) services conducted by trained HTC service providers in someone's home Namibia has implemented the Door To Door approach since 2011. According to the Home based HTC Evaluation report (DAPP, 2013) Namibia piloted Home based HIV Testing and Counseling the Door to Door approach in two regions namely Oshana and Kavango Regions respectively. According to the evaluation report (DAPP, 2013) the results from the pilot have shown increased proportion of males tested, couples and first time testers and that this approach is feasible for implementation in Namibia. This approach has now been scaled up to six more, high burden (high HIV prevalence) and densely populated regions. This approach is implemented by the following community based organizations namely: Development AID from People to People (DAPP) also known as Total

Control of the Epidemic (TCE) in the following six regions Oshana, Ohangwena, Oshikoto, Omusati, Zambezi, Kavango and Khomas regions respectively and Catholic AIDS Action who is operational in Erongo Region. The Door to Door HTC service providers are receiving HIV Rapid Testing kits from the Namibian Government.

1.3.4 Workplace Testing-Mobile/Outreach Delivery Strategy

WHO (2011) defines workplace testing and school based testing as HTC services in a workplace or school which seek to serve individuals—in many contexts mostly men—whose formal employment or school commitments make it hard to go to health facilities and therefore a mobile/ outreach approach is best suited to reach men. In Namibia workplace testing is primarily offered through the Namibia Business Coalition on AIDS (NABCOA) now known as Health Works Namibia as per mandate stipulated in the National Strategic Framework for HIV and AIDS (2010) as well as the Medium Term Plan for HIV. NABCOA offers HIV testing services as part of a wellness package and as a standalone service. They primarily offer HIV testing through a Mobile/Outreach approach and operate in all corners of the country as per company requests. Workplace testing is also done at all military bases however these data are not readily available.

1.3.5 School Based HIV Testing - Mobile Outreach Delivery Strategy

According to WHO (2011) School Based Testing addresses sexually active youth, typically individuals ages 12 or 13 and older. This effort is intended to provide early access to treatment, care and support services for adolescents who test HIV-positive and to HIV prevention services for individuals who test HIV-negative. Namibia piloted School Based Testing in 2014 at 16 Secondary Schools in the Oshana and Omusati Regions. This pilot was done in conjunction with Ministry of Education with technical support and financial support from UNICEF and DAPP Namibia. According to UNICEF (2014) the pilot results showed a high uptake of HTC among learners with more than 60% testing as first time testers. This evaluation has demonstrated that providing HTC in schools can increase uptake of testing amongst adolescents and youth and that a computer tablet is an excellent tool to motivate adolescents and youth to take up the test. The cost analysis that the highest calculated cost per test would be USD76.50 and the lowest USD17.40 which is seen within the normal ranges of cost per client tested (UNICEF, 2014). The National Steering committee is in the process to discuss the way forward for this approach.

1.3.6 HIV National Testing Day Campaigns

WHO (2011) indicates that a number of countries have organized national campaigns to encourage HIV testing, increase knowledge of HIV status, and facilitate referral to treatment and prevention services. In the

implementing countries where this approach was followed showed a “greater-than-expected increase” in the number of people seeking to know their HIV status. National Testing Day has been implemented in Namibia since May 2008 until 2012. According to the (MoHSS, 2012) this strategy aimed to create more awareness amongst the general population on HIV Testing services and to provide more opportunities for people to be tested more especially after hours and over weekends at certain hotspots. A National Steering Committee was established which included all HIV Testing and Counseling National partners and was primarily funded by PEPFAR (Centers for Disease Control in Namibia and USAID) and the Global Fund. The Testing days ranged from 3 days- 1 day events over the years. Incentive or overtime allowances have been paid to staff working after hours during National Testing days. The National Testing Day has since been discontinued to focus on specific regions and certain target populations that are underserved with the other service delivery strategies. HIV Testing services during NTD’s were offered at all public Health facilities including designated outreach points.

1.4 Problem Statement

Namibia currently delivers HTC services utilizing mixed HTC approaches. Given the limited available financial resources to sustain the HIV response amidst donor funding declines. It is increasingly challenging for the HIV Counseling testing programme to budget effectively. Given the expansion of HTC service delivery models over the years no systematic cost and effectiveness analysis has been conducted in Namibia to inform the efficient use of the available limited resources. It is therefore not known which strategies are currently the most effective service delivery in terms of uptake costs and programme outputs such as reaching out to couples, men and first time testers and in identifying HIV infected people and creating successful linkages to treatment, care and support services. It is assumed that if that information is known it would help the HTC programme in particular and the MOHSS in general to budget accordingly. Therefore this study seeks to fill that gap and inform policy related to provision of cost effective HTC services in Namibia.

1.5 Purpose of the study

The purpose of the study was to determine the cost of delivery HCT services as well as to determine the effectiveness of different HTC models in the Ministry of Health and Social Services, Namibia.

1.6 Significance of the study

The outcomes of this study will inform the policy makers in the Ministry of Health and Social Services on various ways to improve the efficiency of HTC service delivery.

Furthermore the study will assist the Ministry of Health and Social services to align financial input and outcomes of the HTC service delivery. In addition to this, the study has outlined deficits of financial status during respective

years the study has covered. MOHSS has been provided with a tool for planning, monitoring and evaluation of the HTC program, thus the study directs the MOHSS to target the modalities of take appropriate population groups may optimize the effectiveness of testing programs in terms of increasing uptake, reaching high risk populations, and creating successful linkages to HIV prevention, treatment and care services.

