



USAID
FROM THE AMERICAN PEOPLE



COST OF HIV AND TUBERCULOSIS SERVICES AT HEALTH FACILITIES IN CAMBODIA

November 2017

This publication was produced for review by the United States Agency for International Development. It was prepared by Benjamin Johns and Koulund Thin for the Health Finance and Governance Project.

The Health Finance and Governance Project

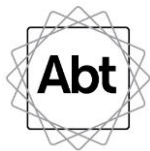
USAID's Health Finance and Governance (HFG) project will help to improve health in developing countries by expanding people's access to health care. Led by Abt Associates, the project team will work with partner countries to increase their domestic resources for health, manage those precious resources more effectively, and make wise purchasing decisions. As a result, this five-year, \$209 million global project will increase the use of both primary and priority health services, including HIV/AIDS, tuberculosis, malaria, and reproductive health services. Designed to fundamentally strengthen health systems, HFG will support countries as they navigate the economic transitions needed to achieve universal health care.

November 2017

Cooperative Agreement No: AID-OAA-A-12-00080

Submitted to: Scott Stewart, AOR
Office of Health Systems
Bureau for Global Health

Recommended Citation: Johns, Benjamin, Kouland Thin. November 2017. *Cost of HIV and Tuberculosis Services at Health Facilities in Cambodia*. Bethesda, MD: Health Finance & Governance Project, Abt Associates Inc.



Abt Associates Inc. | 4550 Montgomery Avenue, Suite 800 North | Bethesda, Maryland 20814
T: 301.347.5000 | F: 301.652.3916 | www.abtassociates.com

Avenir Health | Broad Branch Associates | Development Alternatives Inc. (DAI) |
| Johns Hopkins Bloomberg School of Public Health (JHSPH) | Results for Development Institute (R4D)
| RTI International | Training Resources Group, Inc. (TRG)



COST OF HIV AND TUBERCULOSIS SERVICES AT HEALTH FACILITIES IN CAMBODIA

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development (USAID) or the United States Government.

CONTENTS

Acronyms.....	iii
Acknowledgments	iv
Executive Summary	v
Introduction.....	v
Methodology.....	v
Results	vi
Discussion	vii
1. Introduction	1
1.1 Objectives.....	1
2. Methodology.....	3
2.1 Study population and sample.....	3
2.2 Services included.....	3
2.3 Costs included	4
2.4 Data collection	6
2.5 Data analysis.....	10
3. Results	13
3.1 Final sample	13
3.2 Total cost of services.....	14
4. Discussion	33
4.1 Main findings.....	33
4.2 Limitations	35
4.3 Future uses of these data	37
Annex A: Allocation metrics for indirect costs	39
Annex B: Allocation metrics for step-down costs.....	41
Annex C: List of facilities visited.....	43
Annex D: Detailed breakdown of total costs.....	45
Annex E: Total costs by facility.....	53
Annex F: Sources of financing.....	65
Annex G: Human resources productivity	75



List of Tables

Table ESI: Summary of average service utilization and average unit costs for services...	vii
Table 1: Sources of data	7
Table 2: Final sample of facilities included in the analyses.....	13
Table 3: Number of facilities in sample offering selected services	14
Table 4: Total costs for VCCT services, average by type of facility	14
Table 5: Average utilization of VCCT services	17
Table 6: Results of variance analysis for VCCT services.....	18
Table 7: Total costs for ART services, average by type of facility.....	19
Table 8: Average utilization of ART services.....	22
Table 9: Unit costs of ART services.....	23
Table 10: Results of variance analysis for ART services	24
Table 11: Total costs for inpatient care for OIs, average by type of facility.....	24
Table 12: Average utilization and unit costs of inpatient care for OIs, average by type of facility.....	25
Table 13: Total costs for TB outpatient services, average by type of facility	26
Table 14: Average utilization of TB outpatient services	29
Table 15: Unit costs of TB outpatient services.....	30
Table 16: Results of variance analysis for TB outpatient services	31
Table 17: Total costs for inpatient care for TB, average by type of facility	32
Table 18: Average utilization and unit costs of inpatient care for TB, average by type of facility.....	32

List of Figures

Figure 1: Illustrative example of step-down costing	11
Figure 2: Breakdown on costs for VCCT.....	15
Figure 3: Sources of Financing for VCCT	16
Figure 4: Breakdown on costs for ART	20
Figure 5: Sources of Financing for ART.....	21
Figure 6: Breakdown on costs for TB outpatient care	27
Figure 7: Sources of Financing for TB	28

ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral therapy
ARVs	Antiretroviral drugs
CENAT	National Center for Tuberculosis and Leprosy Control
FTE	Full-time equivalent
RGC	Royal Government of Cambodia
HEF	Health Equity Funds
HIS	Health information system
HIV	Human Immunodeficiency Virus
NAA	National AIDS Authority
NCHADS	National Center for HIV/AIDS, Dermatology and Sexually Transmitted Diseases
NGO	Non-governmental organization
NSSF	National Social Security Fund
OD	Operational District
OIs	Opportunistic infections
OP	Outpatient
PICT	Provider initiated counseling and testing
PMTCT	Prevention of mother to child transmission of HIV
SDG	Service delivery grant
SS+	Sputum smear positive
TB	Tuberculosis
USAID	United States Agency for International Development
VCCT	Voluntary and confidential counseling and testing



ACKNOWLEDGMENTS

The authors would like to acknowledge Virak Prum, the research coordinator in Cambodia, for organizing and overseeing the data collection necessary for these analyses. Dr. Ly Penhsun and Dr. Mun Phalkun (NCHADS) helped to organize the data collection as well. We would also like to thank the data collectors for their diligent work in compiling the data from health facilities. Dr. Marta Levitt and Dr. Suntakna Mengchum (USAID) provided guidance and comments on the study design, while Christina Lau and Jean-Jacques Frere (USAID) provided comments and insights on the results. Dr. Sophie Faye (Abt Associates) served as quality check for this study and her useful suggestions and guidance are also acknowledged. We would like to acknowledge all the staff at the health facilities included in this study for taking the time to answer questions and organize the data necessary for this study. Finally, we would like to extend our sincere thanks and appreciation to Dr. Tia Phalla (NAA) and key stakeholders for HIV/AIDS and TB programs in Cambodia for their useful comments.

EXECUTIVE SUMMARY

Introduction

In Cambodia, donor funding for HIV/AIDS and TB is declining, the government is struggling to generate new resources dedicated to the prevention and treatment of these diseases, and out-of-pocket spending still accounts for a significant share of health and disease expenditures, although HIV and TB services (within certain definitions) should be provided free of charge to patients. Understanding the cost of delivering HIV and TB health services can help inform transitioning from donor funds to domestic resources, inform payment rates for future mechanisms to pay for these services, and serve as a baseline to track and monitor changes in costs over time.

The purposes of this study are to:

1. Understand the unit costs of delivering HIV/AIDS and TB services,
2. Identify the major components of costs,
3. Identify the sources of funding for HIV/TB services, and
4. Inform HEF and NSSF reimbursement rates. Because there are different perspective and potential needs for the use of the data, we provide detailed cost breakdowns in the annexes of the report.

Methodology

A detailed costing of services was done in selected facilities in four provinces, covering:

1. Voluntary and confidential counseling and testing (VCCT), testing and counseling of pregnant women, and provider initiated counseling and testing (PICT).
2. Antiretroviral treatment (ART, including first-line, second-line, and pediatric ART).
3. Inpatient care for the treatment of opportunistic infections (OIs).
4. Outpatient care for TB, including TB investigation and diagnosis, as well as TB treatment, including costs for sputum smear positive (SS+) adult patients, other adult TB patients, and pediatric treatment.
5. Inpatient care for people diagnosed with TB.

Note that the costs for community-based activities, such as community DOTs, are not included in this cost analysis except when health facility staff support these activities.

Data collectors visited 21 health facilities: 2 provincial hospitals, 6 referral hospitals, 12 health centers, and 1 non-governmental (NGO) clinic in four provinces in Cambodia. Price and inputs for HIV and TB services were collected.

In addition, facility level indirect and overhead costs were collected and allocated to TB and HIV services. For all services included in the analysis, costs were calculated in total and per unit (e.g., per visit or per patient per year). Additionally, the sources of financing were tracked and calculated, and a



variance analysis was done to identify cost-drivers (i.e., factors that most explain differences in unit costs across the facilities included in the sample). Data were collected for the year 2016 and results are presented in 2016 US dollars. Cost was done from the provider perspective. Patient payments, including costs for accessing services (such as payments for transportation) and food expenditure were not included.

Results

The number of visits per year for VCCT was about 1,000 at health centers and referral hospitals, and the cost per visit for VCCT averaged \$8.92 at health centers, and up to \$14.03 at referral hospitals (Table ESI). Differences in the number of visits per staff were the primary factor for differences in the cost per visit.

The provision of first-line ART costed around \$250 per patient per year, and again the number of patients per staff was an important cost driver. The result is reasonably similar studies from Vietnam which found costs of about \$272¹ to \$325² per patient per year (although the price of some of the drugs has declined since the studies in Vietnam were conducted). Second-line ART costed from \$500 to \$716 per patient per year, on average, across the types of facilities offering this service. While patients on second-line ART constituted 5.8 percent of all ART patients, they represented 14.5 percent of ART costs. The quantity and mix of second-line antiretroviral drugs was an important determinant of costs for this service. Inpatient care for OIs at referral and provincial hospitals in total represented less than 2 percent of the costs of outpatient ART.

The number of patients per year for TB diagnosis was about 120 at health centers and over 1,000 at referral hospitals, and the cost per patient diagnosed averaged \$18 at health centers, and about \$44 at referral hospitals. Only half of the health centers included in the analysis performed sputum smear laboratory tests on site; the remainder transported the sputum specimens to higher level facilities. The costs for these investigations are included in the referral and provincial hospital levels, and thus, it is expected that costs would be higher at these levels than at health centers. The cost of treating a SS+ adult averages just under \$40 at health centers, and was almost \$120 at provincial hospitals, where (again) laboratory costs were a more substantial proportion of the overall costs. While the number of patient per staff remains an important cost driver, the treatment success rate and the amount of drugs per patient were also found to be an important factor determining differences in costs among facilities of the same type.

Referral hospitals admitted 49 TB patients, on average, in 2016 (compared with treating 68 TB patients, on average, on an outpatient basis). The two provincial hospitals admitted 385 TB patients, while treating 240 TB patients on an outpatient basis, on average. Thus, inpatient TB care amounted to 78 percent of the cost of outpatient TB care at referral hospitals and 65 percent at provincial hospitals

ART is the most donor-dependent of the services assessed, with over 50 percent of costs paid for by donors across the facilities included in the sample. For VCCT, donors funded between 20 percent and 35 percent of the costs (not including the NGO clinic, where donors funded the majority of costs). For

¹ Kiet, P. H. T., H. V. Minh, N. T. Son and K. T. Binh (2013). Costing HIV/AIDS Services in supported DDM Provinces in Vietnam. Hanoi, Vietnam, Health Policy Initiative, Abt Associates Inc.

² Duong, A. T., M. Kato, S. Bales, N. T. Do, T. T. Minh Nguyen, T. T. Thanh Cao and L. T. Nguyen (2014). "Costing analysis of national HIV treatment and care program in Vietnam." J Acquir Immune Defic Syndr 65(1): e1-7.

TB outpatient care, donors accounted for about 20 percent to 40 percent of costs, although this underrepresents donors' contribution to TB care because community-based services (which are largely funded by donors) were not included in this analysis.

Table ESI: Summary of average service utilization and average unit costs for services

Service	Unit	Health Center	Clinic	Referral Hospital	Provincial Hospital
VCCT	Number of visits	1,006	3,284	979	2,517
	Cost per visit	\$8.92	\$13.89	\$14.03	\$8.79
ART	Number of patient-years, first-line ART		690	353	2,612
	Cost per person per year; first-line ART		\$323	\$263	\$214
	Number of patient-years, second-line ART		93	11	181
	Cost per person per year; second-line ART		\$501	\$618	\$716
	Number of patient-years, pediatric ART		13	3	300
	Cost per person per year; pediatric ART		\$298	\$143	\$320
Inpatient care for HIV	Number of admissions			10	133
	Cost per admission			\$266	\$93
TB Outpatient care	Number of patients for diagnosis	120		1,034	1,963
	Cost per patient, diagnosis	\$18.17		\$44.12	\$34.55
	Number of patients, adult SS+	19		31	96
	Cost per patient, adult SS+	\$39.32		\$54.27	\$119.59
	Number of patients, other adult	10		14	141
	Cost per patient, other adult	\$57.48		\$141.52	\$203.39
	Number of patients, pediatric	2		23	3
	Cost per patient, pediatric	\$46.31		\$35.97	\$77.81
Inpatient care for TB	Number of admissions			49	385
	Cost per admission			\$517	\$187

Discussion

This report summarizes the cost of providing HIV/AIDS and TB services at health facilities in Cambodia. It presents a detailed and comprehensive approach to assessing the costs of these services, although it has some limitations, which are discussed in detail in the main report.

The main findings of these analyses are as follows:

HIV/AIDS and TB services in Cambodia are dependent on donor funding: Upwards of two-thirds of all ART costs are financed by donors (inclusive of the US Government, The Global Fund, and other donors). When planning to transition funding of HIV and TB services to domestic funds, the important items identified include:

- I. Procurement of disease-specific (both TB and HIV) drugs is largely financed by donors. Procurement of HIV and TB commodities has been a challenge in other settings during financial

transitions, and securing not just the financing, but ensuring that logistic and administrative capacity is in place may also need to be addressed in Cambodia.

2. NGO staff work in ART activities (and account for over 40% of salary costs at referral hospitals and 30% of salaries at provincial hospitals). All referral and provincial hospitals reported that NGO staff worked to support ART services through triage, adherence support and linkages to the community. Whereas for other services, except VCCT at provincial hospitals, all staff were paid either by government or health facility resources. Thus, securing the staff necessary to deliver ART services at hospitals will be an important issue to address when financing of ART is transitioned from external to domestic financing.
3. Many ancillary support activities that are required to successfully deliver services, such as training, supervision, laboratory sample transport, loss to follow-up tracking, etc., are largely supported by donors. While these activities do not make up a substantial proportion of the costs of delivering services, ensuring their continuity during transition will be important.

The results of this analysis in general, and for sources of financing in particular, may not be applicable to parts of Cambodia not included in this analysis. Donor support is variable by province and region, and a more detailed understanding of what activities are done and what activities use donor support in other parts of Cambodia may be necessary if sustainability or self-reliance is of major concern.

There is a substantial range in the unit cost of providing services across facility types and among individual facilities: When there are large differences in unit costs of delivering services, it may be possible to provide services in a more efficient manner. Three primary causes of inefficiency were identified across the services considered:

1. In many cases, the level of effort of staff per patient served is an important determinant of the differences in costs. At health centers, HIV and TB services typically (but not universally) are delivered in a clinic that is not specifically for HIV or TB (i.e., HIV and TB services are integrated into another service, be it ANC, vaccination, or general outpatient care). In these cases, deriving efficiencies from staff effort may be difficult. However, at referral and provincial hospitals, some efficiency may be gained by rationalizing staff load (while ensuring that enough staff with the necessary skills to deliver services remain).
2. Investigation of the use of second-line antiretroviral drugs may be warranted. This analysis found use of these drugs (which can be up to 10 percent of the costs of ART overall) was widely variable on a per patient basis across sites. Part of this variation found in this study may be the result of poor record keeping (rather than actual differences in usage) but likely some rationalizing of the use of second-line antiretroviral drugs may be possible.
3. Treatment success rates for TB patients were highly variable. Identifying and remedying facilities with low treatment success rates will increase both the efficiency and the effectiveness of TB services. Low treatment success rate may also affect treatment costs in the future.

Inpatient care for TB is a large component of TB costs: Of the total cost for TB care, inpatient care represented about 44 percent at referral hospitals and 39 percent at provincial hospitals. Inpatient care costs at referral hospitals is driven by long lengths of stay (over 3.5 months, on average) in the inpatient ward, coupled with about 40 percent of TB patients being admitted to the ward. Further investigation into whether or not the inpatient care for TB patients can be further rationalized may be warranted.

I. INTRODUCTION

In Cambodia, donor funding for HIV/AIDS and TB is declining, the government is struggling to generate new resources dedicated to the prevention or treatment of these diseases, and out-of-pocket spending still accounts for a significant share of health and disease expenditures. One means of generating ‘new’ resources is to identify mechanisms to improve the efficiency of HIV/AIDS and TB spending (i.e. spending money wisely). In the short term, this may mean finding ways to improve outputs—such as use of services and quality—for a given level of spending on HIV/AIDS and TB. In the medium- to long-term, finding mechanisms to fund the prevention and treatment of HIV/AIDS and TB with domestic resources will be necessary.

HIV/AIDS and TB have historically been financed by donors, the Ministry of Health, and households (via out-of-pocket spending). However, in recent years Health Equity Funds (HEFs) have begun to provide incentives for HIV/AIDS and TB services that are not funded by National Center for HIV/AIDS, overall funding for HIV/AIDS was estimated at about US\$40 million in 2016, and for TB about US\$14.7 million, according to the latest National Health Accounts data. Dermatology and Sexually Transmitted Diseases (NCHADS) and National Center for Tuberculosis and Leprosy Control (CENAT). Upcoming social health protection reforms increase the likelihood that new social health insurers (e.g. National Social Security Fund - NSSF) will also cover HIV/AIDS and TB services, as has been done in other countries in the region, including Vietnam, Thailand, and the Philippines. The NSSF does not clearly specify that HIV/AIDS and TB services are included in the benefit package; rather the NSSF health benefit package specifies that it covers ‘treatment and care services with medical professional techniques’. Currently, the NSSF reimbursement schedule is about \$1 for an outpatient visit at a health center, \$2 at a referral hospital, and \$3 at a provincial hospital, while the HEF pays similar amounts at health centers and slightly less at hospitals. The NSSF has also set reimbursement rates for TB inpatient care at about \$38 to \$42 per admittance depending on the level of the hospital. These reimbursements are not meant to cover the full costs of a visit (e.g., they are not meant to pay for items the government already provides).

A key factor driving provider incentives is whether, for each patient treated, the revenue brought in from these various sources (government, health insurance schemes, donors, and direct patient payments) is less than, equal to, or greater than the cost of delivering those services. While revenue is largely known, costs are not. As HEFs (and possible other funds, such as NSSF) take on a greater share of HIV/AIDS and TB financing, cost data from health facilities can be used to shape the payment mechanisms used to purchase services and inform the rates at which HIV/AIDS and TB services are reimbursed. Evidence from Indonesia, the Philippines, Thailand, and Vietnam suggest that without up-to-date cost data, public payers tend to set reimbursement rates that are below the actual costs needed to deliver services. In response, health care providers may be less likely to treat members insured by those funds, more likely to bring in supplemental revenue from other, less equitable sources (e.g. patient out-of-pocket costs), or provide services at low quality.

