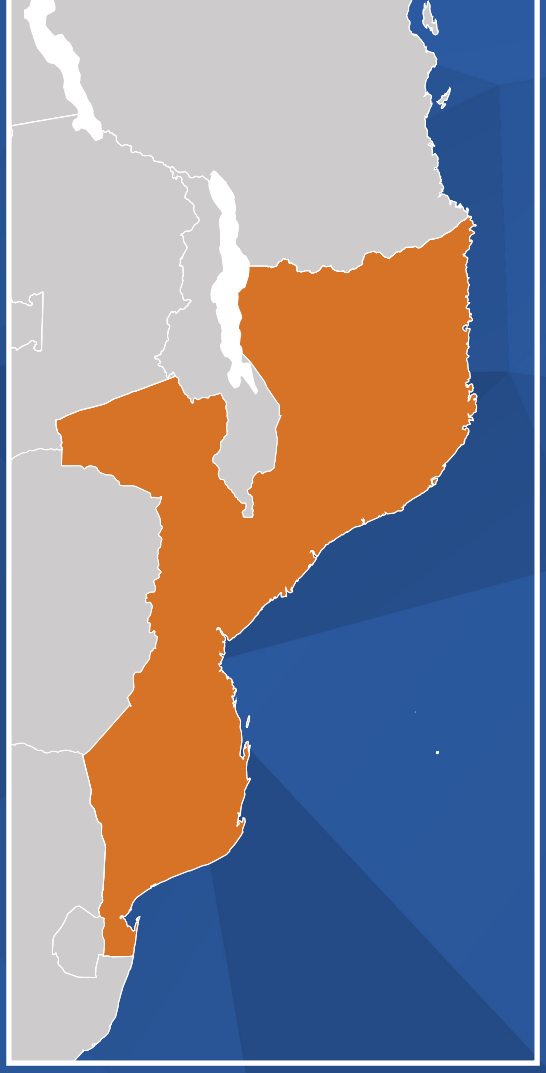

October 2022

APPLYING ACTIVITY-BASED COSTING AND MANAGEMENT TO HIV SERVICES IN MOZAMBIQUE

Improving Resource Allocation and Efficiency

USAID FROM THE AMERICAN PEOPLE
PEPFAR
HP+ HEALTH POLICY PLUS
REPÚBLICA DE MOÇAMBIQUE
MINISTÉRIO DA SAÚDE

OCTOBER 2022

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Health Policy Plus (HP+) is a seven-year cooperative agreement funded by the U.S. Agency for International Development under Agreement No. AID-OAA-A-15-00051, beginning August 28, 2015. The project's HIV activities are supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR). HP+ is implemented by Palladium, in collaboration with Avenir Health, Futures Group Global Outreach, Plan International USA, Population Reference Bureau, RTI International, ThinkWell, and the White Ribbon Alliance for Safe Motherhood.

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Foreword

Activity-based costing and management (ABC/M) is a multi-agency initiative led by the U.S. Global AIDS Coordinator with the U.S. Agency for International Development (USAID) as the technical implementation lead and additional high-level support provided by a technical review board consisting of the Office of the U.S. Global AIDS Coordinator (chair), USAID, the U.S. Centers for Disease Control and Prevention (CDC), UNAIDS, the U.S. Treasury Department, the Global Fund, and the Bill & Melinda Gates Foundation. The overarching objective of ABC/M is to identify expenditure and costs for providing HIV prevention, testing, and treatment services. This will inform decision making for more financially sustainable and effective HIV programs through routine collection of service delivery costs.

Mozambique was the fourth country to adopt and implement the ABC/M approach under the Health Policy Plus (HP+) project, funded by USAID, which had previously been applied in Tanzania, Uganda, and Kenya using a consistent methods framework. In all cases, ABC/M is a country-owned effort with an in-country steering committee performing a governance role for the activity and a local research institution leading study efforts. ABC/M in Mozambique will be rolled out as a two-phased approach with Phase 1 concluding upon the publication of this report, which provides a retrospective baseline of HIV costs for one year at four different levels: above-site, facility, community, and client. Initial plans for Phase 2 are to focus on capacity building and data use with the ultimate goal of institutionalizing the ABC/M approach to provide cost data more routinely and to reach global consensus on the methods framework.

Abbreviations

ABC/M	activity-based costing and management
ART	antiretroviral therapy
ARV	antiretroviral
CD4	cluster of differentiation 4
CDC	U.S. Centers for Disease Control and Prevention
DHIS2	District Health Information Software 2
HP+	Health Policy Plus
HTC	HIV testing and counseling
IT	information technology
MISAU	Ministério da Saúde (Ministry of Health)
MZN	Mozambique new metical
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PMTCT	prevention of mother-to-child transmission
PrEP	pre-exposure prophylaxis
REO	Relatório de Execução Orçamental (budget implementation report)
SIS-MA	Sistema de Informação de Saúde para Monitoria e Avaliação (health information system for monitoring and evaluation)
SISTAFE	Sistema de Administração Financeira do Estado (national financial management system)
SPO	Sistema de Planificação e Orçamento (planning and budgeting system)
TDABC	time-driven activity-based costing
US$	U.S. dollar
USAID	U.S. Agency for International Development
VMMC	voluntary medical male circumcision

Executive Summary

Investments from donors and countries in costing studies over the years have been important for estimating resource needs for the HIV response. The U.S. Global AIDS Coordinator, with the U.S. Agency for International Development (USAID) as the technical lead and in collaboration with the Health Policy Plus (HP+) project, funded by USAID, has implemented an activity-based costing and management (ABC/M) application that provides cost data to improve the cost-effectiveness and efficiency of high-quality HIV-related service delivery in Mozambique.

Phase 1 of the ABC/M application concludes with the publication of this report, which provides a retrospective baseline of HIV costs for one year at four different cost levels: facility, community, client, and above-site. Costing was done for five HIV interventions: antiretroviral therapy for new, stable, and unstable patients; HIV testing; prevention of mother-to-child transmission; voluntary medical male circumcision; and pre-exposure prophylaxis. Phase 1 included a landscape assessment that determined where patients seek HIV services and a data systems assessment to identify gaps that need to be addressed in order to produce more routine HIV cost data. Phase 2, anticipated to start in 2023, will initially focus on capacity building and data use with the ultimate goal of institutionalizing the ABC/M approach to provide cost data more routinely.

In Phase 1, facility-level costs were determined using a method called "time-driven activity-based costing" (TDABC), which measures costs at the patient level by directly observing resources allocated throughout the patient's care visit. An advantage of the TDABC approach compared to more traditional costing methods is the development of process maps, which can provide insight into how services are delivered and allow for easy comparisons between clients and facilities. It was not possible to apply the TDABC approach at the above-site and community levels given data, time, and resource constraints; therefore, a top-down approach was used. Client-level costs were determined from income, assets, and consumption information gathered from a client exit survey.

At the facility-level, findings showed that antiretrovirals and lab tests are the largest cost drivers and that other components of service delivery costs related to facility space and furniture, equipment, and indirect costs were very low. Personnel expenses were also low, for example capacity cost rates for the health cadres providing most services (e.g., health technicians and nurses) averaged only US$0.06 and US$0.07 per minute. There were variations observed in the way services were delivered across facilities and within facilities as the care process could vary among clients, with process steps sometimes skipped. Clinical contact times were typically shorter than expected based on the protocols, while waiting times were longer than optimal. At the community level, care and treatment support services were estimated to be US$5.36 per client and 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 near zero.

It will be important to get clinical leadership's interpretation of the data to understand the root causes of what was observed. Given the significance of above-site costs, understanding those cost drivers may show potential for efficiency gains. More insight into the extent of absenteeism will enable more optimal design of human resources for health staffing models and it's possible that low wages for clinical staff may contribute to absenteeism. Lastly, direct transport and opportunity costs borne by the client are significant, highlighting the

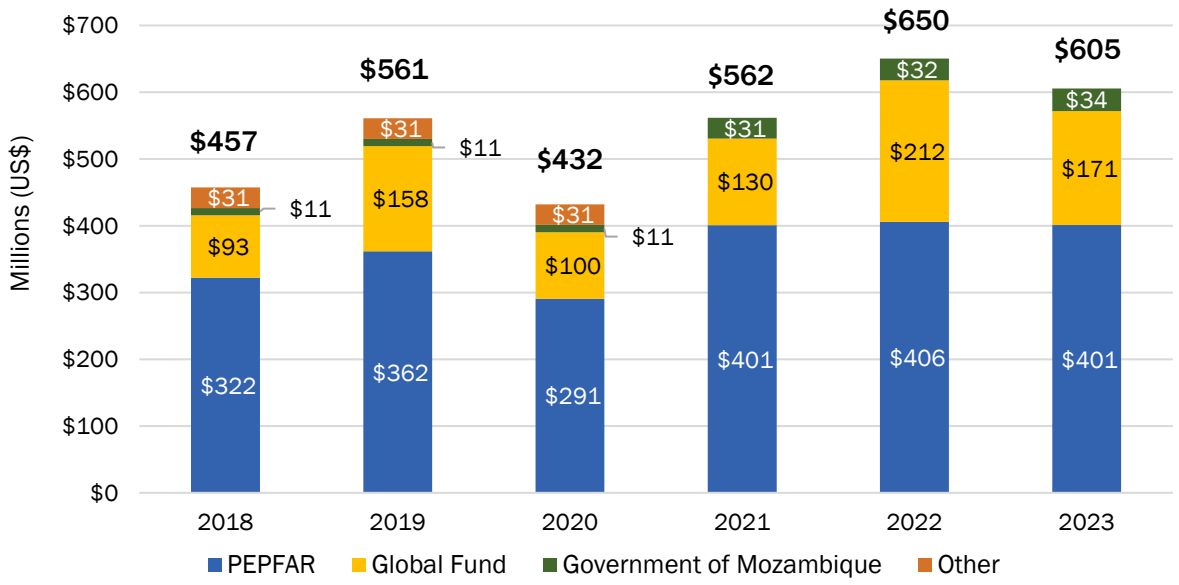
importance of differentiated care, such as multi-month and decentralized dispensing of ARVs at community outlets located closer to the client that removes barriers to access of HIV services.

Introduction

Mozambique HIV Landscape

In Mozambique, HIV remains a high-burden disease, with an estimated 2.1 million people living with HIV and an estimated adult prevalence rate of 11.5 percent (UNAIDS, 2020). With significant financial support from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund (see Figure 1), Mozambique has achieved antiretroviral therapy (ART) coverage of 68 percent (UNAIDS, 2020). In 2022, PEPFAR funded 62 percent of the total budget of US$650 million for the Mozambique HIV response and the Global Fund contributed 33 percent, primarily for the procurement and distribution of antiretroviral (ARV) drugs and some laboratory commodities (excluding viral load). The government of Mozambique contributed 5 percent, most of which was for healthcare worker salaries and facility operation expenses. However, additional resources will be required to achieve "test and start" treatment policies and to attain the 95-95-95 targets suggested by UNAIDS. Given the expectation of flat or declining external support for HIV in the future, there is an urgent need to increase domestic resources and to increase efficiency to achieve program objectives. In this context, effective and efficient allocation of resources will be key factors affecting HIV program sustainability in Mozambique.