Furthermore, the results of this study will close the literature gap that currently exists on a systematic cost and effectiveness analysis of the HIV counseling and testing programme service delivery strategies in Namibia.

1.7 Objectives of the study

- To describe HTC output data across HTC service delivery strategies.
- To describe input costs per HTC service delivery strategy.
- To calculate and compare the cost per client tested for HIV delivered using different HTC strategies disaggregated by:
 - Cost per positive HIV individuals identified for each service delivery strategy;
 - Cost per new client tested for HIV infection.
 - Cost per couples tested.

2. LITERATURE REVIEW

HIV Testing and Counselling (HTC) is described by World Health Organization (WHO) and others as the “gateway” to treatment, care, support and prevention services. HTC is defined as a confidential dialogue between a counselor and an individual, couple or family. The common components are pre-test and posttest counseling HIV testing and ongoing support. There are two mayor approaches to HTC which are the Provider Initiated Approach and the Client Initiated Approach. The Client Initiated Approach is defined by WHO (2012) as involving individuals actively seeking HIV Testing and Counseling at a facility that offers these services. Whereas WHO (2007) defines Provider –initiated HIV testing and Counseling as HIV testing and Counseling which is recommended by health care providers to persons attending health care facilities as a standard component of medical care. The major purpose of such testing and counseling is to enable specific clinical decisions to be made or specific medical services to be offered.

According to Paxton et al ((2013) it has become increasingly important to define the role that HTC can play in the overall response to HIV and AIDS and more importantly which mix of service delivery modes are most strategic, and which are the drivers of unit costs per service delivery strategy. They further contend that once the most appropriate strategic mix and drivers of unit costs is known, policy makers and programme managers can guide decision making processes toward pursuit of cost effective, quality HTC service delivery modalities

that can potentially expand coverage, especially among key populations and get people on treatment at earlier stage of infection. WHO (2015) indicate that in addition to the health system, local context, epidemiology, current testing coverage and available financial and human resources and what the intended clients want, will determine the appropriate mix of HTS approaches to reach populations at high risk and geographic areas with largely undiagnosed HIV infection. In addition to the factors mentioned above FHI (2005) indicate that in choosing the best HTC service delivery strategy to deliver the programme goals should also be considered.

WHO (2011) provides a framework as illustrated below in Figure 1 for understanding HIV testing and Counselling service delivery strategies which are divided into two broad categories namely Community based and Facility Based HIV Testing and Counselling service delivery strategies. The Facility Based HIV testing and counselling includes clinical settings that is characterized by the Provider Initiated Testing and Counselling (PITC) approach and in some instances an Integrated Voluntary Counselling and Testing (VCT) approach as well as VCT standalone centers which are also classified under Facility based HTC services. Furthermore, Community Based HTC services include approaches such as Home Based HTC, Mobile/Outreach, Testing Campaigns and School Based HTC. Community-based strategies offer “**great potential**” to reach people and places not previously served as well as identify infections earlier according to WHO (2012).

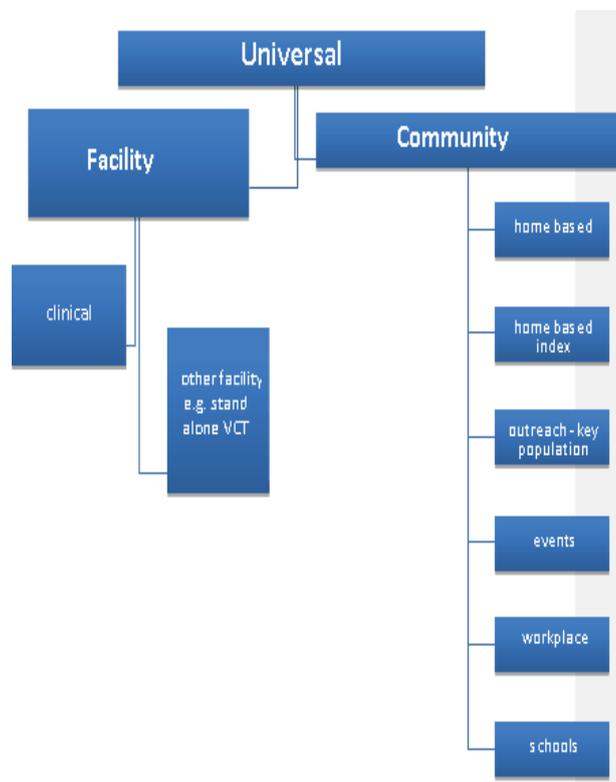


Figure 1: WHO (2011) HIV testing and Counseling Strategies Framework.

1. In the index strategy, HIV testing and Counseling is offered to the household members of an individual with HIV or TB, also known as the index patient.

3. HTC TARGET POPULATIONS FOR DIFFERENT HTC SERVICE DELIVERY STRATEGIES

WHO (2011) indicate that these strategies as shown in Table 1 below are mutually reinforcing and complementary, with each model of delivery addressing specific populations that are a priority within distinct epidemic types. The strategic expansion of HTC should involve a combination of these strategies of delivery. They contend that each model should be implemented strategically, where it will most effectively increase coverage and uptake by populations that are not making use of currently available services. WHO (2012), suggests that providing HTC to all who could benefit requires a variety of approaches especially in countries with generalized epidemics. They further contend that one HIV counseling and testing service delivery strategy would not be able to address the different sections of the population adequately.