I.1 Objectives

The purposes of this study are to:

1. Understand the unit costs of delivering HIV/AIDS and TB services,
2. Identify the major components of costs,



3. Identify the sources of funding for HIV/TB services, and
4. Inform HEF and NSSF reimbursement rates.

2. METHODOLOGY

2.1 Study population and sample

The study population consisted of all the health facilities (excluding national hospitals) offering HIV/AIDS services in the six provinces in Cambodia with the highest burden of HIV and TB: Banteay Meanchey, Battambang, Kampong Cham, Phnom Penh, Siem Reap and Tbong Khmum. Four of these six provinces were selected at random to be included in the study sample: Battambang, Kampong Cham, Phnom Penh, and Siem Reap.

Within each province, we selected four health centers and two hospitals, including referral and provincial hospitals using simple random sampling. In addition, we deliberately selected one non-governmental clinic offering HIV/AIDS services in Phnom Penh for inclusion in this study; this clinic is unique in Cambodia. This clinic offers HIV/AIDS services at two sites, but they are administratively handled together. We collected data for both sites, but report the combined costs for the two sites together.

2.2 Services included

Costs for services, to the extent possible, were inclusive of all the inputs used (e.g., clinical, pharmacological, laboratory) to deliver services at the health facility level. The services accounted for in the costing include:

1. HIV counseling and testing: Including the costs of voluntary and confidential counseling and testing (VCCT), testing and counseling of pregnant women, and provider initiated testing and counseling (PICT).
1. Antiretroviral treatment (ART): The provision of antiretroviral therapy, including first line antiretroviral drugs (ARVs), second-line ARVs, pediatric ARVs, laboratory monitoring, and outpatient treatment of opportunistic infections (OIs). Costs were calculated for ART overall, and then broken down into costs for patients on first-line, second-line, and pediatric ART. Pediatric ART costs include the costs of early infant diagnosis of HIV. These costs do not include the costs of community-based activities.
2. Prevention of mother-to-child transmission of HIV (PMTCT): Due to difficulty in allocating costs, only costs for visits and treatment of infants exposed to HIV were included (while testing of pregnant women is included in VCCT). Because HIV-positive pregnant women are enrolled in ART, costs for these services are included in ART.
3. Inpatient care for the treatment of OIs (where applicable).
4. Outpatient care for TB includes two broad categories of activities:
 - a. TB investigation and diagnosis, including sputum microscopy, GeneXpert, X-rays and imaging, and conventional drug sensitivity (C&S) testing and the associated costs; and
 - b. TB treatment, including the provision of TB treatment (i.e. the DOTs intensive phase and the DOTs maintenance phase). Costs are presented for TB treatment overall, and broken down into costs for SS+ patients, other adult TB patients (extra pulmonary,

retreatment, and multidrug resistant cases), and pediatric treatment. Costs are inclusive of ancillary TB services, including contact tracing and loss-to-follow-up tracking by health facilities' staff.

Note: the costs for community-based activities, such as community DOTs, are not included in this analysis except insofar as much as health facility staff support these activities.

5. Inpatient care for people diagnosed with TB (where applicable).

2.3 Costs included

2.3.1 Direct costs

The direct costs associated with the services at the health facility level were included in the cost analyses. These include:

1. HIV- and TB-specific drugs – ARVs and drugs used only for the treatment of TB.
2. Other drugs that could directly be tracked at the clinic offering HIV or TB services within the health facility. These primarily consist of drugs used for OI prophylaxis or treatment.
3. Medical supplies were included as direct costs if records of medical supply consumption were available at the relevant clinic, or staff could estimate medical supply usage. If these costs could not be obtained at the clinic level, medical supplies costs obtained at the facility level were included as an indirect cost (see Section 2.3.2).
4. Human resources costs for staff working directly in the clinic providing the service. These costs were based on interviews with staff estimating the amount of time they spend working in different clinics within the health facility. In cases where HIV/AIDS or TB services were provided in clinics with multiple functions (e.g., in the antenatal clinic or the general outpatient department), staff costs were allocated to HIV/AIDS or TB services based on the number of visits. Costs for human resources were inclusive of salary and benefits, overtime pay, and user fee and other incentives.
5. Laboratory and imaging (X-ray) consumables associated with HIV/AIDS or TB services. This includes reagent and annual equivalent machine costs. Note that other laboratory or imaging costs (including human resources) are included as an overhead cost (see Section 2.3.3). These costs include the cost associated with the transport of laboratory samples to another facility, when applicable. Reagents and consumables associated with laboratory tests done off-site were included in these analyses based on estimated reagent usage per test. However, we could not include the human resources and other costs associated with conducting laboratory tests off-site due to lack of data from the referral laboratories (unless the referral laboratory was located at a site included in our sample). To avoid double counting of costs, we do not include the costs of laboratory tests done off-site if the testing is referred to a type of facility that is included in the sample. Thus, if a health center transports sputum slides to a referral hospital for examination, the costs of the sputum test are not included in this analysis at the health center level (while they should be captured at the referral hospital level). However, if a health facility transports sputum slides to a facility type *not* included in the sample, such as a national referral laboratory or district laboratory, then we include the costs of the sputum test in this analysis.

6. Ancillary services directly related to HIV/AIDS and TB services, including partner notification, loss-to-follow-up tracking, contact tracing done by health facilities' staff, etc.
7. HIV/AIDS- and TB-specific training, mentoring, and supervision.
8. Annual equivalent costs for equipment and furniture costs for items in the clinic where HIV/AIDS and TB services were offered. As with human resources, in cases where HIV/AIDS or TB services were provided in clinics with multiple functions (e.g., in the antenatal clinic or the general outpatient department), equipment and furniture costs were allocated to HIV/AIDS or TB services based on the number of visits.
9. Costs for pharmaceutical products and laboratory investigations for inpatient care: In each facility where inpatient care was offered to HIV positive patients or patients with TB, up to 20 patient medical records each for HIV and TB (that is, up to 40 medical records in one facility) were randomly sampled. In facilities with fewer than 20 admissions for a particular condition, all applicable medical records were taken. Data on the type and quantity of drugs and lab tests received were extracted from the patient medical records to estimate the costs for these categories of items.

Cost was done from the provider perspective. Patient payments, including out-of-pocket payments at point-of-service, costs for accessing services (such as payments for transportation) and food expenditure were not included. Costs incurred by patients to access care may not be, for example, reimbursed by insurance agencies.

2.3.2 Indirect costs

Indirect costs are costs incurred at a broad facility level or across multiple clinics or departments within a health facility. They are allocated to specific units based on a pre-defined 'allocation' metric. See Annex A for the allocation metrics used for each type of indirect cost. For this study, indirect costs include: vehicle costs, medical gases (including oxygen), medical supplies, patient food, staff food, estimated cost of rent for the building, electricity, fuel and oil, cooking gas, water and water disposal, building/general maintenance, vehicle maintenance, repair & licensing, cleaning supplies / expenses, bed and linen supplies, telecommunications (landline, mobile phone, and internet), office supplies/printing, insurance (car, building), meeting/visitor reception costs, uniforms, treasury tax, festival/ceremony expenses, and other indirect costs.

2.3.3 Administrative, logistic, and intermediate clinic ('step-down') costs

Step-down costs are costs incurred by offices, services, or clinics that do not, generally speaking, directly deal with patients or that are ancillary to clinical services (i.e., 'intermediate clinical services', which includes services such as laboratory, imaging, and pharmacy services), but are components of the overall operation of the health facility. As per indirect costs, step-down costs are allocated to specific final clinical service centers based on pre-defined allocation metrics (see Annex B). Step-down costs are specific to individual facilities – not all of these administrative, logistical, or intermediate clinical services are in operation in all health facilities.

2.4 Data collection

2.4.1 Data collector training

Six data collectors and one data collection supervisor received five days of training on the data collection tools and process starting 22 June 2017. Training included piloting the data collection instruments at Meanchey referral hospital in Phnom Penh. The training was conducted by HFG staff and consultants and the local research coordinator, and consisted of review of the data collection tools, exercises, and discussions. HFG staff and consultant remained with the data collection teams for data collection at one facility in Phnom Penh; the HFG consultant also joined the data collection teams in Siem Reap. Staff from NCHADS also participated in the training and visited the data collection teams while they were collecting data.

2.4.2 Data collection

Two data collection teams, consisting of two data collectors and one team leader, visited each facility and undertook structured data extraction and interviews with health facility staff. The two teams each visited the same provinces at the same time, and were accompanied by a data collection supervisor who reviewed data collected each day and helped resolve problems. The local research coordinator visited provinces and districts ahead of data collection to meet the directors of the facilities to discuss the study and to ensure staff availability, and stayed with data collectors as scheduling permitted.

Data were recorded on paper data collection forms. The paper-based data was double entered into prepared templates in Microsoft Excel, and differences between the two data entry forms were reconciled based on the paper-based data collection form. Entered data were further reviewed by HFG staff and the consultant. Questions were sent to the data collection supervisor and data collectors for clarification and, if necessary, corrections.

Up to 40 medical records (20 for HIV and 20 for TB) for patients admitted to inpatient wards were reviewed at all health facilities that offer these services. In order to match patients referred for inpatient admittance from the HIV/AIDS and TB outpatient treatment sites, it was occasionally necessary to record patients' medical record numbers. Once the patient medical records had been located, the list of medical record numbers was destroyed (burned).

In addition to visiting health facilities, data collectors also collected price data from local pharmacies outside the facility. Prices of drugs, furniture, equipment, medical supplies, and laboratory reagents were also collected from relevant agencies (e.g., NCHADS and CENAT). Finally, financial records were occasionally not available at the health facility, but available at operational district (OD) offices, in which case data collectors visited the OD offices to obtain the necessary information.

2.4.3 Data sources

Table I lists the types of data collected, the sources of data, and the level of health facility for which the data were relevant.

Table 1: Sources of data

Category	No.	Data Item	Data Description	Relevant facility level
General information	1	Departments / wards List	List of all hospital / clinic / health center services / wards (clinical, intermediate, administrative)	All
	2	Organization chart	Organization structure of hospital / clinic / health center	All
	3	Staff lists and positions	Government, contractual, and NGO (working at the facility)	All
	4	Staff schedule and ward assignments	Staff schedules and percent time allocation across wards/outpatient (OP) departments/units, based on set schedule and interviews with staff	All
Utilization	5	Bed Count	Number of beds by ward	Hospital, health center
	6	Health information system (HIS) reports and/or facility registers/records (including where HIV and TB patients are admitted)	Discharges, days, admittances (official HIS and hospital management reports)	Hospital, health center
	7	Health information system (HIS) reports and/or facility registers/records	Number of visits for OP services (general, special)	All
	8	Lab register, interviews with laboratory staff	Number and type of test by ward / OP department, cost of tests (if available)	Facilities with laboratories
	9	Blood bank register	Blood unit consumption report by ward / OP department	Facilities with blood banks
	10	X-ray register, interviews with imaging department staff	Number of x-rays by ward / OP department	Facilities with X-ray machine
	11	Ultrasound (Echo) register	Number of scans by ward / OP department	Facilities with ultrasound machine
	12	Operating theater register	Number of surgeries by ward / OP department	Facilities with operating theater
	13	Other intermediate department forms	Logs from orthopedics, etc. as necessary: number of visits by ward / OP department	All (as needed)
Labor costs	14	Staff salaries and allowances	Salary and allowance payments by staff member (contract staff) / salary grade (health facility or district health office) and in total based on financial records	All
	15	Staff overtime payments	Overtime payments in total (health facility or district health	Hospital and health center

Category	No.	Data Item	Data Description	Relevant facility level
			office) based on financial records	
	16	User fee / health equity fund incentives	Incentive payments in total based on financial records	Hospital and health center
	17	Service delivery grant (SDG) incentive payments	Incentive payments in total based on financial records	Hospital and health center (if needed)
	18	Non-governmental / donor direct payments	Incentive payments for HIV in total based on financial records	Hospital and health center (as needed)
	19	Other incentive payments	Incentive payments in total, including mission payments and midwife incentives based on financial records	Hospital and health center (as needed)
HIV and TB specific utilization, cost, and financing	20	HIV clinic utilization (HMIS quarterly reports; HIV/AIDS outpatient service records at site of service delivery)	HIV testing and counselling, Number of visits for ART, number of patients on ART (pre-ART, first-line, second-line, PMTCT/EID), laboratory testing	All
	21	TB clinic utilization (TB outpatient service records at site of service delivery)	Number of cases (by type), number of visits (by type if possible), number successfully treated (by type), laboratory testing	Hospital and health center
	22	Interview with head of HIV and TB clinics	Staffing split between services. medical equipment lists, size of clinic; other HIV and TB costs. Sources of financing.	All
	23	Pharmacy (or similar) stock cards	Use of antiretroviral and TB-specific drugs; use of drugs for opportunistic infections; medical supplies. Usage is inclusive of wastage (due to expiry, damage, etc.)	All
	24	HIV and TB clinics / laboratory registers and laboratory records and VCCT/PICT service records	Use of laboratory services by HIV and TB clinics, quantities of reagents consumed, size of lab, number of lab tests done	All (as needed)
	25	Frequency and cost of sample transport to laboratory outside of health facility	Interviews with staff	All (as needed)
	26	Patient medical records	Quantity usage of resources (services, bed-days, drugs, laboratory tests) by HIV and TB patients in inpatient wards	Hospital
	27	Training, mentoring, and supervision for HIV/TB	Interviews with staff; all training received in the last 3 years,	All (as needed)

Category	No.	Data Item	Data Description	Relevant facility level
			number trained, type of training, training agency. Mentoring in the last 3 years, length on mentoring, mentoring agency. Supervision in the last year, number of supervisors, supervising agency.	
	28	Other HIV or TB activities (partner notification, loss-to-follow-up tracking, contact tracing, etc.)	Interviews with staff	All (as needed)
Drug and Medical Supply Cost	29	Interviews at local pharmacies (outside the facilities)	Drug description, strength, form, quantity, unit cost (as necessary)	Hospital and health center (as needed)
	30	Interviews with other government agencies, other local shops	Prices for drugs, laboratory reagents and equipment, furniture, equipment, travel, etc.	N/A
Other financial information	31	Financial reports, receipts, cash books, accounting ledgers, etc	Income and expense for government budget, user fees, SDGs, health equity funds, and donors for indirect (and occasionally direct) costs	All
	32	Annual rental cost of building	Interview with facility head; in cases where facility head could not estimate the rental cost, average rental cost per m ² in other facilities in province was used.	All

2.4.4 Ethical approval

The Abt Associates Institutional Review Board approved this study via expedited review on 12 May 2017, and the National Ethics Committee for Health Research (Cambodia) on 07 June 2017. NCHADS endorsed the study on 16 May 2017, and all requisite letters of approval were submitted in each province for permission to proceed before the start of data collection. Interviews of health facility staff were done only in their official capacity. The information collected from the health facilities comprised routinely collected data on utilization, supply usage, and financial records. Names, sex, age, and other direct or indirect identifying data on patients were not recorded as part of the data collection (except in cases where patients needed to be tracked between clinics and wards, in which case the identifying information did not leave the facility), nor were patients interviewed or contacted as part of this research.

2.5 Data analysis

Data were first analyzed for each facility separately. For each facility, a Microsoft Excel workbook was set up based on the Management Accounting Systems for Hospitals template for costing health facilities.³ The approach combines top-down (or step-down) costing with bottom-up costing of the HIV and TB services themselves. This approach, as described below, allows the ultimate total and unit costs to include both direct costs incurred in the provision of HIV/AIDS and TB services and the relevant costs of administration, etc., allocated to the provision of HIV/AIDS and TB services.

2.5.1 Metrics reported

The following cost metrics are reported on average for each type of facility included in the sample. Total costs are also broken down by source of financing. Due to the small sample sizes, ranges in total and unit costs are reported (rather than by standard errors).

1. HIV counseling and testing: Cost per visit, cost per initial (Determine™) HIV test administered.
2. ART: cost per visit, cost per patient per year, and total costs.
3. Prevention of mother-to-child transmission of HIV (PMTCT): Cost per visit.
4. Inpatient care for the treatment of OIs (where applicable): Admissions per 1,000 patients per year, cost per admission, average length of stay, inpatient care costs divided by the total number of patients-years treated (whether admitted to an inpatient ward or not) per year.
5. TB investigation and diagnosis: Cost per visit, cost per patient.
6. TB treatment: Cost per sputum positive patient, cost per other adult TB patient, cost per pediatric TB patient, and costs for the three categories above per successfully treated patient.
7. Inpatient care for people diagnosed with TB: Admissions per 1,000 diagnosed patients, cost per admission, average length of stay, inpatient care costs divided by the total number of patients treated for TB (whether admitted to an inpatient ward or not).

2.5.2 Step down costing

First, each 'unit' in a health facility was defined based on the organizational chart and interviews with hospital management. Each unit is then defined as 'administrative' (e.g., administration, human resources, director's office, billing, maintenance, etc.), 'intermediate' (units that provided diagnostic and clinical support services to clinical units), and 'final clinical' (units that provide direct inpatient or outpatient care to patients). Second, the number of services (visits, inpatient days) was determined per unit, the staffing and staff costs of each unit calculated, and the size of each unit entered or estimated. Each unit has direct costs – costs attributable completely to the unit, such as staff working directly in the unit. Staff costs were calculated using an ingredients-based approach, where the number of staff by cadre was collected for each unit, and then the number is multiplied by the appropriate salary (based on grade, and total salary payments) to determine the cost of staff.

³ See http://www.phrplus.org/Pubs/Tool010_fin.pdf

For intermediate services, the direct costs of pharmacy, imaging, or laboratory include the staff, etc., but do not include, for example, the cost of drugs, laboratory reagents and machines, and the x-ray film (if applicable). These costs are collected for HIV/AIDS and TB services directly.

After calculating the direct costs for each unit, we then allocated indirect costs to each unit using the allocation metrics listed in Annex A. Once direct and indirect costs were determined for all units in the health facility, administrative, and intermediate services were allocated to final clinical services (outpatient and inpatient care). Allocation of administrative, logistic, and intermediate clinical services was done using a 'single step down' approach, as illustrated in Figure 1.