Figure 1. Trend in Total Budget for HIV by Funder, 2018–2023



Source: PEPFAR, unpublished (2022)

Study Rationale

Investments from donors and countries in costing studies over the years have been important in many countries for estimating resource needs for the HIV response, identifying significant cost drivers, and increasing efficiency of service delivery. However, these figures may be incomplete and/or quickly become outdated as the epidemic evolves. Reliability of these estimates over time is compromised by transformations in service delivery modalities, variable availability of HIV-related services at subnational levels, changing demographic characteristics of persons newly infected with HIV, 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 to establish an approach that regularly collects data to produce valid and reliable information required for decision making.[1] Additionally, the reduction of international assistance for health and competing demands for public funding have increased the emphasis on the transparency and efficiency of health spending and placed a focus on performance measurement of HIV-related services. This has become even more evident during the COVID-19 pandemic as countries faced unforeseen fiscal constraints compounded with an increased need for emergency funding to address the health and economic impacts of the pandemic.

To meet these demands, the U.S. Global AIDS Coordinator, with the U.S. Agency for International Development (USAID) as the technical implementation lead, has implemented an activity-based costing and management (ABC/M) application to provide routine data to improve the efficiency, cost-effectiveness, and quality of HIV service delivery in Mozambique. Funding was provided by the Sustainable Financing Initiative for HIV/AIDS (SFI) and implementers included the USAID-funded Health Policy Plus (HP+) project, in collaboration with Austral Consultoria and the National Bioethics Committee for Health. The ABC/M approach identifies expenditures and actual costs for providing HIV prevention, testing, and treatment services—to equip policymakers with a robust rationale for optimizing resource allocation for the HIV response and to promote transparency of expenditures. This approach has global consensus among key donors and stakeholders.

In addition to measuring service delivery costs, the approach requires an understanding of the HIV activities that are funded at a non-service delivery level, above-site level, and at community levels. Examples of non-service delivery activities include clinical mentoring, supportive supervision, and training; examples of above-site expenditures include resources spent on policy, governance, health systems administration, and coordination. Many countries, including Mozambique, have adopted differentiated service delivery models to enhance efficiency and patient-centeredness across the HIV care cascade. A systematic framework is needed to routinely map resources and care delivery processes across cadres and health systems to promote viral suppression among HIV patients.

Value of Time-Driven Activity-Based Costing at the Facility Level

At the facility level, HP+ collected data using time-driven activity-based costing (TDABC), an approach that accurately measures patient costs throughout their medical treatment. There are five main advantages to using the TDABC approach rather than more traditional costing methods (McBain et al., 2016):

1. Data are collected at the patient level, which assures direct observation of resources allocated to each patient and allows measurement of additional costs incurred when treating high-risk patients.
2. TDABC ascertains the cost of care for specific treatment pathways and therefore facilitates comparisons among interventions used to treat the same condition.

[1] The HIV care cascade refers to the steps that people living with HIV go through, from initial diagnosis to achieving viral suppression.

3. TDABC measures the extent to which resource capacities are allocated to specific activities relative to others, using a standard metric (the capacity cost rate, explained in the Methods section).
4. Tracking patients through a care visit maps the existing system of care (process maps) and helps identify opportunities to optimize the visit for better outcomes and efficiencies.
5. TDABC produces a cost estimate for each patient—based on that patient's consumption of resources. This allows the data collection team to examine variation in resources consumed and costs across patients including, for example, if there are differences according to patient demographics or the severity of the patient's condition.

Low-resource settings typically use a bottom-up approach—such as the World Health Organization's Choosing Interventions that are Cost Effective (CHOICE) framework—or a top-down approach to measure costs and produce estimates for setting priorities at a macro level (McBain et al., 2016). However, neither of these approaches captures variations in the cost of care across patients, types of healthcare facilities, and providers. This knowledge gap has significant ramifications in low- and middle-income countries where resources are scarce. There is increasing pressure to improve efficiency and reduce the cost of care while still generating positive patient outcomes. The benefits of applying TDABC in low-resource settings were made apparent in studies from Haiti (McBain et al., 2016) and Zimbabwe (Bodnar and Desai, 2019). The results in Haiti gave Partners in Health a firm basis for negotiating the price of health services with insurers and private funders, plus an ability to identify opportunities for task-shifting to increase patient access to care, eliminate medicine stockouts, fix broken laboratory equipment, and standardize clinical protocols and processes to reduce patient-level variance in resource allocation (McBain et al., 2016).

An important note about the TDABC approach in low-resource settings is that, often, process varies considerably for care visits. For example, clinical contact times may be shorter in practice than what is recommended. In these cases, the unit costs derived from a time-driven approach will be lower than what is recommended, but more representative of how services are being delivered in practice.

Activity Scope

The overall ABC/M scope is being rolled out as a two-phased approach with Phase 1 (2021–2022) concluding with the publication of this report, which provides a retrospective baseline of HIV costs for one year at four different cost levels. Phase 2 (anticipated to start in 2023) focuses on capacity building and data use with the ultimate goal of institutionalizing the ABC/M approach to capture cost data more routinely and reach global consensus on the methods framework.

Under Phase 1, costs related to HIV programming were collected at four levels:

1. At the facility level for direct provision of HIV services using the TDABC method; inputs for facility-level costs include personnel, facility space, equipment and furniture, consumables, and indirect costs

2. At the community level for HIV support programs for care and treatment and for testing, using a top-down costing approach[2]
3. At the client level, through a client exit survey administered to determine costs borne by the patient for each facility visit and the client's perspective on the quality of service delivery
4. At an above-site level, considering expenditures supporting health administration, policy, governance, and training, using a top-down costing approach[3]

In addition to determining unit costs of HIV interventions, the scope of the study under Phase 1 included a landscape assessment with two parts: (1) an ecosystem mapping to determine where patients seek HIV services to guide facility sampling and (2) a data systems assessment to identify gaps that need to be addressed to produce more routine HIV cost data.

Subsequent work under ABC/M Phase 2 will focus on strengthening local capacity to apply the ABC/M method, identifying the best use of the data gathered, and advocating for financial system upgrades to include higher-resolution information on HIV programs. The primary goal of Phase 2 will be to assure that the ABC/M application and processes for data collection are sustained and institutionalized.

The remainder of this report will highlight the findings from Phase 1.

HIV Interventions

The focus of ABC/M in Mozambique was on people living with HIV who receive care and treatment in district hospitals and health centers/primary healthcare facilities. This included three patient categorizations: new patients, stable patients, and unstable patients. In Mozambique, the criteria to be categorized as a stable patient are: (1) 10 years or over; (2) more than six months on ART; (3) with a viral load measurement below 1,000 copies/mL or CD4 ≥ 200 cells/mL (where viral load is not available); and (4) no active stage 3 or 4 clinical conditions (according to World Health Organization guidelines), no factors suggestive of poor adherence, and without adverse reactions to medications that require regular monitoring (MISAU, 2018).

Using the TDABC approach, HP+ was able to verify that the care pathway of a visit by an ART patient varied depending on the patient's ART classification. HP+ made assumptions on the expected number of facility visits per year for each ART patient classification (based on the observed number of months of ARVs prescribed during facility visits) in order to annualize the cost per ART patient per year. ABC/M was also applied to the core services of prevention of mother-to-child transmission (PMTCT), voluntary medical male circumcision (VMMC), oral pre-exposure prophylaxis (PrEP), and HIV testing and counseling (HTC) at the facility level—all of which are preventive services. Clients under 18 years of age were

[2] It was not possible to apply the TDABC approach at the community level, given time and resource constraints. However, there are plans to apply a TDABC "light" approach at the community level for subsequent applications of ABC/M. This would allow for better comparisons between costs at the facility and community levels.

[3] The PEPFAR resource alignment tool is the only source of data for above-site expenditure for HIV. Given the breadth of and nature of the above-site programs (e.g., program management and non-service delivery) it did not make sense to apply TDABC at this level.

excluded from the study for all HIV interventions and all ART classifications. All clients who participated in the study did so with their informed consent.

Activity Governance

Steering Committee

A wide group of experts are supporting the implementation of ABC/M across several countries in Africa. The initiative is led by the U.S. Global AIDS Coordinator with USAID serving as the technical lead. Other members of the ABC/M review board include the U.S. Centers for Disease Control and Prevention (CDC), UNAIDS, the U.S. Treasury Department, the Global Fund, and the Bill & Melinda Gates Foundation. In Mozambique, the U.S. Global AIDS Coordinator and USAID facilitated introductory meetings with in-country stakeholders to explain the activity objectives and to ensure country buy-in from the government, partners, and the PEPFAR Mozambique team. At the time of writing this report, an in-country steering committee was in the process of being formed with designated points of contact for each institution involved. It is anticipated that steering committee members will consist of representatives from: the PEPFAR Coordination Office, CDC, the U.S. Department of Defense, USAID, the National AIDS Council, the National Health Coordinating Council at the Ministry of Health, the Ministry of Economy and Finance, UNAIDS, and the National Bioethics Committee for Health. A virtual meeting to review the ABC/M approach was facilitated by HP+ in March 2021 with the Ministry of Health and with a subset of potential members of the not yet established steering committee in December 2021. The Ministry of Health Planning and Cooperation Directorate and the U.S. government developed a terms of reference for the steering committee that is not yet approved by the Minister of Health. Once the steering committee is officially formed, it will be given an opportunity to review the study findings. The steering committee will also be involved with the implementation of Phase 2.

Research Institution

HP+ partnered with a local research institution, Austral, to implement the ABC/M application, including developing the research protocol and data collection instruments, securing ethical clearance, collecting data, and participating in steering committee consultations. HP+ trained colleagues at Austral to manage the field work across selected facilities and to conduct quantitative and qualitative data collection using the ABC/M method. Additionally, HP+ supported the Austral team on data analysis and report development. As a result of the significant investments made to build its capacity, Austral is now equipped to lead subsequent ABC/M applications.

Objectives and Research Questions

Cost Estimates of HIV Interventions to Inform Decision Making

The main short-term objective of implementing the ABC/M application was to identify costs for the provision of HIV services at facilities throughout Mozambique and to assess costs incurred by clients during the care cycle. The analysis was supplemented with the collection of HIV expenditure data at the community level and above-site level. While there have been other HIV costing studies completed in Mozambique, figures can quickly become outdated or do not account for how HIV service delivery has evolved. A distinguishing feature of the ABC/M approach is that it provides a fully loaded unit cost that includes above-site and community-level costs, which previous costing studies in Mozambique do not.

The primary research question for the study was:

- What is the actual unit cost per recipient for providing select HIV services in Mozambique and what are the main drivers of the unit cost?

Secondary research questions, some of which will be further explored during ABC/M Phase 2, include:

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

Applications of Activity-Based Costing and Management

ABC/M will help stakeholders identify actual costs for HIV services, which in Mozambique are largely unknown or have been determined for only one point in time. ABC/M is therefore more useful in an environment in which costs are constantly changing. This information is essential to facilitate strategic evolution toward increasing domestic resources and absorption of interventions into the government's programs and budgets. Some of the objectives for ABC/M remain aspirational and the scope of Phase 2 includes identifying the best use of ABC/M data and findings for HIV-related financial planning and management. High-level applications of ABC/M data include:

- Facilitating more financially sustainable and effective HIV service delivery via routine use of data on service delivery cost and resource allocation
- Filling information gaps on service delivery to accelerate the reach of HIV prevention, testing, and treatment to people who have been left behind—this being necessary to curb the epidemic
- Supporting the goal of moving Mozambique toward higher levels of country ownership and sustainability of its HIV program
- Informing the development of broader national strategic plans
- Laying future groundwork for more effective and efficient value-based provider payment rate-setting, for example payments from health insurance schemes, such as the Assistência Médica e Medicamentosa

Methods

Landscape Assessment

Ecosystem Mapping

HP+ conducted a mapping exercise of the health facility ecosystem to show where clients were seeking HIV services and the patient volumes at those facilities for specific services. Secondary data were sourced from the government health facility registry, District Health Information Software 2 (DHIS2), and Service Availability and Readiness Assessment reports. This information was organized and disaggregated by HIV intervention type, level of the healthcare facility (tertiary hospital, secondary hospital, health center, and health post), sector (public versus private/nongovernmental organization), geography (province and

urban versus rural), and funder (PEPFAR-supported versus government of Mozambique only). HIV prevalence data by province was also sourced.

