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Antiretroviral Therapy in Botswana: Comparing Costs, Service Utilization, and Quality at Three Levels of Care



New Challenges in Financing Botswana’s HIV Response

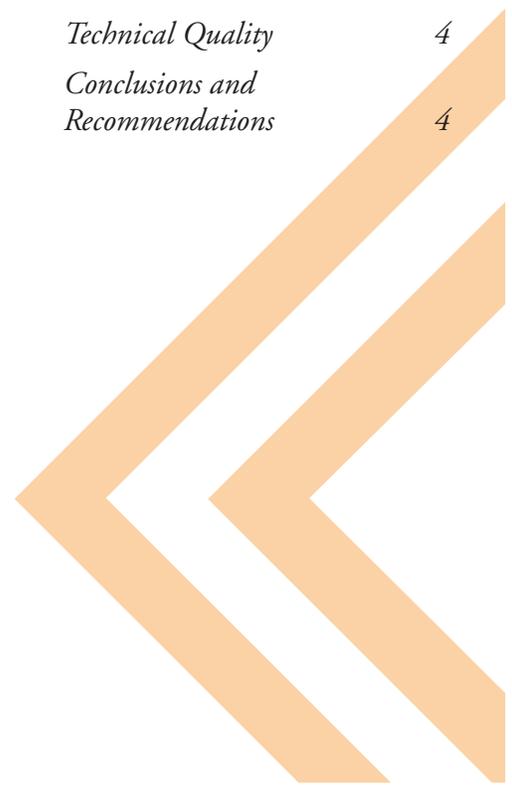
Under Botswana’s ambitious Treat All Strategy, nearly 350,000 people living with HIV will require antiretroviral therapy (ART) by 2020. With almost half of Botswana’s health expenditure already allocated to HIV, the Ministry of Health (MOH) will need to mobilize additional resources and achieve efficient use of available resources to sustain successful ART coverage. To support the MOH, the USAID-funded Health Finance and Governance project (HFG) estimated costs and service utilization of adult outpatient ART care at Botswana’s public health facilities. With patient numbers already rising under “Treat All,” understanding the current cost variations is essential to identify opportunities to improve efficiency and for the future sustainability of Botswana’s ART programming.

Estimating the Costs of Adult Outpatient ART Care

HFG collected data from 120 facilities providing adult ART outpatient services in Botswana, including all 29 hospitals in the country and a representative sample of 73 clinics and 18 health posts. Clinical records from each facility were examined for a probability sample of 2,241 patients on 1st line ART and 152 patients on 2nd line ART. HFG estimated that, in 2014, the national average ART unit cost was US\$283 (BWP 2,540) per patient per year.

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How Do Costs Vary by Level of Care, and Why?

Figure 1. Total Unit Costs of ART by Level of Care

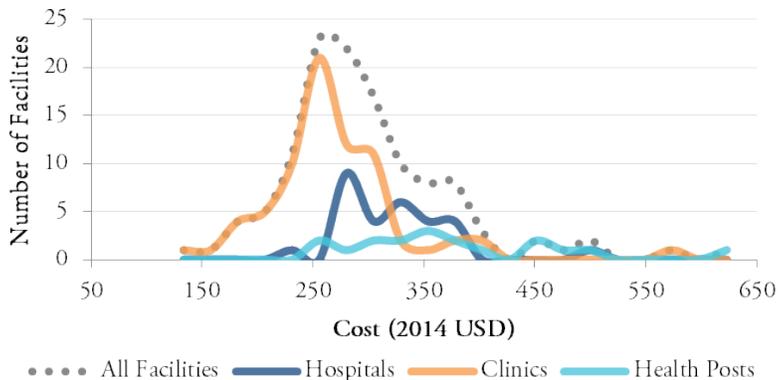


Figure 1 shows frequency distribution within specific ranges of costs (x-axis) for all facilities and curves that represent only hospitals, clinics, or health posts; 70 percent of facilities have total unit costs below \$305 per patient (BWP 2,734) while 95 percent are below \$405 (BWP 3,613). We found seven facilities with unit costs greater than \$405: one hospital, one clinic, and five health posts.

