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UGANDA AIDS COMMISSION

UGANDA HEALTH SYSTEMS STRENGTHENING (UHSS) ACTIVITY

Applying Activity-Based Costing and Management (ABC/M) to HIV Services in Uganda: Improving Resource Allocation and Efficiency

June 2022

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ABBREVIATIONS

ABC/M	activity-based costing and management
AIDS	acquired immune deficiency syndrome
ART	antiretroviral therapy
ARV	antiretroviral
CCR	capacity cost rate
CDC	U.S. Centers for Disease Control and Prevention
HC	health center
HIV	human immunodeficiency virus
HMIS	health management information system
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PMTCT	prevention of mother-to-child transmission
PrEP	pre-exposure prophylaxis
Std Dev	standard deviation
TDABC	time-driven activity-based costing
UGX	Ugandan shilling
USD or $	U.S. dollar
UHSS	Uganda Health Systems Strengthening
USAID	U.S. Agency for International Development
VMMC	voluntary medical male circumcision

ACKNOLWLEDGMENTS

This publication was prepared by Catherine Cantelmo (Palladium), Thomas Maina (Palladium), Gerald Karegyeya (Palladium), Bryant Lee (Palladium), Steven Forsythe (Avenir Health), Carlyn Mann (U.S. Agency for International Development), Elizabeth Ekirapa (Makerere University School of Public Health), and Hudson Balidawa (Ministry of Health).

The authors would like to thank all the individuals from the U.S. Agency for International Development (USAID) and the USAID-funded Uganda Health System Strengthening (UHSS) Activity who contributed their time and expertise to this work. The authors would also like to thank those who provided valuable input and feedback during the activity-based costing and management activity design, implementation, and creation of the report, including Carlyn Mann, Elan Reuben, Rose Okot-Chono, and Garoma Kena (USAID); Mark Tumwine (U.S. Centers for Disease Control and Prevention, Uganda); Allyala Nandakumar (Office of the U.S. Global AIDS Coordinator and Health Diplomacy); Dr. Joshua Musinguzi (Uganda AIDS Control Program, Ministry of Health); and Dr. Sarah Byakika (Commissioner Planning, Financing and Policy, Ministry of Health).

The authors also gratefully acknowledge the support provided by various stakeholders in Uganda who provided data, comments, and suggestions during the study design and implementation. Specifically, the authors would like to thank the Uganda AIDS Commission; the AIDS Control Program and Department of Planning, Financing and Policy of the Ministry of Health; and the Ministry of Local Government. In addition, the authors thank the Office of the U.S. Global AIDS Coordinator and Health Diplomacy; USAID; the U.S. Centers for Disease Control and Prevention, Uganda; and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) Coordination Office in Uganda for supporting this study and providing data, and for their review of this report.

FOREWARD

HIV remains a high-burden disease in Uganda. The Ministry of Health and partners involved in funding and managing HIV programs need current information on how HIV service delivery costs, financing, utilization, and performance vary across Uganda and the factors that affect them. The application of activity-based costing and management (ABC/M) can provide cost information on the provision of HIV services at the facility level and this information can be used to effectively allocate resources, improve monitoring efforts, and increase efficiency.

In this study, a time-driven activity-based costing (TDABC) approach was used to capture costs of care and treatment provided to persons living with HIV and the costs of core prevention services (e.g., pre-exposure prophylaxis, male circumcision, prevention of mother-to-child transmission, and HIV testing) at the facility level. Using the TDABC client-centered approach, the research team followed the flow of individual clients through the services they received and measured all the resources (human, equipment, medications, consumables, etc.) used to provide the clients with the required health services.

In addition, the research team collected and analyzed above-site, community-level, and out-of-pocket expenditures for the provision of HIV services. The results of this study will help the Ministry of Health and other health system players better budget for the provision of HIV services to enhance optimal and efficient resource allocation and reduce wastage of precious financial resources.

Uganda and Tanzania were the first two countries to apply the ABC/M approach to cost HIV services, which has subsequently been applied in other countries (Kenya and Mozambique). In all cases, ABC/M has been a country-owned effort with an in-country steering committee performing a governance role for the activity and a local research institution leading the study effort. ABC/M has been rolled out as a two-phased approach. Phase 1 concludes with the publication of this report, which provides a retrospective baseline of HIV service costs for one year at four different levels: above-site, facility, community, and client level.

ABC/M Phase 1 results feed into Phase 2, which focuses on the institutionalization of capturing and using regularly collected HIV cost and expenditure data to produce information required for effective decision-making on a routine basis. The Ministry of Health expresses sincere gratitude for support from the U.S. Agency for International Development (USAID) and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) to undertake this informative study on the costs of care and treatment provided to persons living with HIV as well as costs of core HIV prevention services.

Special thanks go to USAID's Uganda Health System Strengthening (UHSS) Activity and Makerere University School of Public Health, who worked in close collaboration with the Ministry of Health core team led by Dr. Joshua Musinguzi, Program Manager, AIDS Control Program and Dr. Sarah Byakika, Commissioner, Department of Planning, Financing, and Policy on behalf of the Permanent Secretary.

We hope that this information will be of great use to a range of players contributing to HIV prevention and care efforts.

Dr. Diana Atwiine
Permanent Secretary

EXECUTIVE SUMMARY

Over the years, estimating resource needs for the HIV response has been greatly helped by investments from donors and countries in costing studies. The Office of the U.S. Global AIDS Coordinator and Health Diplomacy, with the U.S. Agency for International Development as the technical lead and in collaboration with the Uganda Health System Strengthening (UHSS) Activity, has implemented activity-based costing and management (ABC/M) that provides cost data to improve the cost-effectiveness and efficiency of quality HIV-related service delivery in Uganda.

This report, which concludes Phase 1 of the ABC/M application, provides a retrospective baseline of HIV costs for one year at four different costs levels: facility, community, client, and above-site. Costing was conducted for five HIV interventions: antiretroviral therapy for new, stable, and unstable clients; HIV testing; prevention of mother-to-child transmission of HIV; voluntary medical male circumcision; and pre-exposure prophylaxis.

Phase 1 included a landscape assessment that determined where clients seek HIV services and a data systems assessment to identify gaps that need to be addressed to produce more routine HIV cost data. The multi-year Phase 2 (started in December 2021) focuses on further landscape mapping of information systems; strengthening the capacity of data managers, users, and policymakers; and supporting data, use with the ultimate long-term goal of institutionalizing the ABC/M approach to provide cost data more routinely.

In Phase 1, facility-level costs were determined using a methodology called time-driven activity-based costing (TDABC), an approach that measures costs at the client level by directly observing resources allocated throughout the client's care visit. The TDABC approach has an advantage over more traditional costing methods in that it involves the development of process maps which can provide insight into how services are delivered and allow for easy comparisons between clients and the facilities.

It was not possible to apply the TDABC approach at the above-site level because services at that level are not client-specific but rather system-specific; therefore, the approach does not make sense for above-site activities. At the community level, the TDABC approach was not used because of time and resource constraints. A top-down approach was used for both of these levels of costs. Client-level costs were determined from income, assets, and consumption information gathered from a client exit survey.

At the facility level, findings showed that antiretroviral drugs and labs are the largest cost drivers, and personnel capacity cost rates were very low, even for the highest health cadres such as medical officers. There were substantial variations observed in the way services were delivered across facilities; even within the same facility, the care process could vary between clients with process steps sometimes skipped and some steps ideally performed by clinicians being covered by non-clinicians.

Clinical contact times were often shorter than expectations based on key informant interviews with providers while waiting times were longer than optimal. At the community level, care and treatment support services were estimated to be $17.18 per client reached while above-site expenditures represented a significant proportion of all costs. Finally, at the client level, opportunity costs and direct transport costs were significant, but out-of-pocket spending for HIV services at the facility was almost non-existent.

It will be important to get clinical leadership's interpretation of the data to understand the root causes of the outputs observed. Given the significance of above-site costs, understanding drivers may show potential for efficiency gains. More insight into the extent absenteeism impacts service delivery will enable more accurate estimates for personnel costs. Low wages of clinical staff may be contributing to absenteeism. Lastly, direct transport and opportunity costs borne by the client are significant, highlighting the importance of differentiated care models that remove barriers to access to HIV services.

INTRODUCTION

HIV LANDSCAPE

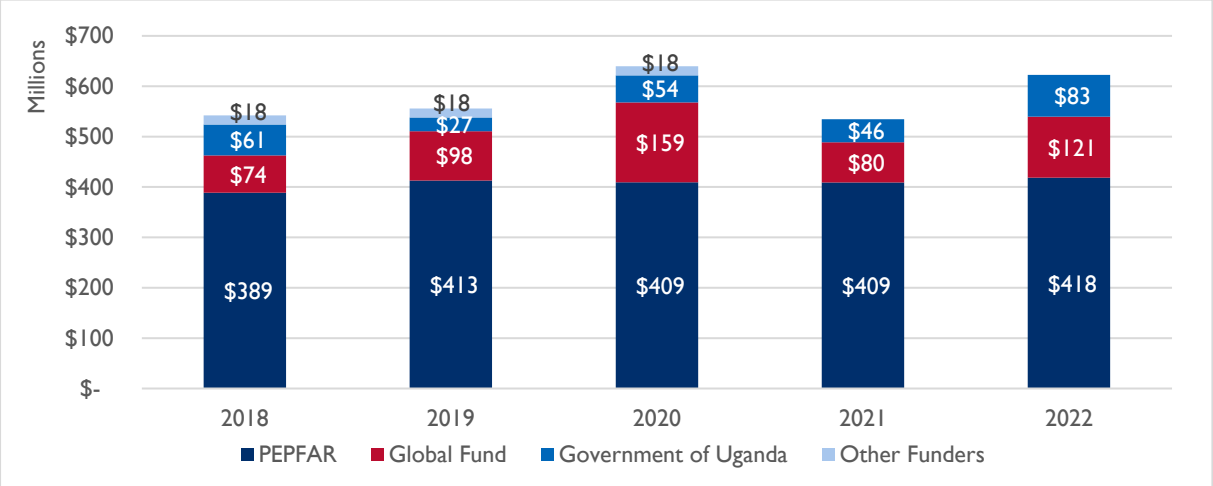
Uganda's HIV epidemic remains among the largest in sub-Saharan Africa with 1.4 million adults aged between 15–49 years estimated to be living with HIV and an adult HIV prevalence rate of 5.8% (UNAIDS, 2020). Women are disproportionately affected, with 7.5% of adult women living with HIV compared to 4.3% of adult males. Other groups particularly affected by HIV in Uganda are sex workers, young girls and adolescent women, men who have sex with men, people who inject drugs, and people from Uganda's transient fishing communities (Ministry of Health, 2019).

The Government of Uganda, with support from development partners that include the Global Fund and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), has however managed to significantly scale up coverage of key HIV interventions in recent years resulting in the achievement of the UNAIDS 90-90-90 targets, which aimed to bring HIV testing and treatment to the vast majority of people living with HIV, reduce the amount of HIV in their bodies to undetectable levels so that they can live a healthy life, and prevent further spread of the virus by 2020 (UNAIDS, 2017). At the end of 2019, an estimated 89% of people living with HIV knew their status of whom about 94% were on HIV treatment; 90% of those on treatment were virally suppressed (UNAIDS, 2020).

While there have been increased efforts to scale up treatment initiatives in Uganda, there are still many adults and children who are eligible for antiretroviral therapy (ART) and are not on treatment. In addition, low ART coverage among pediatric clients indicates a significant need for ART scale-up among that population. Achieving this will however require significant mobilization of new resources.

Significant scale-up of HIV services in Uganda over the past decade has been largely supported through external funding. External funding accounted for 84% and 83% of total HIV funding in fiscal years 2017/18 and 2018/19, respectively (Uganda AIDS Commission, 2021). Domestic government sources accounted for about 16% and 19% of total HIV financing in 2017/18 and 2018/19, respectively. The low contribution of domestic government sources highlights the need for new domestic resource mobilization and to identify areas for efficiency in resource use in Uganda. Figure 1 shows a declining trend of HIV funding in Uganda from 2020 to 2021, which is due to a reduction in Global Fund resources. Although government contribution is low, the Government of Uganda has started to take on some more financial responsibility.

Figure 1: Trends in Total Budget (Millions USD) by Funder 2018–2022



Source: Data obtained from PEPFAR-Global Fund's Resource Alignment initiative.
Note: Other funders refers to the private sector and any other donors.

STUDY RATIONALE

Investments in costing studies have been essential to estimating resource needs for the HIV response and identifying significant cost drivers increasing the efficiency of service delivery. However, these figures may be incomplete and/or become outdated as the epidemic evolves, and the reliability of these estimates over time is compromised by transformations in service delivery modalities, variability in the availability of HIV-related services at sub-national levels, changing demographic characteristics of persons newly infected with HIV, as well as new technologies and price changes.