According to WHO (2015) key priority populations include adolescents, couples, children, men, pregnant women and key populations (Men having sex with men, Commercial sex workers). The table below indicates that most of the strategies outlined above is highly recommended for countries with generalized epidemics. However, to reach more men and young people, community based approaches such as Door to Door and Index Partner Home-based Testing and Mobile/Outreach testing works better. The latest WHO (2015) guidelines on HIV Testing and Counselling Services indicate that Community-based HTS is an important approach for increasing early diagnosis, reaching first-time testers and people who seldom use clinical services, including men and adolescents in high prevalence settings and people from key populations in all settings. Mgori, Mash (2015) investigated HIV and/or AIDS-related deaths and modifiable risk factors: A descriptive study of medical admissions at Oshakati Intermediate Hospital in Northern Namibia and found that 85% of HIV related hospital deaths were late presenters therefore the ongoing and timely identification of cases remains critical.

A recent systematic review and meta-analysis of community-based approaches found that community-based HTC approaches were successful in reaching populations early in the course of HIV infection and that earlier HIV diagnosis supports timely access to ART, which could improve life expectancy and reduce HIV transmission (Suthar et al 2013).

On the other hand, facility based approaches such as VCT centers also known as standalone sites are located in the community and is defined by Family Health International (FHI) (2005) as free standing sites that are generally operated by non-governmental organizations

(NGO's). This approach is recommended for young people <24 years in urban areas. PITC approach is recommended for men, pregnant women, TB and STI patients who visit health facilities. Roura et al (2013) conducted a review of studies in Sub-Saharan Africa related to the implementation of Provider Initiated Testing and Counseling (PITC) approach and their findings showed that the routine offer of an HIV test during patient-provider encounters is gaining momentum and contend that the widespread adoption of PITC for HIV provides an unprecedented opportunity for identifying HIV-positive individuals who are already in contact with the health services, with the introduction of PITC in diverse settings, the uptake of HIV testing has increased remarkably. However, the study indicates that there are substantial missed opportunities related to

implementing the policy, with wide variations in the rates of acceptance of the test and high proportions of individuals failing to access subsequent HIV treatment and care services as well as failing to access further screening for conditions such as STI's or TB. Similarly, Davyduke et al (2015) investigated enablers and barriers to the uptake of provider-initiated testing and found that PITC in Namibia was largely delivered by lay Counselors operating in designated rapid testing rooms located in health facilities and found a large number of missed opportunities for HIV testing through this model. According to the MOHSS (2013) report, Namibia continues to see high uptake of PITC services by pregnant women attending ANC services with 90% reported for the period 2013/2014 and 84% TB patients tested.

Table 1: Target populations for HIV Testing and Counseling service delivery Strategies

Strategy of HTC Delivery	General Epidemic	Men	Young people <24 years	MSM	SW	Rural	Urban
VCT (Standalone VCT)	xx	x	x	-	-	nr	x
PITC	xx	x	not required	x	x	-	x
Door to Door HBC	xx	xx	xx	-	--	xx	x
Index Patient: HBC	xx	xx	xx	--	-	xx	x
Mobile/Outreach	x	xx	xx	xx	xx	xx	x
Workplace	x	x	not required	-	-	x	x

MSM = men who have sex with men; According to WHO (2011) the ratings provided for each category are based on a review of published and unpublished literature and the experiences of programme.

Key

- **X:** Recommended. For Conditions for implementation: Required.
- **XX:** Highly recommended and should be considered a key strategy. For Conditions for implementation: Highly required.
- **Not Required (NR):** Not considered effective in this context/for this population. For Conditions for implementation: Not required.
- Where no symbol appears, there are insufficient data or experience.

4. HIV TESTING AND COUNSELLING SERVICES DELIVERY STRATEGIES: COSTS AND EFFECTIVENESS

This section outlines theories on economic evaluations and highlights of some cost effectiveness studies especially in the area of HTC programming as well as literature regarding cost effectiveness of HCT services delivery.

Paxton et al (2013) defines Economic Evaluation (EE) is a set of research techniques that systematically and objectively collect and calculate the costs and outcomes of health interventions. The results of a cost analysis are often expressed as a total program cost and/or a unit cost (cost-per-patient or cost-per-encounter, for example). They contend that HIV programs can differ dramatically depending on the nature of the intervention. Paxton et al (2013) continue to explain that by analyzing the unit costs identified as critical inputs for service delivery, the planner can identify "cost drivers" (aspects of the program that require the most resources), which can help identify potential cost savings through increased

efficiencies in the future. They further contend that this information can help program planners understand whether it is prudent to continue a program or service, and/or cost-effective ways to expand the program or service. Cost effectiveness is described by Paxton et al (2013) as an analysis to compare interventions with similar outputs. The outcomes measured in this approach is expressed as the cost per program outcome (infections averted, patients successfully treated, et al.) WHO (2011) describes cost effectiveness for HIV Testing and Counseling approaches as measured by the number of infections newly identified for the number of tests performed. WHO (2015) indicates that cost estimates and budgets can now be informed by actual expenditure analysis.

According to the UNAIDS (2012) Global AIDS report there is limited published data on the costs of various HTC strategies. This report indicates that traditional Voluntary Counseling and Testing may be a more expensive strategy than other Community based approaches and provider initiated testing. Obure et al.