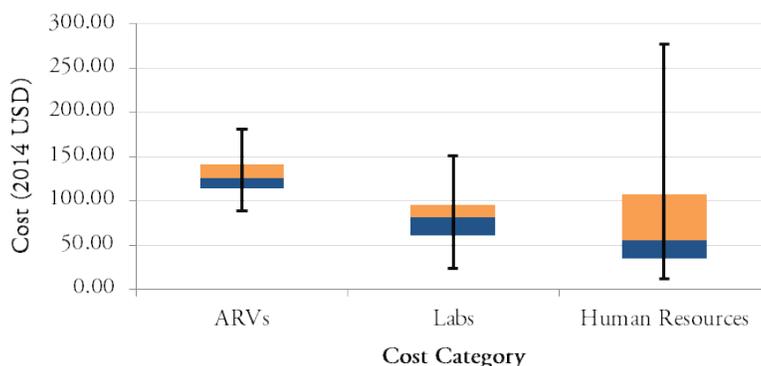
Table 1 presents the absolute and relative contributions of each service category to total unit costs stratified by facility level. Antiretroviral drugs (ARVs) are the largest component cost in hospitals and clinics, while human resources are the largest in health posts. Due primarily to the variation in human resource cost, average total unit costs are much higher in health posts than in clinics and hospitals. Average human resource costs in health posts are \$76 (BWP 680) higher than in hospitals and \$111 (BWP 996) higher than in clinics. In contrast, average ARV and laboratory unit costs are relatively consistent, each with a range of \$15 (BWP 132), across the three levels of care. Of the three levels of care analyzed, only clinics have an average total unit cost less than the all-facilities average of \$283.

Table 1. Average Unit Costs of ART Cost Categories by Level of Care

Categories	Hospital (29)		Clinics (73)		Health Post (18)		All Facilities	
	Unit Cost	% Total	Unit Cost	% Total	Unit Cost	% Total	Unit Cost	% Total
ARVs	\$137	45%	\$122	48%	\$128	35%	\$127	44%
Labs	\$84	27%	\$78	31%	\$69	20%	\$78	28%
Human Resources	\$88	28%	\$53	21%	\$164	45%	\$78	28%
Total	\$309	100%	\$254	100%	\$361	100%	\$283	100%

Note: All costs in 2014 USD.

Figure 2. Distribution of Cost Categories*



*Note: For data presentation clarity, Human Resources exclude two facilities considered outliers (z-score > 3 SDs from the mean). Kgwatlheng Clinic has a human resource unit cost of \$336 and Kumakwane Health Post has a human resource unit cost of \$439

Figure 2 shows the distribution of unit costs for the ARV, lab, and human resource cost categories. ARV unit costs were least variable, clustering tightly around a median of \$125 (BWP 1,128). Lab costs had intermediate variability among the three categories and generally fell between \$60 and \$96 (BWP 541–859). Human resource costs were highly variable, with a wide distribution of costs well above the \$55 median (BWP 496).

The unit cost of ARVs includes drugs used in 1st and 2nd lines of treatment. Across all facilities, the average unit cost of 1st line ARVs was \$119 (BWP 1,068) per patient, and this cost did not vary much by level of care. Unit costs of 2nd line ARVs, on the other hand, are twice as high, at \$238 (BWP 2,135) per patient, and more variable both between and within levels of care, peaking at \$264 (BWP 2,374) per patient in hospitals. Based on the 2,393 sampled patient records, hospitals had a higher proportion of patients on 2nd line ART (11 percent) than clinics (6 percent) or health posts (5 percent), which would influence the higher overall ARV unit cost observed at hospitals.

Hospitals had higher unit costs for lab tests, spending \$12 and \$66 (BWP 104 and 594) per patient on CD4 and viral load tests annually. Blood tests and renal function tests, important for detecting HIV-related comorbidities, were slightly more common in clinics and health posts than in hospitals.

Among human resource unit costs, nurses and midwives are the most common clinical cadres working in HIV clinics at all facility levels. Human resources are most expensive at health posts (\$101 per patient per year, BWP 909), where their workload is distributed across fewer patients on average than at hospitals and clinics. Non-clinical human resource costs, incurred in the management and maintenance of facilities, are also highest in health posts for the same reason, though to a lesser extreme (\$46, BWP 410). Clinical human resource costs are similar in hospitals and clinics, but low non-clinical costs observed in clinics lead to a substantial difference in their total human resource costs, as seen in Table 1. The most impactful determinant of human resource costs is related to the output or number of patients treated at each level of care. Staff at health posts attends an average of 102 patients, while providers in hospitals and clinics attend an average of 2,438 and 1,329 patients, respectively.