Figure 1: Illustrative example of step-down costing

Unit	Direct costs	Indirect costs	Direct + Indirect costs						
Administration	\$75	\$25	\$100	↓					
Maintenance	\$50	\$25	\$75	+ \$20 = \$95	↓				
Pharmacy	\$160	\$40	\$200	+ \$20	+ \$24 = \$244	↓			
Imaging	\$145	\$30	\$175	+ \$20	+ \$23	+ \$0 = \$218	↓		
HIV Clinic	\$250	\$50	\$300	+ \$20	+ \$24	+ \$122	+ \$109	=	\$575
TB Clinic	\$190	\$60	\$250	+ \$20	+ \$24	+ \$122	+ \$109	=	\$525

In the example above, administration has a cost of \$100 (including direct and indirect costs). These costs are allocated to units below administration based on an allocation metric (Annex B, although in the example, costs are simply divided for ease of presentation; in reality, costs are usually unevenly distributed across the lower units).

2.5.3 Bottom-up costs

Once the direct, indirect, and step-down (i.e., costs allocated through the step-down process) were calculated for each final clinical service, we added the other costs associated with HIV and TB care to the units providing these services. Thus, the costs of the HIV and TB clinics include the direct costs associated with the clinic (staff, equipment, supplies, drugs, etc., specifically consumed within the clinic), the indirect costs, and the allocated costs from the step-down exercise.

Thus, the costs for the HIV/AIDS and TB services centers include the costs for drugs and laboratory tests done / provided specifically for the relevant clinic or ward. The quantities of drugs, medical supplies, equipment, furniture, laboratory tests, etc. were multiplied by the associated unit prices to determine the costs for these items. Thus, allocation of pharmaceutical items, laboratory reagents, and imaging supply costs themselves did not need to be done. However, care was taken to avoid double

counting. For example, the estimated unit cost of a laboratory test did not include the costs of labor, which were allocated to each final clinical service unit in the step-down process.

Costs within units providing HIV/AIDS and TB services also needed to be allocated to specific services. For example, costs needed to be allocated between ART first-line, second-line, and pediatric treatment. In general, we used the number of visits as the first metric of allocation within a unit; however, for items that were specific to a particular type of patient (e.g., pediatric, first-line, and second-line ARVs, and early infant diagnosis lab test), direct attribution of costs to a particular category was possible.

Capital items (e.g., equipment and furniture) and start-up costs (e.g., training and mentoring) are calculated as the annual equivalent cost. In order to estimate the annual equivalent cost, we used the following formula:

$$\text{Annual equivalent cost} = P / ((1 - (1 / (1+r)^L)) / r)$$

Where:

P = the price to purchase the item,

r = the discount rate (assumed to be 3 percent), and

L = the useful life of the item.

The useful life of the item is taken from international standards for equipment and furniture, while training and mentoring are assumed to have a useful life of 3 years. The unit price of training is an estimate of the cost of training *per trainee* and is multiplied by the number of staff trained at the facility.

Results are presented in 2016 US dollars. The average 2016 exchange rate from the International Monetary Fund of 4,238.75 Cambodian Riel per dollar is used to convert figures reported in Riel into US dollars.⁴

2.5.4 Variance analysis

As part of the analyses, we assessed the differences in the quantity of inputs and the prices of inputs between health facilities of the same type. In order to do this, we replaced the individual input (quantity or price) of each health facility with the average amount/price of the input for that type of facility. We then recalculated the unit costs of services, and assessed the change in the average unit cost of the service. We identified all input quantities or prices that changed the average unit costs by more than 2 percent from the observed average unit costs. The items that changed the average unit costs by more than 2 percent are considered to be ‘cost drivers’ – that is, inputs that potentially could be leveraged to increase the efficiency of service delivery.

⁴

[https://www.imf.org/external/pubs/ft/weo/2017/01/weodata/weorept.aspx?pr.x=22&pr.y=4&sy=2016&ey=2016&scsm=1&ssd=1&sort=country&ds=.&br=1&c=522&s=NGDPPC%2CNGDPDPC&grp=0&a=\)](https://www.imf.org/external/pubs/ft/weo/2017/01/weodata/weorept.aspx?pr.x=22&pr.y=4&sy=2016&ey=2016&scsm=1&ssd=1&sort=country&ds=.&br=1&c=522&s=NGDPPC%2CNGDPDPC&grp=0&a=),), accessed 15 September 2017.

3. RESULTS

The results section is organized as follows. First, we discuss the final sample. Then results for each of the service categories (VCCT, ART, inpatient care of OIs, OP care for TB, and inpatient care for TB) are presented. Each of these sections discusses the total cost, on average, for the provision of services at different types of health facilities, summarizes the components of the total costs, assesses the sources of financing for the total costs, presents total utilization numbers on average for the provision of services at different types of health facilities, the results for the unit costs of delivering the service, and finishes with a discussion of the variance analysis. Annexes D, E, and F present more detailed tables on the breakdown of the average total costs (Annex D), total costs by facility (Annex E) and on sources of financing for the total costs (Annex F). Annex G provides details of human resource / staffing efforts to provide services, and compares them to outputs.

3.1 Final sample

One hospital sampled for inclusion declined to participate in the study; a replacement hospital was selected from the same province. Further, the provincial hospital in Battambang is a very large hospital, and data collection at this facility took longer than anticipated. In order to maintain data collection within the available budget, data were not collected from health centers in Battambang. Thus, the final sample included 21 health facilities: 2 provincial hospitals, 6 referral hospitals, 12 health centers, and 1 non-governmental (NGO) clinic (Table 2). Annex C contains a list of facilities visited.

Table 2: Final sample of facilities included in the analyses

Province	Number of Provincial Hospitals	Number of Referral Hospitals	Number of Government Health Centers	Number of clinics
Phnom Penh	0	2	4	1
Kampong Cham	0	2	4	0
Siem Reap	1	1	4	0
Battambang	1	1	0	0

None of the health centers visited offered ART or PMTCT services, while one of the referral hospitals visited did not offer TB or VCCT services – VCCT and TB patients were referred to a health center on-site (Table 3). The NGO clinic, one referral hospital, and one provincial hospital provided pediatric ART, while four additional referral hospitals offered treatment for infants exposed to HIV (PMTCT).

Table 3: Number of facilities in sample offering selected services

Type of facility	VCCT	ART (first-line or second-line)	Pediatric ART	Inpatient care for OIs	TB outpatient care	Inpatient care for TB
Provincial Hospital	2	2	1	2	2	2
Referral Hospital	5	6	1 + 4 PMTCT only	5	5	5
Health Center	12	0	0	0	12	0
Clinic	1	1	1	0	0	0

3.2 Total cost of services

3.2.1 VCCT

On average across the sample, the total cost of VCCT at health centers was about \$4,800 per facility per year, ranging from \$760 to \$13,600 (Table 4). At referral hospitals, the total cost of VCCT was about \$9,200 on average (ranging from \$3,800 to \$13,800); the two provincial hospitals incurred about \$20,000 for VCCT. The NGO clinic had the most costs for VCCT in the sample, incurring about \$45,600 in total.

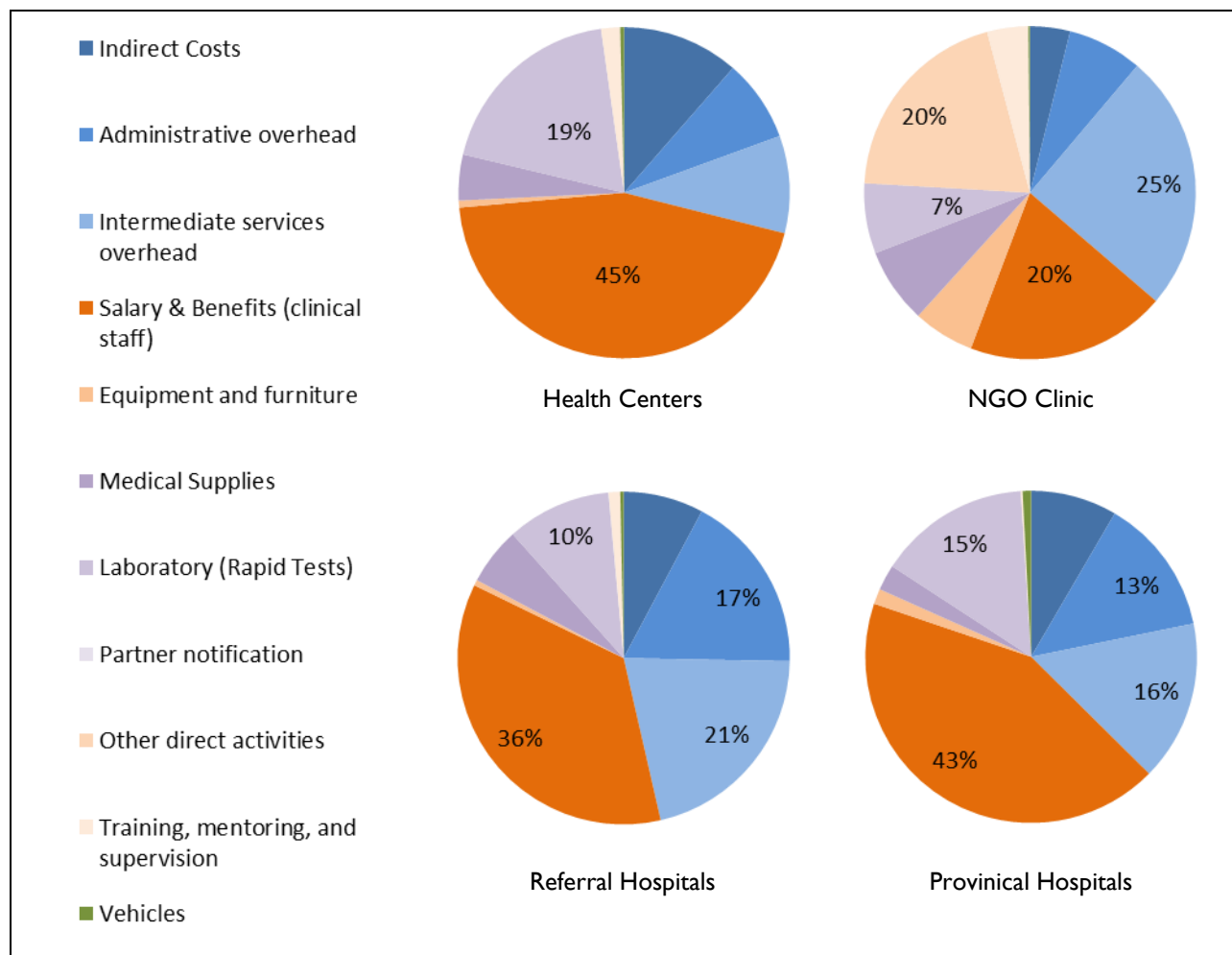
Table 4: Total costs for VCCT services, average by type of facility

Cost category	Health Center	Clinic	Referral Hospital	Provincial Hospital
<i>Number of facilities</i>	12	1	5	2
Building and utilities	\$463	\$1,711	\$599	\$1,114
Administrative step-down	\$382	\$3,329	\$1,602	\$2,661
Intermediate services step-down	\$453	\$11,428	\$1,933	\$3,108
Other operational indirect costs	\$81	\$73	\$115	\$559
<i>Subtotal: Step-down / indirect costs</i>	<i>\$1,378</i>	<i>\$16,541</i>	<i>\$4,250</i>	<i>\$7,442</i>
Salary & Benefits (clinical staff)	\$2,126	\$8,916	\$3,278	\$8,511
Equipment and furniture	\$33	\$2,722	\$51	\$296
Medical Supplies	\$213	\$3,342	\$512	\$498
Laboratory	\$907	\$931	\$2,947	\$2,947
Partner notification	\$0	\$0	\$2	\$0
Other direct activities	\$0	\$9,086	\$0	\$0
Training, mentoring, and supervision	\$88	\$1,829	\$103	\$35
Vehicles	\$18	\$70	\$30	\$164
<i>Subtotal: Direct costs</i>	<i>\$3,385</i>	<i>\$29,080</i>	<i>\$4,907</i>	<i>\$12,451</i>
Total	\$4,763	\$45,622	\$9,157	\$19,893

At government-owned facilities (health centers, referral hospitals, and provincial hospitals), costs for staff was the largest category of costs, comprising over a third of costs at all levels (Figure 2). Step-down costs (for administrative, logistic, and intermediate clinical services) comprised 18 percent of costs at health centers, but 39 percent of costs at referral hospitals, while indirect costs comprised between 8 percent and 11 percent of costs at government-owned facilities. Together, indirect costs and step-down costs comprise 46 percent of the total costs, on average, at referral hospitals.

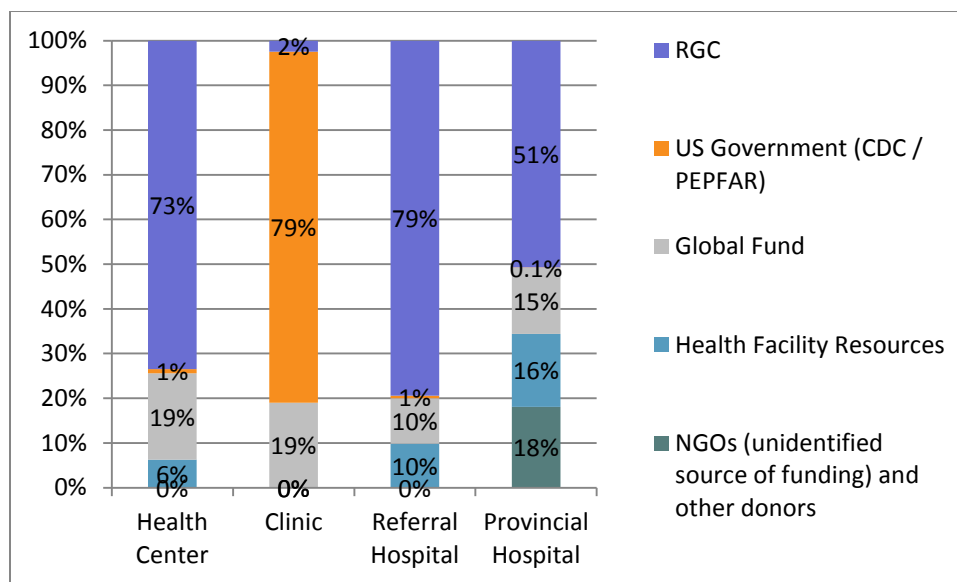
At the NGO clinic, ‘other direct activities’ comprised the second largest cost category at 20 percent of costs (after intermediate services step-down costs); most of these were costs incurred for a risk tracking pilot. These costs likely will change in the future as the risk tracking program matures. Of the other facilities, only two referral hospitals reported doing partner notification activities outside of the health facility. Costs for the rapid tests were under 20 percent of the costs, on average, across facility types.

Figure 2: Breakdown on costs for VCCT



The Royal Government of Cambodia (RGC) financed the majority of costs at government owned facilities, while the US Government funded the majority of costs at the NGO clinic (Figure 3). External resources (The Global Fund, US Government, and other non-government sources) together provided the financing for about 11 percent to 33 percent of the costs, on average, across the types of facilities included in the sample. The Global Fund supports test kits. The US Government also provided funding at all types of public health facilities, providing support for equipment or furniture, and training, mentoring and supervision. Health facility resources constituted about 6 percent of costs at health centers and referral hospitals, and 16 percent of costs at provincial hospitals. Generally, health facility resources are represented in medical supplies and some staff salaries – these items represent a cross-subsidy of resources from other services where user fees are charged.

Figure 3: Sources of Financing for VCCT



Health centers and referral hospitals averaged about 1,000 visits for VCCT. However, at health centers, 81 percent of visits for VCCT were from pregnant women, while less than 10 percent of visits for VCCT at referral hospitals were from pregnant women (Table 5). PICT comprised a small (at health centers) or non-existent service at most facilities. Less than 1 percent of initial tests resulted in a confirmatory test at health centers, while over 3 percent of initial tests led to a confirmatory test at the NGO clinic and referral hospitals. At provincial hospitals, over 9 percent of initial tests were followed by a confirmatory test.

Table 5: Average utilization of VCCT services

Service	Health Center	Clinic	Referral Hospital	Provincial Hospital
Number of facilities	12	1	5	2
Number of visits	1,006	3,284	979	2,517
...of which for pregnant women	816	3	92	352
...of which PICT	62	0	0	0
Average number of initial (Determine) HIV tests administered	1,007	3,284	979	2,830
Average number of confirmatory (Uni-Gold or Stapat) HIV tests administered	0.4	105	33	265

The cost per VCCT visit costed, on average, \$8.92 at health centers, \$13.09 at the NGO clinic, \$14.03 at referral hospitals, and \$8.79 at provincial hospitals. At health centers, the cost per test ranged from \$2.10 to \$18.34, at referral hospitals from \$5.75 to \$29.05, and at provincial hospitals from \$5.89 to \$11.69. Cost per initial test was similar to the cost per visit because most visits included a test.

The variance analysis showed the same two inputs were cost drivers at health centers, referral hospitals, and provincial hospitals (Table 6). When the number of full time equivalent (FTE) staff per visit was changed to the average across health centers and unit costs recalculated using this average, the cost per VCCT visit changed by 19 percent (a change of \$1.68 from the baseline average of \$8.92), and at referral hospitals the cost per VCCT visit changed by 30 percent (a change of \$4.21 from the baseline average of \$14.03). At provincial hospitals, the change was 6 percent (a change of \$0.49 from the baseline average of \$8.79); the more modest change at provincial hospitals may be due to having only two observations.

The second cost driver was the average salary of staff, which changed unit costs by 5 percent, 2 percent, and 5 percent at health centers, referral hospitals, and provincial hospitals, respectively. At health centers, VCCT was delivered variably across sites by staff cadres from all three broad salary scales in Cambodia (staff with grade A, B, and C), meaning that average salaries differed across the health centers depending on the type of staff delivering VCCT. At referral hospitals, VCCT was delivered predominately by staff in salary grade B, with one site having some staff with salary grade C and one site using contract staff (as well as salary grade B staff) to deliver VCCT. Similarly, at provincial hospitals, salary grade B staff delivered VCCT, but both sites also had NGO staff delivering VCCT (representing 33 percent and 50 percent of staff at the two sites).

The two cost drivers reflect staff salaries and benefits as being the largest cost component of VCCT at government health facilities, and suggest that standardizing the level of effort per visit is a potential means of increasing the efficiency of services. However, the level of effort of staff was not precisely measured in this study. At health centers especially, VCCT was delivered in other clinics (e.g., the ANC/maternity clinic) and thus variation in FTE per visit also reflects overall usage of the clinic where VCCT is delivered. While standardizing facility overhead and indirect costs does not affect the unit cost of services by more than 2 percent, it does reduce the variance in the cost per VCCT visit by over 50 percent across the three types of health facilities.