Policymakers and partners involved in funding, establishing, and managing HIV-related programs need current information on how costs, financing, utilization, and performance of different patterns of delivery vary, and the factors that affect them. This highlights the need for cost analyses that reflect the swift pace of changes to HIV care cascades in recent years and the need for an approach that regularly collects data to produce valid and reliable information required for decision-making on a routine basis.

Additionally, the reduction of international assistance on health and competing demands for public funding have increased the emphasis on transparency of expenditures and placed a focus on health spending efficiency as well as performance measurement in HIV-related services. One-time cost studies, which are often outdated, will not be able to equip policymakers with the robust rationale for funding HIV and health responses, nor will they support improved performance, efficiency, and transparency of expenditure.

To meet these demands, the U.S. Agency for International Development (USAID)-funded Uganda Health Systems Strengthening (UHSS) Activity and PEPFAR's Sustainable Financing Initiative for HIV/AIDS-funded Health Policy Plus project, in collaboration with the AIDS Control Program, Makerere University School of Public Health, and other stakeholders, has implemented an activity-based costing and management (ABC/M) system that will provide routine data to improve the efficiency, cost-effectiveness, and quality of HIV-related service delivery in Uganda. The ABC/M approach identifies actual costs for providing HIV prevention, testing, and treatment services—with the express aim of equipping policymakers with a robust rationale for optimizing resource allocation for the HIV response and promoting transparency of expenditures. This approach has global consensus with key donors and stakeholders.

In addition to service delivery costs, ABC/M requires an understanding of the HIV activities that are funded at non-service delivery, above-site, and community levels. Examples of non-service delivery activities include clinical mentoring, supportive supervision, and training while examples of above-site expenditures include resources spent on activities related to policy, governance, health system administration, coordination, and training.

Also, many countries, including Uganda, have adopted differentiated service delivery models to enhance efficiency and client-centeredness in the delivery of services across the HIV clinical cascade. A systematic framework is needed for routinely mapping resources and care delivery processes across cadres and health systems to promote viral suppression among HIV clients.

VALUE OF TIME-DRIVEN ACTIVITY-BASED COSTING AT THE FACILITY-LEVEL

At the facility level, UHSS collected data using time-driven activity-based costing (TDABC), an approach that allows for costs to be accurately measured at the client level throughout the client's care visit. There are five main advantages to using the TDABC approach as opposed to more traditional costing methods (McBain et al., 2016):

1. Data is collected at the client level, which assures you are directly observing resources allocated to each client and allows for measurement of additional costs incurred when treating certain high-risk clients.

2. TDABC ascertains the cost of care for specific treatment pathways and therefore facilitates comparisons between specific interventions for treating the same condition.

3. TDABC measures the extent to which resource capacities are allocated to specific activities relative to others using a standardized metric, the capacity cost rate.

4. Tracing clients through a care pathway maps out the existing system of care (process maps) and allows for the identification of opportunities to optimize the care pathway for better outcomes and efficiencies.

5. TDABC produces a cost estimate for each client—based on the extent to which the client consumes resources. This allows the data collection team to examine variation in resources and costs across clients including, for example, whether resources and costs differ according to client demographics or the severity of the client's condition.

Low-resource settings typically use a bottom-up approach such as the WHO-CHOICE framework or a top-down approach to measure costs and produce estimates for macro-level priority setting (McBain et al., 2016). However, these approaches do not capture variations in the cost of care delivery across clients and types of healthcare facilities and providers. This knowledge gap has significant ramifications in low- and middle-income countries where resources are scarce and there is increasing pressure to improve efficiency, reduce the cost of care, and nevertheless generate positive client outcomes.

The benefits of applying TDABC in low-resource settings were made apparent in completed studies from Haiti (McBain et al., 2016) and Zimbabwe (Chirenda et al., 2021). The results in Haiti gave Partners in Health a firm basis for negotiating the price of health services with insurers and private funders as well as the ability to identify opportunities for task-shifting to increase client access to care, eliminate medicine stock-outs, fix broken laboratory equipment, and standardize clinical protocols and processes to reduce client-level variance in resource allocation (McBain et al., 2016).

An important note about the TDABC approach in low-resource settings is that often, process steps taken during the care visit do vary considerably. For example, clinical contact times may be shorter in practice than what is recommended in the protocols. In these cases, the unit costs derived from a time-driven approach will be lower than a normative costing approach.

ACTIVITY SCOPE

The ABC/M activity in Uganda will be undertaken in two phases (Phase 1 and Phase 2). Phase 1, which culminates with the publication of this report, focused on capturing baseline data on costs, the health facility ecosystem, and the data systems architecture. More specifically, under Phase 1, costs related to HIV programming were collected at four levels:

1. Facility level for direct provision of HIV services that captured costs of providing the following services at the health facility: HIV testing, HIV treatment of a new client, HIV treatment of a stable client, HIV treatment of an unstable client, prevention of mother-to-child transmission (PMTCT), pre-exposure prophylaxis (PrEP), and voluntary male medical circumcision (VMMC).

The TDABC approach was only used for facility-level costs. Inputs for facility-level costs include personnel, facility space, equipment and furniture, consumables, and indirect costs.

2. Community level for HIV prevention programs that target key populations that have a higher risk of HIV exposure. A top-down costing approach was used.

3. Client level through a client exit survey that was administered to determine costs borne by the client per facility visit and the quality of service delivery from the client's perspective.

4. Above-site level through data obtained from PEPFAR-Global Fund's Resource Alignment initiative which includes expenditures from PEPFAR, the Global Fund, the government, and other funders where data was available. The above-site level analysis looked at expenditure supporting non-service delivery activities such as training, clinical mentoring, supportive supervision, and above-site/systems activities such as health administration, policy, governance, training, etc. A top-down costing approach was used.

In addition to determining unit costs of HIV interventions, the scope of the study under Phase 1 of ABC/M included a landscape assessment. This landscape assessment has two parts: (1) an ecosystem mapping to determine where clients seek HIV services to guide the facility sampling approach and (2) a data systems assessment to identify gaps that need to be addressed to produce more routine HIV cost data. Phase 2 will focus on capturing this cost data more routinely.

Subsequent work under ABC/M Phase 2 will be on strengthening local capacity to apply the methodology and implement ABC/M, identifying the best use of the data accrued from the ABC/M application, and advocating for financial systems upgrades to include higher-resolution information on vertical HIV programs. The primary goal of ABC/M Phase 2 will be to assure that the ABC/M application and associated processes for ongoing data collection are sustained and progress toward institutionalization. Building the capacity of policymakers and data users to collect, analyze, and interpret ABC/M data is an important step toward achieving this goal.

HIV INTERVENTIONS

The focus of ABC/M in Uganda was on clients seeking HIV prevention services and care/treatment services for people living with HIV in primary healthcare facilities and hospitals as outpatient cases. The prevention services of interest included HIV testing and counseling, PMTCT, VMMC, and oral PrEP.

People living with HIV seeking treatment were categorized into three client categories: new clients, stable clients, and unstable clients. In Uganda, the eligibility criteria to be categorized as a stable client is the following: people living with HIV (1) on current ART regimen for more than six months, (2) on first- or second-line ART regimens, (3) who are virally suppressed, (4) who fall into World Health Organization stages 1 or 2, (5) who have demonstrated good adherence (over 95%) in the last six consecutive months, and (6) who are also tuberculosis clients who have completed two months of intensive phase treatment and are sputum negative for pulmonary tuberculosis.

ACTIVITY GOVERNANCE

A wide group of experts is supporting the implementation of the ABC/M approach across several countries in Africa. The initiative is led by the Office of the U.S. Global AIDS Coordinator and Health Diplomacy with USAID serving as the technical implementation agency. Other members of the ABC/M review board include the U.S. Centers for Disease Control and Prevention (CDC), U.S. Treasury, the Global Fund, UNAIDS, and the Bill & Melinda Gates Foundation. Implementation was

also supported by technical advisors with special expertise in the ABC/M methodology including Robert Kaplan, who developed the ABC approach (with Michael Porter) and Ryan McBain, who has implemented ABC in low-resource settings. In Uganda, USAID working together with UHSS, facilitated introductory meetings with in-country stakeholders to explain the activity objectives and to ensure country buy-in from the government, partners, the PEPFAR Uganda team, and the HIV/AIDS program.

STEERING COMMITTEE

An in-country steering committee was formed with designated points of contact for each institution involved in the activity. The steering committee was composed of representatives from USAID/Uganda; CDC/Uganda; UNAIDS; the Ministry of Health; the Uganda AIDS Commission; the Ministry of Finance, Planning, and Economic Development; and the private sector, including private for-profit and private not-for-profit. A meeting to review the ABC/M approach and draft the research protocol with the steering committee members was facilitated, which also signified the official launch of the ABC/M activities in Uganda.

RESEARCH INSTITUTION

UHSS partnered with a local research institution, Makerere University School of Public Health, to implement the ABC/M activities, including developing the research protocol and data collection instruments, securing ethical clearance, and participating in steering committee consultations. UHSS trained colleagues at Makerere University School of Public Health to manage the field component of the study across selected facilities and to conduct data collection using the ABC/M methodology. Additionally, UHSS supported the university team on data analysis and report development such that the school is equipped to lead subsequent ABC/M capacity building of local researchers, policymakers, and implementers of HIV control programs.

OBJECTIVES AND RESEARCH QUESTIONS

COST ESTIMATES OF HIV INTERVENTIONS TO INFORM DECISION MAKING

The main objective of implementing Phase 1 of the ABC/M study in Uganda was to obtain baseline data on the cost of providing HIV services at the above-site, facility, and community levels in Uganda and to assess costs incurred by clients during a typical care visit. This type of data may be used by policymakers and partners to assist in making more evidence-based decisions for budgeting, resource allocation, improving processes, and resource use. The goal is for Uganda to develop a more financially sustainable and effective HIV platform through routine collection and analysis of ABC/M data.

Benefits from the ABC/M application for HIV services include helping stakeholders identify the unit costs for HIV services, which in Uganda is largely unknown or determined for one point in time, which is not as useful in a dynamic health service delivery system.

The primary research question for the ABC/M costing study was:

- What is the observed total unit cost per recipient of providing select HIV services in Uganda and what are the main drivers of the unit cost? In this study, the total unit cost was used to mean the total cost (including personnel, consumables, indirect, facility, and equipment costs) of all inputs consumed to deliver a selected HIV service.

Secondary research questions include:

- Can variations in cost be explained by the facility and/or client characteristics?
- Are there opportunities to drive efficiencies through improved, standardized processes?
- How can the collection of cost data be made more routine to produce a steady stream of needed and accurate cost data?

METHODS

LANDSCAPE ASSESSMENT

The landscape assessment consisted of two components: an ecosystem mapping exercise and a data systems assessment.

ECOSYSTEM MAPPING

UHSS conducted a health facility ecosystem mapping exercise to show where clients were seeking HIV services and the client volumes for the services in the study. UHSS sourced secondary data from the AIDS Control Program and DHIS2. This information was organized and disaggregated by HIV intervention type, facility type, facility ownership, location, and geography (urban versus rural). This data was used to determine the sample selection of facility sites for the TDABC primary data collection.

DATA SYSTEMS ASSESSMENT

UHSS assessed which data systems in Uganda were used to track clinical and financial information related to health service provision. The assessment included a literature review of existing reports and surveys and key informant interviews with implementing partners, which included organized demonstrations of the data systems. An interview guide was used to collect information on how routine data is collected, what data is being collected, and how the data is used. This assessment informed discussions on the data systems architecture needed to produce more routine, up-to-date costing information that can be used for budgeting, monitoring, and analysis.

FACILITY-BASED COSTS

TDABC was used to capture costs for care and treatment provided to persons living with HIV, core prevention services (oral PrEP, VMMC, PMTCT), and HIV testing at the facility level. Overall, TDABC identifies and measures the following:

- **Activities:** What activities are performed over the care visit for a condition, which person performs each activity, and how long do they spend on each activity?
- **People, furniture, equipment, and facility space:** What is the cost, per unit of time, for each type of personnel, furniture, equipment, and facility space used during the care visit (capacity cost rate)?
- **Materials:** What materials are consumed during the care visit (supplies/consumables, drugs, lab tests and reagents, test kits, etc.)?
- **On-site indirect cost:** What are the additional costs incurred that are not directly consumed over the care visit? Indirect costs that do not directly contribute to individual client care but are

expended for service provision to be made possible, include salaries of administrators, cleaners, and security personnel, as well as utilities such as heating and electricity.

The TDABC methodology applied at the facility level, developed by Robert Kaplan and Michael Porter of the Harvard Business School, is a seven-step approach (Kaplan and Porter, 2011). The TDABC approach steps are as follows:

1. **Select the medical condition and/or client population:** As noted in the activity scope, the HIV interventions included in the study are ART, PMTCT, HIV testing and counseling, VMMC, and oral PrEP. ART costs were further subdivided into new, stable, and unstable clients.