Service Utilization

Total costs are driven by the frequency and unit costs of each service delivery component. Adult patients had an average of three ambulatory visits per year and 4.4 lab tests across all levels of care. The latter represents a surprising but positive figure given that many health posts and clinics do not have their own labs and rely on an inter-facility network for test samples and results. Viral load and CD4 tests were most common, each with average annual utilization of 1.7 tests per patient in hospitals and slightly lower utilizations in clinics and health posts. Lab test costs are less variable across levels of care. Careful adherence to routine laboratory monitoring guidelines will help facilities maximize lab efficiency moving forward.

ARV drugs represent the main cost driver of ART care. There is little variation in overall or 1st line ARV unit costs between the three levels of care, but the same is not true for the doubly expensive 2nd line drugs. ARVs account for nearly half of the total unit cost at clinics, yet the average costs of 1st and 2nd line regimens are lower at clinics than at hospitals or health posts. Closer analysis of ART regimens, particularly for 2nd line regimens, is needed to discern what regimens are optimally efficient. As more patients initiate ART under “Treat All,” more will inevitably require costly 2nd line ARVs, making their efficient use critical to ART programming sustainability. Table 2 displays the most commonly used ARV combinations among sampled patients.

Table 2. Frequency of ARV Drug Combinations

First Line ARVs	# of Patients	% of Patients
Tenofovir/Emtricitabine/Efavirenz - TDF/FTC/EFV	831	37%
Efavirenz – EFV + Zidovudine/Lamivudine - AZT/3TC	533	24%
Nevirapine – NVP + Zidovudine/Lamivudine - AZT/3TC	530	23%
Nevirapine – NVP + Tenofovir/Emtricitabine - TDF/FTC	246	11%
Other 1st line ARVs	101	5%
Total	2241	100%
Second Line ARVs	# of Patients	% of Patients
Lopinavir/Ritonavir - LPV/r + Tenofovir/Emtricitabine - TDF/FTC	119	78%
Lopinavir/Ritonavir - LPV/r + Zidovudine/Lamivudine - AZT/3TC	14	9%
Other 2nd line ARVs	19	13%
Total	152	100%



About HFG

A flagship project of USAID's Office of Health Systems, the Health Finance and Governance (HFG) Project supports its partners in low- and middle-income countries to strengthen the health finance and governance functions of their health systems, expanding access to life-saving health services. The HFG project is a five-year (2012-2017) global health project. To learn more, please visit www.hfgproject.org.

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Technical Quality

Overall these findings suggest that ART clinics in Botswana comply with national and international guidelines. Patients are benefiting from less treatment variance; a significant proportion of patients (95 percent) receive fixed dose combinations, mainly emtricitabine+tenofovir+efavirenz (37 percent) and lamivudine+zidovudine (47 percent). The shift towards one daily pill not only simplifies treatment, but also reduces dosing errors, the number of hospitalizations and even the likelihood of developing HIV resistance. Overall single dose regimens improve adherence and treatment effectiveness. There is low variation in ARV regimens and near to 95 percent of 1st line patients and 87 percent of 2nd line patients comply with national and WHO ARV guidelines. Patients at all levels of care have almost a quarterly clinical check and receive on average at least one viral load and CD4 test per year, with hospital and clinic patients receiving closer to two of each. Botswana's achievement of high care standards favorably compare to ART services in the United States and Europe.

Conclusions and Recommendations

Understanding the costs of ART provision is an essential first step to improving access, quality, and efficiency of care. Current ART costs highlight variability that represents opportunities for improvement across hospitals, clinics, and health posts in Botswana. Our analysis reveals the main cost drivers and potential interventions at each level of care. Nearly half of the total unit cost at health posts is attributable to human resources, suggesting the current distribution of clinicians to patients is skewed. Hospitals and clinics achieve lower human resource unit costs than health posts by providing services to many more patients, suggesting economies of scale. Future reduction in ARV purchasing costs, providing guidelines for laboratory monitoring tests and rebalancing of human resources represent all potential interventions to condense variance, reduce average costs, and ultimately improve efficiencies in the delivery of ART services in Botswana.

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