(2012) showed similar findings investigated the cost efficiencies between PITC services versus VCT services in low resource settings in Kenya and Swaziland with a high HIV prevalence and concluded that there may be potential for substantial gains in efficiency in the provision of HTC services. This study concluded that the cost per client and per person testing HIV positive is lower for PITC than VCT across all facility types in Kenya with an average cost per client for PITC ranged from U\$4.81 – USD6. The results for Swaziland indicate that the average cost for PITC ranged from USD6.92 to USD13.51. The average cost per client for VCT ranged from USD5.05 to USD16.05 in Kenya and USD8.68 to USD19.32 in Swaziland. Obure *et al* (2012) therefore recommend that considerations of how to deliver services efficiently need to be informed by local contextual factors, such as prevalence, service demand and availability of human resources. In Namibia, a study by De Beer *et al* (2015) investigated the cost of mobile voluntary counseling and testing at the workplace versus facility based voluntary counseling and testing in Namibia. The study results show that in 2009, the average cost per person tested for HIV at the Bophelo! Mobile clinic was an estimated USD60.59 (USD310,451 for the 5124 people tested). Private employer contributions to the testing costs reduced the public cost per person tested to USD37.76. They further found that the cost of testing one person for HIV in 2009 at the New Start centers was estimated at USD58.2. They concluded that mobile clinics can provide cost-effective wellness testing services at the workplace and have the potential to mobilize local private funding sources.

In contrast another study conducted to determine the cost effectiveness of four HIV Testing and Counseling strategies (Standalone, Health Facility Based, Home Based Index and Home-based Door to Door) in Uganda indicated that all testing strategies had relatively low per client costs (Menzies *et al* 2009). They concluded that hospital-based HTC most readily identified HIV-infected individuals (27% prevalence) eligible for treatment, whereas home-based strategies more efficiently reached populations with low rates (>90% of all clients) of prior testing and HIV- infected people with higher CD4 cell counts. This study thus suggests that multiple HTC strategies with different costs and efficiencies can be used to enable populations to easily access HTC. Costs per client (2007 USD) were \$19.26 for stand-alone HCT, \$11.68 for hospital-based HCT, \$13.85 for household-member HCT, and \$8.29 for door-to-door-HCT. Suthar *et al.* (2013) conducted a systematic review and meta-analysis of community based approaches on Pub Med and found that Community based approaches showed increased HTC uptake, the proportion of first-time testers, and the proportion of participants with CD4 counts above 350 cells/ml, and obtained a lower positivity rate relative to facility-based approaches. The study also found that in low and middle-income countries, the cost per person tested ranged from USD2— USD126.

Forsthythe *et al* (2002) indicated that integrating services into health centers can significantly reduce the cost of VCT. Furthermore, they postulated that if health Centre staff are hired to perform the counselling additional costs reductions may be feasible. This study revealed that incremental cost from the Government's perspective of adding VCT's approximately 16USD dollars per client. This cost estimates may be partly attributed to the integration VCT services into existing health centers rather than standalone sites. The study suggested that the cost of VCT services may be further reduced to as little as 8USD dollars per client if a Government health worker could perform the counselling. Although this study might be outdated, findings shed some light on the integration of services and the possible reductions and cost savings with such an approach.

Remme *et al* (2014) assessed the scope for savings and efficiency gains in HIV services in low and middle income countries and found that cost efficiency may improve by reducing input prices, task shifting and improving client adherence. They further contend that HIV programs need to optimize the scale of service provision to achieve efficiency and investigate the potential of integrated service delivery which they contend could be more efficient than standalone services. WHO (2015) indicates that the challenge is that cost effectiveness analysis may not be widely generalizable across settings and that a cost of a programme, and hence its relative cost effectiveness, depends greatly on the details of the programme itself.

5. METHODOLOGY

The design used was quantitative non-experimental, retrospective and descriptive. A retrospective analysis of HIV Testing and Counselling Services data and program financial information on different HCT services delivery strategies implemented in Namibia for three financial years, namely 2010-2011, 2011-2012 and 2012 and 2013 was conducted. Routine collected HTC service statistics data for HCT strategies in Namibia contains individual socio-demographic data, previous HIV testing experiences, sexual partner testing and outcome of the HIV test amongst others. This data was compared with HTC program expenditure information for each HTC service delivery strategies.

The study population included data related to all clients who received HIV testing in each of the specific HTC service strategies during the period between the financial years 2010/11-2012/13 and program expenditure information for financial year 2012/13 were included in the study. National data was used and therefore no sampling procedure was followed. All test reported nationally for each HTC service delivery strategy were analyzed. Research instruments including programme output data was obtained from existing data bases for the three financial years 2010/11, 2011/12 and 2012/13. Programme expenditure information was obtained from financial reports and extracts for the financial year April

2012-March 2013 across HCT service delivery strategies.

Data collection procedure was followed according to the study objectives. The objective was to describe HTC output data across HTC service delivery strategies. The programme output data across service delivery areas were extracted from the original data bases and converted into Microsoft excel. Data was converted according to codes as per standard HIV testing MOHSS register 2010 version. Thereafter data cleaning was done and merged into one file.

Ethical approval was sought from the Ministry of Health and Social Services, Ethical clearance from the University of Namibia and de-identified data from each of the service providers, Ministry of Health and Social Services (MOHSS), New Start Centres and workplace data, Namibia Business Coalition on AIDS (NABCOA).