Table 6: Results of variance analysis for VCCT services

Output	Health Center		Referral Hospital		Provincial Hospital	
	Input	Absolute percentage change in unit cost	Input	Absolute percentage change in unit cost	Input	Absolute percentage change in unit cost
Cost per Visit	FTE per visit	19%	FTE per visit	30%	FTE per visit	6%
	Average salary of staff	5%	Average salary of staff	2%	Average salary of staff	5%

FTE: Full Time Equivalent number of staff; only inputs with an absolute percentage change of 2% or greater are included in the table.

3.2.2 ART

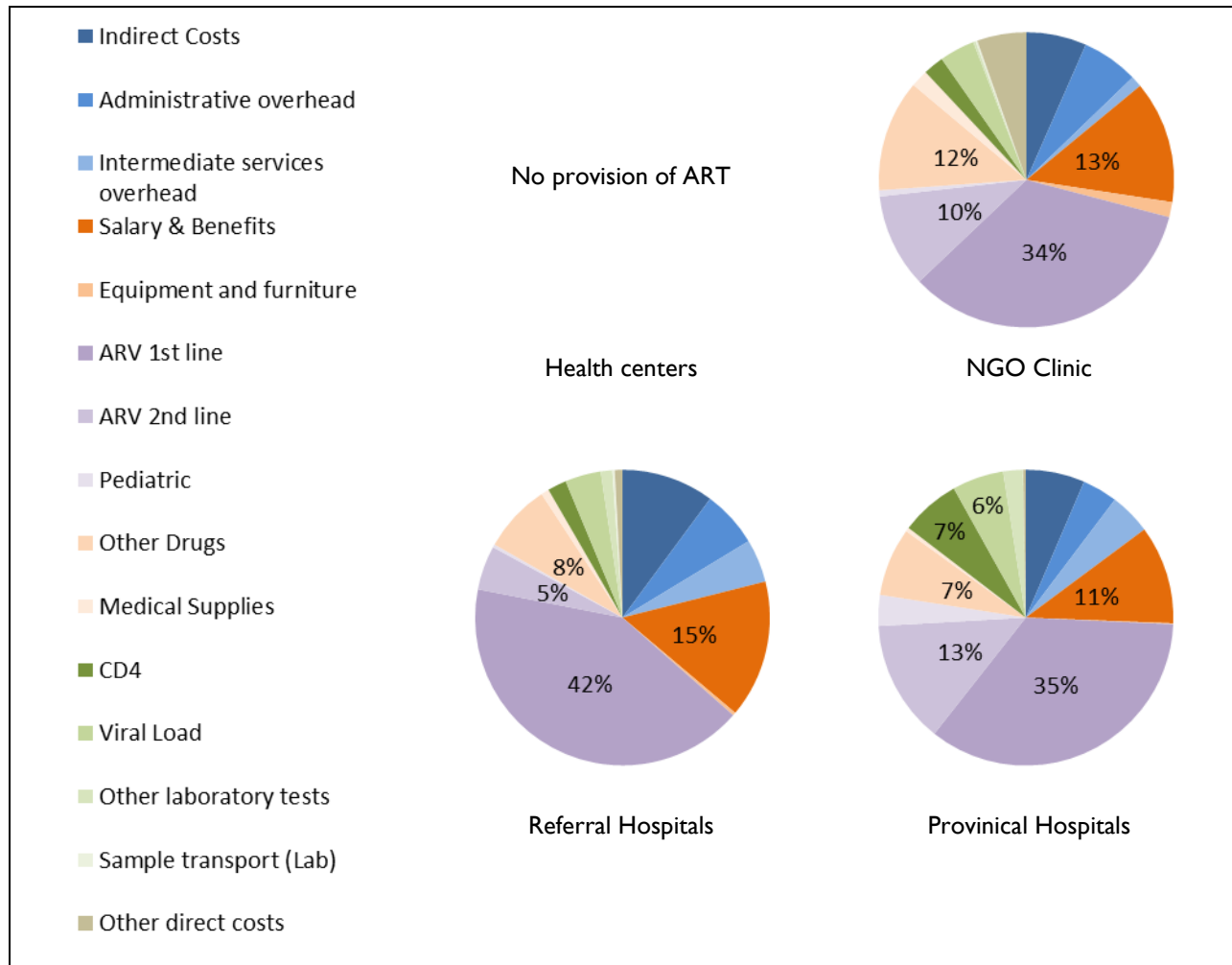
On average across the sample, the cost of ART at referral hospitals was about \$104,000 in total per facility per year, ranging from \$31,000 to \$179,000 at individual facilities (Table 7). The two provincial hospitals incurred about \$740,000 for ART, ranging from \$583,000 to \$904,000 across the two sites. The NGO clinic incurred about \$283,000 for ART. Note that in 2016, Cambodia was transitioning to a ‘test and treat’ strategy where all patients diagnosed with HIV should start treatment immediately. However, some patients attending ART before the transition occurred, and some patients not returning until late in the year, were still classified at ‘Pre-ART’. The costs for these patients is included below, but is not reported separately because this category of costs will not be relevant in Cambodia in the future.

Table 7: Total costs for ART services, average by type of facility

Cost category		Clinic	Referral Hospital	Provincial Hospital
Number of facilities		1	6	2
Building and utilities		\$18,393	\$9,989	\$42,613
Administrative step-down		\$17,570	\$6,426	\$28,659
Intermediate services step-down		\$3,427	\$4,888	\$33,649
Other operational indirect costs		\$274	\$516	\$5,406
Subtotal: Step-down / indirect costs		\$39,664	\$21,819	\$110,328
Salary & Benefits (clinical staff)		\$38,062	\$15,613	\$80,149
Equipment and furniture		\$4,671	\$346	\$709
Pharmaceutical	ARV first-line	\$95,908	\$43,081	\$259,706
	ARV second-line	\$29,116	\$5,005	\$99,963
	Pediatric	\$1,920	\$346	\$25,089
	Other Drugs	\$34,694	\$7,778	\$55,543
Medical Supplies		\$5,386	\$907	\$3,198
Laboratory	CD4	\$6,410	\$2,143	\$48,464
	Viral Load	\$10,931	\$4,077	\$41,916
	Other	\$751	\$1,303	\$16,121
	Sample transport	\$548	\$285	\$144
Subtotal: Direct clinical costs		\$228,397	\$80,884	\$631,003
Loss-to-follow-up tracking		\$0	\$5	\$0
Other direct activities		\$10,600	\$49	\$0
Training, mentoring, and supervision		\$4,452	\$742	\$212
Vehicles		\$264	\$69	\$1,916
Subtotal: Other direct costs		\$15,316	\$866	\$2,128
Total		\$283,377	\$103,570	\$743,459

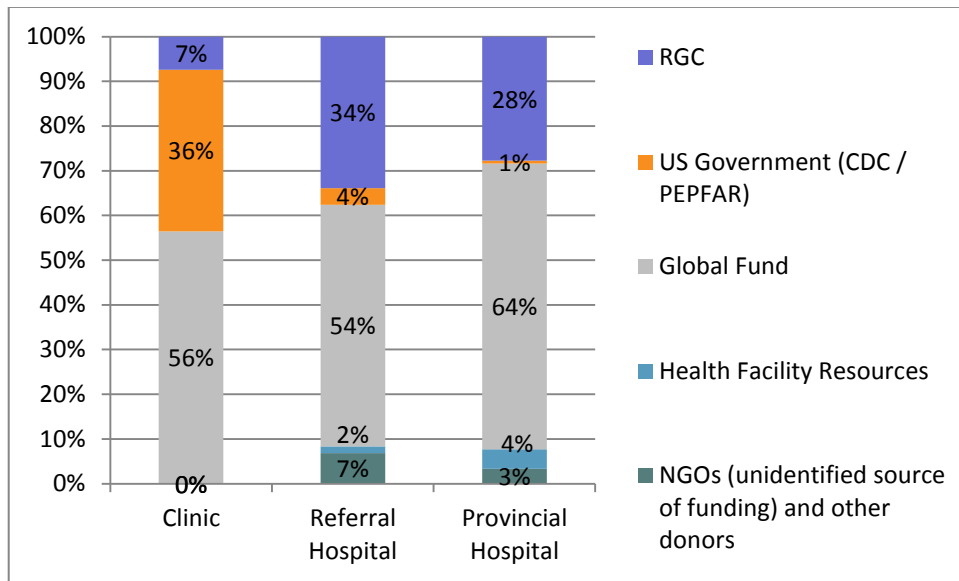
Cost for first-line ARVs was the largest category of costs across the facility types, ranging from 34 percent to 42 percent of total costs (Figure 4). At provincial hospitals, second-line ARVs were the second largest cost category (13 percent of total costs), while at the NGO clinic and referral hospitals, staff salaries and remuneration were the second largest cost category (13 percent and 15 percent of total costs, on average, respectively). All ARVs comprised 44 percent, 46 percent (differs from Figure 4 due to rounding error), and 49 percent of costs at the NGO clinic, referral hospitals, and provincial hospitals, respectively, while laboratory testing comprised 6 percent, 7 percent, and 14 percent of total costs, respectively across the three types of facilities. Indirect and step-down costs constituted about 14 percent to 15 percent of costs at the NGO clinic and provincial hospitals, and 21 percent of costs at referral hospitals, on average.

Figure 4: Breakdown on costs for ART



The Global Fund, which finances the majority of costs for CD4 and Viral Load laboratory tests and about 90 percent of the costs for ARVs and some of the drugs for treating OIs, accounted for the majority of costs across the three facility types, on average (Figure 5). The US government provides 36 percent of the costs at the NGO clinic, with RGC contributing towards ARVs, drugs for outpatient treatment of OIs and medical supplies. At referral hospitals, the US Government contributes to some other direct costs including training, mentoring and supervision, as well as direct salary support for some data staff. The US Government also contributes to similar items at provincial hospitals, but, because overall total costs were higher at provincial hospitals than they were at referral hospitals, it constitutes a smaller portion of the total costs at provincial hospitals than at referral hospitals. Health facility resources contribute to less than 5 percent of the costs across facility types, on average.

Figure 5: Sources of Financing for ART



Referral hospitals had the lowest volume of ART services, at just less than 2,000 visits per year, on average, serving about 380 patients per year (Table 8). The NGO clinic had over 5,000 visits for ART and served over 1,100 patients per year, while provincial hospitals had the highest volume of ART patients, at over 16,000 visits on average in 2016, serving over 3,000 patients.

In provincial hospitals, 94 percent of adult patients were on first-line ARVs, while for referral hospitals and the NGO clinic it was, 97 percent and 88 percent respectively.

Patients (excluding those on pre-ART) across the types of facilities tended to have visits around every 2 months (6 visits per year); the exception is for pediatric cases at referral hospitals, where the one hospital offering pediatric ART may have misreported the number of visits. Patients at the NGO clinic and referral hospitals tended to get about 1 CD4 count test per year, and 0.6 viral load tests per year, while patients at provincial hospitals received 2.6 CD4 count tests per year, on average, and 0.8 viral load tests per year. Patients at the NGO clinic were reported to receive fewer 'other' (usually biochemistry or hematology) laboratory tests per year than patients at the government hospitals.

Table 8: Average utilization of ART services

Service / Cost category	Item	Clinic	Referral Hospital	Provincial Hospital
Number of facilities		1	6	2
Number of visits*		5,292	1,981	16,397
Visits by type	ARV first-line	4,284	1,815	13,686
	ARV second-line	586	73	1,227
	Pediatric	78	3	1,698
Number of patient-years*		1,106	382	3,079
Patient-years by type	ARV first-line	690	353	2,612
	ARV second-line	93	11	181
	Pediatric	13	3	300
Visits per patient-year*		4.8	5.4	5.3
Visits per patient-year by type	ARV first-line	6.2	5.4	5.2
	ARV second-line	6.3	5.2	7.0
	Pediatric	6.0	0.9	5.7
Laboratory	CD4	1,282	429	7,913
	Viral Load	643	240	2,343
	Other	1,484	1,171	10,796
Laboratory tests per patient per year	CD4	1.2	1.1	2.6
	Viral Load	0.6	0.6	0.8
	Other	1.3	3.1	3.5

*Includes patients on pre-ART.

The cost per visit for first-line ART was generally around \$50, although at individual facilities the cost per visit ranged from under \$26 to more than \$65 (Table 9). The cost per visit for second-line ART ranged from about \$80 to more than \$100, on average across the facility types, while at individual facilities the cost per visit for second-line ART ranged from just over \$70 to over \$130.

The cost per patient per year for first-line ART was \$323, \$263, and \$214 on average for the NGO clinic, referral hospitals, and provincial hospitals, respectively. At individual facilities, the cost per patient per year for first-line ART ranged from \$160 to \$373. The cost per patient per year for second-line ART at individual facilities ranged from \$417 to \$976, while the cost per patient per year for pediatric ART ranged from \$143 to \$320 at individual facilities.

The cost per visit for treating infants exposed to HIV was about \$6.40 at provincial hospitals. At provincial hospitals, infants had about 8 visits per treatment. Data on the number of visits were missing at referral hospitals to calculate these costs.

Table 9: Unit costs of ART services

Unit	Clinic	Referral Hospital	Provincial Hospital
Number of facilities	1	6	2
Cost per visit			
First-line ART	\$52.06	\$50.31	\$45.22
Second-line ART	\$79.30	\$99.16*	\$108.49
Pediatric ART	\$49.62	\$162.73**	\$28.29
ART (all)	\$53.55	\$50.92	\$48.43
Cost per patient per year			
First-line ART	\$323	\$263	\$214
Second-line ART	\$501	\$618*	\$772
Pediatric ART	\$298	\$143**	\$320
ART (all)	\$256	\$267	\$240
PMTCT			
Number of facilities	0	4	1
Cost per visit for treatment of HIV exposed infants	N/A	N/A	\$6.37

*Five referral hospitals offered second-line ART services

**One referral hospital offered pediatric ART services.

When replacing individual facility input values with the average values for provincial hospitals, none of the inputs changed the cost per person per year for first-line ARV patients by 2 percent or more. At referral hospitals, changing the number of non-CD4 and non-viral load (VL) laboratory tests changed the average cost per patient per year for first-line ARV patients by 9 percent (by \$23.29 compared to a baseline average of \$263.18). One referral hospital reported a high number of non-CD4 and non-VL laboratory tests compared to other facilities in the sample; the accuracy of these data could not be confirmed. The number of patient-years per FTE at referral hospitals ranged from 33 to 309, while staffing costs constituted 15 percent of total costs (on average). Replacing the facility-specific number of patient-years per FTE with the average cost per patient per year for first-line ARV patients changes unit costs by 7 percent (by \$19.18 compared to a baseline average of \$263.18). All referral and provincial hospitals had outside NGO staff working in the delivery of ART, ranging from 18 percent of FTE to 84 percent of FTE. Referral hospitals with more or a greater percentage of staff paid by NGOs also tended to have more ART patients. Thus, there is no apparent association between the percentage of staff employed by NGOs and the ART patient-years per staff FTE (correlation coefficient = -0.02).

Facilities showed that patients on second-line ARVs predominantly were on an Atazanavir + Ritonavir or a Lopinavir + Ritonavir based regimen. Standardizing the percentage of patients on each type of regimen, and the number of pills used per patient per year for each regimen, would change the cost per patient per year on second-line ARVs by 10 percent per patient per year (by \$60 compared to a baseline average of \$618) at referral hospitals and 2 percent (by \$18 compared to a baseline average of \$772) at provincial hospitals. At referral hospitals, changing the number of non-CD4 and non-VL laboratory tests is again found to be a cost-driver, again due to one facility with a high number of these types of laboratory tests. The number patients per staff, similar to patients on first-line ARVs, is also again found to be a cost driver at referral hospitals reflecting the large range in this metric at referral hospitals.

Table 10: Results of variance analysis for ART services

Output	Referral Hospital		Provincial Hospital	
	Input	Absolute percentage change in unit cost	Input	Absolute percentage change in unit cost
Cost per person per year, first-line	Number of non CD4/VL lab tests per patient per year	9%	None	N/A
	Patient-years per FTE	7%		
Cost per person per year, second-line	Quantity/mix of second-line drugs per patient per year	10%	Quantity/mix of second-line drugs per patient per year	2%
	Number of non CD4/VL lab tests per patient per year	6%		
	Patient-years per FTE	5%		

FTE: Full Time Equivalent number of staff; VL: Viral Load; only inputs with an absolute percentage change of 2 percent or greater are included in the table.

3.2.3 Inpatient care for OIs

The average total cost of inpatient care for OIs was about \$1,650 at referral hospitals and \$12,300 at provincial hospitals per facility per year (Table 11). In both cases, this cost is less than 2 percent of the cost outpatient ART care. At referral hospitals, ward direct, indirect, and step-down costs comprise 91 percent of costs, on average, at referral hospitals and 71 percent of costs, on average, at provincial hospitals.

Table 11: Total costs for inpatient care for OIs, average by type of facility

Cost category	Referral Hospital	Provincial Hospital
<i>Number of facilities</i>	5	2
Pharmaceuticals	\$137	\$2,521
Laboratory testing	\$16	\$1,076
Ward direct, indirect, and step-down costs	\$1,493	\$8,684
Total	\$1,647	\$12,281

Referral hospitals and provincial hospitals had a similar admission rate of about 40 admissions per 1,000 ART patient-years (the NGO clinic reported that they did not refer any ART patients for inpatient care) (Table 12). Referral hospitals had substantially longer average length of stay (30.1 days per admission) than provincial hospitals (8.4 days per admission), and consequently a higher cost per admission (\$266 per admission at referral hospitals versus \$93 per admission at provincial hospitals) despite lower costs for drugs and laboratory procedures. Drug costs per admission averaged \$17.86 per admission at referral hospitals (range: \$4.53 to \$40.42) and \$19.00 per admission at provincial hospitals (range: \$17.17 to \$20.84).

If the cost of inpatient care for OIs were considered per patient on ART per year (whether admitted to an inpatient ward or not), it would add about \$6.40 to the cost of ART care at referral hospitals and almost \$8.00 at provincial hospitals.