Data Systems Assessment

HP+ assessed which data systems in Mozambique were used to track clinical and financial information on 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 are collected, what data are collected, and how the data are 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 (e.g., PrEP), and HTC at the facility level. TDABC identifies and measures the following:

- **Activities**: Those that are performed over the care visit for a condition, who performs each activity, and how long they spend on each activity.
- **People, furniture, equipment, and facility space**: Cost per unit of time for each type of personnel, furniture, equipment, and facility space used during the care visit (capacity cost rate, see Table 1).
- **Materials**: Items consumed during the care visit (supplies/consumables, drugs, lab tests and reagents, test kits, etc.).
- **On-site indirect cost**: Additional costs incurred that are not directly consumed over the care visit. These are costs that do not directly contribute to individual patient care but are required for service provision to be possible, such as salaries for administrators, cleaners, and security personnel and utilities, such as water and electricity.

Time-Driven Activity-Based Costing

The TDABC method applied at the facility level, developed by Robert Kaplan and Michael Porter at Harvard Business School (Kaplan and Porter, 2011), is a seven-step approach:

1. **Select the medical condition and/or patient population:** As noted in the activity scope, the HIV interventions included in the study are ART, HTC, PMTCT, PrEP, and VMMC. ART costs were further subdivided into new, stable, and unstable patient categories.
2. **Define the care delivery value chain:** The care delivery value chain is a descriptive and prescriptive tool that charts all activities involved in a patient's care visit, spanning multiple providers and nonclinical settings. Key informant interviews were conducted with the clinicians at each facility to provide a simple map of the care delivery value chain for when and where HIV services are provided and what activities are performed at each stage and by whom. When required, multiple people were interviewed.
3. **Develop process maps of care delivery for each medical condition:** Process maps depict the path that a patient 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 based on key informant interview responses. Process maps created during the study are available upon request from policyinfo@thepalladiumgroup.com.

4. **Obtain time estimates for each process step:** Data collectors measured the time that providers spent delivering care, inclusive of time with a patient and non-patient time. The patient time was quantified by shadowing patients; the non-patient time was quantified based on provider self-reports of time spent, which were gathered in key informant interviews. How much time a piece of equipment or other resource was used for each process step was also quantified from key informant interviews. Estimates of time and steps required that were gathered from interviews was compared to data collected while following patients—this was done to assess inconsistencies between the normative process map and the actual steps taken during delivery of care.

5. **Estimate the cost of supplying patient care resources:** The research team estimated costs of all inputs used to provide the necessary patient care, including direct and indirect costs. Direct costs included provider compensation, depreciation or leasing of equipment and furniture, and supplies. These data were collected from general facility ledgers, budgeting systems, other information technology (IT) systems, clinical partners supporting the facilities, and price lists from the Central Medical Stores (Central de Medicamentos e Artigos Medico or CMAM) and the Global Fund Pooled Procurement Drug List. Indirect costs included support staff and other overhead expenses needed to provide services but not directly related to HIV services, such as utilities, infrastructure, etc. 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	• Total number of days an employee works per year • Total number of hours worked per day • Average number of hours used for non-patient work (e.g., breaks, training, education, and administrative meetings)
Equipment and Furniture	• Current cost of replacing an item • Useful life of equipment • Quantity of items in a room • Total available equipment minutes
Indirect	• Annual overhead expenditure (electricity, maintenance, etc.) over 12 months • Total outpatient and inpatient visits per year • Average duration of inpatient visit

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 were obtained and divided by how often, in minutes, the resource could be used annually (the practical capacity). This is the

hypothetical cost if resources were used at capacity. The resource capacity cost rate is estimated by dividing the resource's total cost by the resource capacity, which provides 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 outpatient visit. For a catalogue of all major assumptions used in the study, see Annex A.

7. **Calculate the total cost of patient care per intervention:** This final step consists of estimating the unit cost of each HIV intervention. This is done by multiplying the capacity cost rates for each resource used in each patient process by the duration of a client's consumption of that resource (step 4). Then, the costs are summed across all processes used during the patient's care visit to arrive at an estimated total cost of the patient visit (see Annex B for an example of how unit costs were calculated).

Community-Level Expenditure

The HIV response also includes programs offered in the community, including programs that target populations who have a higher risk of HIV exposure. This includes HIV support services such as adherence counseling, peer support, and tracking patients lost to follow-up. Given the nature of these programs and time and resource constraints, it was not possible to apply the TDABC approach at the community level. To estimate community-level costs, HP+ interviewed seven HIV service delivery implementors that operate community-level HIV programs in the same catchment areas as the facilities in the sample. Each implementor provided information about the total expenditure their community programs incurred over the most recent 12 months and the number of HIV clients reached, per intervention.

Recognizing that a significant portion of implementors' expenditures were for non-service delivery and program management, HP+ used data from the PEPFAR Expenditure Reporting initiative that disaggregates community-level expenditures for each implementing partner by non-service delivery, service delivery, and program management. It was necessary to isolate the proportion of spending on non-service delivery and program management to avoid double counting these expenses, which are also reported at the above-site level.

Non-service delivery activities include clinical mentoring, supportive supervision, and training. Expenditure related to program management is also included under non-service delivery costs. To remove these supportive services from the unit cost analysis of service delivery, HP+ assessed the ratio of service delivery costs to the total expenditure for care and treatment from each organization and applied it to the community-level expenditures. This made it possible to isolate the estimated unit cost for service delivery. HP+ assumed the service delivery/total expenditure ratio at the community level was similar to the ratio for the implementing partner nationally. HP+ also assumed that the national expenditure reporting data for each implementing partner would be comparable to the expenditure data collected for analysis from the seven implementers in selected provinces in the country.

After removing estimated costs for non-service delivery and program management from the total expenditure of the implementor, HP+ could then calculate the unit cost per HIV community intervention by dividing the implementing partner's service expenditure by the number of HIV clients reached at the community level over a 12-month period.

It is important to highlight limitations of this method for calculating community-level costs. First, it is not possible to make direct comparison of the community-level unit costs with the

facility-level unit costs because different methods were used. Second, PEPFAR expenditure reporting data only accounts for spending by PEPFAR and does not include spending by the government or the Global Fund for community-level HIV interventions. Third, PEPFAR financial classification of community-level spending can be blurry—sometimes service delivery spending is classified as non-service delivery and vice versa.

Client Survey

HP+ administered a short 25-minute client exit interview prior to patients leaving the health facility, capturing the following information:

- Demographic data
- Socioeconomic data
- Health insurance coverage
- Costs borne by clients
- Patient satisfaction with current visit
- Service delivery performance

Cost to clients for each facility visit included out-of-pocket health expenses at the facility, transportation costs to get to and from the facility, and opportunity costs of seeking services. Opportunity costs were based on time spent at the facility and travel, calculated based on responses to questions on personal income. To map respondents to socioeconomic quintiles, HP+ created a simplified asset register that aligned strongly with Mozambique's Demographic and Health Survey wealth index and assigned clients to a wealth quintile based on their responses to asset questions. 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). The direct client costs as a percentage of monthly household discretionary spending (non-food and non-tax) served to represent the economic burden to the client.

Above-Site Expenditure

To capture the above-site costs that occur within government administration levels, a top-down approach was applied using data from PEPFAR's Resource Alignment initiative, which includes expenditure reporting from PEPFAR, the Global Fund, and the government of Mozambique. It was assumed that expenditures are equal to costs. PEPFAR headquarters conducted the analysis of above-site expenditures. Expenditures include resources spent on activities related to policy, governance, health systems 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 above-site figures, spending reported in the PEPFAR resource alignment tool were disaggregated by funder, program area, and interaction type. This process was done twice: with commodities and also without commodities, for comparison. Above-site 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 HTC and ART, the allocated above-site expenditures were then divided by the number of people tested and the number of people receiving care and treatment from the period of October

2020 to September 2021 to estimate the spending per person tested and per person receiving treatment. Estimates for the number of people receiving prevention services annually were not available.

Sampling Approach

Facility sites were purposively selected to include facilities operating for at least two years and providing at least four of the core HIV services included in the study. A fully representative sample was not feasible, given time and resource constraints. HP+ selected 30 facilities representing a cross-section of characteristics with variations in geography (province), setting (urban or rural), facility type (hospital or health center), funder (PEPFAR or government of Mozambique), and sector (public or private/nongovernmental organization) using the data collected from the ecosystem mapping exercise.

Five provinces (Gaza, Maputo City, Nampula, Sofala, and Zambezia) with high HIV prevalence were randomly selected (see Annex C for the distribution of facility characteristics in the sample). Provinces with high disease burdens were prioritized because these areas would require a higher proportion of HIV resources and also to achieve an adequate sample size for each HIV intervention. Maputo City was automatically selected due to its unique characteristic as the capital city. Six facilities in different districts from each of the sampled provinces were selected randomly with different HIV treatment patient volume criteria based on three tiers: low (20–349 patients), medium (350–1,249 patients), and high (1,250+ patients). The facilities were then cross-checked with services offered (HTC, PMTCT, PrEP, and VMMC). Selected facilities with characteristics that were over-represented were replaced as needed to arrive at the targeted distribution criteria.

The patient sample comprised adult patients (18 years of age and over, including for VMMC and PrEP) accessing the services to be costed. The inclusion of pediatric patients in the study would have required a longer ethical review process, which was not possible with the given timeline. Service providers assisted to identify participants during patient registration as they entered the facility. Potential participants were informed of the study objectives, asked if they would participate, and presented with a consent form. If consent was given, each patient was assigned a unique ID for the study and the tracking of their facility visit began. To ensure confidentiality, names and other identifiable information were not collected.

Results

Landscape Assessment

Ecosystem Mapping

There are an estimated 1,817 health facilities in Mozambique, of which roughly 88 percent offer at least one type of HIV service, while 1,552 facilities (85 percent) offer ART services (MISAU, 2020b). Roughly 41 percent (638) of the facilities that offer HIV services receive intensified PEPFAR-support, while the remaining receive some support for human resources for health, commodities, and technical assistance channeled through local government institutions. The rural/urban split in Mozambique is approximately 85 percent rural and 15 percent urban. Table 2 shows a breakdown of facility types and ownership.