2. **Define the care delivery value chain:** The care delivery value chain is both a descriptive and prescriptive tool that charts out the full set of activities involved in the client's care visit, spanning multiple providers and nonclinical settings. Key informant interviews were conducted with the "facility-in-charge" at each facility to provide a simple map of the care delivery value chain for when and where HIV services are provided, what activities are performed at each stage of the chain, and by whom. When required, multiple people were interviewed.

3. **Develop process maps of care delivery for each medical condition:** Process maps were developed to depict the path that a client would be expected to follow when receiving care during a facility visit. The process map includes the resources (personnel, facilities, equipment, furniture, and consumables) involved in each step of the care visit used by the client or provider. A separate process map was developed for every HIV intervention in the study. Responses from the key informant interviews were used to develop the process maps.

4. **Obtain time estimates for each process step:** Data collectors measured the duration of time providers spend on each step in the care delivery process inclusive of time with clients and non-client-related activities as well as how much time a piece of equipment or other resources were used for each process step. Estimates of client time were then quantified through shadowing clients as they consume care while non-client time was estimated based on self-reported durations by the providers. Time and steps obtained by following clients were compared with the normative process map to assess inconsistencies between the recommended clinical pathway and the actual steps taken in the process of care delivery.

5. **Estimate the cost of supplying client care resources:** Staff estimated costs of all inputs used to provide the needed client care. This included both direct and indirect costs. Direct costs included staff compensation, depreciation or leasing of equipment, and supplies. These data were collected from general facility ledgers, budgeting systems, and other information technology systems, as well as price lists from the National Medical Stores and Global Fund Pooled Procurement Drug List. Indirect costs include support staff and other overhead expenses needed to provide services but not directly related to HIV service provision, such as utilities, infrastructure, etc. In calculating facility indirect costs, the team assumed that, on average, a routine HIV care visit lasts the same duration as a routine non-HIV care visit. The team obtained the total indirect costs of the facility for the last 12-month period and divided it by the total number of clients seen in the 12 months and by the average duration of a routine care visit. See Table 1 for the data needed for each resource type.

Table 1: Data Needed to Calculate the Capacity Cost Rate per Resource Type

Resource	Data Needed
Personnel	• The total number of days an employee works per year • The total number of hours worked per day • The average number of hours used for non-client-related work (e.g., breaks, training, education, and administrative meetings)
Equipment and Furniture	• Cost of replacing an item at today's cost • The useful life of the equipment • Quantity of items in a room • Total available equipment minutes
Facility Space	• Square meters of building and facility space • Cost of construction or rent per square meter • The useful life of space • Total availability of space in a given year
Indirect	• Annual expenditure for overhead (electricity, maintenance, etc.) over 12 months • Total outpatient and inpatient visits per year • The average duration of routine outpatient and inpatient visits

Source: Adapted from Kaplan and Anderson (2004) and McBain et al. (2016)

6. **Estimate the capacity of each resource:** This consists of estimating the capacity cost rate for personnel, equipment, furniture, facility space, and indirect costs. Data on the annual cost of each resource was obtained and divided by how often, in minutes, the resource could be used annually (the practical capacity).

   This is the hypothetical cost if resources are used at their capacity. The resource capacity cost rate was estimated by dividing the resource's total cost by the resource capacity to obtain a rate measured in U.S. dollar per minute. Facility indirect capacity cost rates were calculated assuming that the duration of an average outpatient visit was the same as an average ART visit. For a catalog of all major assumptions used in the study, see Annex A.

7. **Calculate the total cost of client care per intervention:** This final step consists of estimating the unit cost of each HIV intervention. This was done by multiplying the capacity cost rates for each resource used in each client process by the duration that individuals consumed that resource (step 4). Then, the costs were summed across all processes used during the client's care delivery value chain for the estimated total unit cost of the client visit.

COMMUNITY-LEVEL EXPENDITURE

The HIV response includes programs that are offered in the community. Given the nature of these programs as well as time and resource constraints, it was not possible to apply the TDABC approach at the community level. To estimate community-level costs, UHSS interviewed six HIV implementing partners operating community-level HIV programs in the same catchment areas as the facilities in the sample. Each implementing partner provided information about their total expenditure for community programs incurred over the most recent 12-month period, as well as the number of HIV clients reached at the community level, per intervention, as defined by the implementing partner.

Recognizing that a significant portion of implementing partners' expenditure was for non-service delivery and program management, UHSS used PEPFAR expenditure reporting data that disaggregated community-level expenditure for each implementing partner by non-service delivery,

service delivery, and program management. To avoid double-counting, it was necessary to isolate the proportion of implementing partner expenditures that were not attributed to non-service delivery and program management.

Non-service delivery activities include clinical mentoring, supportive supervision, and training. To remove non-service delivery from the unit cost analysis, the team assessed the service delivery/total expenditure ratio for care and treatment from each organization using expenditure reporting data and applied this to the community-level expenditure. In this way, the team was able to estimate the unit cost for service delivery alone.

One caveat is that the team assumed the service delivery/total expenditure ratio for implementing partners at the community-level was similar to its expenditure ratio as a whole, across activities at all levels. The team also assumed that the national expenditure reporting data for each implementing partner would be comparable to the expenditure data collected for this analysis, even though the expenditure data collected as part of the ABC/M exercise was focused on only selected regions in the country.

Next, program management was removed from the unit cost analysis. To do this, the team calculated the percentage of program management expenditure relative to total expenditure. The proportion was 22% in Uganda. This percentage was used to derive the unit cost for care and treatment that excluded both non-service delivery and program management. One assumption in this calculation was that program management as a proportion of all expenditures for implementing partners was similar across all interventions. This assumption was necessary because program management expenditure is not collected for a particular HIV intervention but instead is collected for all interventions.

After removing estimates for non-service delivery and program management expenditure from the total expenditure of the implementing partner, the team calculated unit cost per HIV community intervention. This unit cost was calculated by dividing the implementing partner's self-reported expenditure, excluding estimates for non-service delivery and program management expenses derived using PEPFAR expenditure reporting data as explained above, by the number of HIV clients the implementing partner reached at the community level over 12 months.

It is important to highlight the limitations of this methodology for calculating community-level costs for HIV services. First, it is not possible to make a direct comparison of the community-level unit costs with the facility-level unit costs since different methodologies were used. Second, PEPFAR expenditure reporting data only accounts for spending by PEPFAR and does not include government or Global Fund expenditure for community-level HIV interventions. Third, PEPFAR expenditure reporting's financial classification of community-level spending can be blurry as sometimes service delivery spending can be classified as non-service delivery and vice versa.

ART CLIENT SURVEY

UHSS administered a short client exit interview before clients left the health facility. The survey captured the following information:

- Demographic data
- Socioeconomic data
- Health insurance coverage
- Costs that were borne by clients

- Client satisfaction with the current visit
- Service delivery performance

Included in the calculation of the economic cost to clients for each facility visit were out-of-pocket health expenditures at the facility, direct transportation costs to get to and from the facility, and opportunity costs from seeking services based on time spent at the facility and traveling to and from the facility. Responses to questions on personal income in the survey were used to calculate the opportunity costs to the client.

To map respondents to socioeconomic quintiles, UHSS created a simplified asset register that aligned strongly with Uganda's Demographic and Health Survey wealth index. Clients were assigned to a wealth quintile based on their responses to asset questions in the survey. Lastly, household consumption questions in the survey were used to calculate the economic burden of direct costs (out-of-pocket expenditure and direct transport costs) to the client. The economic burden to the client was represented as the direct costs to the client as a percentage of monthly household discretionary (non-food and non-tax) spending.

ABOVE-SITE EXPENDITURE

To capture the above-site expenditures that occur within government administration levels, a top-down approach was applied using data from PEPFAR-Global Fund's Resource Alignment initiative, which includes expenditure reporting from PEPFAR, the Global Fund, the Government of Uganda, and other funders where data is available. The analysis of above-site expenditures was conducted by PEPFAR headquarters. Expenditures included resources spent on activities related to policy, governance, health system administration, coordination, and training. The PEPFAR Resource Alignment tool also tracks program management and non-service delivery expenditures. Examples of site-level non-service delivery activities include clinical mentoring, supportive supervision, and training.

To analyze the above-site figures, budgets, and spending data available from the Resource Alignment tool were disaggregated by funder, program area, and interaction type. This process was done twice, with commodities and without commodities, for comparison. Above-site budgets and expenditures were allocated to prevention, testing, and care and treatment based on the proportion of site-level expenditures that were allocated to each of these programs.

For HIV testing and care and treatment, the allocated above-site budgets and expenditures were then divided by the number of people tested and the number of people receiving care and treatment from the period of October 2019 to September 2020 to estimate the budget and spending per person tested and per person receiving treatment. Estimates for the number of people receiving prevention services annually were not available.

SAMPLING APPROACH

UHSS and Makerere University School of Public Health used a multi-stage sampling approach. First, the teams randomly selected eight districts from the four administrative regions of Uganda (North, East, Central, West). Two districts were selected per region. Second, the team identified all facilities that provided the services included in the study (oral PrEP, PMTCT, VMMC, HIV testing, and ART) in each of the eight districts using the master facility list for facilities that provide HIV services.

Third, the team stratified facilities according to geography (urban or rural), facility type (hospital or health center [HC]), ownership (public and private not-for-profit), and client volumes (high and low) per month for the targeted services. Fourth, the team randomly selected 31 sites from the stratified

groups to meet specific criteria based on distribution of facilities. The criteria used to select facilities were funding agency for HIV services, facility ownership, geographical representation (regional and urban/rural), facility type, and client volumes for HIV services. A majority of the facilities included in the sample were health centers (81% of all sampled facilities), publicly owned (84%), and located in rural areas (71%) (see Table 2).

Table 2: Distribution of Facilities in Sample

Category	Sub-category	#
District	Arua	4
	Ibanda	3
	Iganga	4
	Lira	4
	Masaka	4
	Mbale	4
	Mukono	4
	Ntungamo	4
	Total	**31**
Facility Type	HC III	16
	HC IV	9
	Hospital	6
	Total	**31**
Facility Ownership	Private	5
	Public	26
	Total	**31**
Urban/Rural	Urban	9
	Rural	22
	Total	**31**

The team conducted a landscape assessment to obtain the data needed to produce an appropriate client sample population. The client sample population was adult clients (18 years and older, including for VMMC) (see Annex B for additional client demographics). Participants were identified during the client registration process when a client first entered the facility; clients that gave verbal informed consent were then assigned a unique ID and the tracking process began.

Names and other identifying information of the client were not collected to ensure confidentiality. The number of clients tracked by intervention, disaggregated by district and facility type, is shown in Table 3. The data collection team was unable to meet the desired targeted sample size (10 clients per intervention type per facility to be able to confidently verify responses from key informant interviews) for VMMC and PrEP services due to low service utilization during the COVID-19 pandemic.

Table 3: Number of HIV Clients Observed and Interviewed, by District and Facility Type

Category	District/ Type	HIV Testing	HIV Treatment (New)	HIV Treatment (Stable)	HIV Treatment (Unstable)	PMTCT	PrEP	VMMC	Total
District	Arua	53	27	41	43	36	2	0	202
	Ibanda	31	23	38	36	34	1	0	163
	Iganga	31	26	36	41	31	1	1	167
	Lira	20	26	40	42	51	2	13	194
	Masaka	51	22	38	41	33	0	0	185
	Mbale	49	39	39	42	45	9	0	223
	Mukono	40	26	37	37	40	4	5	189
	Ntungamo	42	27	39	35	42	0	0	185
	Total	**317**	**216**	**308**	**317**	**312**	**19**	**19**	**1,508**
Facility Type	HC III	125	81	149	127	123	12	11	628
	HC IV	111	72	90	118	116	3	2	512
	Hospital	81	63	69	72	73	4	6	368
	Total	**317**	**216**	**308**	**317**	**312**	**19**	**19**	**1,508**

RESULTS

LANDSCAPE ASSESSMENT

ECOSYSTEM MAPPING

There are about 7,803 health facilities in Uganda. Fifty percent (3,906) of the total facilities offer HIV services (at least HIV testing), while 24% (1,892 facilities) offer ART services. Of the facilities offering HIV services, 41% are health centers level II, 39% are health centers level III, 6% are health centers level IV, 4% are district hospitals, 1% are tertiary hospitals, and 9% are other categories like medical centers (see Table 4). This is a reflection of the existing architecture of the health system, which has more lower-level facilities than higher-level facilities. PEPFAR supports 98% (1,852) of the health facilities offering HIV services. Of the 1,892 health facilities offering ART services, 75% are public, 23% are private not-for-profit, and 2% are private for-profit (see Table 5).