DATA ANALYSIS

The programme output data across service delivery strategies was analyzed by using EPIINFO 7 computer program. The database for workplace testing and Standalone New Start Centers were incomplete for the financial year 2012-2013 hence monthly summary reports were used to complete this data and manually added to EPI frequencies. Finally tables and graphs were then produced in Microsoft excel. The variables analyzed as per HTC service delivery strategy were proportion of clients counseled, tested and received results, proportion of HIV infected individuals identified proportion of first time testers identified proportion of couples tested and proportion of men tested. Data collection According to objective 2, namely to describe input costs per HTC service delivery strategy was as follows, programme input data costs per service delivery area was extracted from available financial reports and extracted from existing financial data bases to coincide with the Government financial year. Only input data for the financial year 2012/2013 was readily available hence the input analysis was only for that period. The financial inputs were divided according to the cost categories namely salaries of all personnel contributing to the work in HCT site including fringe benefits were computed, recurrent goods that included HIV test kits, supplies make condoms, behavioral communication materials etc.

Capital goods, that included furniture, electrical fixtures, air conditioners etc. Rentals for all HTC services provided in Public Health facilities. The recurrent services include training of staff, cleaning, building, maintenance, water, telephone, waste disposal etc. The objective 3 was to compare the cost per client tested for HIV, using different HTC strategies. Financial expenditure input cost data and programme output data for the financial year 2012/13 was utilized to compute cost per client tested, cost per HIV positive client identified, cost per couples tested and cost per first time testers identified. The expenditure data was computed in

Namibian dollars and also converted to USD dollars. The average exchange rate in respect to United States Dollars 9.254 for reporting period 2012-2013 was used for this study (MOHSS:2014). The Namibian amounts contained in the data was converted to USD dollar using their exchange rates, irrespective of the month in which the expenditure was incurred.

Cost per client was determined using the following method.

- Total expenditure per HTC service delivery area divided by the number of clients counseled and tested for financial year 2012-2013.
- Total expenditure per service delivery area divided by the number of HIV positive individuals for financial year 2012-2013
- Total expenditure per HTC service delivery area divided by number of tested individuals for the financial year 2012-2013
- Total expenditure per HTC service delivery area divided by the number of couples tested for the financial year 2012-2013. Ethical principles were closely followed and the MOHSS and UNAM Postgraduate Committee granted prior to commencement of the study.

To protect the identity of the client, unidentified data was utilized for the purpose of the study. Internal and external validity were ensured for the input expenditure data and the output by categorizing the expenditure according to the cost categories as per study objectives. With regard to sample size and sampling strategy. The MOHSS standard electronic database was utilized to obtain output service data for three fiscal years across all HTC strategies. Data was obtained in full without a need for applying sampling techniques or interviews thus limiting the chances of introducing bias in the study findings which might be attributable to sampling and data collection procedures. This study used univariate and bivariate data analysis techniques to describe frequencies and proportions.

Some variables did not have sufficient statistical power to allow measurement of associations of different outcome/independent variables to HIV test yield or cost HTC service strategies using multi-variate analysis. Reliability with regards to the services output data would be fairly accurate as the HIV test yield rate would mostly remain the same if the study is repeated sometime in the future due to the stable nature of HIV epidemic in Namibia. However, one might find different outcomes with regard to analysis expenditure due to variations of data capturing approaches for different HTS services providers and the measure underpinning costing. Additionally, there may be an under or over representation of cost per HIV positive client identified due to reporting differences and omission of some financial data by some service delivery organizations.

The Namibian Government reporting and financial years are coded as follows: FY11 is of reporting period April 2010-March 2011, FY 12 are for the reporting period April 2011-March 2012 and FY13 for the reporting period April 2012-March 2013. The results are presented in 3 Sections which describes HTC output data, input costing expenditures and cost per positive clients identified across HTC delivery strategies.

6. HTC OUTPUT DATA ACROSS, HTC SERVICE DELIVERY STRATEGIES FOR FINANCIAL YEARS 2011-2013.

6.1 Proportion of HIV tests done per HTC Strategy FY2011-2013

As illustrated below in Figure 1 the proportion of test per HTC strategy for FY 2011-2013 showed that the highest proportion of HIV tests done is recorded in the Public Health Facilities (72%) followed by National Testing Days (15%), Standalone (12%) and lowest proportion of tests at the workplace (0.9%).

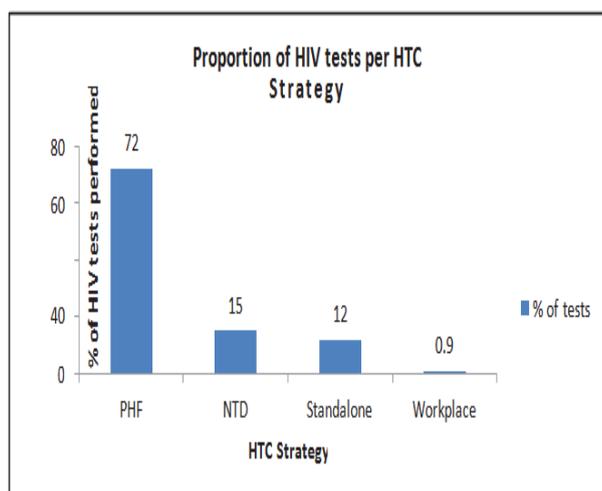


Figure 1: Proportion of tests per HTC Strategy for FY 2011-2013.