Table 2. Disaggregation of Facilities that Provide HIV Services by Facility Type and Ownership

Category	Type	Percent
Facility type	Health post	12.7%
	Health center	83.5%
	District hospital	1.2%
	Secondary or tertiary hospital	2.2%
	Other	0.4%
Ownership type	Private, for-profit, or other	1.2%
	Public	98.8%

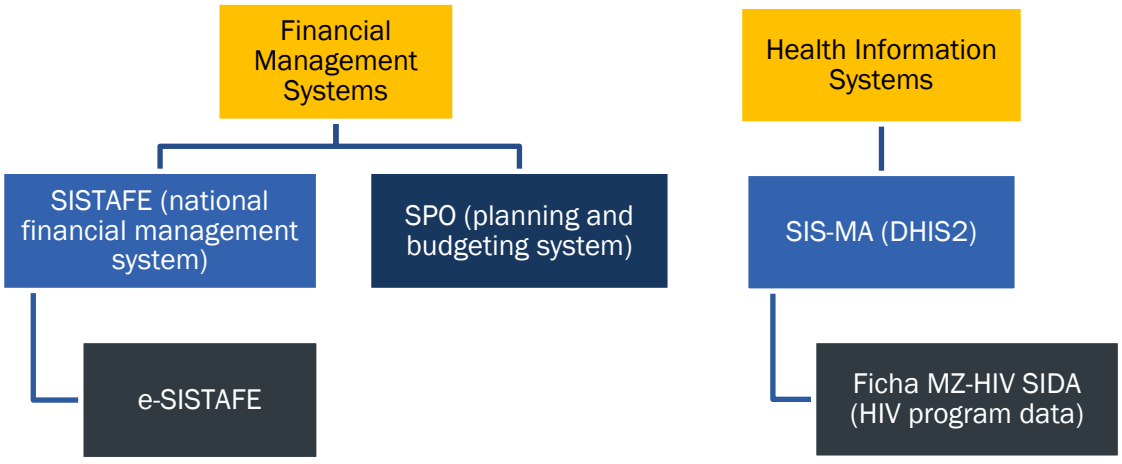
Source: MISAU, 2020a

In general, HIV services are not well-integrated in Mozambique, meaning they do not use existing fixed and operational capacity for HIV services and that services are not shifted to being provided at the lowest and most cost-effective level of the system. Most health facilities have separate sections for HIV whereas other programs, such as tuberculosis and malaria, are integrated with primary care units. The head of the Department of Health Information believes there is some progress integrating HIV services. For example, at primary healthcare units, a nurse that provides HIV services may also be providing other services, such as maternal health.

Data Systems Assessment

HP+ conducted key informant interviews with government personnel from the Ministry of Health's, or Ministério da Saúde (MISAU), Department of Statistics, Planning, and Monitoring and Evaluation; Department of Administration and Finances; Department of Health Information; and Directorate of Planning and Cooperation. Figure 2 maps some of the main healthcare data systems in Mozambique, which are elaborated on in this section.

Figure 2. Data Systems in Mozambique



Clinical Data

The Sistema de Informação de Saúde para Monitoria e Avaliação (SIS-MA) is the health information system used for monitoring and evaluation and is Mozambique's version of DHIS2 for clinical data. SIS-MA aims to support the collection, analysis, interpretation, and dissemination of clinical health data that MISAU uses to plan public health services. Data collected are inputs for reports to the president, MISAU national directors, international

organizations, donors, and other stakeholders. Data is analyzed to check for quality (accuracy, consistency, completeness, and timeliness), indicator trends to determine if services are improving or worsening, and progress toward targets in relevant health service areas, including HIV. Ficha MZ-HIV SIDA is the folder/record where the HIV program data is reported within SIS-MA.

SIS-MA is available at the central, provincial, and district levels and all active, public facilities are registered into the system. To access the system, one must be a health professional, work for a health institution, or work at MISAU. A central server is located at MISAU and is available at any time to personnel with the proper credentials. According to some users, SIS-MA is easy to navigate, with about 18 percent of users saying they were able to access and use the system without any training.

SIS-MA is an integrated system in which all health programs are reported, including vertical programs such as HIV, malaria, and tuberculosis. There are no parallel reporting systems in place within the government (and there is no financial data shown in this system). Donors such as PEPFAR and the Global Fund track similar information in their systems, which Mozambique's HIV program can access upon request.

Clinical data, such as health history and lab results, are first collected manually on paper and then the data is sent to focal points (typically located at the district level but sometimes at the provincial level) and logged into the digital system. Data are collected daily or weekly for individual analysis and monthly or quarterly for official monitoring and evaluation purposes. At the end of the reporting period (monthly or quarterly), providers analyze the number of patients seen, client characteristics, utilization of health service areas, lab results, etc. Challenges are usually associated with digital system errors and there is a helpdesk for anyone who encounters issues. The biggest limitations to this system are gaps in the quality of data because it originates from paper records.

Financial Management Data

MISAU uses a national financial management system called Sistema de Administração Financeira do Estado (SISTAFE) for control of all financial operations. The Ministry of Economy and Finance uses SISTAFE for data quality checks and analysis of investments, expenses, and performance of the health sector. SISTAFE is the only financial system used at the central, provincial, and district levels. Only some health facilities have access to SISTAFE. If a health facility does not have access, it can access the system at a larger, higher-level facility. MISAU uses e-SISTAFE (the SISTAFE information technology system), which is an online integrated financial management information system that supports the implementation of the SISTAFE.

MISAU's Directorate of Administration and Finance uses the data for monitoring and evaluation and to create budget implementation reports, such as the Relatório de Execução Orçamental (REO), that track health service funds allocated to finance activities approved in MISAU's economic and social plan. The REO reports the general expenditures, which can be disaggregated by district, including line-items such as salaries, remunerations, other staff costs, goods and services, and provincial capital costs. The REO also tracks the budget balance of the health sector at the national, provincial, and district levels, accounting for internal and external resources, operating expenses, investments, and donations. Expenditures are not separated by health service area and so it is not possible to see disaggregated data on vertical programs, such as HIV, malaria, and tuberculosis. The only

HIV-specific information found in the REO is the amount that individual donors allocate to the HIV program.

All e-SISTAFE financial data collected electronically are stored online and accessible at any time to any health department via an internal application. Supplemental physical documents are stored at MISAU's Directorate of Administration and Finance's accounting department. MISAU does not allow the use of any parallel financial system. Users say that the system is user-friendly, and a refresher training is available every year.

Although the system can show different funding source contributions, MISAU can only analyze data if a budget line is entered into the system. Many contributions, including those for HIV, do not have separate line-items, making it difficult to analyze how much is spent on the HIV program.

Systems Functionality

MISAU is actively working on a way to obtain and record disaggregated financial information to fill gaps in data access. Each program has data on expenditure and funding. However, some funds are not contained in the national budget, meaning MISAU has no way to track this information. Donors may have access to more disaggregated data on HIV, but they do not always share it with MISAU. In 2022, MISAU's Directorate of Administration and Finance was planning to launch a planning and budgeting system called the Sistema de Planificação e Orçamento (SPO) in which one could separate expenses by programs (e.g., HIV, nutrition, tuberculosis).

Data Uses

The Ministry of Economy and Finance determines budget amounts. The planning process begins with a strategic plan of programs that each sector carries out at the central, provincial, and district levels. Technicians in each sector obtain detailed cost information to determine budget amounts for each activity, based on the sector's strategic plan. When planning for the following year, MISAU's Directorate of Planning and Cooperation looks at the health sector's budget ceiling assigned the previous year and its strategic plan of activities for the following year. Based on the limits and strategic plan, each sector adjusts its expenses accordingly. All information is then consolidated at the central level.

Mozambique does not require donors to contribute a certain amount, each donor determines how much it will contribute. However, Mozambique has guiding documents, such as the strategic plan, which contains information on each sector's budget deficit that must be filled to cover its needs. Any donor interested in supporting the health sector can approach the central level via MISAU or through the provincial or district office and say how much they can contribute to the budget.

Recommendations for upgrades to data systems will be a sub-activity under ABC/M Phase 2, including an assessment of the SPO, once it is up and running.

Facility-Level Results

Data were collected for 1,641 patients followed through care visits using the TDABC approach (see Annex Table D1 for the patient sample size by HIV intervention and facility type). The number of demand-generation activities for VMMC at the community level was reduced because of the COVID-19 pandemic, which explains the lower-than-expected patient volume for this service. Meanwhile, rollout of PrEP in Mozambique was still in the early

implementation stages at the time of the study and was further limited by COVID-19, explaining the small sample size for PrEP clients.

Observations from Patient-Following/Time Motion

The average time spent at the facility per patient, per care visit, and the average time that patients were in direct contact with service providers per visit is shown in Table 3. For example, the average new ART patient spent 60 minutes at the facility per visit, while the average time these patients were in direct contact with a service provider was 27 minutes per visit. Meanwhile, continuing ART-stable patients spent an average of 23 minutes in direct contact with service providers while continuing ART-unstable patients spent an average of 32 minutes in direct contact with service providers. ART-stable patients report incurring the highest percentage of time (60 percent) spent waiting, compared to ART-unstable patients (54 percent) and ART-new patients (52 percent).

Table 3. Average Time in Minutes per Care Visit by HIV Intervention and Facility Types

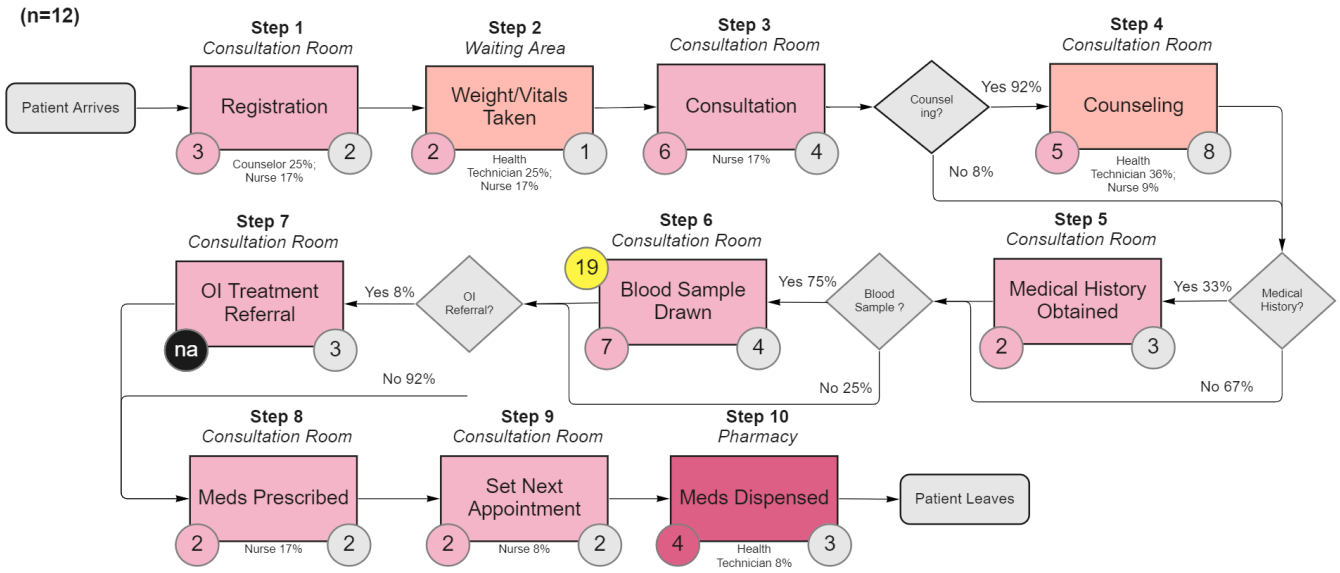
HIV Intervention/ Facility Type	Average Clinical Time with Provider	*Standard Deviation*	Average Time Spent at Facility	*Standard Deviation*	Average % of Time Waiting at Facility
ART-New	27	*16*	60	*25*	52%
Health center	29	*18*	64	*28*	53%
Hospital	26	*13*	55	*21*	50%
ART-Stable	23	*14*	63	*33*	60%
Health center	24	*15*	67	*36*	61%
Hospital	22	*13*	57	*28*	58%
ART-Unstable	32	*20*	70	*31*	54%
Health center	33	*18*	75	*33*	55%
Hospital	31	*23*	63	*26*	52%
HTC	27	*16*	58	*27*	52%
Health center	27	*18*	61	*30*	54%
Hospital	26	*15*	54	*23*	50%
PMTCT	26	*15*	60	*25*	55%
Health center	27	*16*	63	*26*	56%
Hospital	25	*13*	55	*22*	54%
VMMC	48	*26*	80	*36*	41%
Health center	38	*21*	77	*34*	53%
Hospital	49	*26*	80	*37*	40%
PrEP	30	*20*	67	*31*	53%
Health center	32	*21*	65	*29*	50%
Hospital	28	*18*	68	*33*	57%
Overall Average	**28**	***24***	**63**	***53***	**54%**