Table 4: Disaggregation of Facilities that Provide HIV Services

Facility Type	%
HC II	41
HC III	39
HC IV	6
District hospital	4
Tertiary (regional and national referral) hospital	1
Other (medical centers, clinics, etc.)	9

Source: Ministry of Health, National Health Facility Master List 2018 (accessed 2020)

Table 5: Disaggregation of Facilities that Provide HIV Services by Ownership

	#	%	Ownership		
			Government	Private for Profit	Private not for Profit
All facilities*	7,803	–	–	–	–
Facilities offering HIV testing services	3,906	50%	58%	23%	19%
Facilities offering ART services	1,892	24%	75%	2%	23%
ART facilities supported by PEPFAR	1,852	98%	–	–	–

* All facilities reporting into the DHIS2 in 2020.
Source: Ministry of Health, Health Information Management System (accessed 2020)

In general, HIV services are well-integrated into the Ugandan health system and HIV testing services are fully integrated with other primary healthcare services. HIV testing is generally accessible at any point of care in a health facility. The health system uses existing fixed and operational capacity and has considerably moved services to the lowest and most cost-effective levels of the system.

DATA SYSTEMS ASSESSMENT

This section reviews the main healthcare data systems in Uganda and elaborates on their functionality in reporting clinical or financial data.

CLINICAL DATA

UgandaEMR: UgandaEMR is the customization of OpenMRS for Uganda. It initially started with HIV-related forms but later expanded to other areas, such as maternal and child health services and tuberculosis treatment, following guidelines issued by the Ministry of Health under its health management information system (HMIS) manuals. UgandaEMR was rolled out in 2017 by the Ministry of Health with the support of health development partners to improve health data collection, access, and use.

The system has gone through several upgrades to improve functionality and usability. UgandaEMR is a point-of-care information system that captures HIV data across the whole chain of HIV service delivery (triage, counseling, clinical room, laboratory, and pharmacy). Data is captured and input into the system as the client is going through the care delivery chain. The data officer at the point-of-care compiles information from the system every month and submits it for input into the national HMIS.

ClinicMaster: ClinicMaster is a proprietary HMIS mainly used in private health facilities in Uganda; however, there is a publicly available version being used by a few public health facilities. Unlike UgandaEMR, which focuses on HIV and maternal and child health data, ClinicMaster is used to capture data on a whole range of medical conditions.

DHIS2: DHIS2 is an open source HMIS that the Ministry of Health has adapted to suit the Ugandan context. The system captures information on all disease conditions. Data on client volumes are compiled monthly at every health facility by an HMIS focal person from UgandaEMR or ClinicMaster, where they exist, and from paper forms where the electronic systems have not yet been installed and made functional.

The data is then input into DHIS2 to generate health systemwide reports. HIV data includes clinical outcomes for ART, HIV testing, and VMMC, as well as CD4 counts and viral load. This data is used for the quantification of commodities and budgeting purposes. Data is also analyzed to aid program planning, development of education campaigns for specific disease programs, and research on the effectiveness of interventions. Healthcare costs are not collected through the HMIS.

Reporting through the HMIS is mandatory for public facilities. Private not-for-profit facilities are required to report through the HMIS; the Ministry of Health uses the primary healthcare grant to this category of facilities as a lever to enforce compliance. Private for-profit facilities are also required to report through the HMIS but there are no clear incentives or mechanisms to enforce compliance.

FINANCIAL MANAGEMENT DATA

The Ministry of Finance, Planning and Economic Development uses a national program budgeting system. Several other systems and gateways are used in public finance management by the ministry, for example, the integrated financial management system and integrated personnel and payroll system.

SYSTEMS FUNCTIONALITY

As of November 20, 2020, the USAID/SITES EMR Support Report showed that of the 464 health facilities with UgandaEMR installed, 346 health facilities were using the system for HMIS reporting.

Most districts in Uganda are connected to the internet and therefore DHIS2 functionality is possible in most of the districts. Data can be easily consolidated in the DHIS2 once it gets to the District Health Office. For facilities that still use paper forms, delays usually come from challenges with relaying hard copy records that are compiled at health facilities to the District Health Office. The DHIS2 is the mainstay system for all health information in Uganda

Challenges that would need to be addressed for successful institutionalization of the ABC/M methodology include:

- Power outages in facilities that do not have power back-up
- Poor internet connectivity in some areas
- Knowledge gaps in some data officers
- Inadequate information technology equipment to meet the data collection needs of some health facilities

The next sections of the report detail the final cost results for above-site, facility-level, and community-level HIV services, as well as results from the client exit survey on the economic burden to clients in accessing HIV services.

FACILITY-LEVEL RESULTS

TIME SPENT AT THE FACILITY BY CLIENTS

The average time spent at the facility per client per care visit and the average time that clients were in direct contact with service providers per visit is shown in Table 6. For example, the average time a new ART client spent with a provider per visit was 35 minutes, while the average time such a client spent at the facility was 58 minutes per visit. Unstable ART clients tended to have longer visits, spending an average of 44 minutes with providers and an average of 78 minutes at the facility. On average a stable ART client spent 39 minutes with a provider per visit and a total of 66 minutes at the facility.

Oral PrEP clients spent an average of 48 minutes with a provider and 62 minutes at the health facility. HIV testing clients spent an average of 51 minutes with a provider and 75 minutes at the facility. PMTCT clients spent an average of 46 minutes with a provider per visit and 73 minutes at the facility. VMMC visits tended to consist of the longest duration, with an average of 97 minutes per visit with the provider and 2.5 hours (148 minutes) at the facility per visit.

A significant portion of clients' time was spent waiting to see a provider. For example, nearly half (44%) of the time unstable ART clients spent at the facility was waiting to see a provider. There were no considerable variations across facility types for how long clients spent with providers or waiting to see a provider. However, there were some variations by location.

In Mukono district, for example, 50% of clients' time (across all HIV services) is spent waiting, whereas wait times are relatively low on average in Mbale and Iganga districts. In Lira and Mbale, clients visiting facilities based in rural locations generally spent less time waiting, but this pattern is not true for all urban versus rural locations.

Table 6: Average Time per Facility Visit by HIV Intervention and Facility Type

Intervention/Facility Type	Average Clinical Time with Provider (Minutes)	*Std Dev*	Average Time Spent at Facility (Minutes)	*Std Dev*	Percent of Time at Facility Waiting
HIV testing (n=315)	**51**	***58***	**75**	***59***	**32%**
HC III (n=112)	48	*37*	73	*55*	34%
HC IV (n=123)	58	*76*	79	*56*	27%
Hospital (n=80)	45	*49*	71	*68*	37%
ART-new (n=213)	**35**	***39***	**58**	***56***	**40%**
HC III (n=72)	28	*30*	45	*55*	38%
HC IV (n=78)	39	*37*	66	*56*	41%
Hospital (n=63)	39	*50*	63	*56*	38%
ART-stable (n=305)	**39**	***52***	**66**	***72***	**41%**
HC III (n=142)	37	*62*	52	*70*	29%
HC IV (n=95)	41	*36*	83	*66*	51%
Hospital (n=68)	42	*50*	71	*80*	41%
ART-unstable (n=305)	**44**	***49***	**78**	***70***	**44%**
HC III (n=107)	36	*57*	62	*77*	42%
HC IV (n=124)	50	*48*	91	*69*	45%
Hospital (n=74)	43	*35*	80	*58*	46%
PMTCT (n=308)	**46**	***47***	**73**	***68***	**37%**
HC III (n=112)	39	*34*	58	*67*	33%
HC IV (n=127)	51	*50*	86	*63*	41%
Hospital (n=69)	47	*56*	75	*74*	37%
PrEP (n=19)	**48**	***48***	**62**	***62***	**23%**
HC III (n=11)	28	*12*	36	*15*	22%
HC IV (n=4)	110	*82*	154	*89*	29%
Hospital (n=4)	40	*17*	43	*17*	7%
VMMC (n=19)	**97**	***50***	**148**	***51***	**34%**
HC III (n=11)	115	*36*	149	*55*	23%
HC IV (n=2)	39	*0*	174	*1*	78%
Hospital (n=6)	83	*63*	137	*56*	39%

PROCESS MAPS

The team developed process maps to capture client flow through the care visit. Figure 2 provides an example of the steps a stable ART client goes through during a routine visit to Ruhaama HC III in Ntungamo district while Figure 3 shows the steps of the care visit for a stable ART client attending Namatala HC IV in Mbale district. The color associated with each step identifies the health cadre who is delivering the step (see Figure C1 in Annex C for process map conventions). Interestingly, the findings reveal that while Uganda has well laid out guidelines for managing HIV, in practice clinicians are not always following these guidelines.

The team saw variations across facilities in the way services were delivered. Within a facility, sometimes services were delivered differently from the protocols described in key informant interviews and the average time spent with the client was shorter than expected. Across facilities, a wide range of providers (e.g., linkage facilitators, volunteer clients, nurses, and medical officers) may provide counseling, take vitals, or offer consultation services to HIV clients. Also, some facilities spent significant time providing general health education at the beginning of HIV service visits, whereas others did not offer this step.

According to MOH HIV testing service protocol, HIV testing clients are supposed to receive pretest counseling and then another counseling session after the test. In practice, this counseling often does not occur for HIV testing clients at many facilities. Only 16% of the HIV testing clients in the sample received counseling. This may be an indication of the quality of care in some of the facilities and is just one of many examples of the variation in service delivery across facilities (see Table 7).

In some cases, certain steps were skipped completely, for example, at Ruhaama HC III, HIV stable clients did not go to the lab after consultation but rather proceeded straight to the pharmacy or left the facility. This may mean that the client was not yet due for viral load testing or the step was missed for some other reason. The example in Figure 3 shows that only 45% of stable clients observed at this facility received a consultation. Figure 3 also depicts that 40% of the clients that received a consultation went straight to the pharmacy for a medication refill. The other 60% went through other steps like lab or adherence counseling before heading to the pharmacy.

While the average of 10 minutes per step was calculated based on the observed clients that received the step, the overall average time spent with clinicians per facility visit is reduced because some steps were skipped for certain clients. Steps in the care process that were skipped were not included in the unit cost calculation, which is one of the main differences between the TDABC approach compared to more traditional normative costing approaches.

Figure 2: Process Map of HIV Treatment (Stable Case), Ruhaama HC III, Ntungamo District

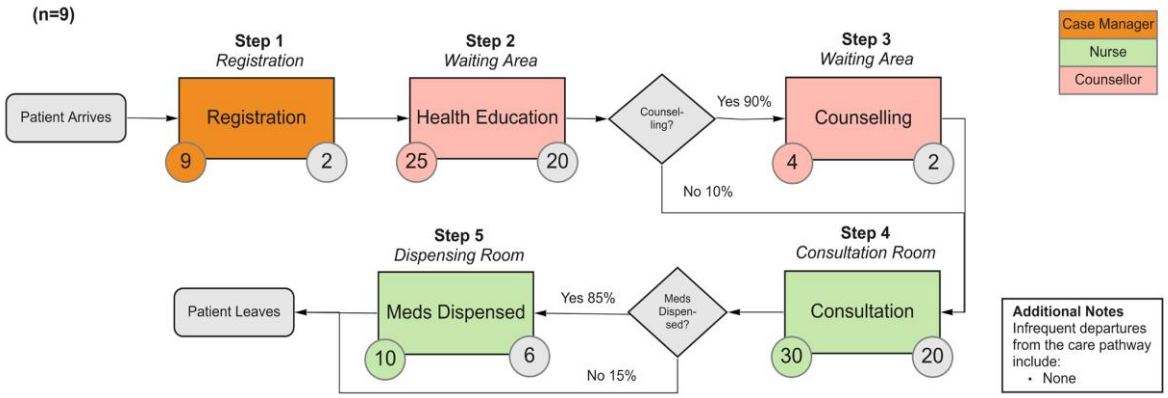


Figure 3: Process Map of HIV Treatment (Stable Case) Namatala HC IV, Mbale District

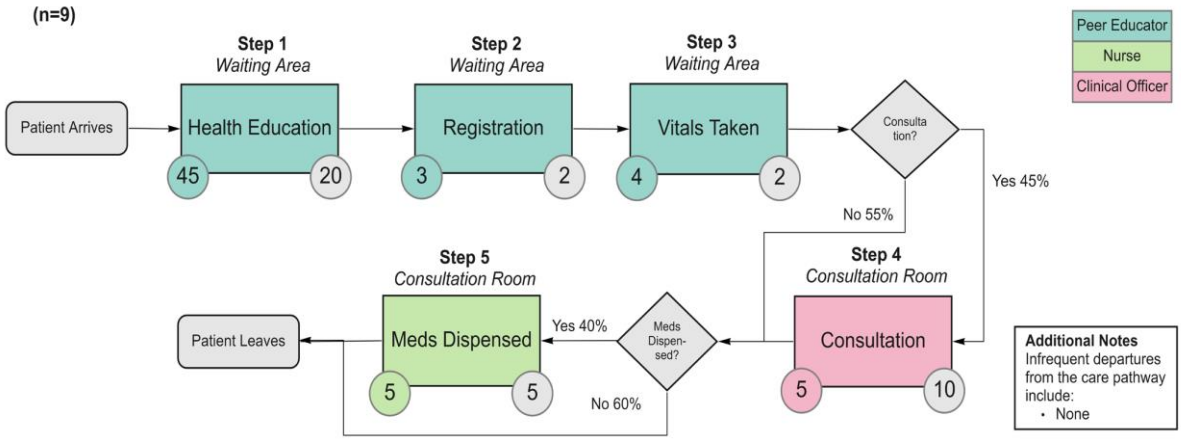


Table 7: Percentage Occurrence by Service Type per HIV Intervention

Service	ART-New	ART-Stable	ART-Unstable	PMTCT	HIV Testing	VMMC	PrEP
Clients tracked (#)	216	308	317	312	317	19	19
Lab work	16%	23%	22%	30%	63%	5%	100%
Medicine dispensed	99%	99%	96%	93%	12%	32%	89%
Counseling	31%	12%	55%	10%	16%	32%	89%

CAPACITY COST RATES

Personnel capacity cost rates (CCRs) ranged from $0.02 per minute for linkage facilitators and peer support personnel/volunteers (e.g., mentor mothers) to $0.23 per minute for medical officers (see Table 8). There were variations in average annual compensation (including benefits) within each cadre due to differences in seniority and experience, as well as variations in practical capacity. Across cadres, average practical capacity ranged from 802 hours per year for data clerks to 1,209 hours per year for nurses (all types).