HIV positivity per HTC strategy for FY 2011-2013

The proportion of HIV Positive Test per HTC Strategy Fy11-13 was the highest (21%) at the workplace, (9%) at the Public Health Facilities, 6% at the standalone Centers and (5%) for National Testing Days as illustrated below in Figure 2. The workplace positively yield results have shown a twofold difference as opposed to Public Health Facilities.

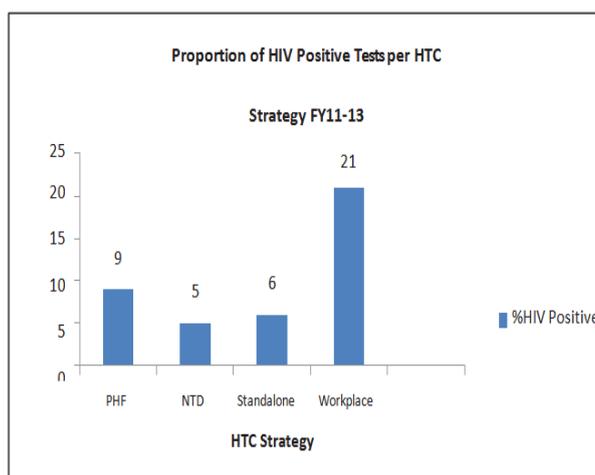


Figure 2: Proportion of HIV positive Tests per HTC Strategy for FY11-13.

Proportion of First Time testers per HTC Strategy FY11-13

Figure 3 below shows that the highest proportion of first time testers for the Financial Years 11-13 is observed at Standalone VCT centers with 62% and the lowest proportion of first time testers was recorded for National Testing Days with 19%. WHO (2012) indicate that to expand the number of people who know their HIV status, programmes should prioritize first-time testing and set targets for it.

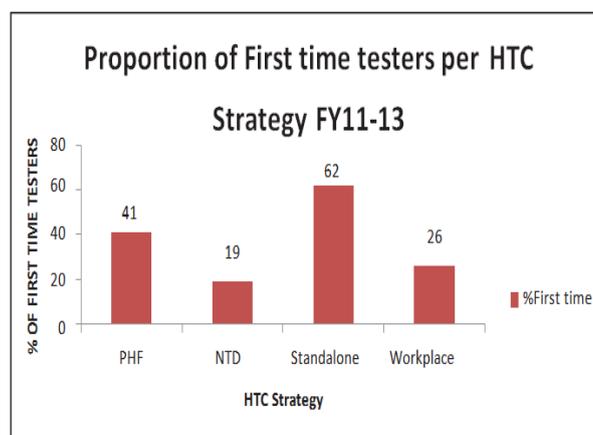


Figure 3: Proportion of First Time testers per HTC Strategy FY11-13.

Proportion of males tested per HTC Strategy FY2011-2013

Figure 4 below illustrates that the proportion of males tested per HCT Strategy FY 11-13 have shown that more males (65%) were tested at the workplaces, followed by (40%) at Standalone Centers, (40%) on National Testing Dates and (30%) and lowest of the males tested at the Public Health Facilities. The findings show that more men are tested at workplaces and that these men are likely to be HIV positive.

Proportion of individuals tested as Couples per HTC Strategy FY 2011- 2013

As illustrated in the Figure 4 the proportion of individuals tested as couples were the highest at the Standalone centers shown (18%), lowest (5%) at the PHF and at the workplaces.

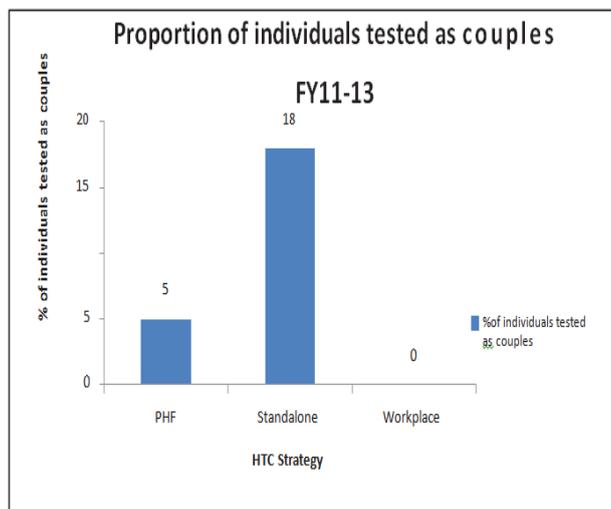


Figure 4: Proportion of individuals tested as Couples per HTC Strategy FY 11- 13.

SECTION 2: ESTIMATED INPUT PER HTC SERVICE DELIVERY STRATEGY FOR FINANCIAL YEARS (FY) 2011-2013)

Estimated Input Costs per cost category

The table 2 below illustrate that the highest expenditures for Public Health Facilities during the Financial Year 2012/13 was incurred in the cost category recurrent goods (41%) and salaries and fringe benefits (39%) with the 9% expenditure incurred for rentals. On National Testing Days estimated input per cost category demonstrated that expenditure for recurrent goods were the highest (74%), 21% for recurrent services and lowest salaries and fringe benefits (5%). At the workplace for the financial year 2012-2013 salaries and fringe benefits (58%) recorded the highest expenditures and zero expenditures for rentals and recurrent services. Whereas at the standalone VCT Centers, for financial year 2012-2013, highest expenditures were incurred in the cost category salaries and fringe benefits (52%), recurrent goods (30%) and lowest expenditures 0.3% incurred for capital goods and recurrent goods (9%). The main cost drivers for Standalones and workplaces are salaries and fringe benefits for staff with 52% and 58% respectively. Whereas for Public Health facilities and National Testing days cost drivers are recurrent goods expenditures with 41% and 74% respectively.