Source: HP+ calculations

Examining the process maps for each of the HIV interventions reveals the sequence of care provision, how much time the provider is spending on each step in the care visit, which cadre

is providing care, and the location of the service. These figures show variation in care, even within a facility, from patient to patient. For example, at Chiraco Health Center, certain steps in the care process did not always occur for unstable ART patients. For example, step 6, getting a blood sample drawn, was performed for 75 percent of the patients followed (see Figure 3 and Annex D, Figure D1 for process map conventions). There was also significant variation in the sequence of steps. For example, half of the clients followed had their vitals taken prior to registration. Key informant interviews with providers reveal that there are sometimes differences in the way services are delivered in practice compared with the protocols described. For example, protocols at Polivalente Dream Health Center estimate that consultations for a new ART client will take 20 minutes but on average they were completed in 8 minutes.

Figure 3. Example of a Process Map of HIV Treatment for Unstable ART Patients at Chiraco Health Center



Source: HP+ calculations

Legend: Counselor | Health Tech | Pharmacist

% Observed occurrence of step

● Actual time spent

● (colored circle corresponding with cadre color) Time spent estimates from key informant interviews

● Time spent handling lab specimens

OI = opportunistic infection

See Annex D, Figure D1 for full process map conventions and legend

Additional notes: Infrequent departures from the care pathway include:

- 6 clients had vitals taken before registration
- 2 patients had consultations after medical history obtained
- 2 clients had blood drawn before counseling
- 2 patients had counseling before the consultation
- 1 patient had meds prescribed before blood drawn
- 3 clients set next appointment after meds dispensed

As expected, the average observed time clinicians spent with stable ART clients (23 minutes) was less than time spent with unstable ART clients (32 minutes), though there was not much difference in the steps of the care process per visit except that unstable ART clients were more likely to receive lab tests than were stable ART clients. However, the frequency of lab tests for unstable ART clients was not as much as expected. National guidelines state that unstable clients are supposed to receive lab tests at each facility visit—but in practice these tests often are not given for many unstable patients. At some facilities, some steps were skipped entirely for the clients observed. For example, at Bagamoio Health Center, viral load or CD4 tests for unstable ART patients were not administered to any clients that the team

followed. Generally, it was seen that providers at district hospitals spent about the same amount of time with clients as did providers at lower-level facilities, although the average percentage of time waiting for services at health centers was 4 percentage points higher than at hospitals. There was variation among provinces in clinical contact time and waiting time. For example, the average clinical contact time in Maputo was 34 minutes, compared to 20 minutes in Gaza province; the percentage of waiting time in facilities in Maputo province was 36 percent, compared to 62 percent in Gaza.

Table 4 provides the percentage of time that certain services were provided per HIV intervention across facilities. Note that not all services are expected to occur for every facility visit. For example, stable ART patients are not expected to receive lab tests at every visit and HTC clients are not expected to be dispensed medications. However, the expectation for "new" and "unstable" ART patients, according to protocols, is to receive counseling and laboratory tests 100 percent of the time and all ART patients should receive their medications 100 percent of the time. The reasons for departures from standardized or expected protocols are largely unknown, but this will be part of the focus of ABC/M Phase 2.

Table 4. Percentage Occurrence of Service per HIV Intervention

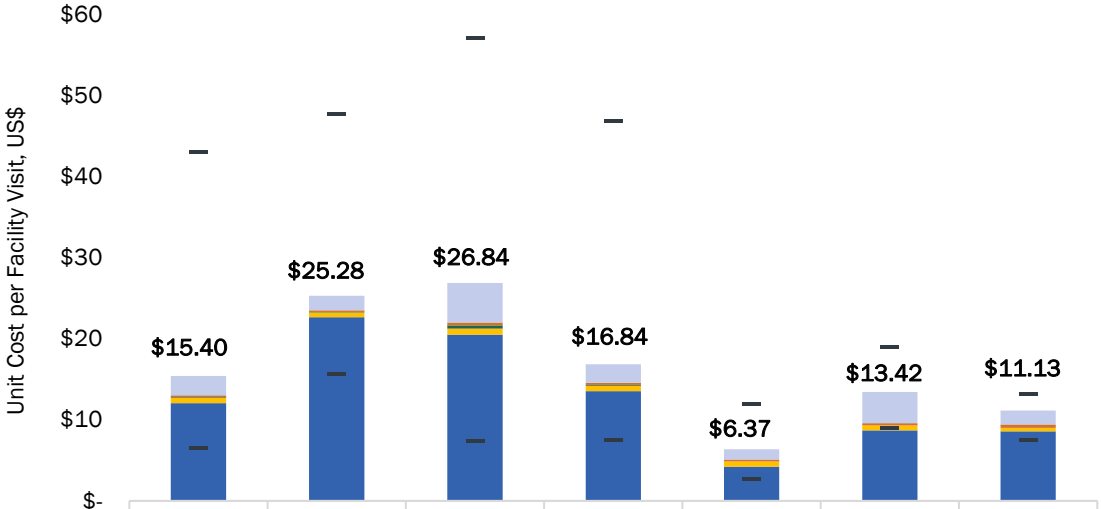
Service	ART-New	ART-Stable	ART-Unstable	PMTCT	HTC	VMMC	PrEP
Number of patients tracked	257	349	236	316	300	74	109
Lab tests performed	24%	14%	47%	22%	99%	54%	49%
Medication dispensed	98%	99%	98%	97%	0%	30%	97%
Counseling	61%	48%	82%	75%	99%	93%	61%

Source: HP+ calculations

Unit Costs of Patient Care Visit per HIV Intervention and Cost Drivers

Figure 4 shows the average facility-level unit cost in Mozambique, disaggregated by HIV intervention and further disaggregated by cost category. The range of unit costs per intervention are marked by the maximum and minimum cost found across the 30 facilities sampled. Note that the similar unit cost per visit for stable and unstable ART patients does not suggest that these patients cost the same to treat, but rather the unit cost per visit must be considered along with the frequency of visits throughout the year for each patient categorization. Annualized unit costs are shown in Figure 5. The annualized unit cost assumes an average of four facility visits per year for a stable patient—this is based on three months of ARV prescriptions dispensed, as was observed during the data collection process. Unstable ART patients are expected to make a facility visit once per month and therefore are typically provided a one-month supply of ARVs. While there is a higher cost for multiple months of ARVs dispensed for stable patients there is a higher cost for more comprehensive and expensive labs administered for unstable patients. Unit costs weighted by patient volume are shown in Annex D, Figure D2. There are no significant differences between the unweighted and weighted unit costs.

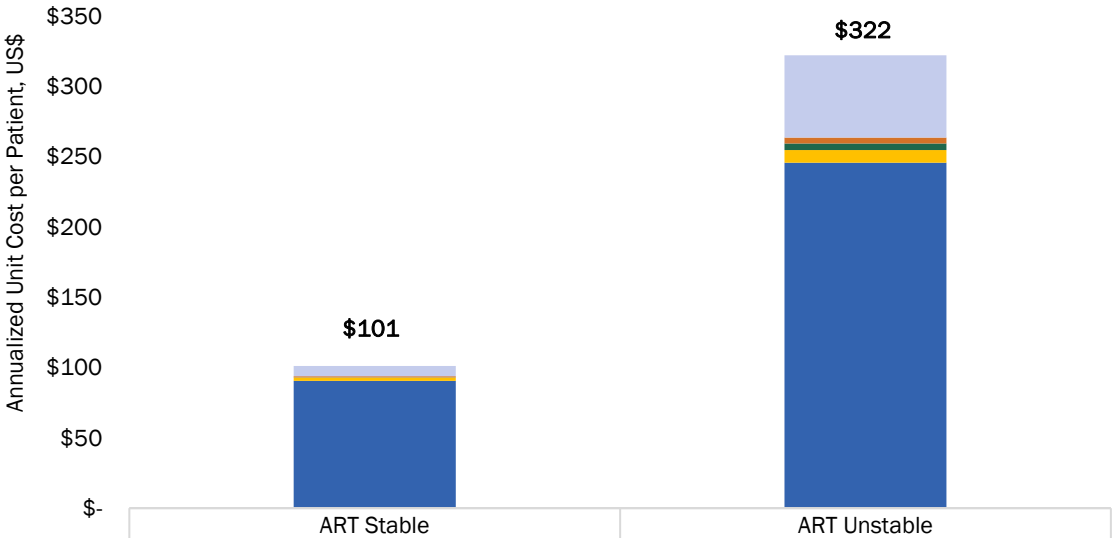
Figure 4. Average Unit Cost per Facility Visit



	ART New	ART Stable	ART Unstable	PMTCT	HIV Testing	VMMC	PrEP
Personnel	$2.40	$1.80	$4.87	$2.29	$1.27	$3.86	$1.71
Facility	$0.21	$0.20	$0.35	$0.26	$0.25	$0.26	$0.41
Equipment	$0.08	$0.05	$0.40	$0.10	$0.00	$0.00	$0.01
Indirect	$0.66	$0.59	$0.75	$0.67	$0.64	$0.63	$0.43
Consumables	$12.05	$22.64	$20.48	$13.52	$4.22	$8.68	$8.56
Min	$6.44	$15.57	$7.41	$7.50	$2.64	$8.92	$7.46
Max	$42.95	$47.68	$57.03	$46.73	$11.90	$18.90	$13.14

Source: HP+ calculations

Figure 5. Average Annualized Unit Cost per Patient



	ART Stable	ART Unstable
Personnel	$7.21	$58.47
Facility	$0.81	$4.20
Equipment	$0.21	$4.75
Indirect	$2.34	$8.96
Consumables	$90.55	$245.73

Source: HP+ calculations

Consumables represent 80 percent of the overall cost for service delivery at the facility level across HIV interventions, with ARVs and lab tests being the largest cost driver. Commodities (other than ARVs) are centrally procured from the Central Medical Stores, so prices are homogenous. ARVs are purchased through the Global Fund's pooled procurement process. Unlike in high-income countries, personnel costs are low as a proportion of total costs, representing 14 percent of facility-level costs. The capacity cost rate for even the highest health cadre (i.e., medical doctors) is only US$0.20 per minute, on average, while the lowest capacity cost rate by cadre is for peer educators at US$0.01 per minute. The most common providers for HIV services are health technicians and nurses. These cadres have average capacity cost rates of US$0.07 and US$0.06 per minute. Provider's total annual compensation was slightly higher on average for staff at hospitals compared to health centers, though there was very little difference in the average capacity cost rates. See Annex D, Table D2 for key inputs to the personnel capacity cost rate.