Of note, the CCR for clinical officers in the public sector is nearly twice that in the private sector; annual compensation for clinical officers in the public sector being 2.8 times that in the private sector and public sector clinical officers reporting lower practical capacity than private sector clinical officers. Whereas these differences in CCRs may be due to recent compensation enhancements made to health workers in public health facilities, it is also possible that significant differences in CCRs may be explained by the small sample size of private facilities (n=5), which may not be representative of all private facilities.

Table 8: Personnel CCRs for all HIV Services

Cadre	Annual Compensation (USD)	*Std Dev*	Practical Capacity per Year (Hour)	*Std Dev*	CCR USD/Minute	*Std Dev*
Clinical officer (n=38)	$5,739	*$2,875*	1,076	*403*	$0.11	*$0.07*
Counselor (n=53)	$2,002	*$995*	1,176	*333*	$0.03	*$0.01*
Data clerk (n=12)	$2,006	*$1,248*	802	*565*	$0.10	*$0.07*
Lab assistant (n=28)	$1,892	*$777*	1,079	*431*	$0.04	*$0.03*
Lab technician (n=30)	$3,378	*$1,318*	1,035	*381*	$0.08	*$0.07*
Linkage facilitator (n=45)	$775	*$491*	1,057	*428*	$0.02	*$0.04*
Medical officer (n=6)	$8,291	*$4,457*	1,141	*531*	$0.23	*$0.21*
Nurse (n=153)	$2,763	*$1,428*	1,209	*416*	$0.04	*$0.03*
Peer support and volunteers (n=66)	$594	*$240*	833	*390*	$0.02	*$0.01*

Facility space and indirect CCRs were very low across all facilities. Indirect CCRs ranged from $0.001 per minute to $0.03 per minute (Table C1 in Annex C provides a subset of facility indirect CCRs). Facility space CCRs depended on the type of room but were $0.01 or less per minute across all rooms and facilities.

COST PER FACILITY VISIT

The average cost per facility visit ranged from $4.11 per client for HIV testing to $36.04 per stable client on ART (see Figure 4). The average cost per visit among stable ART clients is higher than that for new or unstable ART clients due to stable clients requiring fewer facility visits in a year and receiving multi-month dispensing of antiretrovirals (ARVs) at each visit. Stable clients, therefore, have higher costs per visit but lower costs per year when compared to new and unstable clients.

Consumables are the main cost driver for all HIV interventions. Consumables account for 49% of average HIV testing unit costs per visit and 94% of stable client HIV treatment unit costs per visit. Consumables for HIV testing include HIV rapid test kits (which range from $0.80 to $2.00 per kit depending on the type of test) and other supplies, such as surgical masks and gloves. Consumables for ART include antiretroviral drugs, which on average cost $103 per client on ART per year; viral load testing supplies and reagents, which on average cost $16 per test; other laboratory monitoring/diagnostic tests (e.g., for tuberculosis), and other supplies like appointment cards, surgical masks, and gloves.

Personnel costs per visit range from $1.45 for stable ART clients to $6.44 for VMMC clients. There is wide variation in personnel costs across facilities and clients receiving the same intervention due to differences in the types of personnel who provide each step in the care process and their CCRs. Cost range per facility visit for each intervention is provided in Figure 5.

Figure 4: Average Cost (USD) per Facility Visit by Intervention

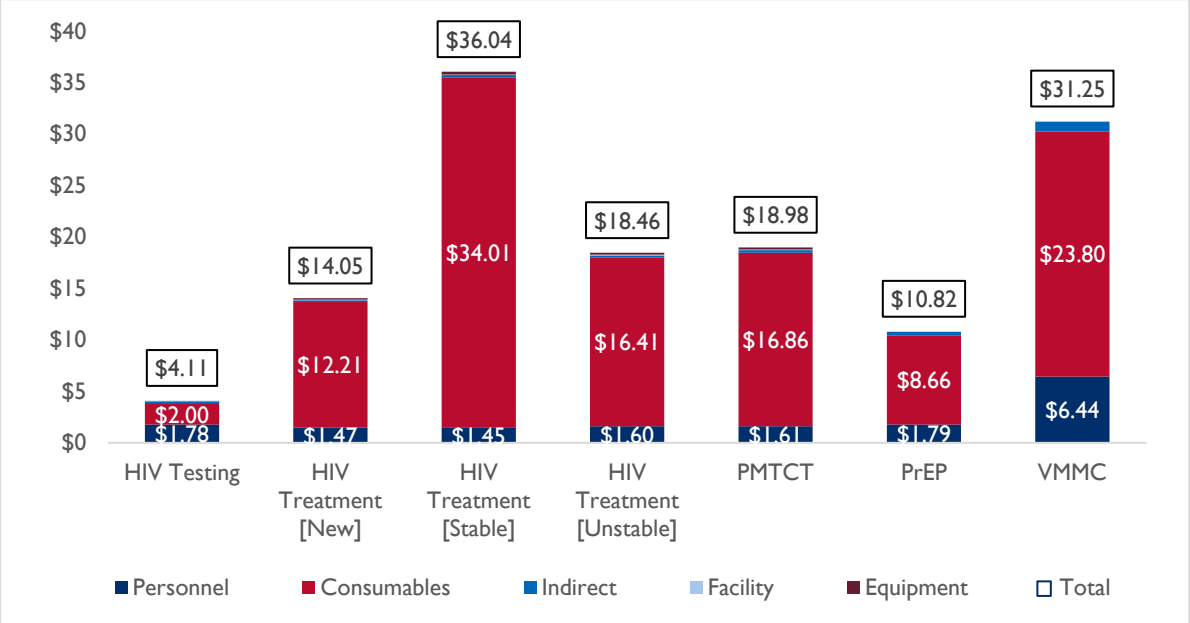
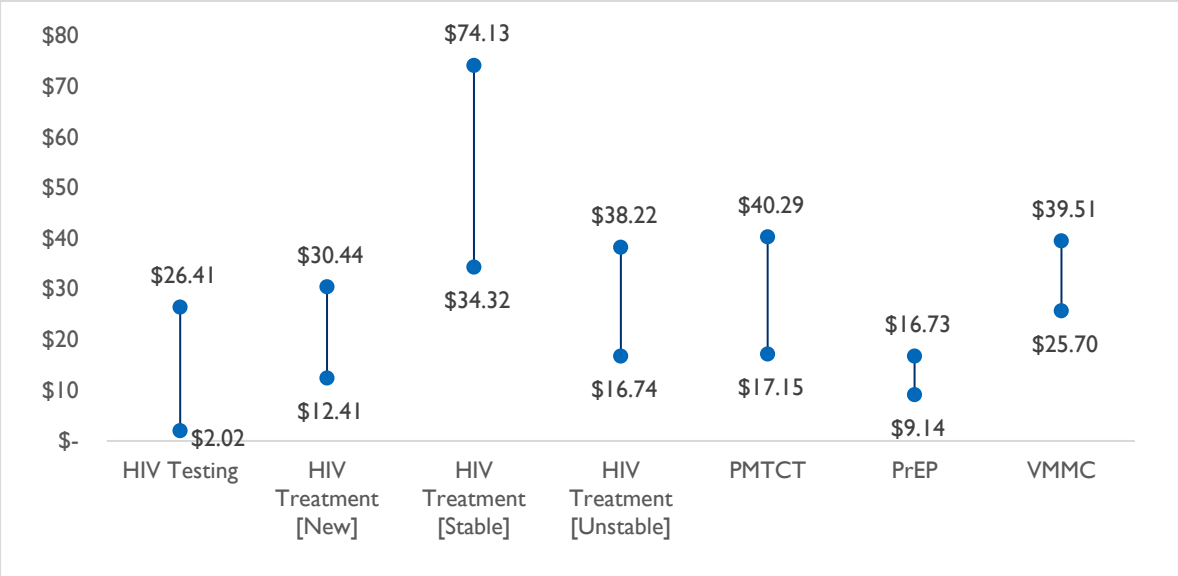


Figure 5: Range in Costs (USD) per Facility Visit by Intervention



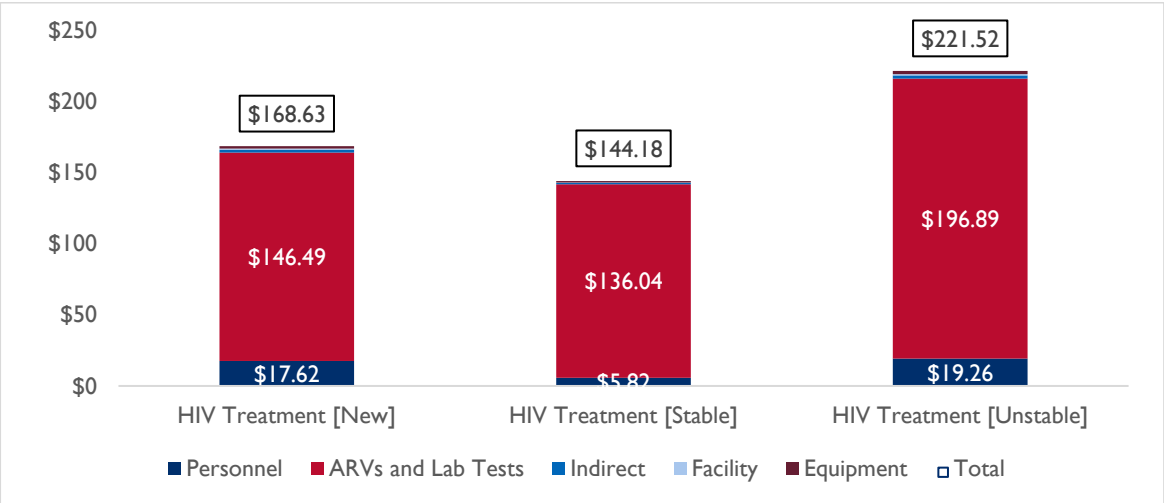
The remaining costs—facility space, indirect, and equipment—account for just a small proportion of unit costs. These cost categories represent 2% of the average cost per visit for stable and unstable ART clients and 8% of the average cost per visit for HIV testing clients.

When weighting average costs per visit by facility service volume, the results remain relatively unchanged (see Figure C2 in Annex C). There is also little variation in costs per visit by facility type, district, facility ownership, and urbanity.

ANNUALIZED ART COSTS

Figure 6 converts the average cost per visit for ART clients into an average cost per client per year based on an assumed number of facility visits made by a client in a year. Treating stable clients costs on average $144 a year per client, less than treating new clients ($169 a year per client) or unstable clients ($222 a year per client). The team assumed that a stable client makes quarterly facility visits per year (i.e., four visits in a year), a new client makes monthly visits for the first six months and then graduates to quarterly visits (i.e., eight visits in a year), while an unstable client makes monthly visits for the entire year (i.e., 12 visits in a year).