Table 2: Summary of input costs per HTC service delivery strategy Health Facilities (FY2012-2013).

Health Facilities	Salaries and fringe benefit Expenditure	Recurrent good Expenditure	Capital Goods Expenditure	Rentals Expenditure	Recurrent Services Expenditure	Total
PHF	39%	41%	11%	0	9%	100%
NTD	5%	74%	0	0	21%	100%
Standalone	52%	30%	0.03%	9%	9%	100%
Workplaces	58%	15%	27%	0	0	100%

SECTION 3: COSTS PER CLIENT ANALYSIS PER HTC SERVICE DELIVERY STRATEGY

The costs per client analysis was computed with total expenditure divided by number of positives, couples and first time testers per HTC strategy for the financial year 2012-2013, for one year.

Cost per client tested per HTC Strategy

Table 2 below illustrates that the cost per client tested was the lowest for National Testing day at 10 USD and followed by Public Health Facilities with 23 USD with the highest recorded for workplace testing at 344 USD per client tested.

Table 2: Cost per client tested per HTC service delivery Strategy FY13.

HTC Strategy	Total number of clients FY13	Total expenditure FY13 (NAD)	Total expenditure FY13 (USD)	Cost per client tested (NAD)	Cost per client tested (USD)
PHF	214294	45,578,665.08	4,925,293.5	213	23
NTD	44134	4,245,310.00	458,753.98	96	10
Standalone	25343	8,508,101.48	919,397.17	336	36
Workplace	683	2,175,091.20	235,043.35	3,185	344

Cost per HIV positive individuals identified per HTC Strategy

Table 3 below above shows that the lowest cost per positive client identified was for the National Testing days with 247 USD per positive client identified and followed by Public Health Facilities at 297 USD with the highest cost per positive clients identified at the workplace 3,791 USD.

Table 3: Cost per HIV positives identified for HTC service delivery strategy FY13.

HTC Strategy	Number of HIV Positives FY 13	Total expenditure FY13 (NAD)	Total expenditure FY13 (USD)	Cost per Positive Identified (NAD)	Cost per Positive Identified (USD)
PHF	16582	45,578,665.08	4,925,293.5	2749	297
NTD	1859	4,245,310.00	458,753.98	2284	247
Standalone	1280	8,508,101.48	919,397.17	6647	718
Workplace	62	2,175,091.20	235,043.35	35,082	3,791

Cost per new client tested for HIV infection per HTC Strategy

Table 4 below indicate that the lowest cost per new client tested was recorded at standalone VCT centers at 39 USD and public health facilities 58 USD with no new clients tested during the National Testing days and the

highest cost per new client tested was at workplace 2,500.

Table 4.11: Cost per new client tested for HIV for HTC service delivery strategy FY13.

HTC Strategy	Number of new clients FY13	Total expenditure FY13 (NAD)	Total expenditure FY13 (US\$)	Cost per new client identified (NAD)	Cost per new client Identified (US\$)
PHF	85350	45,578,665.08	4,925,293.5	534	58
NTD	0	4,245,310.00	458,753.98	0	0
Standalone	23672	8,508,101.48	919,397.17	359	39
Workplace	94	2,175,091.20	235,043.35	23,139	2,500

DISCUSSIONS

The output results show that 72% of all HIV tests conducted in FY 11-13 were done at public health facilities and the lowest number of tests at workplaces with 0.9%. The DHS (2013) results indicate about 70% of HIV testing occurs at public health facilities which confirms this study finding. The highest positivity rate is observed at workplace testing with 21% however with the least number of clients tested through this model and the lowest proportion of first time testers. This could mean that some of the positives identified through this strategy may not be newly diagnosed. Corbett *et al* (2006) also found high positivity ranging 19.8% and 18.4% in a randomized trial to assess workplace uptake of HTC. They also concluded that VCT at the workplace offers potential for high uptake when offered onsite and linked to basic HIV care. Standalone VCT centers had the highest proportion of first time testers with 62% and the lowest proportion of first time testers were recorded for National Testing Days (19%). This low proportion of First time testers during NTD remains a concern because one of the key objectives for NTD was and is to identify first time testers. Workplace Testing recorded the highest proportion of males tested at 65% and the lowest proportion of males tested were recorded at Public Health Facilities at 35%. WHO (2015) contend that the low HTC uptake of males is because HTC is conducted mainly in reproductive health services therefore they recommend additional approaches to increase uptake of HTS among men, including the provision of HTC in settings that are more appropriate and acceptable to men. The high uptake of men testing at the workplace is coupled with a high positivity rate of 21 % show that there is potential in reaching more HIV positive men through the workplace testing approach.