There is some variation in self-reported staff compensation and practical capacity (the annual cost of a resource divided by how often, in minutes, the resource can be used annually) within each cadre, with case managers displaying the widest range. As expected, the provider's total annual compensation is larger in higher-level facilities, such as hospitals, but the average capacity cost rate is the same between hospitals and health centers because higher wages at hospitals are offset by higher practical capacities (i.e., how often, in minutes, the resource [personnel, furniture, equipment, facility space] can be used annually). Costs for specimen handling by lab technicians were a significant driver of personnel costs—in part because the time required for handling lab specimens sometimes exceeds the time patients spend with clinicians during their care visit.

The capacity cost rate for facility space and rooms used in the care visit (including common furniture and equipment in the rooms) was largely below US$0.01 per minute in Mozambique. Rooms such as laboratories, pharmacies, and operating rooms that housed more expensive equipment had higher capacity cost rates, but overall, these facility expenses represented only 1 percent of the unit costs for facility-level HIV interventions.

Capacity cost rate calculations for equipment used directly for service delivery were necessary only for lab machines. Facility and equipment capacity cost rates were calculated using estimates for their practical maximum capacities, not their actual time in use, so they do not factor in underutilization of facility and equipment resources. Similarly, equipment costs were very small proportions of the total costs (1 percent), so although underutilization was not captured in the calculation, this has little impact on the overall unit costs.

Facility indirect capacity cost rates were calculated based on annual operating expenses and the number of outpatient and inpatient visits per year, assuming that the duration of an average outpatient visit was the same as a typical ART visit. See Annex D, Table D3 for indirect cost calculations. Health centers reported higher capacity cost rates than hospitals for indirect costs, despite having significantly lower operating expenses in some cases. This is because high operating expenditures at larger facilities were offset by higher patient utilization in the indirect capacity cost rate calculation.

Time Spent by HIV Service Providers on Non-HIV Service Delivery

During interviews with HIV service providers, HP+ asked if staff were hired to be dedicated providers of HIV services. Among those who affirmed that they were dedicated providers, HP+ asked if they, nevertheless, contributed to non-HIV care. If yes, they were then asked to estimate their time spent on non-HIV service delivery. Seventy-eight service providers, or 24

percent of the providers interviewed, indicated that they were HIV-specific providers who regularly provided non-HIV service delivery. On average, these providers spent 2.7 hours per day (32 percent of their time at the facility) on non-HIV service delivery (see Table 5). Based on this, HP+ concludes that there is some cross-subsidization of non-HIV services. However, the extent of PEPFAR cross-subsidization could not be calculated because HP+ was not able to determine if providers were specifically supported by PEPFAR only, partially supported by PEPFAR, or were supported by the government. This question will be asked in subsequent applications of ABC/M.

Table 5. Time Spent by HIV-Specific Providers on Non-HIV Service Delivery

Cadre	n	Averages per Day			
		Work Hours	Clinical Hours	Clinical Hours on HIV Services	Clinical Hours on Non-HIV Services
Counselor	10	8.0	6.2	5.2	1.0
Data clerk	5	8.0	6.6	5.6	1.0
Health technician	7	8.0	6.3	3.3	3.0
Lab technician	1	8.0	7.0	5.0	2.0
Mother mentor	7	8.0	6.3	5.3	1.0
Nurse	2	8.0	7.0	6.0	1.0
Pharmacist	1	8.0	6.5	6.0	0.5
Psychologist	2	8.0	7.0	6.0	1.0

Source: HP+ calculations

Community-Level Results

Based on interviews with implementing partners operating at the community level in the same catchment areas of the ABC/M facilities sample, HP+ determined that the unit cost for care and treatment support services at the community level, per client reached, was US$9.08 (see Table 6). This includes activities such as adherence counseling, peer support, and tracking patients lost to follow-up. The unit cost, excluding non-service delivery and program management expenditures, is US$5.36.

Table 6. Unit Cost of Community-Level Care and Treatment Support Services

Calculation	Result
Programs costed (n)	7
Unit cost, community-based care and treatment (US$)	$9.08
Non-service delivery and program management/total expenditures (%)	41%
Unit cost (excluding non-service delivery) (US$)	$5.36

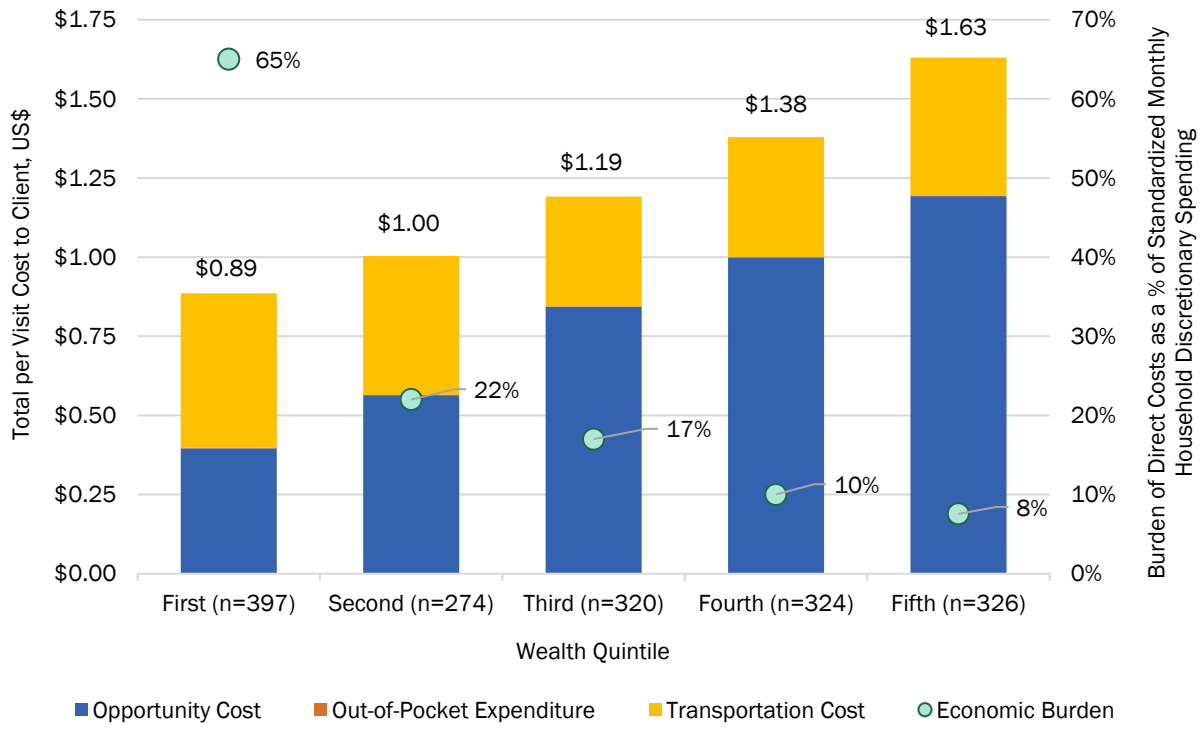
Source: HP+ calculations

Client Survey Analysis

Using data collected from a client exit survey, HP+ quantified the cost borne by the patient per care visit (see Figure 6). Demographics of the patients surveyed can be found in Annex D, Table D4. Out-of-pocket expenditures to receive HIV services in Mozambique are almost

negligible. Only 29 out of 1,641 clients surveyed reporting having to pay out-of-pocket for their HIV services, with an average expenditure of US$0.11. However, clients do incur substantial transportation and opportunity costs for facility visits. This is particularly the case for patients who must come to the facility every month, such as unstable ART patients. In the lowest (first) income quintile, the economic burden of these costs is significant, quantified as 65 percent of monthly household discretionary spending. This suggests that transportation ($0.42 on average) and opportunity costs ($0.79 on average) may represent a major barrier for facility visits.

Figure 6. Total per Visit Cost to the Client and Burden of Direct Costs by Wealth Quintile



Source: HP+ calculations

The client survey also revealed that 93 percent of respondents were either very satisfied (73 percent) or somewhat satisfied (20 percent) with the services they received. There did not appear to be a relationship between client satisfaction and the cost of services borne by the client.

Above-Site Expenditures

The ABC/M application aims to understand the full cost of an intervention, across all elements of the HIV program: facility-level, community-level, laboratory, commodity, non-service delivery, program management, and above-site costs. Figure 7 shows data for a patient on ART. The cost figures represent an amount that has to be spent to secure the resources necessary for generating a service.

The PEPFAR Resource Alignment initiative provides above-site, non-service delivery, and program management data on the annual expenditure for PEPFAR, the Global Fund, and the government of Mozambique. Program activities at the above-site level include health administration, policy, governance, systems strengthening, and training. Given that the

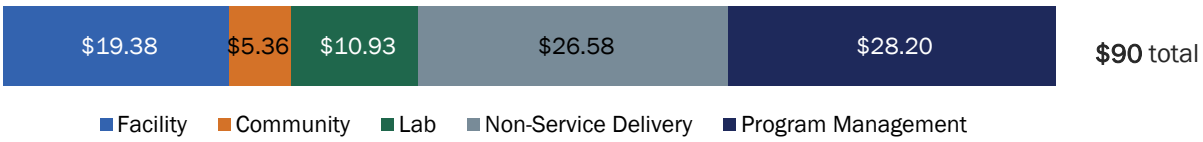
PEPFAR resource alignment tool does not report on cost, HP+ assumed that the spending reported will equal the cost for those functions. The facility-level, laboratory, and commodity costs were derived from TDABC. Community-level costs were derived using the community-level methods described earlier.

Figure 7. Annual Cost per Patient on ART, All Costs

Source: PEPFAR, unpublished (2022); HP+ calculations

In order to increase focus on what is happening with service delivery and program oversight, one can exclude above-site and commodity costs and compare costs across the remaining line-items (see Figure 8).

Figure 8. Annual Cost per Patient on ART, Excluding Above-Site and Commodity Costs



Source: PEPFAR, unpublished (2022); HP+ calculations

Figure 9 shows that the full cost of HTC is US$10.39 per person. This total includes facility-based and community-based components that are weighted based on information showing that, in Mozambique, 86 percent of clients receive testing at facility-based sites and 14 percent of clients receive testing at community-based sites. This ratio was derived from PEPFAR expenditure reporting data. When above-site costs and commodities are excluded, the cost is US$5.17 per person tested (see Figure 10). 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 E.

Figure 9. Cost per HTC Client

Source: PEPFAR, unpublished (2022); HP+ calculations

Figure 10. Cost per HTC Client, Excluding Above-Site and Commodities

Source: PEPFAR, unpublished (2022); HP+ calculations

It is important to understand all levels of costs, not only facility-level costs. Focusing only on facility-level costs misses important areas for potential cost savings, efficiency gains, and opportunities to discuss sustainability. For example, in some cases, above-site, non-service delivery, and program management costs comprised a significant proportion of all costs. More investigation is warranted to gain key insights into the allocation and spending for site level/non-service delivery activities in the context of the Mozambique program.