Table 12: Average utilization and unit costs of inpatient care for OIs, average by type of facility

Service / Cost category	Item	Referral Hospital	Provincial Hospital
Number of facilities		5	2
Average number of admittances for OIs		10	133
Number of admittances per 1,000 patient-years		37.6	43.1
Average length of stay (days)		30.1	8.4
Average cost per admission		\$266	\$93
Average cost per ART patient-year		\$6.38	\$7.97

3.2.4 TB outpatient care

On average across the sample, the cost of TB outpatient care at health centers was about \$3,200 in total per facility per year, ranging from about \$600 to more than \$8,100 (Table 13). Referral hospitals incurred about \$18,000, on average, for TB outpatient care, ranging from \$12,000 to \$21,800 across the five sites. The two provincial hospitals incurred about \$113,300 for TB outpatient care, on average (about \$80,000 at one site and \$147,000 at the other).

Table 13: Total costs for TB outpatient services, average by type of facility

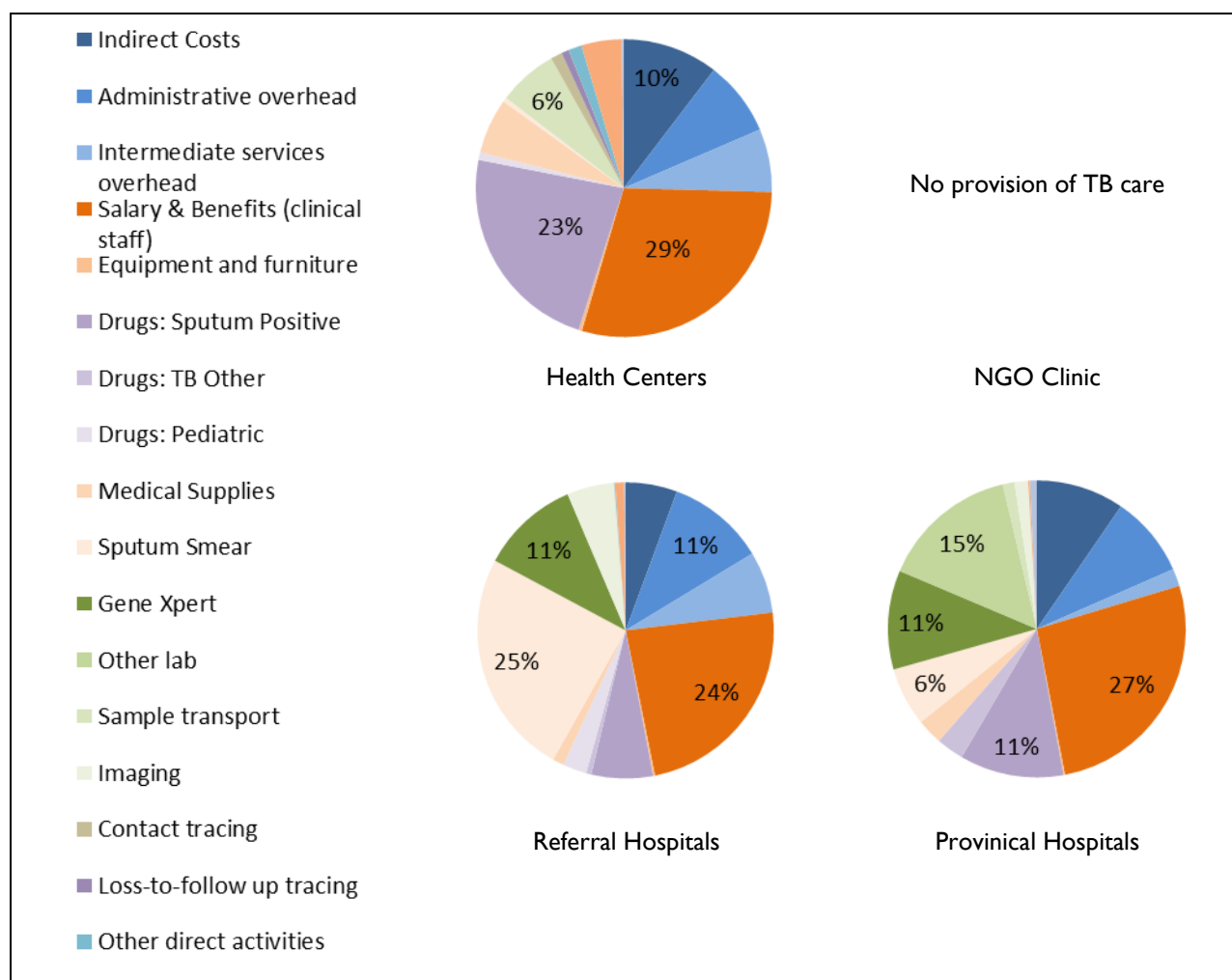
Cost category		Health Center	Referral Hospital	Provincial Hospital
Number of facilities		12	6	2
Building and utilities		\$285	\$909	\$9,002
Administrative step-down		\$258	\$1,944	\$10,041
Intermediate services step-down		\$217	\$1,225	\$2,156
Other operational indirect costs		\$45	\$112	\$1,827
<i>Subtotal: Step-down / indirect costs</i>		<i>\$804</i>	<i>\$4,191</i>	<i>\$23,027</i>
Salary & Benefits (clinical staff)		\$922	\$4,319	\$30,206
Equipment and furniture		\$12	\$38	\$195
Pharmaceutical	TB sputum positive	\$730	\$1,218	\$12,795
	Other TB	\$0	\$104	\$3,396
	Pediatric TB	\$26	\$474	\$9
Medical Supplies		\$190	\$223	\$3,150
Laboratory	Sputum Smear	\$15	\$4,481	\$7,238
	Gene Xpert	\$0	\$1,960	\$12,223
	Other	\$0	\$0	\$16,924
	Sample transport	\$205	\$0	\$1,440
Imaging		\$0	\$937	\$1,679
<i>Subtotal: Direct clinical costs</i>		<i>\$2,100</i>	<i>\$13,754</i>	<i>\$89,255</i>
Contact tracing		\$39	\$8	\$0
Loss-to-follow up tracing		\$26	\$1	\$0
Other direct activities		\$47	\$17	\$1
Training, mentoring, and supervision		\$138	\$170	\$203
Vehicles		\$7	\$32	\$852
<i>Subtotal: Other direct costs</i>		<i>\$258</i>	<i>\$228</i>	<i>\$1,056</i>
Total		\$3,161	\$18,173	\$113,338

Staff salaries and benefits were the largest category of costs at health centers and provincial hospitals, ranging from 27 percent to 29 percent of total costs (Figure 6). At referral hospitals, costs for sputum smears were almost the same as the cost for salaries and benefits (25 percent and 24 percent of total costs, respectively). Taken together, all laboratory costs represented more than salaries at the referral and provincial hospitals, on average, accounting for 35 percent of costs at referral hospitals and 32 percent of costs at provincial hospitals. At health centers, laboratory costs together accounted for about 6 percent of costs, mostly incurred for sample transport. Six of the 12 health centers visited did not do sputum tests within the facility, but transported them to a referral hospital (and, thus, the costs are not counted here as incurred at health facilities).

All TB drugs together accounted for 24 percent, 10 percent, and 14 percent of TB outpatient costs at health centers, referral hospitals, and provincial hospitals, respectively. Step-down and indirect costs accounted for 25 percent, 23 percent, and 20 percent of all costs at health centers, referral hospitals,

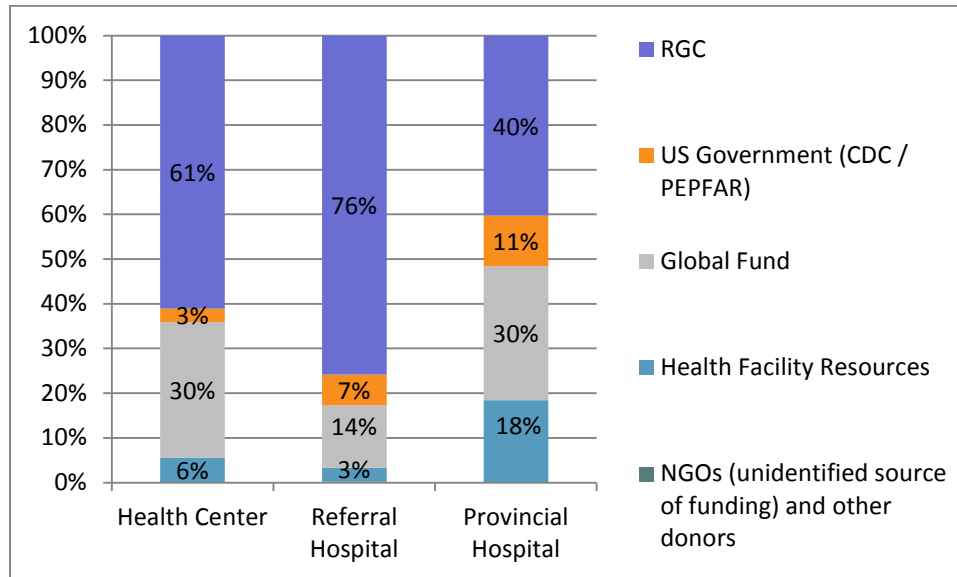
and provincial hospitals, respectively, while direct clinical costs accounted for 66 percent, 76 percent, and 79 percent of all costs at health centers, referral hospitals, and provincial hospitals, respectively.

Figure 6: Breakdown on costs for TB outpatient care



RGC financing accounted for 40 percent or more of costs at all types of health facilities, and upwards of 75 percent of all costs at referral hospitals (Figure 7). Note again that these figures do not include community-based activities. The Global Fund, which finances second-line and pediatric TB drugs sample transport, and GeneXpert and sputum culture lab tests, was the second largest source of financing, comprising 14 percent to 30 percent of costs, on average, across facilities. The US Government, which pays for first-line TB drugs as well as other clinical activities (including training, supervision, etc.), financed about 3 percent to 11 percent of costs, on average, across facility types. Hospital resources (from user fees charged elsewhere) accounted for 18 percent of costs at provincial hospitals, where some contract staff worked on TB – these costs are cross-subsidized by resources gained from other services (that is, the patient payments are accrued at the health facility in general across all services, and then these resources are used to pay contract staff, some of which provide TB services).

Figure 7: Sources of Financing for TB



Note that costs for community-based activities were not included in these analyses; since donors are reported to fund a large proportion of community-based activities; external financing for TB care in its totality will be higher than is shown in this figure.

Provincial hospitals had the highest volume of patients for TB outpatient services, both for diagnosis and treatment, with almost 2,000 patients for diagnosis, on average, over 3,700 visits for diagnosis, and treating almost 240 patients, on average (Table 14). Referral hospitals averaged about half the number of patients for diagnosis (about 1,000) compared to provincial hospitals. Referral hospitals treated less than a third (a little under 70 per hospital) of the number of patients that were treated at provincial hospitals. Health centers had the lowest volume of TB outpatient services, having, on average, 120 patients for diagnosis and treating about 30 patients per health center.

About 66 percent and 69 percent of adult TB patients at health centers and referral hospitals, respectively, were SS+, while about 41 percent of adult TB patients at provincial hospitals were SS+. The treatment success rate for SS+ patients was 89 percent at health centers, 94 percent at referral hospitals, and 71 percent at provincial hospitals.

As mentioned above, records on the number of visits for TB outpatient care after diagnosis were often incomplete or unavailable, and these numbers are not available.

Table 14: Average utilization of TB outpatient services

Service / Cost category	Health Center	Referral Hospital	Provincial Hospital
<i>Number of facilities</i>	12	5	2
Patients for diagnosis	120	1,034	1,963
Visits for diagnosis	276	1,364	3,704
Sputum slides	112	1,616	4,527
Gene Xpert tests	9	73	987
X-rays images	0	50	852
Patients treated (outpatient)	31	68	239
...of which SS+	19	31	96
...of which Pediatric	2	23	3
...of which other TB	10	14	141
Patients successfully treated (outpatient)	26	53	166
...of which SS+	17	29	68
...of which Pediatric	2	14	1

The cost of TB diagnosis, inclusive of all visits and laboratory testing, on average ranged from \$18.17 at health centers to \$44.12 at referral hospitals. Again, referral and provincial hospitals performed sputum tests, etc., for patients at health centers; those costs are included here at referral and provincial hospitals. Thus, the costs of diagnosis are expected to be higher at referral and provincial hospitals, all else equal, than at health centers. The cost of diagnosis at individual facilities ranged from \$2.15 to about \$104 (Table 15).

Note that the cost of diagnosis is not included in the cost per patient treated; the full cost of diagnosing and treating a patient is the sum of the cost of TB diagnosis and the cost of TB treatment. The cost per SS+ patient average from \$39.32 at health centers to \$119.59 at provincial hospitals. Cost differences are largely accounted for by differences in costs for staff and laboratory monitoring (drugs costs were generally similar across facilities for SS+ patients). The cost per SS+ patient successfully treated ranged from about \$42 at health centers, on average, to \$170 per patient at provincial hospitals, with the lower treatment success rate at provincial hospitals inflating costs for this type of facility (compared to health centers), above differences in staff and laboratory costs. Treatment of non-sputum positive patients tended to be higher in costs than treatment of sputum positive patients due to differences in drug regimens. At provincial hospitals, a few patients with multiple drug resistant TB were treated at least partially on an outpatient basis, but we were not able to fully separate the drugs for these patients from other patients, and thus are not able to report the cost of treating multiple-drug resistant TB. However, this does account to some extent for higher costs at provincial hospitals for non-sputum positive patients.

Table 15: Unit costs of TB outpatient services

Unit	Health Center	Referral Hospital	Provincial Hospital
<i>Number of facilities</i>	12	5	2
Cost of TB Diagnosis	\$18.17	\$44.12	\$34.55
TB SS+ per patient	\$39.32	\$54.27	\$119.59
TB Other per patient	\$57.48	\$141.52	\$203.39
Pediatric TB per patient	\$46.31	\$35.97	\$77.81
TB SS+ per patient successfully treated	\$41.95	\$64.70	\$169.53
TB Other per patient successfully treated	\$74.75	\$186.95	\$302.22
Pediatric TB per patient successfully treated	\$100.64	N/A	\$194.52

The cost drivers for diagnosis at health centers reflect differing utilization of health facilities or staff providing TB care. Standardizing the staff per patient ratio changes the average cost per patient for diagnosis by 5 percent (a change of \$0.98 against the baseline average of \$18.17), as does standardizing the average salary of staff. Staff tended to be salary grade B or C, although 3 health centers also had contract staff working part-time for TB care (generally as part of their duties in the clinic where TB services were delivered). Facility indirect and overhead costs also were identified as a cost driver at health centers, again reflecting utilization as an important component in determining unit costs.

Two of the five referral hospitals incurred costs for imaging, and at one of these hospitals, imaging represented about 20 percent of the total costs. Thus, standardizing the cost of imaging is identified as a cost driver at referral hospitals, with hospitals that have X-ray capabilities tending to incur higher costs for diagnosis. A second cost driver at referral hospitals, also found at provincial hospitals, was the number of sputum slides per patient diagnosed with TB. This is not the slide positivity rate, because referral and provincial hospitals receive sputum samples from lower level facilities, and the number of sputum slides per patient diagnosed with TB is at least partially due to the extent to which they handle referred samples.

No cost drivers were identified at provincial hospitals when assessing the cost per adult patient successfully treated, while multiple cost drivers were found at health centers and referral hospitals. Four cost drivers were identified at referral hospitals, all also found at health centers although with a different degrees of effect on the average unit costs. First, the percentage of patients successfully treated ranged from 44 percent to 100 percent at hospitals and from 74 percent to 100 percent at referral hospitals. Standardizing the treatment success rate changes the average unit costs per adult patient successfully treated by 5 percent at health centers and 46 percent at referral hospitals, with higher success rates lowering the cost per patient successfully treated. Second, as per the cost per patient for diagnosis at health centers, the number of patients per FTE staff and facility indirect and overhead costs are important cost drivers. Finally, the quantity of drugs used per patient treated also is a cost driver, and standardizing the amount of Rifampicin 150mg / Isoniazid 75mg / Pyrazinamide 400mg / Ethambutol Hydrochloride 275mg and Rifampicin 150mg + Isoniazid 75mg used per patient treated changes unit cost per patient successfully treated by 14 percent at health centers and 15 percent at referral hospitals. In part, this last cost driver is also a product of the successful treatment rate (because patients that do not

complete the treatment cycle will use less drugs) but also in part may be due to wastage and the use of different drugs for SS+ and other adult patients diagnoses with TB.

Further cost drivers found at the health center level include the average salary of staff, as was found for the cost per patient for diagnosis. Finally, the amount of money spent on loss-to-follow-up tracking was found to be a cost driver. However, some health centers incur more costs for loss-to-follow-up tracking compared to others (some incurred no costs) but health centers with low or little costs may be working with community-based groups for this activity. Thus, this finding is difficult to interpret without further data.

Table 16: Results of variance analysis for TB outpatient services

Output	Health Centers		Referral Hospital		Provincial Hospital	
	Input	Absolute percentage change in unit cost	Input	Absolute percentage change in unit cost	Input	Absolute percentage change in unit cost
Cost per patient for diagnosis	FTE per patient	5%	Cost of imaging	5%	Sputum slides per diagnosis	3%
	Average salary of staff	5%	Sputum slides per diagnosis	4%		
	Overhead and step-down costs	3%				
Cost per adult patient successfully treated	Quantity of drugs per patient	14%	Percentage successfully treated	46%	None	N/A
	Overhead and step-down costs	7%	FTE per patient	22%		
	FTE per patient	5%	Quantity of drugs per patient	15%		
	Percentage successfully treated	4%	Overhead and step-down costs	8%		
	Loss to follow-up tracking	3%				
	Average salary of staff	2%				

FTE: Full Time Equivalent number of staff; only inputs with an absolute percentage change of 2 percent or greater are included in the table.

3.2.5 TB inpatient care

The average total cost of inpatient care for TB was about \$14,100 at referral hospitals and \$73,650 at provincial hospitals per facility per year (Table 17). This amounts to 78 percent of the cost of outpatient TB care at referral hospitals and 65 percent at provincial hospitals. At referral hospitals, ward direct,

indirect, and step-down costs comprise 87 percent of costs, on average, and 52 percent of costs, on average, at provincial hospitals.

Table 17: Total costs for inpatient care for TB, average by type of facility

Cost category	Referral Hospital	Provincial Hospital
<i>Number of facilities</i>	5	2
Pharmaceuticals	\$1,765	\$25,305
Laboratory testing	\$18	\$10,288
Ward direct, indirect, and step-down costs	\$12,353	\$38,071
Total	\$14,136	\$73,665

Overall, referral hospitals admitted 49 patients for TB care (range: 10 to 118), while provincial hospitals admitted 385 patients for TB care on average (range: 351 to 419) (Table 18). Referral hospitals admitted about 408 patients for every 1,000 patients diagnosed with TB, while provincial hospitals admitted about 617 patients for every 1,000 patients diagnosed with TB (including patients admitted to inpatient care and patients diagnosed on an outpatient basis). None of the health centers sampled reported referring TB patients for inpatient care.