The highest proportion of individuals tested as couples were recorded at Standalone VCT centers for the FY 11 - 13 at 18% and 5% in public health facilities with no couples tested in the workplace. These findings are consistent with Grabbe *et al* (2010) who found that Standalone HTC reported a higher proportion of couples than mobile HTC (18% versus 2%, and a higher proportion of discordant couples (12% vs. 4%). WHO (2015) recommends couples testing and sex partners testing as this may result in better treatment and prevention outcomes given the compelling evidence in the HIV Prevention Trials Network (HPTN) 052 study. *“These findings demonstrate that antiretroviral therapy, when taken until viral suppression is achieved and sustained, is a highly effective, durable intervention for HIV prevention,” and is especially effective among sero discordant couples - Myron Cohen, M.D”*.

These results are consistent with literature in that it shows that the different service delivery models reach different target populations and depending on the programme goals each service delivery strategy can contribute meaningfully to the National scale up of HTC. Furthermore, the estimated input cost analysis show that the main cost drivers for Standalones and workplaces are salaries and fringe benefits for staff with 52% and 58% respectively. Whereas for Public Health facilities and National Testing days cost drivers are recurrent goods expenditures with 41% and 74% respectively. Obure *et al* (2012) obtained similar results and found that staff salary costs make up a significant proportion of total costs across all services (15% to 65%). Other costs which include diagnostics and supplies (35%-85%) are high in both Kenya and Swaziland. Forstythe (2002) concludes that an integrated approach by training existing staff may help to reduce cost or through a task shifting approach recommended by WHO (2015). The NTD approach

utilized existing staff to conduct the testing with a small incentive for additional hours worked hence the low expenditure on salaries and fringe benefits. Additionally, the biggest contributor to the high recurrent goods is the procurement of HIV Rapid Testing kits therefore to save cost on this particular line item Namibia should adopt the serial testing algorithm as per 2015 WHO recommendations as opposed to the current parallel testing algorithm.

CONCLUSION

In conclusion, the estimated crude cost analysis provides some insight into the expenditures for the FY13 and also shows that for the various HTC service delivery strategies cost category expenditures varied. High expenditures are recorded for salaries and fringe benefits for most of the HTC strategies except for National Testing Day and this could be attributed to the fact that NTD is a campaign and a once off event in a year and not a routine service that is offered daily as well as utilizing existing human resources to provide these services. PHF also show some efficiency in this cost category due to the use of the task shifting policy to allow lay counselors to conduct testing in public health facilities.

There is also very high cost experienced for recurrent goods including procurement of HIV Rapid Testing Kits across all testing strategies. There is potential for saving substantial costs on procurement of test kits for Namibia by adopting the WHO recommendations for countries with generalized HIV epidemics with more than 5% HIV prevalence to consider a serial testing algorithm instead of a parallel testing algorithm (WHO, 2015).

The cost per client tested was the lowest for National Testing day at 10 USD and followed by Public Health Facilities with 23 USD with the highest recorded for workplace testing at 344 USD per client tested. Secondly, the lowest cost per new client tested was recorded at standalone VCT centers at 39 USD and public health facilities 58 USD with no new clients tested during the National Testing days and the highest cost per new client tested was at workplace 2,500 USD. The estimated cost per HIV positive client identified indicated that NTD and PHF recorded the lowest cost with 247 USD and 297 USD respectively. Standalone and Workplace had the highest cost per positives identified at 718 USD for Standalone and 3,791 USD for Workplace. Finally, the lowest cost per couples tested was recorded for standalone at 213 USD and the highest recorded at PHF with 513USD and no couples tested at workplace. In conclusion, PHF reach more clients with HTC and was effective in identifying HIV infected people at a lower cost in Namibia. However, there is a need to complement this strategy with the other service delivery strategies whose efficiency needs to be strengthened in order to remain relevant in contributing to the National HTC strategy.

RECOMMENDATIONS

The study recommended the following: The MOHSS should consider expediting the expanded implementation of Provider Initiated HIV Testing and Counselling approach to improve on the identification of HIV positives in Public Health Facilities to maximize on this strategy's ability to test majority of clients. Workplace programmes should consider exploring alternative implementation modalities to maximize on their potential to reach HIV positive men who are hard to reach through mainstream services. Standalone programming should consider alternative implementation modalities to improve efficiency while strengthening their ability to reach more couples and first time testers. The MOHSS and HTC implementing partners should consider improving on efficiency of the NTD strategy by better targeting for NTD's to find new HIV positive clients.

To improve the efficiency the MOHSS should consider introducing the serial testing algorithm to reduce cost for HIV Rapid Test kits as per WHO normative guidance for low and middle income countries. Besides the change to serial testing the MoHSS is encouraged to explore cost saving measures in procuring test kits such as pool procurement with other SADC countries. HTC partners should consider the integration of other Health Services with HIV Counselling and Testing to reduce cost per client tested, as existing staff can be utilized to conduct testing which may possibly save cost on salaries and fringe benefits. HTC partners are also encouraged to keep updated financial information and report regularly as well migrate financial and reporting systems to the Government financial year as this will enable easier comparisons across modalities.

This study illustrates that there is potential to reach key target populations with HIV Testing and Counseling services through key service delivery strategies at a lower cost. However, it is important that financial recording is aligned to GRN financial years and that records are complete as well as standardization of data collection tools to ensure that such cost benefit analysis can be repeated periodically to inform evidence based HIV Counseling and Testing programming.

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CONTRIBUTIONS

All the researchers made contributions to the writing of this article.

COMPETING INTEREST

The researchers declare that they have no financial or personal interest which may have influenced them in appropriately in the writing of this manuscript.

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