Discussion and Recommendations

Summary of Major Takeaways from Data Collected

Variations in Service Delivery Processes

Given the significant variations observed within and across facilities in the way services are delivered, it will be important to get clinical leadership's interpretation of the data to understand the root causes of the outputs observed. Possible explanations for why steps were skipped or why time allocations were lower than expected include: facilities did not have the resources to provide the optimal level of services, healthcare workers did not have time because they were overburdened with too many clients (or else were absent), lab machines were broken or lacked electricity to operate, or providers delivering care were unaware of standard protocols or clinical guidelines. It is also possible that, in some cases, variation could be a result of a clinical determination that specific patients did not actually need certain aspects of care, such as lab work. Under ABC/M Phase 2, process maps will be presented to HIV program leaders who will be interviewed to get their opinions on the root causes for why observed pathways departed from prescribed pathways.

Variations in care highlight that there may be opportunities for quality improvements, reduced bottlenecks, and reduced waiting times through standardizing care and determining the ideal flow of patients at a health facility.

Potential for Cost Savings

The analysis showed that above-site expenditures are a significant portion of the overall costs for providing HIV services. Above-site costs are mostly funded by donors—namely PEPFAR and the Global Fund—to build systems, collect data, and improve quality of care through training and supportive supervision. Ideally, some of these costs will be reduced or unnecessary in the future as health systems are strengthened and some programs are taken over by the government of Mozambique. Still, understanding the key drivers of the above-site costs may offer planners the potential to better prioritize investments to realize cost savings in the future HIV funding landscape.

Opportunities for Efficiency Gains

While not captured in the expenditure assessments, there is anecdotal evidence that donor funding results in additional positive health benefits. Even when a healthcare worker is ostensibly hired only for HIV work, they provide practical support for non-HIV service delivery, consequently producing additional benefits to the health system. There appears to be some level of cross-subsidization that may inform opportunities for efficiency gains if the health system were more integrated.

Meanwhile, more insight into the extent of absenteeism and idle clinical capacity would enable administrators to determine whether new human resource practices should be

established to minimize these occurrences. Focusing on these issues can help determine if wages provide adequate incentive for healthcare workers to show up every day and could lead to more optimal staffing models and cost savings.

At the facility level, ARVs and commodities for labs are the main drivers of cost. Continued focus on the supply chain to reduce procurement bottlenecks and strengthen the government's ability to negotiate lower prices will be an important aspect of efficiency gains, now and in the future. ABC/M results also show that facility-level costs are a relatively small proportion of the overall expenditure on ART. Therefore, it may be possible to improve facility-level service delivery without a huge additional investment. For example, stabilization of patients and measures to improve their adherence to ART will reduce the need and cost incurred for viral load and CD4 testing, more expensive second-line ARV regimens, and diagnosis and treatment of opportunistic infections, such as multiple-drug-resistant tuberculosis.

Finally, outputs from the client survey showed that transport and opportunity costs borne by the patient to visit the facility are a significant burden, especially for people with the lowest incomes. ABC/M data can be used to advocate for implementation of differentiated care policies to reduce the economic burden to the poorest clients by moving HIV services closer to the clients. For example, longer multi-month prescriptions and decentralizing ARV pick-up points should represent an opportunity to reduce the number of times clients must visit facilities where they often spend a long time waiting. A small proportion of clients in Mozambique are already receiving six-month prescriptions and MISAU is piloting pharmacy and community ARV delivery—these are steps in that direction.

Obstacles to Study Implementation

Applying TDABC at the facility level in low- and middle-income countries is a labor- and time-intensive process. The resources required for data collection to measure facility and room sizes and to collect data on the replacement cost, useful life, and annual maintenance costs for furniture and equipment should be weighed against the benefit of remaining consistent with the TDABC method in future exercises. However, the ABC/M effort represents a capital investment that has laid groundwork that, if replicated, has potential to be a more streamlined process at future dates. For example, data collection tools, training materials, and analytic spreadsheets are all readily available for use. Process maps do not need to be reproduced from scratch, but only updated to match the current situation. Collecting TDABC information and updating process maps, although resource- and time-intensive, would not be required every year as they may not change drastically year to year. Part of moving toward routine capture of this information would be to define when and how often updates should be made—for example, after an overhaul of protocols and processes.

Applying TDABC or a TDABC "light" at the community level in future ABC/M exercises could allow direct comparisons between community- and facility-level results and similar resources could be used. Comparing facility- and community-level costs for the same intervention can inform the most cost-effective points of service for prevention and treatment.

In addition, tracking both clients and providers could provide significant insights regarding what is happening when providers are not seeing patients for HIV services. Are these providers absent or treating other patients? Are they engaged in nonproductive activities or are they spending this time on administrative functions? Tracking providers in addition to

patients would require additional resources but PEPFAR's human resources for health division may be available to do this.

Next Steps

Facility-level, community-level, and above-site-level findings will be disseminated to the steering committees in Mozambique and PEPFAR interagency teams. If there is interest, results may also be disseminated to provincial health directorates. That dissemination will end ABC/M Phase 1. HP+ will seek further input from program experts to improve understanding of the context for all findings—which will be an ongoing process and will carry over into ABC/M Phase 2.

Strategy for Operationalizing the ABC/M Framework

Phase 2 of ABC/M will focus on institutionalizing the capture and use of regularly collected HIV cost and expenditure data to produce information required for effective and routine decision making. To achieve these objectives, a PEPFAR implementing partner (to be determined) will:

1. Identify the best use of ABC/M data for HIV-related financial planning and management.
2. Sensitize and build the capacity of government stakeholders in Mozambique on the use of this data.
3. Advocate for financial system upgrades to include more granular data on vertical programs, including for HIV.
4. Produce an ABC/M toolkit and conduct additional training to build the capacity of local researchers, including Austral, and policy stakeholders on the ABC/M method and its implementation. This will include a roadmap for rollout of ABC/M Phase 2 over the next several years.
5. Convene a meeting with clinical and HIV program leadership to discuss and interpret process map outputs from ABC/M Phase 1.

The partner will work with a range of stakeholders to roll out Phase 2. Among the major government stakeholders are the MISAU, specifically the National STI-HIV/AIDS Programme, and the National AIDS Council. The partner will engage PEPFAR Mozambique and USAID implementing partners to discuss their interest in helping to implement Phase 2 and provide support for the analysis. Austral will be a key stakeholder in capacity building as the organization that was the local research lead for Phase 1.

The partner will also facilitate dialogue about the government's interest in updating its data systems (SISTAFE and SPO) to accommodate potential data from ABC/M. e-SISTAFE is managed by the Ministry of Finance and Economy and is used by all government sectors. Therefore, any advocacy will need to explain the benefits of the change, consider the political economy, and align with national priorities. A brief will be developed to support sensitization and advocacy on the use of ABC/M data.

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Annex A: Assumptions

Major assumptions used in the study:

- Facility indirect capacity cost rates were calculated assuming that the duration of an average outpatient visit was the same as an average HIV visit.
- HP+ applied the service delivery/non-service delivery ratio for care and treatment (as is found in PEPFAR expenditure reporting) for each PEPFAR implementing partner to the partner's self-reported community-level expenditures.
- HP+ assumed that the national expenditure reporting data for each implementing partner would be comparable to the expenditure data collected for its analysis, even though the expenditure data collected for ABC/M was focused only on selected regions in the country.
- Above-site 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, HP+ assumed that spending was equal to cost for above-site programs, non-service delivery, and program management.
- A stable ART patient is assumed to average four facility visits per year—this is based on three months of antiretroviral prescriptions provided, which was observed from patient-following.

Annex B: Example Unit Cost Calculation

Table B1. Example of How Unit Cost Stacks Are Calculated: ART Stable Patient, Hospital Geral Machava

Step	Sub-process for ART-Stable Patient	Personnel Type	Time (Min.)	Personnel Capacity Cost Rate	Personnel Cost	Location	Room Cost	Equipment Cost*	Lab Handling Cost	Indirect Cost	Consumables Cost
1	Registration	Receptionist	2	$0.02	$0.04	Reception	$0.001	$0.00	–	$0.02	$0.57
2	Weight/vitals taken	Doctor	2	$0.13	$0.26	Consultation room	$0.002	$0.00	–	$0.02	–
3	Counseling	Nurse	7	$0.03	$0.22	Consultation room	$0.008	$0.00	–	$0.07	–
4	Consultation	Doctor	16	$0.13	$2.09	Consultation room	$0.017	$0.00	–	$0.15	$0.46
5	Medicine prescribed	Doctor	2	$0.13	$0.26	Consultation room	$0.002	$0.00	–	$0.02	–
6	Set next appointment	Doctor	2	$0.13	$0.26	Consultation room	$0.002	$0.00	–	$0.02	–
7	Medicine dispensed	Doctor	3	$0.13	$0.36	Consultation room	$0.003	$0.00	–	$0.03	$12.38
	TOTAL		34	–	$3.49		$0.04	$0.00	$0.00	$0.33	$13.41

* No equipment was used for direct service delivery in this process. Other equipment and furniture are included in the room capacity cost rate.
Source: HP+ calculations

Annex C: Facility Characteristics

Table C1. Distribution of Facility Characteristics in the Sample (Total=30)

Characteristic	Location/Type	#
Province	Gaza	6
	Maputo	6
	Nampula	6
	Sofala	6
	Zambezia	6
Facility type	Health center	19
	Hospital	11
Urban/rural	Rural	17
	Urban	13
Public or private/faith-based organization	Public	27
	Private/faith-based organization	3
Funder	PEPFAR	23
	Government of Mozambique	7
Treatment volume	High	13
	Medium	11
	Low	6

Source: HP+ calculations

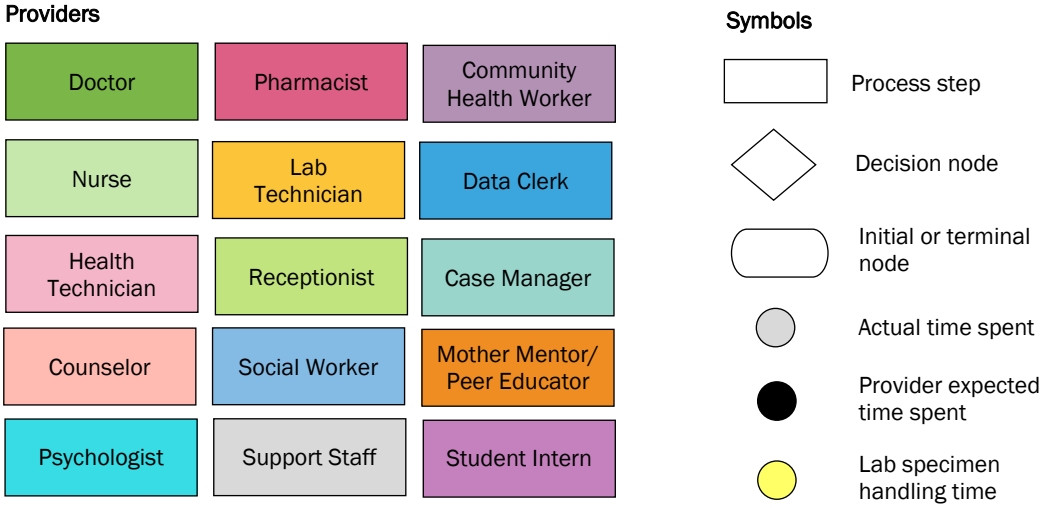
Annex D: Facility-Level Results, Additional Tables and Figures