Referral hospitals had substantially longer average length of stay (almost 110 days per admission) than provincial hospitals (about 23 days per admission), and consequently a higher cost per admission (\$517 per admission at referral hospitals versus \$187 per admission at provincial hospitals) despite lower costs for drugs and laboratory procedures (about \$22 per admission at referral hospitals and \$43 at provincial hospitals). If the cost of inpatient care for TB are divided by the total number of patients treated for TB (inpatient and outpatient), it amounts to \$136 per patient at referral hospitals and \$116 per patient at provincial hospitals.

Table 18: Average utilization and unit costs of inpatient care for TB, average by type of facility

Service / Cost category	Item	Referral Hospital	Provincial Hospital
<i>Number of facilities</i>		5	2
Number of admittances		49	385
Number of admittances per 1,000 patients		407.7	616.6
Average length of stay (days)		109.5	23.4
Average cost per admission		\$517	\$187
Average cost per TB patient		\$136	\$116

4. DISCUSSION

This report summarizes the cost of providing HIV/AIDS and TB services at health facilities in Cambodia. It presents a detailed and comprehensive approach to assessing the costs of these services, including facility step-down costs and indirect costs. As such, it can serve as the basis for future resource needs assessments and other financial projections assessing the costs of these services in the future. It could also be used to track how (and why) unit costs change over time.

4.1 Main findings

1. **HIV/AIDS and TB services in Cambodia are dependent on donor funding.** ART is the most donor dependent, with upwards of 2/3rds of all costs financed by donors (US Government, The Global Fund, and other donors). The bulk of this is for procurement of ARVs, and procurement for disease specific (both TB and HIV) drugs is largely financed by donors. Procurement of HIV and TB commodities has been a challenge in other settings during financial transitions, and securing not just the financing, but ensuring that logistic and administrative capacity is in place may also need to be addressed in Cambodia.

There is a substantial amount (e.g., 10 percent of costs at referral hospitals) of investment from the US Government in terms of staff salaries and support for ART activities. Further, all referral and provincial hospitals reported that NGO staff worked to provide ART services. Whereas for other services, except VCCT at provincial hospitals, all staff were paid either by government or health facility resources. Thus, securing the staff necessary to deliver ART services at hospitals will be an important issue to address when financing of ART is transitioned from external to domestic financing.

For VCCT, 20 percent to 35 percent of costs are paid by donors (excluding the NGO clinic with is largely dependent on donor funding for its operation). Because VCCT is overall less expensive than ART, these funds may be easier to replace with domestic resources, but still include staff salaries (at provincial hospitals) and activities (e.g., training, supervision, risk tracking). TB outpatient services may be the least donor dependent of the outpatient services assessed, with between 10 percent and 25 percent of costs funded by donors, largely for drugs but also for other important activities, including sample transport, training, and supervision.

Many ancillary support activities that are required to successfully deliver services, such as training, supervision, laboratory sample transport, loss to follow-up tracking, etc., are largely supported by donors. While not a substantial proportion of the total costs of delivering services, ensuring their continuity during transition remains important.

The results of this analysis in general, and for sources of financing in particular, may not be applicable to parts of Cambodia not included in this analysis. Donor support is variable by province and region, and more detailed understanding of what activities are done and what activities use donor support in other parts of Cambodia may be necessary.

2. **There is a substantial range in the unit cost of providing services across facility types and among individual facilities.** The cost per patient-year for first-line ART is widely spread around its corresponding average for each type of facility. At some facilities it is only two-thirds the average cost, while at other facilities it is 1.45 times greater than the average.

For the cost per SS+ patient successfully treated, costs at individual facilities can range from one-third of the average cost to over 2.6 times the average cost.

Some variability in the unit costs of providing services is to be expected, given that different facilities will have different service volumes, staffing levels, etc. However, large ranges in unit costs may indicate inefficiencies in the delivery of services. Large ranges also make decisions about, for example, establishing reimbursement rates harder to accurately assess. Further work to understand the reasons for the wide ranges in unit costs and working to limit the variability in costs can help ensure that HIV/AIDS and TB services are sustainable and help enable planning for financing of the services.

In many cases, the level of effort of staff per patient served is an important determinant of the differences in costs. Staff salaries and benefits account for about one quarter of TB services and one quarter to nearly one half of VCCT services. At health centers, HIV and TB services typically (but not universally) are delivered in a clinic that is not specifically for HIV or TB (i.e., HIV and TB services are integrated into another service, be it ANC, vaccination, or general outpatient care). In these cases, deriving efficiencies from staff effort may be difficult. However, at referral and provincial hospitals, some efficiency may be gained by rationalizing staff load (while ensuring that enough staff with the necessary skills to deliver services remain).

Treatment success rates for TB patients were highly variable. Identifying and remedying facilities with low treatment success rates will increase both the efficiency and the effectiveness of TB services.

3. **Cost for ART is driven by drug costs, while staff salary and benefits is the largest cost category for most other services.** ARVs constitute nearly half of the costs of first-line ART (Annex D), and well over half of the costs of second-line ART. While the price of ARVs has fallen in recent years and the future is uncertain, it is not likely that prices for ARVs will fall much further in the future. As Cambodia moves to the 'test and treat' model of ART and more patients enroll on ART, the financing of ARVs must be accounted for. For outpatient TB services at the hospital level, laboratory services taken together are the largest cost category, where again prices are unlikely to drop dramatically in the future.

While patients on second-line ART constituted 5.8 percent of all ART patients, they represented 14.5 percent of ART costs, and second-line drugs can be up to 12 percent of the costs of delivering ART at some types of facilities. Investigation of the use of second-line antiretroviral drugs may be warranted. This analysis found use of these drugs was widely variable, on a per patient basis, across sites. Part of this variation found in this study may be the result of poor record keeping (rather than actual differences in usage) but likely some reduction in wastage of second-line antiretroviral drugs may be possible.

The quantity of drugs used per TB patient also showed high degrees of variability. To some degree, this variability may be a product of treatment success rates and poor record keeping, but may also present unnecessary variation in the treatment of patients. Some of the variation may be reduced over time, as, for example, the use of streptomycin injections are phased out in favor of use of second-line drugs, but active investigation and management of TB drug use would increase the efficiency of service delivery.

4. **Facility step-down and indirect costs** represent a substantial proportion of the overall costs for VCCT (averaging 31 percent to 46 percent of total costs across the facility types), and a not insignificant proportion of the costs for outpatient TB care (20 percent to 24 percent of total costs across the facility types) and ART (14 percent to 21 percent of total costs across

the facility types). The current financing of these costs has not been fully explored – it is likely a mix of government spending through budgetary process and block grants as well as user fee revenue. As financing of HIV/AIDS and TB services shifts, assessment of whether new payment mechanisms need to (and do) account for these costs may be necessary.

5. **Inpatient care for TB is a large component of TB costs.** Of all costs for TB care, inpatient care represented about 44 percent of TB cost at referral hospitals and 39 percent of all costs at provincial hospitals. Inpatient care costs at referral hospitals is driven by long lengths of stay (over 3.5 months, on average) in the inpatient ward, coupled with about 40 percent of TB patients being admitted to the ward. These findings are, generally, longer than what was found in a previous study, which found that the average length of stay at provincial hospitals for the TB ward to be between 8 and 29 days⁵ (while in this study it was just over 4 days at one hospital and over 40 at the other). The same study found the average length of stay at lower level hospitals to be between 21 and 68 days (while for this study the average length of stay ranged from 56 to 176) days. Three of the five referral hospitals in this study admitted 21 or fewer patients for TB in 2016, while one admitted 77 patients and another admitted 118 patients. Further investigation into whether or not the inpatient care for TB patients can be limited may be warranted.

On the other hand, inpatient admittances for ART patients was more limited than for TB, with 3 percent to 4 percent of ART patients at the hospital level being admitted for inpatient care, and less than 2 percent of ART expenses devoted to inpatient care. The admission rate for ART patients may decline in the future due to the adoption of the test and treat strategy, which may lower the OI rate among ART patients in the future compared to 2016.

4.2 Limitations

The study has limitations that should be kept in mind when interpreting or using the data presented in this report. The most prominent of these include:

1. **Limited sample size:** The sample frame did not include low burden of disease provinces, and was limited in the number of and type of facilities that were visited. While covering four provinces, the applicability of the results in this report to other provinces is not testable without further study. Further, the limited size of the sample gives us little ability to generate standard errors, confidence intervals, or other measures of the variance in the findings. Instead we have presented the range of costs and unit costs found. While individual facilities not included in the sample may have costs or unit costs outside the ranges we found here, the ranges found in this study are wide enough that we would expect similar heterogeneity in the costs of providing services in health facilities not included in this sample. Finally, some types of facilities, such as national referral hospitals, NGO hospitals, and private hospitals, were not included in this study, and the results found here are likely not applicable to these types of facilities.
2. **Incomplete, inaccurate, or missing data:** Data collectors found that data were generally, although not universally, available. The most frequently missing data concerned numbers of

⁵ Martin, A. September 3, 2012. Cambodia Hospital Costing and Financial Management Study. Phnom Penh, Cambodia: Belgian Development Agency (BTC) and University Research Company (URC).

services provided by intermediate clinic units to final medical units; in these cases other proxy variables (such as overall utilization) were used to allocate intermediate clinical services costs to final medical units. In some cases, the prices of drugs for treating OIs could not be found from staff or local pharmacies. In these cases, international median prices were used.⁶ Comparing international reference prices (such as listed in the Global Price Reporting Mechanism⁷ or the Global Drug Facility⁸) showed close (in most cases identical) prices between these databases and prices found locally, although occasionally local prices were markedly higher than international median prices.

Inaccurate and incomplete data also existed. We noted above that data on the number of visits for TB DOTS drug pick-up, for example, were frequently not recorded at facilities, and we could not calculate the cost per visit for TB care and one instance where the number of visits for pediatric ART appeared to be in error. Further inaccuracies in visit data may exist for other services, and the cost per visit data presented above should be treated with caution. For example, we used the number of visits as an allocation criterion, and lack of data on the number of visits for TB (in particular) may under-estimate the costs of providing these services (we did, however, have records reflecting the number of visits for TB diagnosis). On the other hand, data on the number of patients seems more robust; many facilities had received supervision visits specifically addressing this issue. Further, data on the number of patients is reported to higher levels of the health system, and staff at facilities are more aware of the need to track these data than they are for the number of visits. Comparing the number of patients for ART obtained from facilities with those reported nationally⁹ showed a close, although usually not identical, match.

We also did not collect data on diagnoses or co-morbidities of patients, especially which received inpatient care. These data may have helped explain differences in length of stay, costs, and other factors between sites.

Financial data on indirect costs and facility expenditures was generally available, and generally based on accounting and other record keeping. Thus, it appeared to be of reasonable quality. Allocation of staff between their multiple duties was reported by data collectors to be challenging in many facilities; the numbers used for this allocation reflect best estimates of the proportion of time staff spend delivering HIV/AIDS and TB services, but some inaccuracy in these estimations is certainly present in the results reported. Occasionally, the estimates seem to not be realistic, but we have retained them in these analyses due to lack of better data. The results of the study, thus, are not precise estimates of the cost of delivering services, but should be interpreted as indicative of the cost of delivering services.

Finally, we relied on facility staff reports (as well as expert interviews) to assess the sources of financing. Facility staff on occasion could not identify the source of financing, or may have misidentified the sources of funding. Thus, the sources of financing analyses may contain some imprecision.

⁶ See <http://mshpriceguide.org/en/home/>; accessed 08 September 2017

⁷ See <http://apps.who.int/hiv/amds/price/hdd/>

⁸ See http://www.stoptb.org/gdf/drugsupply/drugs_available.asp

⁹ Available at: <http://www.nchads.org/index.php?id=6>

3. It was outside of this study's scope and budget to include costs for community-based (in addition to facility-based) activities. For some services, community-based activities are a vital component of the overall service delivery and disease control efforts, and the lack of inclusion in this analysis is not an indication that these are not important activities. Further work on the cost of community-based activities would ideally complement this study.
4. Sources of financing: Facility staff reported the sources of financing for their inputs and activities. In some cases, facility staff may not be fully aware of the ultimate funding mechanism for all inputs and activities, and inaccuracies in their reporting are likely. Thus, the assessment of sources of funding should be viewed as a gross estimation only, and not as a precise estimation of the exact contribution of different partners.

4.3 Future uses of these data

The data could be used *as one input* to consider when setting reimbursement rates for the services assessed by insurers (e.g., NSSF or HEF) to help ensure that providers are adequately reimbursed for their services. If providers are under-paid, or the payment is not inclusive of all the necessary items, providers are more likely to reduce the intensity of resources used to deliver those services, risk-select healthier patients or those without multiple co-morbidities, or charge patients the difference. Similarly, these data could serve as a basis for negotiations to contract HIV/AIDS and TB services to private providers.

In addition to informing unit costs, the data presented here can help to inform resource needs projections or actuarial projections (e.g., estimating the cost to insurers if they were to cover HIV/AIDS and TB services). In these cases, identifying which line items will be reimbursed by insurance companies (versus, for example, continued support from NCHADS or CENAT) will be necessary. We have tried to present the data in highly disaggregated form, but further disaggregation may be necessary to build these models to address who will finance the different line-items. For example, we have included the estimated cost of building rent in these estimates. If the data are used for contracting with private providers, cost of buildings should be included. Most government health facilities are owned by the government, and a social health insurance scheme, for example, may not reimburse facilities for these costs (building rental costs constitute on average about 5 percent of ART costs, 8 percent of VCCT costs, 6 percent of TB outpatient care costs, and 5 percent of inpatient care costs). The detailed data collected for these analyses enables these line-item inclusion and exclusion decisions to be accounted for in projection models.

Finally, these data can be used as a starting point for tracking and monitoring the cost of delivering services over time as, for example, input prices (e.g., costs for ARVs) change or as efforts to improve the efficiency of service delivery are made.

ANNEX A: ALLOCATION METRICS FOR INDIRECT COSTS

Indirect cost	Allocation metric
Vehicles	Number of full-time equivalent (FTE) staff, less ambulance(s), which are treated as step-down costs
Medical gases	Number of bed-days
Patient food	Number of bed-days
Staff Food	Number of FTE staff
Rent of building	Size of clinic or ward (estimated in non-measured areas of the facility by the number of FTE staff; in facilities where applicable, the size of the clinics offering HIV and TB services, laboratory, imagining, and relevant inpatient wards were measured, as well as the size of the facility).
Electricity	Size of office, clinic, or ward
Fuel and oil	Number of vehicles
Cooking gas	Number of bed-days
Water	Number of FTE staff
Building/General Maintenance	Size of office, clinic, or ward
Vehicle maintenance, repair & licensing	Number of vehicles
Cleaning supplies / expenses	Size of office, clinic, or ward
Bed and linen supplies	Number of bed-days
Telecommunication (phone)	Number of FTE staff
Telecommunication (mobile)	Number of FTE staff
Telecommunication (internet)	Number of FTE staff
Office Supplies/Printing	Number of FTE staff
Insurance (car, building; insurance for staff should be included in salary)	Number of FTE staff
Meeting/Visitor Reception	Amount of direct costs
Uniforms	Number of FTE staff working in clinical areas
Treasury Tax	Amount of direct costs
Festival/Ceremony Expense	Amount of direct costs
Other Indirect Costs	Number of FTE staff

ANNEX B: ALLOCATION METRICS FOR STEP-DOWN COSTS

Office or intermediate service center	Allocation metric
Administrative and logistical services	
Financing and logistics (F&L)	Number of FTE staff
General Administrative Office (GAO)	Number of FTE staff
General Nursing Services	Number of FTE nursing staff
Housing and accommodation services	Number of beds
Human Resources Management (HRM)	Number of FTE staff
"Information systems (IS)	Number of FTE staff
Medical records (if separate from PMRS)	Utilization
HEF (health equity fund) and post ID poor services department	Utilization
Revenue / cashier	Utilization
Transport services	Utilization
Office services	Number of FTE staff
Bioengineering	Utilization
Catering / kitchen / dietary services	Number of bed-days
Cleaning	Size of office, clinic, or ward
Laundry	Number of bed-days
Maintenance	Size of office, clinic, or ward
Security	Size of office, clinic, or ward
Intermediate services	
CSSD (sterilization or infection control)	Number of sterilization sets by clinic/ward if available, else utilization
Mortuary	Utilization
General Pharmacy	Number of prescriptions issued by clinic/ward if available, otherwise utilization
HIV/AIDS Pharmacy	Allocated to HIV services
Registration / customer service (PMRS)	Utilization
Stores / supplies warehouse (storage area for non-medical supplies)	Utilization
Waste and Incinerator Services	Utilization
Blood bank	Units of blood by clinic/ward
Laboratory	Number of tests by clinic/ward
Imaging (Radiography / x-ray / ultrasonography)	Number of images / scans by clinic/ward
Anesthesiology	Number of discharges from the operating theater, by clinic/ward
Ambulance services	Number of discharges from the emergency room, by clinic/ward

Casualty / Emergency room	Number of discharges, by clinic/ward
Occupational therapy / Physiotherapy	Number of occupational therapy / physiotherapy visits to clinics/wards
Operating Theater & recovery room	Discharges by clinic/ward
Orthopedics	Number of orthopedics visits to clinics/wards
Training Unit	Number of FTE clinical staff

ANNEX C: LIST OF FACILITIES VISITED

Province	Provincial Hospital	Referral Hospital	Health Center	Clinic
Phnom Penh		Dong Koa		
		Porchen Tong		
			Boeung Thom	
			Kilomet 9	
			Ponhea Pun	
Kampong Cham			Tuek Thla	
				Chouk Sor
		Choeung Prey		
		Srey Santhor		
			Areak Thnut	
Siem Reap			Kien Chrey	
			Roca Ar	
			Sambour	
	Siem Reap			
		Kralanh		
Battambang			Khong Phnom	
			Russey Lork	
			Samroang	
			Sorsor Sdom	
	Battambang			
		Sampov Lun		

ANNEX D: DETAILED BREAKDOWN OF TOTAL COSTS

Note that percentages may not add up to subtotals or to 100 percent for each column due to rounding errors.