Figure 6: Average Cost (USD) per ART Client per Year



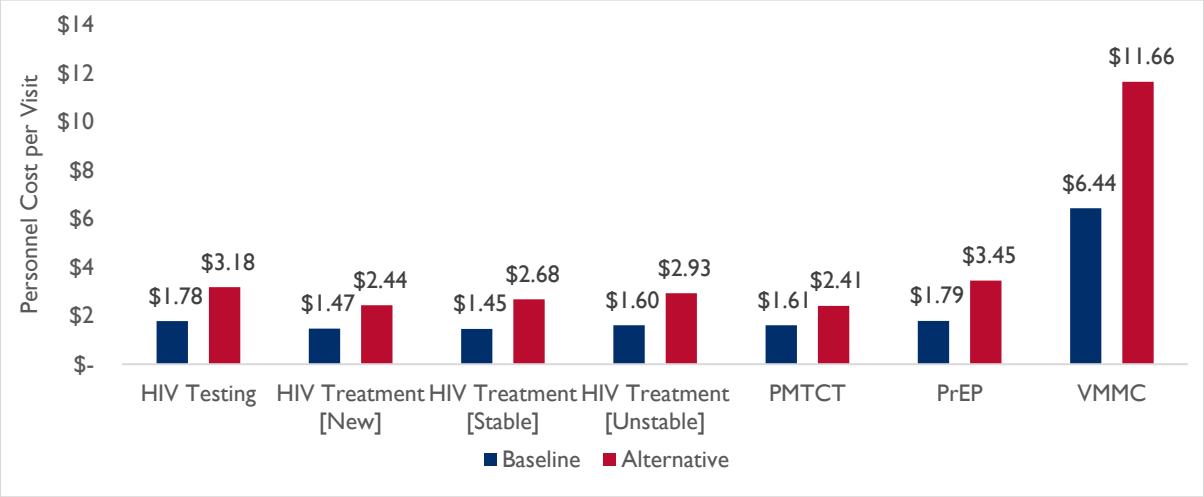
EFFECT OF ABSENTEEISM AND IDLE TIME ON COSTS

During data collection, it was observed that there was some absenteeism of providers occurring. Additionally, the amount of healthcare worker idle time (time spent on breaks, lunch, etc.) self-reported by service providers may have been underrepresented. Since time observed using the TDABC approach was based on observing the client and not the provider, it is likely that providers may have spent significant levels of time completing client charts, which represents a valuable use of time but does not represent either idle time or time spent with a client. Lower client volumes due to COVID-19 may also have contributed to increased idle time of providers, especially for VMMC and PrEP.

To examine the potential effect of absenteeism and increased idle time on the unit costs derived from TDABC, UHSS quantified the value of the time that could have been used for providing clinical care but was otherwise left unused. The team sourced health work absenteeism rates compiled by the Ministry of Health's human resource information system, which estimated the percentage of time clinicians are idle or absent when they are supposed to be providing services at 40%.

Using this estimate, the team calculated how these scenarios would affect the personnel CCR and impact the cost of personnel in the unit cost calculations (labeled as "alternative" in Figure 7). The difference in personnel costs serves as an estimate of the cost of personnel inefficiency from absenteeism and idle time (see Figure 7).

Figure 7: Average Personnel Cost (USD) per Visit using Baseline and Alternate Assumptions to Estimate Personnel Inefficiency



TIME SPENT BY HIV SERVICE PROVIDERS ON NON-HIV SERVICE DELIVERY

During interviews with service providers, UHSS asked whether staff were hired to be dedicated providers of HIV services, and despite this, if they spent any of their client-facing time providing non-HIV services. If yes, they were then asked to estimate their time spent on non-HIV service delivery. Clinical hours spent on non-HIV service delivery ranged from 19% among data clerks to 37% among lab technicians and assistants.

On average, these providers spent 1.5 hours per day (19% of their time at the facility) on non-HIV service delivery (see Table 9), showing that there is some cross-subsidization of non-HIV services. However, UHSS cannot calculate the extent of PEPFAR cross-subsidization because the team was unable to determine whether providers were specifically supported by PEPFAR only, partially supported by PEPFAR, or government-supported.

Table 9: Time Spent by HIV-Specific Providers on Non-HIV Service Delivery

Cadre	Average per Day			
	Work Hours	Clinical Hours	Clinical Hours on HIV	Clinical Hours on Non-HIV
Clinical officer	7.9	5.4	3.6	1.8
Counselor	8.0	5.5	4.2	1.3
Data clerk	8.2	3.7	3	0.7
Lab assistant	8.4	4.9	3.1	1.8
Lab technician	8.4	4.9	3.1	1.8
Linkage facilitator	8.0	5.0	3.7	1.3
Medical officer	8.8	6.1	4.2	1.9
Nurse	8.2	5.9	4.2	1.7
Peer support/volunteers	7.6	4.1	2.7	1.4

COMMUNITY-LEVEL RESULTS

Based on interviews with PEPFAR implementing partners operating at the community level, UHSS determined that the unit cost for care and treatment support services at the community level per client reached was $43.38 (see Table 10). This includes activities such as adherence counseling, peer support, lost-to-follow-up tracking, etc. The unit cost excluding non-service delivery expenditure is $22.14. Further excluding program management expenditure reduces the unit cost to $17.18. A 2019 analysis in neighboring Tanzania estimated community-level care and treatment support services to be $19.49 per client (Forsythe et al., 2019).

Table 10: Unit Cost of Community-Level Care and Treatment Support Services

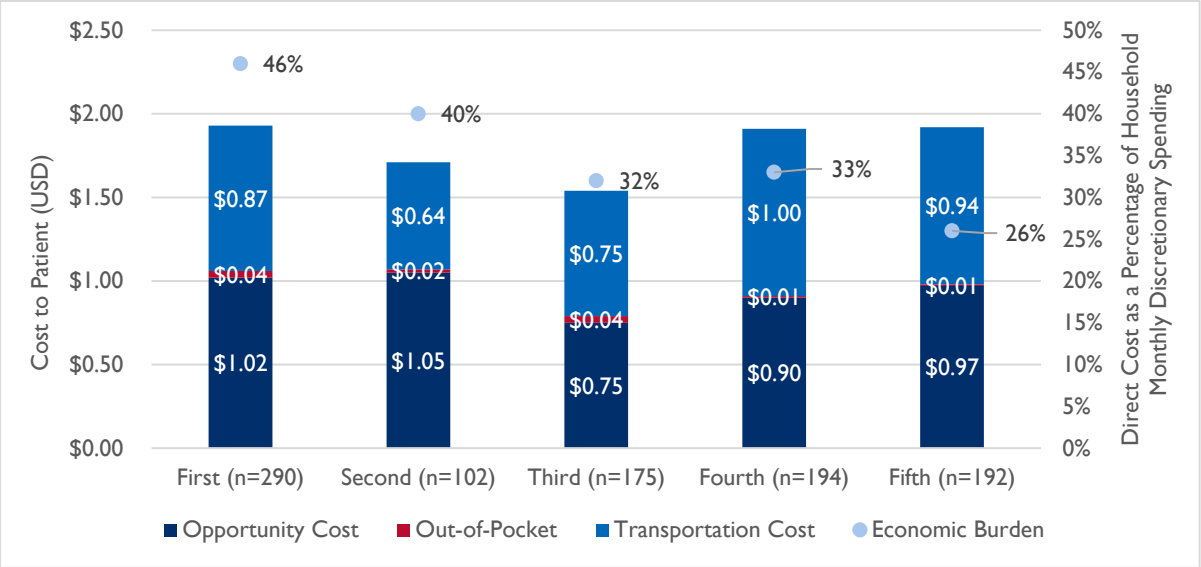
Programs Costed (n)	6
Unit Cost of Community-Based Care and Treatment (USD)	$43.38
Non-service Delivery/Total Expenditure (%)	49%
Unit Cost (Excluding Non-service Delivery) (USD)	$22.14
Program Management/Total Expenditure (%)	22%
Unit Cost of Service Delivery (Excluding Non-service Delivery and Program Management) (USD)	$17.18

CLIENT EXIT SURVEY ANALYSIS

Very few clients reported paying out-of-pocket at the point of service delivery as HIV services are provided free of charge in Uganda. Transportation costs for coming to and from the facility, on average, cost clients $0.86 per visit. Opportunity costs based on clients' reported income and time spent at the facility averaged $0.93 per visit.

When looking at the economic burden of direct costs (transportation and out-of-pocket costs) to clients, direct costs for one facility visit represents 46% of monthly discretionary household spending per capita among the lowest income quintile (see Figure 8). Those in the top income quintile experienced a lower economic burden when visiting a facility for an HIV service (26% on average).

Figure 8: Average per Visit Cost (USD) to the Client and Burden of Direct Costs (%) by Wealth Quintile



TOTAL EXPENDITURE INCLUDING ABOVE-SITE LEVEL

The ABC/M initiative aims to understand the full cost of an intervention, across all elements of the HIV program, namely facility-level, community-level, laboratory, commodity, non-service delivery, program management, and above-site costs. Figure 9 shows data for a client on ART. The cost figure represents an amount that needs to be spent to secure the resources necessary for generating a service (what needs to be spent).

Figure 9: Annual Cost (USD) per Client on ART

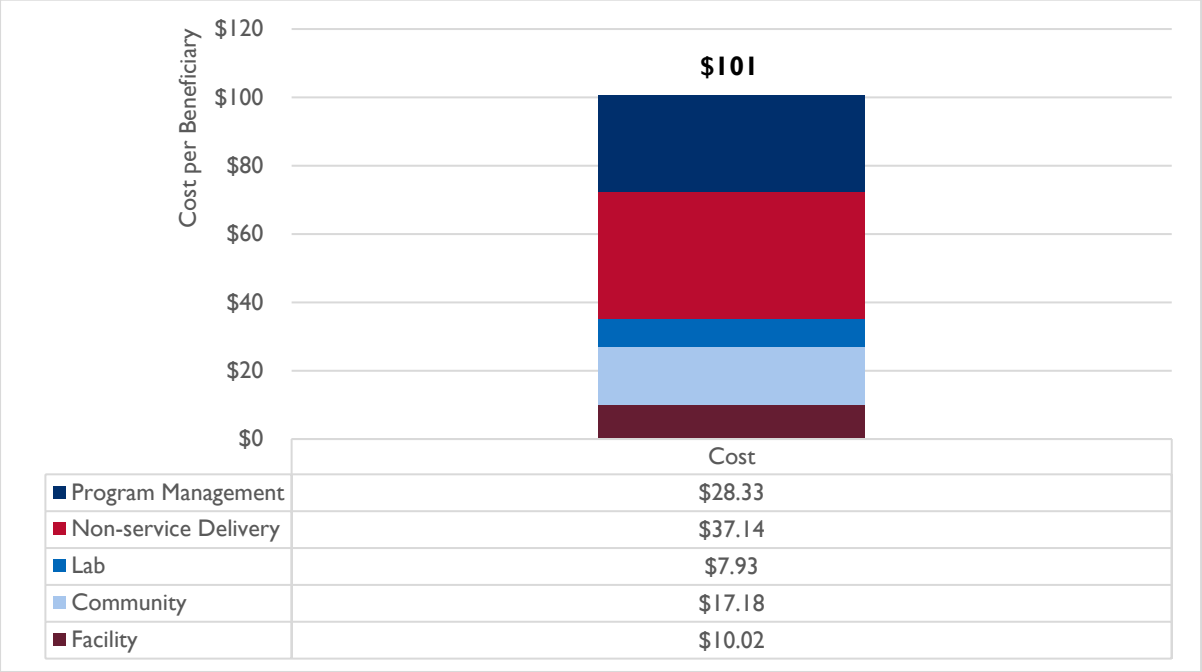
	Cost
Above-Site Programs	$10.86
Program Management	$28.33
Non-service Delivery	$37.14
Commodities	$143.22
Lab	$7.93
Community	$17.18
Facility	$10.02

The PEPFAR Resource Alignment initiative provides above-site, non-service delivery, and program management data for both the budget and the spend annually for PEPFAR, the Global Fund, and the Government of Uganda. Program activities at the above-site level include health administration, policy, governance, systems strengthening, and training. Given that the PEPFAR Resource Alignment tool does not report on cost, UHSS assumed that spending will equal cost for above-site, non-

service delivery, and program management. The facility-level, laboratory, and commodity costs were derived from TDABC. Community-level costs were derived using the community-level methodology described earlier.

Comparisons of costs across line items can also be made excluding above-site and commodity figures to focus on what is happening at the facility level (see Figure 10).