Table D1. Sample Size of Patients Followed by HIV Intervention and Facility Type

Province/ Facility Type	ART-New	ART-Stable	ART-Unstable	HTC	PMTCT	VMMC	PrEP	Total
Gaza	30	73	27	46	61	24	1	262
Health center	5	37	9	16	24	0	0	91
Hospital	25	36	18	30	37	24	1	171
Maputo	61	73	24	66	61	7	3	295
Health center	25	36	12	29	36	0	0	138
Hospital	36	37	12	37	25	7	3	157
Nampula	68	59	72	57	71	10	58	395
Health center	42	35	48	37	48	0	33	243
Hospital	26	24	24	20	23	10	25	152
Sofala	47	72	66	69	52	5	4	315
Health center	23	48	42	45	29	0	4	191
Hospital	24	24	24	24	23	5	0	124
Zambezia	51	72	47	62	71	28	43	374
Health center	38	48	36	42	48	7	18	237
Hospital	13	24	11	20	23	21	25	124
TOTAL	257	349	236	300	316	74	109	1,641

Source: HP+ calculations

Figure D1. Process Map Conventions

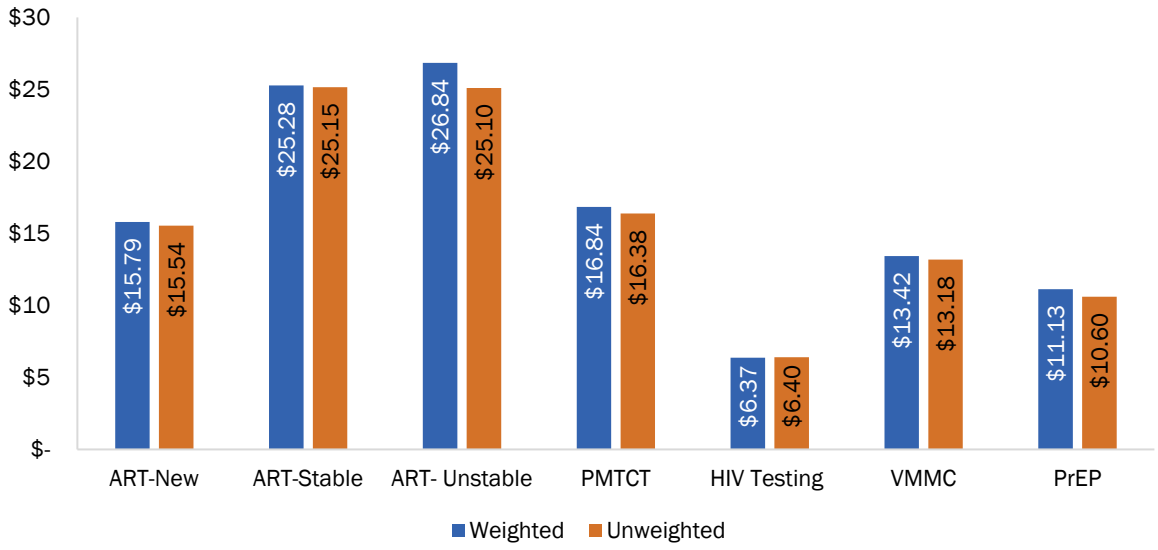


Other Notes

- Steps skipped from those reported in key informant interviews denotated by white squares
- Variations in staff providing services is reported below the step

Recreated from Harvard Business School, 2018

Figure D2. Per Visit Unit Cost of HIV Interventions: Weighted Versus Unweighted by Patient Volume



Source: HP+ calculations

Table D2. Key Inputs to Calculate the Personnel Capacity Cost Rate

Cadre	Annual Compensation (MZN)	*Standard Deviation*	Practical Capacity per Year (Minutes)	*Standard Deviation*	Capacity Cost Rate US$ per Minute	*Standard Deviation*
Doctor	1,113,215	*384,085*	90,631	*15,929*	$0.20	*$0.07*
Psychologist	619,772	*472,301*	92,408	*15,857*	$0.11	*$0.09*
Health technician	338,082	*447,684*	92,397	*15,661*	$0.07	*$0.11*
Nurse	298,789	*420,025*	95,554	*28,098*	$0.06	*$0.10*
Lab technician	330,657	*257,832*	95,065	*16,400*	$0.06	*$0.04*
Social worker	277,437	*187,868*	78,195	*11,307*	$0.05	*$0.03*
Data clerk	334,000	*276,289*	100,986	*12,264*	$0.05	*$0.05*
Pharmacist	270,977	*231,852*	92,677	*16,841*	$0.05	*$0.05*
Phlebotomist	227,431	*0*	97,440	*0*	$0.04	*$0.00*
Counselor	130,145	*45,631*	96,448	*13,730*	$0.02	*$0.01*
Receptionist	121,339	*52,530*	96,718	*17,382*	$0.02	*$0.01*
Case manager	147,109	*61,768*	114,672	*21,599*	$0.02	*$0.01*
Community health worker	71,712	*23,522*	62,309	*16,777*	$0.02	*$0.00*
Support staff	93,368	*34,126*	97,920	*7,723*	$0.02	*$0.01*
Mother mentor	69,180	*15,202*	87,995	*12,283*	$0.01	*$0.00*
Peer educator	49,955	*0*	109,200	*0*	$0.01	*$0.00*

Source: HP+ calculations

Table D3. Capacity Cost Rate Calculations for Facility Indirect Costs

Facility Name	Province	Annual Operating Expenditure (MZN)	Annual Outpatient Visits	Annual Inpatient Visits	Average Inpatient Days	Indirect Cost US$ per Minute
Angoche HR	Nampula	1,525,300	116,217	7,714	7.0	$0.0003
Centro de Saude Alua	Nampula	2,670,928	100,968	1,793	7.5	$0.002
Centro de Saude Chimbua	Zambezia	514,440	10,203	–	–	$0.01
Centro de Saude da Ilha de Mocambique	Nampula	5,670,434	11,112	225	5.0	$0.04
Centro de Saude da Maganja da Costa	Zambezia	7,633,806	43,107	974	3.0	$0.02
Centro de Saude de Bagamoio	Maputo	3,356,433	66,858	–	–	$0.01
Centro de Saude de Chiraco	Zambezia	385,794	10,580	–	–	$0.01

Facility Name	Province	Annual Operating Expenditure (MZN)	Annual Outpatient Visits	Annual Inpatient Visits	Average Inpatient Days	Indirect Cost US$ per Minute
Centro de Saude de Chirassicua	Sofala	255,455	19,390	–	–	$0.003
Centro de Saude de Chocas Mar	Nampula	1,986,597	11,873	–	–	$0.04
Centro de Saude de Funguane	Gaza	116,870	2,053	–	–	$0.01
Centro de Saude de Incassane	Maputo	552,777	5,116	–	–	$0.03
Centro de Saude de Mabomo	Gaza	143,099	15,886	–	–	$0.002
Centro de Saude de Monapo Rio	Nampula	994,192	11,440	–	–	$0.02
Centro de Saude de Munhava	Sofala	6,177,929	71,261	–	–	$0.02
Centro de Saude de Ndolene	Gaza	237,698	1,169	–	–	$0.05
Centro de Saude Derre	Zambezia	8,012,208	27,925	227	3.0	$0.05
Centro de Saude Mepuzi	Gaza	150,466	3,639	–	–	$0.01
Centro de Saude Nensa	Sofala	1,186,442	18,562	–	–	$0.02
Centro de Saude Padre Usera	Zambezia	652,600	55,073	–	–	$0.003
Centro de Saude Romao	Maputo	1,436,398	12,600	–	–	$0.03
Centro Polivalente Dream	Sofala	15,962,600	22,455	–	–	$0.18
Hospital Geral de Chamanculo	Maputo	41,372,518	71,641	221	12.6	$0.08
Hospital Geral Machava	Maputo	12,655,285	31,490	1,168	11.4	$0.01
Hospital Geral Marrere	Nampula	1,133,588	115,439	13,143	6.0	$0.0001
Hospital Rural Alto Molocue	Zambezia	10,906,340	68,179	6,926	2.0	$0.01
Hospital Rural de Chibuto	Gaza	5,778,959	219,121	1,021	5.0	$0.004
Hospital Rural de Chokwe	Gaza	5,993,319	47,169	1,846	5.0	$0.01
Hospital Rural de Marromeu	Sofala	9,739,660	124,668	1,107	5.0	$0.01
Hospital Geral Jose Macamo	Maputo	20,752,953	108,042	–	–	$0.05
Posto de Saude Tica	Sofala	4,087,425	48,071	–	–	$0.02

Source: HP+ calculations

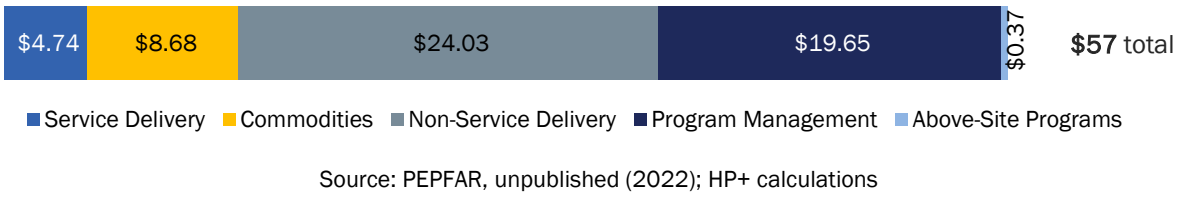
Table D4. Demographics of Clients Surveyed

Characteristic	Type	#	%
Age	Average	33	–
	Median	30	–
	High	82	–
	Low	18	–
Household size	Average	5.0	–
	Median	5	–
Gender	Male	641	39%
	Female	1,000	61%
ART patients	New	257	34%
	Stable	349	41%
	Unstable	236	28%
Marital status	Married/in-union	471	28.7%
	Living together	580	35.3%
	Never married/single	427	26.0%
	Widowed, separated, divorced	160	9.8%
	Don't know/refused to answer	3	0.2%
Education	College/tertiary, completed	17	1.0%
	College/tertiary, didn't complete	21	1.3%
	Secondary, completed	246	15.0%
	Secondary, didn't complete	389	23.7%
	Primary, completed	490	29.9%
	No grade completed	472	28.8%
	Don't know/refused to answer	6	0.4%

Source: HP+ calculations

Annex E: Above-Site Level Results, Additional Figures

Figure E1. Cost per Person for Voluntary Medical Male Circumcision

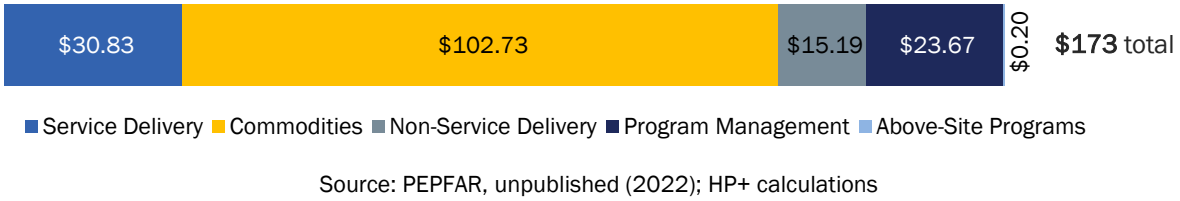


Source: PEPFAR, unpublished (2022); HP+ calculations

Figure E2. Cost per Person for Voluntary Medical Male Circumcision, Excluding Above-Site and Commodities

Source: PEPFAR, unpublished (2022); HP+ calculations

Figure E3. Cost per Person on Pre-exposure Prophylaxis



Source: PEPFAR, unpublished (2022); HP+ calculations

Figure E4. Cost per Person on Pre-exposure Prophylaxis, Excluding Above-Site and Commodities

Source: PEPFAR, unpublished (2022); HP+ calculations

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