VCCT

Service / Cost category	Item	Percentage of total costs			
		Health Center	Clinic	Referral Hospital	Provincial Hospital
Building and utilities		10%	4%	7%	6%
Administrative step-down		8%	7%	17%	13%
Intermediate services step-down		10%	25%	21%	16%
Other operational indirect costs		2%	0%	1%	3%
Subtotal: Step-down and indirect costs		29%	36%	46%	37%
Salary & Benefits (clinical staff)		45%	20%	36%	43%
Equipment and furniture		1%	6%	1%	1%
Medical Supplies		4%	7%	6%	3%
Laboratory	Rapid tests	19%	7%	10%	15%
Partner notification		0%	0%	0%	0%
Other direct activities		0%	20%	0%	0%
Training, mentoring, and supervision		2%	4%	1%	0%
Vehicles		0%	0%	0%	1%
Subtotal: Direct costs		71%	64%	54%	63%

ART

Service / Cost category	Item	Percentage of total costs		
		Clinic	Referral Hospital	Provincial Hospital
Building and utilities		6%	10%	6%
Administrative step-down		6%	6%	4%
Intermediate services step-down		1%	5%	5%
Other operational indirect costs		0%	0%	1%
Subtotal: Step-down and indirect costs		14%	21%	15%
Salary & Benefits (clinical staff)		13%	15%	11%
Equipment and furniture		2%	0%	0%
Pharmaceutical	ARV first-line	34%	42%	36%
	ARV second-line	10%	5%	12%
	Pediatric	1%	0%	3%
	Other Drugs	12%	8%	8%
Medical Supplies		2%	1%	0%
Laboratory	CD4	2%	2%	7%
	Viral Load	4%	4%	6%
	Other	0%	1%	2%
	Sample transport	0%	0%	0%
Subtotal: Direct clinical costs		81%	78%	85%
Loss-to-follow up tracing		0%	0%	0%
Other direct activities		4%	0%	0%
Training, mentoring, and supervision		2%	1%	0%
Vehicles		0%	0%	0%
Subtotal: Other direct costs		5%	1%	0%

ART: Breakdown of cost for patients on first-line ARVs

Service / Cost category	Item	Percentage of total costs		
		Clinic	Referral Hospital	Provincial Hospital
Building and utilities		7%	10%	6%
Administrative step-down		6%	7%	4%
Intermediate services step-down		1%	5%	5%
Other operational indirect costs		0%	1%	1%
Subtotal: Step-down and indirect costs		14%	22%	16%
Salary & Benefits (clinical staff)		14%	17%	12%
Equipment and furniture		2%	0%	0%
Pharmaceutical	ARV first-line	43%	44%	47%
	ARV second-line	N/A	N/A	N/A
	Pediatric	N/A	N/A	N/A
	Other Drugs	13%	7%	8%
Medical Supplies		2%	1%	0%
Laboratory	CD4	2%	2%	8%
	Viral Load	4%	4%	6%
	Other	0%	2%	2%
	Sample transport	0%	0%	0%
Subtotal: Direct clinical costs		80%	78%	84%
Loss-to-follow up tracing		0%	0%	0%
Other direct activities		4%	0%	0%
Training, mentoring, and supervision		2%	1%	0%
Vehicles		0%	0%	0%
Subtotal: Other direct costs		6%	1%	0%

ART: Breakdown of cost for patients on second-line ARVs

Service / Cost category	Item	Percentage of total costs		
		Clinic	Referral Hospital	Provincial Hospital
Building and utilities		4%	5%	3%
Administrative step-down		4%	4%	2%
Intermediate services step-down		1%	3%	2%
Other operational indirect costs		0%	0%	0%
Subtotal: Step-down and indirect costs		9%	12%	8%
Salary & Benefits (clinical staff)		9%	9%	5%
Equipment and furniture		1%	0%	0%
Pharmaceutical	ARV first-line	N/A	N/A	N/A
	ARV second-line	63%	70%	77%
	Pediatric	N/A	N/A	N/A
	Other Drugs	8%	4%	3%
Medical Supplies		1%	0%	0%
Laboratory	CD4	2%	1%	3%
	Viral Load	3%	2%	2%
	Other	0%	0%	1%
	Sample transport	0%	0%	0%
Subtotal: Direct clinical costs		87%	88%	92%
Loss-to-follow up tracing		0%	0%	0%
Other direct activities		3%	0%	0%
Training, mentoring, and supervision		1%	0%	0%
Vehicles		0%	0%	0%
Subtotal: Other direct costs		4%	0%	0%

TB Outpatient

Service / Cost category	Item	Percentage of total costs		
		Health Center	Referral Hospital	Provincial Hospital
Building and utilities		9%	5%	8%
Administrative step-down		8%	11%	9%
Intermediate services step-down		7%	7%	2%
Other operational indirect costs		1%	1%	2%
Subtotal: Step-down and indirect costs		25%	23%	20%
Salary & Benefits (clinical staff)		29%	24%	27%
Equipment and furniture		0%	0%	0%
Pharmaceutical	TB Sputum positive	23%	7%	11%
	TB other	0%	1%	3%
	Pediatric	1%	3%	0%
Medical Supplies		6%	1%	3%
Laboratory	Sputum Smear	0%	25%	6%
	Gene Xpert	0%	11%	11%
	Other	0%	0%	15%
	Sample transport	6%	0%	1%
Imaging		0%	5%	1%
Subtotal: Direct clinical costs		66%	76%	79%
Contact tracing		1%	0%	0%
Loss-to-follow up tracing		1%	0%	0%
Other direct activities		1%	0%	0%
Training, mentoring, and supervision		4%	1%	0%
Vehicles		0%	0%	1%
Subtotal: Other direct costs		8%	1%	1%

TB Outpatient: Cost per patient diagnosed

Service / Cost category	Item	Percentage of total costs		
		Health Center	Referral Hospital	Provincial Hospital
Building and utilities		9%	5%	7%
Administrative step-down		9%	9%	8%
Intermediate services step-down		9%	4%	2%
Other operational indirect costs		2%	1%	2%
Subtotal: Step-down and indirect costs		29%	18%	19%
Salary & Benefits (clinical staff)		45%	34%	25%
Equipment and furniture		1%	0%	0%
Pharmaceutical	TB Sputum positive	N/A	N/A	N/A
	TB other	N/A	N/A	N/A
	Pediatric	N/A	N/A	N/A
Medical Supplies		7%	1%	3%
Laboratory	Sputum Smear	1%	24%	11%
	Gene Xpert	0%	20%	15%
	Other	0%	0%	22%
	Sample transport	7%	0%	3%
Imaging		0%	1%	2%
Subtotal: Direct clinical costs		61%	81%	80%
Contact tracing		1%	0%	0%
Loss-to-follow up tracing		0%	0%	0%
Other direct activities		1%	0%	0%
Training, mentoring, and supervision		7%	1%	0%
Vehicles		0%	0%	1%
Subtotal: Other direct costs		10%	1%	1%

TB Outpatient: Cost per SS+ patient

Service / Cost category	Item	Percentage of total costs		
		Health Center	Referral Hospital	Provincial Hospital
Building and utilities		10%	3%	14%
Administrative step-down		8%	8%	17%
Intermediate services step-down		3%	4%	3%
Other operational indirect costs		0%	1%	2%
Subtotal: Step-down and indirect costs		21%	17%	37%
Salary & Benefits (clinical staff)		9%	25%	41%
Equipment and furniture		0%	0%	0%
Pharmaceutical	TB Sputum positive	59%	38%	15%
	TB other	N/A	N/A	N/A
	Pediatric	N/A	N/A	N/A
Medical Supplies		4%	1%	5%
Laboratory	Sputum Smear	0%	18%	1%
	Gene Xpert	0%	0%	0%
	Other	0%	0%	0%
	Sample transport	0%	0%	0%
Imaging		0%	0%	0%
Subtotal: Direct clinical costs		73%	81%	62%
Contact tracing		0%	0%	0%
Loss-to-follow up tracing		2%	0%	0%
Other direct activities		0%	0%	0%
Training, mentoring, and supervision		4%	1%	0%
Vehicles		0%	0%	1%
Subtotal: Other direct costs		6%	2%	1%

ANNEX E: TOTAL COSTS BY FACILITY

VCCT

Health Centers

Average per facility		A	B	C	D	E	F
Service / Cost category							
Building and utilities		\$320	\$341	\$495	\$127	\$115	\$275
Administrative overhead		\$353	\$403	\$46	\$519	\$43	\$498
Intermediate services overhead		\$265	\$304	\$462	\$366	\$173	\$540
Other operational Indirect		\$71	\$27	\$30	\$51	\$41	\$52
Subtotal: Overhead costs		\$1,010	\$1,074	\$1,033	\$1,063	\$373	\$1,365
Salary & Benefits (clinical staff)		\$1,226	\$1,569	\$1,239	\$3,614	\$1,063	\$2,149
Equipment and furniture		\$9	\$14	\$45	\$9	\$5	\$17
Medical Supplies		\$82	\$213	\$195	\$66	\$4	\$41
Laboratory	Rapid tests	\$396	\$223	\$752	\$1,176	\$171	\$298
Partner notification		\$0	\$0	\$0	\$0	\$0	\$0
Other direct activities		\$0	\$0	\$0	\$0	\$0	\$0
Training, mentoring, and supervision		\$18	\$177	\$194	\$18	\$88	\$35
Vehicles		\$23	\$40	\$0	\$0	\$0	\$0
Subtotal: Direct costs		\$1,754	\$2,236	\$2,426	\$4,883	\$1,331	\$2,539
Total		\$2,764	\$3,311	\$3,459	\$5,947	\$1,704	\$3,904

Average per facility		G	H	I	J	K	L
Service / Cost category							
Building and utilities		\$39	\$712	\$317	\$2,072	\$234	\$508
Administrative overhead		\$56	\$277	\$897	\$602	\$220	\$668
Intermediate services overhead		\$126	\$28	\$55	\$1,007	\$174	\$1,933
Other operational Indirect		\$4	\$88	\$105	\$101	\$131	\$267
Subtotal: Overhead costs		\$226	\$1,106	\$1,375	\$3,782	\$758	\$3,376
Salary & Benefits (clinical staff)		\$392	\$1,939	\$2,478	\$2,946	\$1,415	\$5,479
Equipment and furniture		\$14	\$59	\$29	\$167	\$2	\$26
Medical Supplies		\$21	\$34	\$97	\$844	\$876	\$81
Laboratory	Rapid tests	\$95	\$172	\$284	\$5,836	\$510	\$971
Partner notification		\$0	\$0	\$0	\$0	\$0	\$0
Other direct activities		\$0	\$0	\$0	\$0	\$0	\$0
Training, mentoring, and supervision		\$0	\$194	\$71	\$0	\$71	\$194
Vehicles		\$12	\$0	\$89	\$20	\$29	\$0
Subtotal: Direct costs		\$533	\$2,398	\$3,048	\$9,813	\$2,903	\$6,751
Total		\$759	\$3,504	\$4,423	\$13,595	\$3,661	\$10,127

Referral Hospitals

Average per facility	A	B	C	D	E
Service / Cost category					
Building and utilities	\$501	\$666	\$322	\$780	\$729
Administrative overhead	\$973	\$2,052	\$422	\$2,568	\$1,997
Intermediate services overhead	\$2,452	\$1,234	\$746	\$3,626	\$1,608
Other operational Indirect	\$37	\$77	\$168	\$110	\$180
Subtotal: Overhead costs	\$3,963	\$4,028	\$1,658	\$7,085	\$4,514
Salary & Benefits (clinical staff)	\$3,363	\$3,511	\$1,937	\$3,229	\$4,351
Equipment and furniture	\$133	\$32	\$29	\$32	\$29
Medical Supplies	\$140	\$332	\$1	\$1,893	\$194
Laboratory: Rapid tests	\$674	\$611	\$131	\$1,447	\$1,793
Partner notification	\$0	\$0	\$0	\$0	\$10
Other direct activities	\$0	\$0	\$0	\$0	\$0
Training, mentoring, and supervision	\$0	\$159	\$0	\$0	\$354
Vehicles	\$0	\$27	\$21	\$59	\$43
Subtotal: Direct costs	\$4,311	\$4,673	\$2,118	\$6,659	\$6,773
Total	\$8,274	\$8,701	\$3,777	\$13,744	\$11,287

Provincial Hospitals

Average per facility	A	B
Service / Cost category		
Building and utilities	\$1,435	\$793
Administrative overhead	\$2,088	\$3,233
Intermediate services overhead	\$4,653	\$1,564
Other operational Indirect	\$628	\$490
Subtotal: Overhead costs	\$8,803	\$6,081
Salary & Benefits (clinical staff)	\$8,254	\$8,768
Equipment and furniture	\$219	\$373
Medical Supplies	\$298	\$697
Laboratory: Rapid tests	\$2,482	\$3,412
Partner notification	\$0	\$0
Other direct activities	\$0	\$0
Training, mentoring, and supervision	\$71	\$0
Vehicles	\$277	\$52
Subtotal: Direct costs	\$11,601	\$13,302
Total	\$20,404	\$19,383

ART

Referral Hospitals

Average per facility		A	B	C	D	E	F
Service / Cost category							
Building and utilities		\$12,516	\$11,456	\$7,690	\$5,630	\$18,996	\$3,649
Administrative overhead		\$7,741	\$7,721	\$6,385	\$6,431	\$8,484	\$1,793
Intermediate services overhead		\$7,568	\$3,885	\$1,301	\$5,006	\$10,589	\$978
Other operational overhead		\$272	\$247	\$67	\$1,701	\$709	\$100
Subtotal: Overhead costs		\$28,097	\$23,308	\$15,443	\$18,768	\$38,778	\$6,520
Salary & Benefits (clinical staff)		\$11,672	\$10,060	\$12,993	\$26,198	\$30,316	\$2,438
Equipment and furniture		\$441	\$301	\$431	\$94	\$536	\$271
Pharmaceutical	ARV first-line	\$49,547	\$72,159	\$39,920	\$22,616	\$60,871	\$13,375
	ARV second-line	\$7,284	\$2,103	\$5,210	\$3,328	\$12,102	\$0
	Pediatric	\$2,052	\$6	\$5	\$5	\$8	\$1
	Other Drugs	\$7,421	\$8,493	\$12,838	\$1,880	\$14,917	\$1,122
Medical Supplies		\$653	\$1,014	\$450	\$9	\$3,198	\$118
Laboratory	CD4	\$1,535	\$1,660	\$2,100	\$1,980	\$5,240	\$340
	Viral Load	\$7,446	\$2,907	\$1,020	\$2,873	\$9,605	\$612
	Other	\$238	\$501	\$98	\$292	\$893	\$5,799
	Sample transport	\$660	\$476	\$60	\$340	\$79	\$95
Subtotal: Direct clinical costs		\$88,948	\$99,681	\$75,125	\$59,615	\$137,765	\$24,171
Loss-to-follow up tracing		\$0	\$0	\$19	\$0	\$0	\$11
Other direct activities		\$0	\$0	\$104	\$0	\$0	\$190
Training, mentoring, and supervision		\$1,980	\$88	\$141	\$141	\$1,891	\$212
Vehicles		\$0	\$113	\$0	\$105	\$176	\$21
Subtotal: Other direct costs		\$1,980	\$202	\$264	\$247	\$2,067	\$435
Total		\$119,024	\$123,191	\$90,838	\$78,630	\$178,610	\$31,127

Provincial Hospitals

Average per facility		A	B
Service / Cost category			
Building and utilities		\$70,636	\$14,589
Administrative overhead		\$34,725	\$22,593
Intermediate services overhead		\$48,899	\$18,399
Other operational overhead		\$7,108	\$3,705
Subtotal: Overhead costs		\$161,369	\$59,287
Salary & Benefits (clinical staff)		\$105,622	\$54,676
Equipment and furniture		\$714	\$704
Pharmaceutical	ARV first-line	\$362,619	\$156,793
	ARV second-line	\$82,986	\$88,625
	Pediatric	\$50,173	\$5
	Other Drugs	\$38,461	\$72,626
Medical Supplies		\$2,324	\$4,072
Laboratory	CD4	\$46,881	\$50,048
	Viral Load	\$32,895	\$50,937
	Other	\$16,245	\$15,998
	Sample transport	\$289	\$0
Subtotal: Direct clinical costs		\$739,208	\$494,483
Loss-to-follow up tracing		\$0	\$0
Other direct activities		\$0	\$0
Training, mentoring, and supervision		\$265	\$159
Vehicles		\$3,540	\$292
Subtotal: Other direct costs		\$3,805	\$451
Total		\$904,382	\$554,220

TB Outpatient Services

Health Centers

Average per facility		A	B	C	D	E	F
Service / Cost category							
Building and utilities		\$59	\$95	\$69	\$82	\$10	\$424
Administrative overhead		\$74	\$103	\$3	\$329	\$6	\$265
Intermediate services overhead		\$284	\$75	\$33	\$285	\$109	\$163
Other operational overhead		\$14	\$6	\$2	\$32	\$6	\$18
Subtotal: Overhead costs		\$432	\$279	\$107	\$729	\$131	\$871
Salary & Benefits (clinical staff)		\$219	\$328	\$78	\$2,273	\$138	\$751
Equipment and furniture		\$2	\$1	\$77	\$4	\$3	\$22
Pharmaceutical	TB first-line	\$1,730	\$987	\$339	\$162	\$101	\$546
	TB other	\$0	\$0	\$0	\$0	\$0	\$0
	Pediatric	\$19	\$0	\$0	\$0	\$0	\$0
Medical Supplies		\$50	\$0	\$0	\$24	\$156	\$48
Laboratory	Sputum Smear	\$59	\$8	\$19	\$16	\$0	\$25
	Gene Xpert	\$0	\$0	\$0	\$0	\$0	\$0
	Other	\$0	\$0	\$0	\$0	\$0	\$0
	Sample transport	\$38	\$54	\$32	\$48	\$57	\$71
Imaging		\$0	\$0	\$0	\$0	\$0	\$0
Subtotal: Direct clinical costs		\$2,116	\$1,379	\$545	\$2,527	\$455	\$1,463
Contact tracing		\$0	\$5	\$7	\$8	\$0	\$0
Loss-to-follow up tracing		\$2	\$0	\$5	\$0	\$0	\$0
Other direct activities		\$36	\$5	\$5	\$8	\$1	\$0
Training, mentoring, and supervision		\$0	\$18	\$141	\$159	\$354	\$177
Vehicles		\$4	\$8	\$0	\$0	\$0	\$0
Subtotal: Other direct costs		\$42	\$36	\$159	\$176	\$355	\$177
Total		\$2,589	\$1,693	\$811	\$3,431	\$941	\$2,511