Figure 10: Annual Cost (USD) per Client on ART (Excluding Above-Site and Commodities)



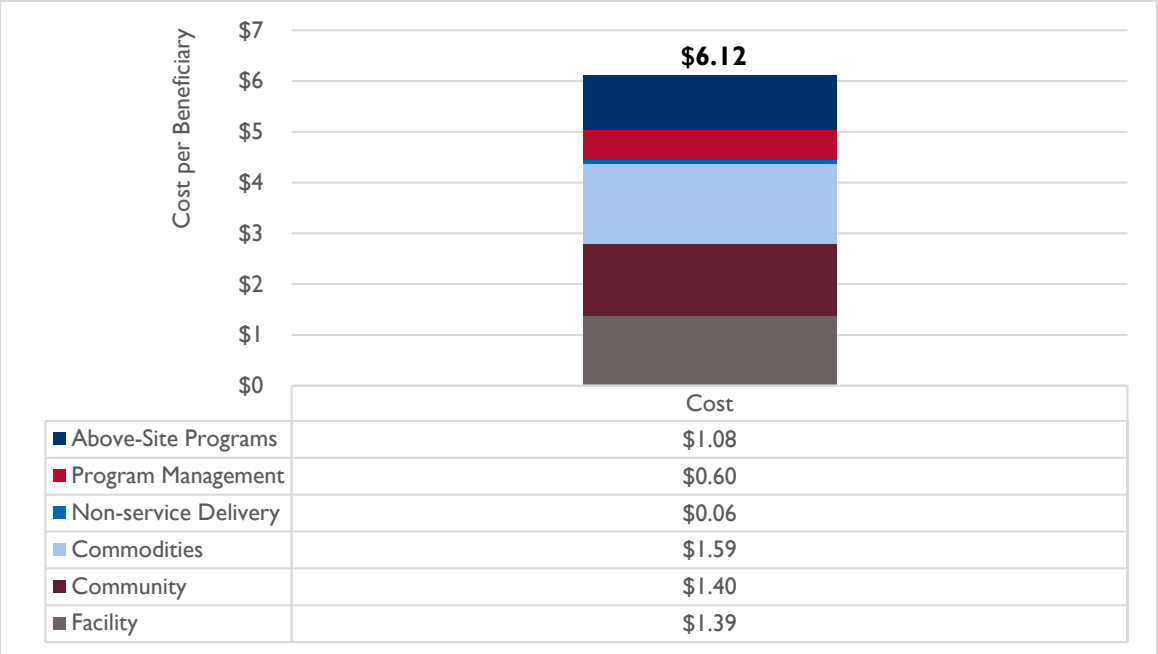
	Cost
Program Management	$28.33
Non-service Delivery	$37.14
Lab	$7.93
Community	$17.18
Facility	$10.02

Figure 11 shows the same disaggregation of the full cost for HIV testing by line item, including both facility-based and community-based components. The facility and community costs are not cumulative, but rather substitutes for one another. Therefore, these costs were weighted assuming that 68% of clients receive testing at facility-based testing sites and 32% of clients receive testing at community-based testing sites.

For the most part, spending reported from the PEPFAR Resource Alignment tool and the cost figures were similar, except for testing commodities. One reason for this difference in this study is that commodities were purchased in the fiscal year prior to the year that they were consumed. In this case, the costs included money paid for test kits that were not used in the same year, which would inflate the unit cost of commodities. After excluding above-site spending and commodities (see Figure 12), the cost amount is reduced from $6.12 to $3.45 per person tested.

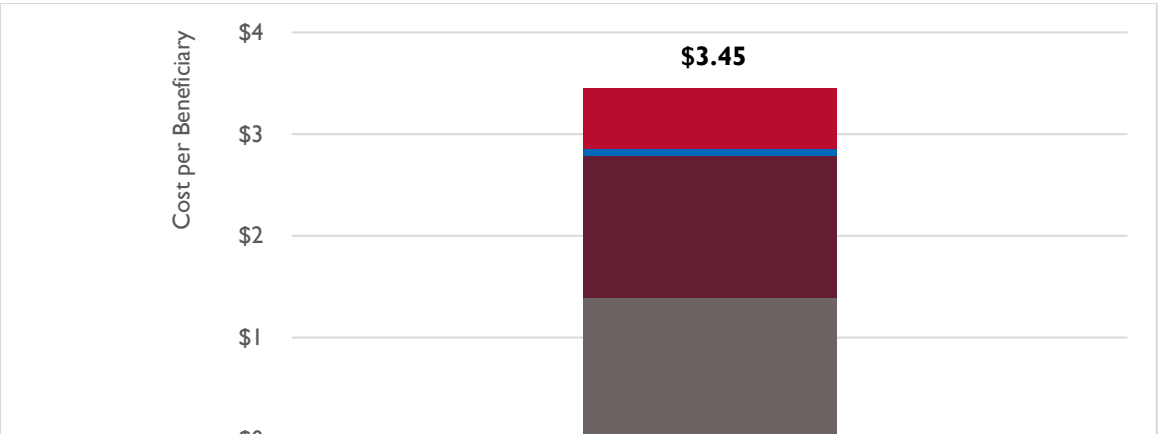
Figures showing the disaggregation of the full cost (both inclusive and exclusive of above-site and commodity figures) for VMMC and PrEP can be found in Annex D, figures D1 through D4. Due to COVID-19, uptake of VMMC was significantly lower than prior to the pandemic, which could have resulted in significant idle time of providers.

Figure 11: Cost per Client Tested for HIV



	Cost
Above-Site Programs	$1.08
Program Management	$0.60
Non-service Delivery	$0.06
Commodities	$1.59
Community	$1.40
Facility	$1.39

Figure 12: Cost per Client Tested for HIV (Excluding Above-Site and Commodities)



	Cost
Program Management	$0.60
Non-service Delivery	$0.06
Community	$1.40
Facility	$1.39

DISCUSSION AND RECOMMENDATIONS

SUMMARY OF MAJOR TAKEAWAYS FROM DATA COLLECTED

VARIATIONS IN SERVICE DELIVERY PROCESSES

With the variations observed in the process maps between facilities for the same service categories, it is important to subject findings to the interpretation of senior clinicians in HIV care in Uganda to understand how study observations relate to what is considered standard.

Understandably, there will always be variations between facilities and even within the same facilities in settings where some resources are scarce, and managers are constantly making adjustments to fill

gaps. One possible explanation for why the process maps may differ is facilities not having adequate resources. For example, an HIV testing clinic may be staffed by a single nurse as the clinician on a given day; in such a situation, the nurse will perform the consultation and lab testing functions and will possibly obtain the lab sample during the consultation. This process would then differ from a visit in which a nurse and lab technician are both present and their steps are performed sequentially.

Another example is a clinic that doesn't have space to operate separate stations for each step of the process map. Some steps will be merged as they have to be performed in the same space. An activity under ABC/M Phase 2 is to present process maps to HIV program leaders. UHSS, in collaboration with Makerere University School of Public Health, will interview these clinical experts to get their opinions on the root causes for why observed pathways departed from ideal pathways.

POTENTIAL FOR COST SAVINGS

From observations, above-site costs are a significant part of the overall cost of providing HIV services. The main funders of the above-site costs are PEPFAR and the Global Fund. The main purpose in allocating these costs is to build systems and improve quality of care with the expectation that in the future, when these systems have been strengthened and most of the components have been taken over by the Government of Uganda, the need for this support would decrease. However, it is important to understand the key drivers of these above-site costs to better prioritize where they are invested to reap the maximum benefits and obtain the best value for the investments.

OPPORTUNITIES FOR EFFICIENCY GAINS

Personnel. There is a need to understand the effect of absenteeism and idle clinical capacity more deeply on the delivery of HIV services in Uganda. This would help with getting more value out of the resources invested in HIV care and also shed light on whether the levels of compensation (salaries) are inadequate as an incentive to minimize downtime and absenteeism.

Facility-Level Costs. ARVs and laboratory work make up a large portion of facility-level costs. Efforts geared toward reducing the costs of these items could go a long way to freeing some resources to be channeled to other cost areas. For example, enhancing bulk purchases and addressing procurement bottlenecks could bring the prices lower, thereby getting more value out of the available resources.

Client Costs. Even though in Uganda clients do not pay for HIV services at the point of service, transport costs and opportunity costs borne by the client pose a significant burden, most pronounced in the lowest-income categories. Such costs could be harmful to the client if they had to prioritize clinic visit costs over other equally important costs, such as for proper nutrition. Efforts should be made to reduce this burden by exploring delivery models that reduce the need for physical clinic visits without compromising the quality of care. Uganda is already implementing differentiated service delivery models of HIV care, but these could be enhanced to further reduce the financial burden on the clients.

OBSTACLES TO IMPLEMENTATION

Most of the challenges faced were related to the fact that TDABC is a resource-intensive process and is a new approach to costing HIV services in Uganda. A lot of resources are needed to meet the data collection requirements related to activities, personnel, furniture, equipment, facility space, and materials and these need to be weighed against the benefit of remaining consistent with the TDABC methodology for planning for health service delivery in low-resource settings. However, this

exercise has laid the ground for further deepening of the ABC/M methodology in the Ugandan health system. Capacity has been built within the health system to base future work on and implement similar or follow-on exercises.

Data collection tools have been developed that could be adapted for use in future exercises. Similarly, training materials, analytical spreadsheets, and process maps could be adopted for use in future exercises. Data collection and updating process maps, although resource- and time-intensive, do not need to be done every year as processes may not change drastically from year to year. Health system planners, especially those directly engaged in planning for HIV services, will need to decide how often to conduct ABC/M exercises to inform planning in the Ugandan context.

One of the limitations of this exercise is that UHSS was not able to apply the TDABC methodology at the community level. Extending the approach to the community level would allow direct comparison of community- and facility-level results, as well as identify the cost drivers of each approach.

Lastly, this study followed clients. Extending the process to tracking providers might provide more insight into the activities HIV service providers engage in, especially those specifically hired to provide HIV services. For example, observing lab technicians as they process lab tests may give a more accurate picture of the time required to handle HIV-related lab specimens. However, following providers may also result in behavior change and introduce some observation bias.

NEXT STEPS

UHSS has disseminated facility-level, community-level, and above-site-level findings to the in-country steering committees and PEPFAR interagency teams, completing Phase I of the ABC/M activity. UHSS will seek further input from program experts to improve understanding of the context for all findings. This will be an ongoing process and will carry over into Phase 2.

STRATEGY FOR OPERATIONALIZING THE ABC/M FRAMEWORK

Phase II of ABC/M will focus on the institutionalization of capturing and using regularly collected HIV cost and expenditure data to produce information required to inform effective decision making on a routine basis. To achieve these objectives, UHSS will:

- Identify the best use of ABC/M data for HIV-related financial planning and management.
- Sensitize and strengthen the capacity of key Government of Uganda stakeholders on the use of these data.
- Advocate for financial systems upgrades to include more granular data on vertical programs, including for HIV.
- Produce an ABC/M toolkit and conduct additional training to aid and build the capacity of local researchers, including from the Makerere University School of Public Health, and policy stakeholders on the ABC/M methodology and its implementation. The toolkit will include a roadmap for rolling out ABC/M Phase 2 over the next several years.
- Convene a meeting with clinical leadership to discuss and interpret process map outputs from ABC/M Phase 1.

UHSS and Makerere University School of Public Health will work with a range of key stakeholders to roll out Phase II of ABC/M. Among the major government stakeholders are the Ministry of Health, specifically the AIDS Control Program and the Uganda AIDS Commission. UHSS will engage PEPFAR Uganda and USAID implementing partners, like those involved in the Regional Health Integration to Enhance Services (RHITES) activity, to discuss their interest in helping to implement the activity and provide support for the analysis. As the lead local research institution for ABC/M Phase 1, Makerere University School of Public Health will be a key stakeholder in the capacity building efforts.

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ANNEX A: MAJOR ASSUMPTIONS

- Facility indirect capacity cost rates were calculated assuming that the duration of an average outpatient visit was the same as an average ART visit.
- The service delivery/non-service delivery ratio for care and treatment found in PEPFAR expenditure reporting for each PEPFAR implementing partner was applied to the implementing partner's self-reported community-level expenditures.
- National expenditure reporting data for each implementing partner was assumed to be comparable to the expenditure data collected for this analysis, even though the expenditure data collected from the ABC/M application was focused on only selected regions in the country.
- Above-site budgets and expenditures were allocated to prevention, testing, and care and treatment based on the proportion of site-level expenditures that were allocated to each of these programs.
- Because the PEPFAR Resource Alignment tool does not report on cost, it was assumed that spending will equal cost for above-site, non-service delivery, and program management.
- A stable ART client was assumed to average four facility visits per year based on three months of antiretroviral prescriptions.

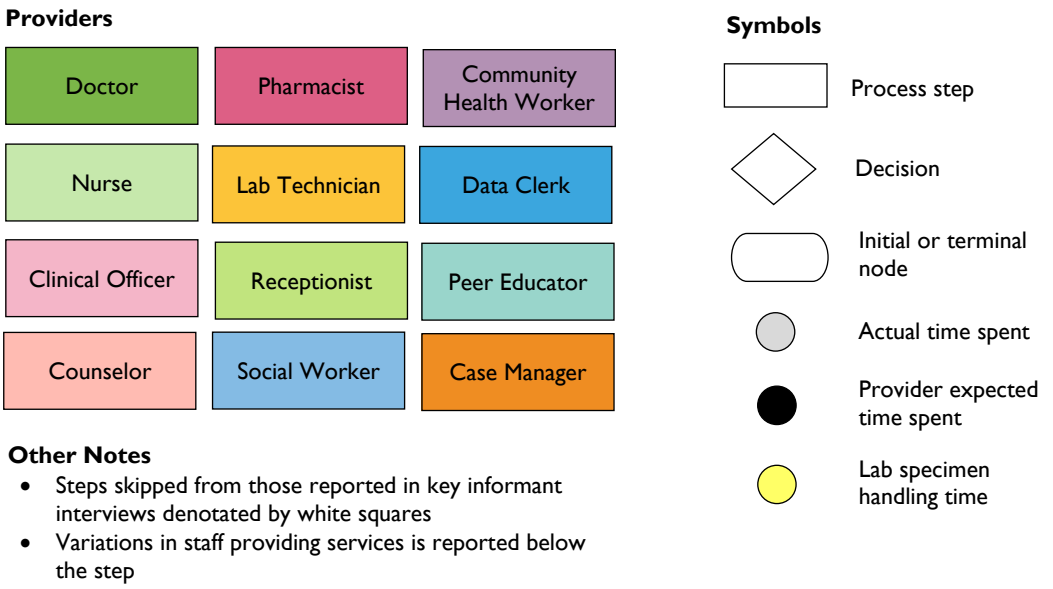
ANNEX B: CLIENT DEMOGRAPHICS

Category	Indicator	#
Age	Average	35
	Median	33
	Max	85
	Min	18
Household Size	Average	5
	Standard deviation	3

Category	Indicator	n	%
Education	College/tertiary, completed	62	4%
	College/tertiary, didn't complete	20	1%
	Secondary, completed	118	8%
	Secondary, didn't complete	301	20%
	Primary, completed	283	19%
	Primary, didn't complete	571	38%
	None	153	10%
Marital Status	Married/in-union	632	42%
	Living together	254	17%
	Never married/single	261	17%
	Widowed/separated/divorced	360	24%
Gender	Male	441	29%
	Female	1,068	71%
Health Insurance	Yes	13	1%
	No	1,495	99%
ART Clients	New	216	26%
	Stable	308	37%
	Unstable	317	38%

ANNEX C: FACILITY-LEVEL RESULTS, ADDITIONAL FIGURES AND TABLES

Figure C1: Process Map Conventions



Adapted from: Harvard Business School, 2018

Figure C2: Per Visit Unit Cost of HIV Intervention: Weighted versus Unweighted by Client Volume

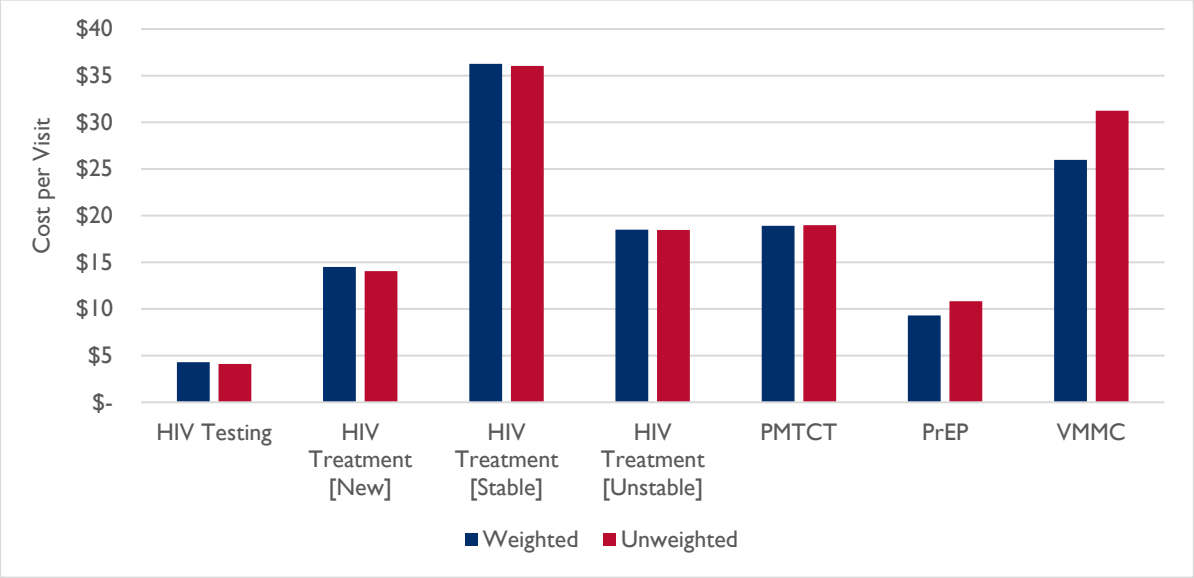


Table C1: Capacity Cost Rate (CCR) Calculations for Facility Indirect (Subset)

Facility	Total (UGX)	Outpatient	Inpatient	HIV Average Visit	Inpatient Minutes	Total Minutes	CCR (USD/ Minute)
amach_hc_iv_	102,740,495	23,950	2,698	95	3,600	11,999,372	0.002
aromo_hc_iii	54,559,684	12,139	668	63	3,600	3,171,985	0.005
bondo_hc_iii	10,750,931	3,591	1,124	62	3,600	4,270,531	0.001
bufunda_hc_iii	24,288,441	10,263	182	98	3,600	1,659,564	0.004
bugono_hc_iv	20,829,492	19,452	2,868	52	3,600	11,340,843	0.000
bukoto_hc_iii	24,324,211	3,709	108	123	3,600	843,604	0.008
bulamagi_hc_iii	5,502,000	14,554	304	46	3,600	1,765,703	0.001
charis_hc_iii	278,640,500	9,089	1,493	64	3,600	5,960,773	0.013
goma_hciii	64,764,286	14,262	-	37	3,600	520,693	0.033
ibanda_hospital	425,616,435	25,574	10,228	130	3,600	40,142,134	0.003
iganga_hospital	222,975,355	80,934	21,597	57	3,600	82,358,867	0.001
ishongororo_hc_iv	159,328,785	21,235	4,239	111	3,600	17,625,894	0.002
itojo_hospital	137,180,873	32,170	8,630	106	3,600	34,478,523	0.001
kitwe_hc_iv	163,085,058	10,995	1,602	106	3,600	6,929,421	0.006

ANNEX D: TOTAL EXPENDITURE INCLUDING ABOVE-SITE-LEVEL RESULTS, ADDITIONAL FIGURES

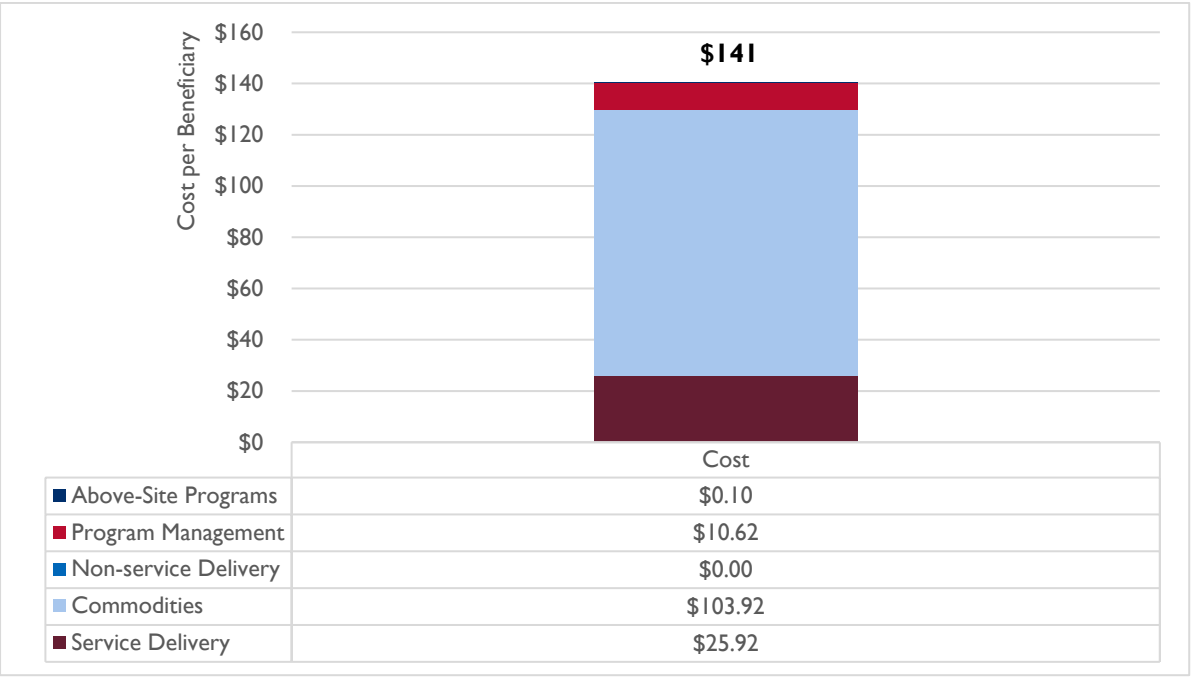
Figure D1: Cost (USD) per Male Circumcised

	Cost
Above-Site Programs	$1.61
Program Management	$8.40
Non-service Delivery	$1.79
Commodities	$23.80
Service Delivery	$7.45

Figure D2: Cost (USD) per Male Circumcised Excluding Above-Site and Commodities

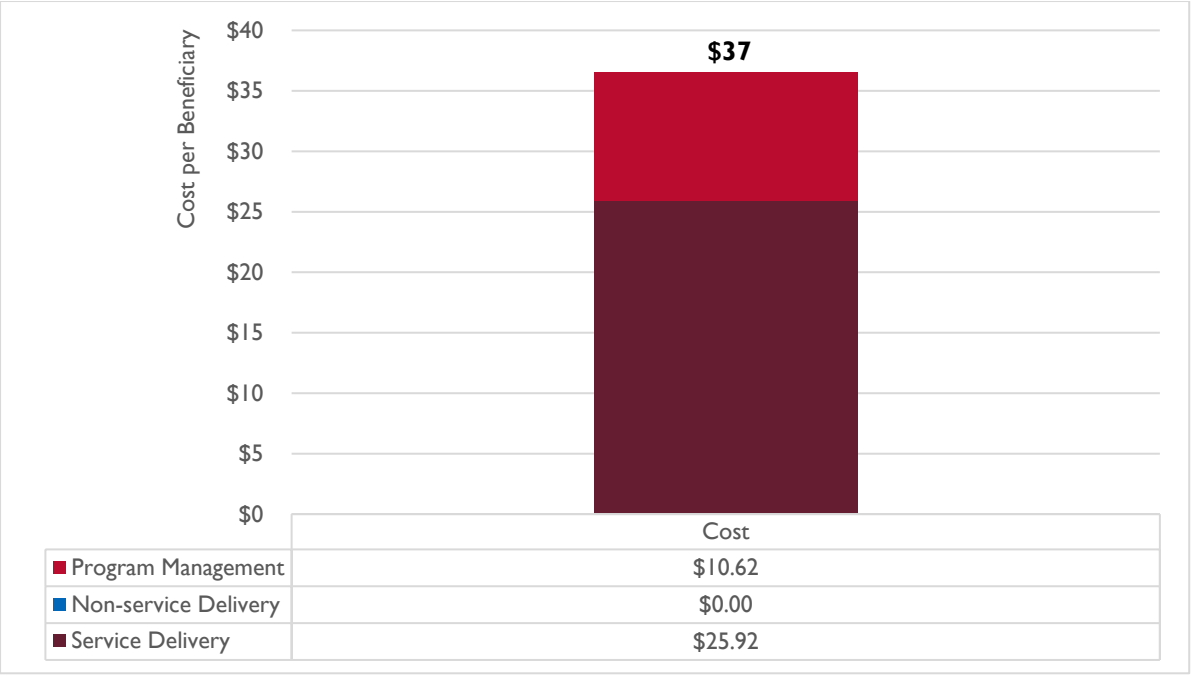
	Cost
Program Management	$8.40
Non-service Delivery	$1.79
Service Delivery	$7.45

Figure D3: Cost (USD) per Individual on PrEP



	Cost
Above-Site Programs	$0.10
Program Management	$10.62
Non-service Delivery	$0.00
Commodities	$103.92
Service Delivery	$25.92

Figure D4: Cost (USD) per Individual on PrEP Excluding Above-Site and Commodities



	Cost
Program Management	$10.62
Non-service Delivery	$0.00
Service Delivery	$25.92