Average per facility		G	H	I	J	K	L
Service / Cost category							
Building and utilities		\$11	\$20	\$1,930	\$88	\$361	\$266
Administrative overhead		\$15	\$7	\$1,508	\$75	\$381	\$328
Intermediate services overhead		\$380	\$17	\$51	\$558	\$121	\$521
Other operational overhead		\$5	\$8	\$21	\$35	\$261	\$127
Subtotal: Overhead costs		\$411	\$53	\$3,510	\$756	\$1,124	\$1,242
Salary & Benefits (clinical staff)		\$394	\$152	\$154	\$1,082	\$2,783	\$2,710
Equipment and furniture		\$1	\$1	\$8	\$11	\$6	\$4
Pharmaceutical	TB first-line	\$210	\$181	\$703	\$2,503	\$769	\$533
	TB other	\$0	\$0	\$0	\$0	\$0	\$0
	Pediatric	\$0	\$15	\$0	\$277	\$0	\$0
Medical Supplies		\$161	\$86	\$440	\$648	\$652	\$19
Laboratory	Sputum Smear	\$0	\$0	\$0	\$57	\$0	\$0
	Gene Xpert	\$0	\$0	\$0	\$0	\$0	\$0
	Other	\$0	\$0	\$0	\$0	\$0	\$0
	Sample transport	\$176	\$29	\$95	\$1,728	\$83	\$48
Imaging		\$0	\$0	\$0	\$0	\$0	\$0
Subtotal: Direct clinical costs		\$942	\$463	\$1,400	\$6,305	\$4,293	\$3,313
Contact tracing		\$64	\$14	\$9	\$360	\$5	\$1
Loss-to-follow up tracing		\$0	\$0	\$0	\$300	\$0	\$1
Other direct activities		\$129	\$0	\$9	\$360	\$5	\$0
Training, mentoring, and supervision		\$0	\$88	\$194	\$71	\$354	\$106
Vehicles		\$13	\$0	\$0	\$7	\$57	\$0
Subtotal: Other direct costs		\$205	\$103	\$212	\$1,098	\$421	\$108
Total		\$1,558	\$619	\$5,122	\$8,160	\$5,838	\$4,664

Referral Hospitals

Average per facility		A	B	C	D	E
Service / Cost category						
Building and utilities		\$889	\$785	\$170	\$920	\$1,782
Administrative overhead		\$1,267	\$1,894	\$735	\$1,381	\$4,443
Intermediate services overhead		\$506	\$481	\$466	\$914	\$3,761
Other operational overhead		\$113	\$145	\$67	\$110	\$125
Subtotal: Overhead costs		\$2,775	\$3,305	\$1,439	\$3,325	\$10,112
Salary & Benefits (clinical staff)		\$9,065	\$5,660	\$775	\$3,229	\$2,867
Equipment and furniture		\$0	\$43	\$25	\$55	\$65
Pharmaceutical	TB first-line	\$542	\$181	\$1,735	\$1,669	\$1,964
	TB other	\$0	\$426	\$95	\$0	\$0
	Pediatric	\$1,628	\$0	\$165	\$0	\$579
Medical Supplies		\$81	\$343	\$8	\$458	\$225
Laboratory	Sputum Smear	\$1,300	\$1,785	\$12,831	\$5,515	\$2,275
	Gene Xpert	\$6,158	\$0	\$3,640	\$0	\$0
	Other	\$0	\$0	\$0	\$0	\$0
	Sample transport	\$0	\$0	\$0	\$0	\$0
Imaging		\$0	\$0	\$0	\$94	\$4,589
Subtotal: Direct clinical costs		\$18,773	\$8,438	\$19,274	\$11,020	\$12,564
Contact tracing		\$6	\$0	\$30	\$3	\$0
Loss-to-follow up tracing		\$0	\$0	\$0	\$6	\$0
Other direct activities		\$6	\$0	\$80	\$0	\$0
Training, mentoring, and supervision		\$212	\$159	\$159	\$177	\$141
Vehicles		\$0	\$68	\$8	\$59	\$27
Subtotal: Other direct costs		\$224	\$227	\$278	\$244	\$168
Total		\$21,773	\$11,970	\$20,990	\$14,589	\$21,544

Provincial Hospitals

Average per facility		A	B
Service / Cost category			
Building and utilities		\$8,852	\$9,152
Administrative overhead		\$7,523	\$12,559
Intermediate services overhead		\$2,315	\$1,998
Other operational overhead		\$2,497	\$1,158
Subtotal: Overhead costs		\$21,186	\$24,867
Salary & Benefits (clinical staff)		\$40,543	\$19,869
Equipment and furniture		\$56	\$334
Pharmaceutical	TB first-line	\$15,247	\$10,344
	TB other	\$2,334	\$4,459
	Pediatric	\$18	\$0
Medical Supplies		\$3,408	\$2,893
Laboratory	Sputum Smear	\$7,415	\$7,062
	Gene Xpert	\$22,707	\$1,738
	Other	\$29,312	\$4,536
	Sample transport	\$0	\$2,880
Imaging		\$2,669	\$689
Subtotal: Direct clinical costs		\$123,708	\$54,803
Contact tracing		\$0	\$0
Loss-to-follow up tracing		\$0	\$0
Other direct activities		\$2	\$0
Training, mentoring, and supervision		\$159	\$247
Vehicles		\$1,521	\$182
Subtotal: Other direct costs		\$1,682	\$430
Total		\$146,576	\$80,100

Inpatient care for OIs

Referral Hospitals

Average per facility	A	B	C	D	E
Service / Cost category					
Pharmaceuticals	\$72	\$73	\$384	\$81	\$214
Laboratory testing	\$2	\$73	\$19	\$0	\$2
Hotel costs	\$916	\$560	\$4,802	\$1,500	\$1,183
Total	\$991	\$706	\$5,205	\$1,581	\$1,398

Provincial Hospitals

Average per facility	A	B
Service / Cost category		
Pharmaceuticals	\$2,793	\$2,249
Laboratory testing	\$1,223	\$929
Hotel costs	\$9,446	\$7,923
Total	\$13,461	\$11,101

Inpatient care for TB

Referral Hospitals

Average per facility	A	B	C	D	E
Service / Cost category					
Pharmaceuticals	\$1,783	\$514	\$2,484	\$295	\$3,748
Laboratory testing	\$82	\$0	\$10	\$0	\$0
Hotel costs	\$18,058	\$4,930	\$13,921	\$9,126	\$15,730
Total	\$19,922	\$5,444	\$16,415	\$9,421	\$19,478

Provincial Hospitals

Average per facility	A	B
Service / Cost category		
Pharmaceuticals	\$3,242	\$47,369
Laboratory testing	\$1,953	\$18,623
Hotel costs	\$43,981	\$32,162
Total	\$49,176	\$98,154

ANNEX F: SOURCES OF FINANCING

Note that percentages may not add up to subtotals or to 100 percent for each column/row due to rounding errors. When the source of financing for NGO contributions was not identified, these sources of financing are listed in “NGOs and Other.”

VCCT

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
Health Center							
Building and utilities		\$463	100%	0%	0%	0%	0%
Administrative step-down		\$382	100%	0%	0%	0%	0%
Intermediate services step-down		\$453	100%	0%	0%	0%	0%
Other operational indirect		\$81	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$1,378	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$2,126	86%	0%	0%	14%	0%
Equipment and furniture		\$33	89%	0%	0%	2%	8%
Medical Supplies		\$213	100%	0%	0%	0%	0%
Laboratory	Rapid tests	\$907	0%	0%	100%	0%	0%
Partner notification		\$0					
Other direct activities		\$0					
Training, mentoring, and supervision		\$88	40%	43%	17%	0%	0%
Vehicles		\$18	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$3,385	62%	2%	27%	9%	0%
Total		\$4,763	73%	1%	19%	6%	0%
Clinic							
Building and utilities		\$1,711	0%	100%	0%	0%	0%
Administrative step-down		\$3,329	0%	100%	0%	0%	0%
Intermediate services step-down		\$11,428	0%	100%	0%	0%	0%
Other operational indirect		\$73	0%	100%	0%	0%	0%
Subtotal: Step-down and		\$16,541	0%	100%	0%	0%	0%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
indirect costs							
Salary & Benefits (clinical staff)		\$8,916	0%	100%	0%	0%	0%
Equipment and furniture		\$2,722	0%	100%	0%	0%	0%
Medical Supplies		\$3,342	55%	45%	0%	0%	0%
Laboratory	Rapid tests	\$3,115	0%	0%	100%	0%	0%
Partner notification		\$0					
Other direct activities		\$9,086	0%	100%	0%	0%	0%
Training, mentoring, and supervision		\$1,829	0%	100%	0%	0%	0%
Vehicles		\$70	0%	100%	0%	0%	0%
Subtotal: Direct costs		\$29,080	1%	73%	27%	0%	0%
Total		\$45,622	2%	79%	19%	0%	0%
Referral Hospital							
Building and utilities		\$599	100%	0%	0%	0%	0%
Administrative step-down		\$1,602	100%	0%	0%	0%	0%
Intermediate services step-down		\$1,933	100%	0%	0%	0%	0%
Other operational indirect		\$115	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$4,250	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$3,278	81%	11%	0%	19%	0%
Equipment and furniture		\$51	90%	10%	0%	0%	0%
Medical Supplies		\$512	48%	27%	0%	52%	0%
Laboratory	Rapid tests	\$931	0%	0%	100%	0%	0%
Partner notification		\$2	100%	0%	0%	0%	0%
Other direct activities		\$0					
Training, mentoring, and supervision		\$103	59%	41%	0%	0%	0%
Vehicles		\$30	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$4,907	62%	1%	19%	18%	0%
Total		\$9,157	79%	1%	10%	10%	0%
Provincial Hospital							
Building and utilities		\$1,114	100%	0%	0%	0%	0%
Administrative step-down		\$2,661	100%	0%	0%	0%	0%
Intermediate services step-		\$3,108	100%	0%	0%	0%	0%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
down							
Other operational indirect		\$559	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$7,442	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$8,511	23%	0%	0%	35%	42%
Equipment and furniture		\$296	94%	6%	0%	0%	0%
Medical Supplies		\$498	40%	0%	0%	60%	0%
Laboratory	Rapid tests	\$2,947	0%	0%	100%	0%	0%
Partner notification		\$0					
Other direct activities		\$0					
Training, mentoring, and supervision		\$35	100%	0%	0%	0%	0%
Vehicles		\$164	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$12,451	21%	0%	24%	26%	29%
Total		\$19,893	51%	0%	15%	16%	18%

ART

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
Clinic							
Building and utilities		\$18,393	0%	100%	0%	0%	0%
Administrative step-down		\$17,570	0%	100%	0%	0%	0%
Intermediate services step-down		\$3,427	0%	100%	0%	0%	0%
Other operational indirect		\$274	0%	100%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$39,664	0%	100%	0%	0%	0%
Salary & Benefits (clinical staff)		\$38,062	0%	100%	0%	0%	0%
Equipment and furniture		\$4,671	0%	100%	0%	0%	0%
Pharmaceutical	ARV first-line	\$95,908	10%	0%	90%	0%	0%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
	ARV second-line	\$29,116	10%	0%	90%	0%	0%
	Pediatric	\$1,920	10%	0%	90%	0%	0%
	Other Drugs	\$34,694	21%	2%	77%	0%	0%
Medical Supplies		\$5,386	7%	50%	43%	0%	0%
Laboratory	CD4	\$6,410	0%	0%	100%	0%	0%
	Viral Load	\$10,931	0%	0%	100%	0%	0%
	Other	\$751	0%	100%	0%	0%	0%
	Sample transport	\$548	0%	100%	0%	0%	0%
Subtotal: Direct clinical costs		\$228,397	9%	21%	70%	0%	0%
Loss-to-follow up tracing		\$0					
Other direct activities		\$10,600	0%	100%	0%	0%	0%
Training, mentoring, and supervision		\$4,452	0%	100%	0%	0%	0%
Vehicles		\$264	0%	100%	0%	0%	0%
Subtotal: Direct costs		\$15,316	0%	100%	0%	0%	0%
Total		\$283,377	7%	36%	56%	0%	0%
Referral Hospital							
Building and utilities		\$9,989	100%	0%	0%	0%	0%
Administrative step-down		\$6,426	100%	0%	0%	0%	0%
Intermediate services step-down		\$4,888	100%	0%	0%	0%	0%
Other operational indirect		\$516	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$21,819	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$15,613	33%	13%	0%	10%	43%
Equipment and furniture		\$346	80%	0%	0%	0%	20%
Pharmaceutical	ARV first-line	\$43,081	10%	0%	90%	0%	0%
	ARV second-line	\$5,005	10%	0%	90%	0%	0%
	Pediatric	\$346	10%	0%	90%	0%	0%
	Other Drugs	\$7,778	21%	2%	77%	0%	0%
Medical Supplies		\$907	57%	0%	43%	0%	0%
Laboratory	CD4	\$2,143	0%	0%	100%	0%	0%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
	Viral Load	\$4,077	0%	0%	100%	0%	0%
	Other	\$1,303	26%	74%	0%	0%	0%
	Sample transport	\$285	16%	0%	0%	0%	84%
Subtotal: Direct clinical costs		\$80,884	16%	4%	69%	2%	9%
Loss-to-follow up tracing		\$5	0%	100%	0%	0%	0%
Other direct activities		\$49	0%	100%	0%	0%	0%
Training, mentoring, and supervision		\$742	25%	75%	0%	0%	0%
Vehicles		\$69	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$866	29%	71%	0%	0%	0%
Total		\$103,570	34%	4%	54%	2%	7%
Provincial Hospital							
Building and utilities		\$42,613	100%	0%	0%	0%	0%
Administrative step-down		\$28,659	100%	0%	0%	0%	0%
Intermediate services step-down		\$33,649	100%	0%	0%	0%	0%
Other operational indirect		\$5,406	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$110,328	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$80,149	27%	4%	0%	40%	30%
Equipment and furniture		\$709	66%	34%	0%	0%	0%
Pharmaceutical	ARV first-line	\$259,706	10%	0%	90%	0%	0%
	ARV second-line	\$85,805	10%	0%	90%	0%	0%
	Pediatric	\$25,089	10%	0%	90%	0%	0%
	Other Drugs	\$55,543	21%	2%	77%	0%	0%
Medical Supplies		\$3,198	57%	0%	43%	0%	0%
Laboratory	CD4	\$48,464	0%	0%	100%	0%	0%
	Viral Load	\$41,916	0%	0%	100%	0%	0%
	Other	\$16,121	100%	0%	0%	0%	0%
	Sample transport	\$144	100%	0%	0%	0%	0%
Subtotal: Direct clinical costs		\$616,845	15%	1%	76%	5%	4%
Loss-to-follow up tracing		\$0					

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
Other direct activities		\$0					
Training, mentoring, and supervision		\$212	79%	21%	0%	0%	0%
Vehicles		\$1,916	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$2,128	98%	2%	0%	0%	0%
Total		\$729,301	28%	1%	64%	4%	3%

TB outpatient

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
Health Center							
Building and utilities		\$285	100%	0%	0%	0%	0%
Administrative step-down		\$258	100%	0%	0%	0%	0%
Intermediate services step-down		\$217	100%	0%	0%	0%	0%
Other operational indirect		\$45	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$804	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$922	93%	0%	0%	7%	0%
Equipment and furniture		\$12	100%	0%	0%	0%	0%
Pharmaceutical	TB Sputum positive	\$730	0%	0%	100%	0%	0%
	TB other	\$0					
	Pediatric	\$26	0%	0%	100%	0%	0%
Medical Supplies		\$190	42%	0%	0%	58%	0%
Laboratory	Sputum Smear	\$15	100%	0%	0%	0%	0%
	Gene Xpert	\$0	0%	0%	100%	0%	0%
	Other	\$0					
	Sample	\$205	0%	0%	100%	0%	0%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
	transport						
Imaging		\$0					
Subtotal: Direct clinical costs		\$2,100	46%	0%	46%	8%	0%
Contact tracing		\$39	0%	98%	0%	0%	2%
Loss-to-follow up tracing		\$26	100%	0%	0%	0%	0%
Other direct activities		\$47	100%	0%	0%	0%	0%
Training, mentoring, and supervision		\$138	61%	39%	0%	0%	0%
Vehicles		\$7	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$258	64%	36%	0%	0%	0%
Total		\$3,161	61%	3%	30%	6%	0%
Referral Hospital							
Building and utilities		\$909	100%	0%	0%	0%	0%
Administrative step-down		\$1,944	100%	0%	0%	0%	0%
Intermediate services step-down		\$1,225	100%	0%	0%	0%	0%
Other operational indirect		\$112	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$4,191	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$4,319	100%	0%	0%	0%	0%
Equipment and furniture		\$38	48%	0%	0%	0%	52%
Pharmaceutical	TB Sputum positive	\$1,218	0%	100%	0%	0%	0%
	TB other	\$104	0%	0%	100%	0%	0%
	Pediatric	\$474	0%	0%	100%	0%	0%
Medical Supplies		\$223	100%	0%	0%	0%	0%
Laboratory	Sputum Smear	\$4,481	100%	0%	0%	0%	0%
	Gene Xpert	\$1,960	0%	0%	100%	0%	0%
	Other	\$0					
	Sample transport	\$0					
Imaging		\$937	40%	0%	0%	60%	0%
Subtotal: Direct clinical costs		\$13,754	68%	9%	18%	4%	0%
Contact tracing		\$8	100%	0%	0%	0%	0%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
Loss-to-follow up tracing		\$1	100%	0%	0%	0%	0%
Other direct activities		\$17	100%	0%	0%	0%	0%
Training, mentoring, and supervision		\$170	67%	21%	0%	0%	13%
Vehicles		\$32	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$228	75%	15%	0%	0%	9%
Total		\$18,173	76%	7%	14%	3%	0%
Provincial Hospital							
Building and utilities		\$9,002	100%	0%	0%	0%	0%
Administrative step-down		\$10,041	100%	0%	0%	0%	0%
Intermediate services step-down		\$2,156	100%	0%	0%	0%	0%
Other operational indirect		\$1,827	100%	0%	0%	0%	0%
Subtotal: Step-down and indirect costs		\$23,027	100%	0%	0%	0%	0%
Salary & Benefits (clinical staff)		\$30,206	40%	0%	0%	60%	0%
Equipment and furniture		\$195	67%	1%	0%	0%	32%
Pharmaceutical	TB Sputum positive	\$12,795	0%	100%	0%	0%	0%
	TB other	\$3,396	0%	0%	100%	0%	0%
	Pediatric	\$9	0%	0%	100%	0%	0%
Medical Supplies		\$3,150	40%	0%	0%	60%	0%
Laboratory	Sputum Smear	\$7,238	100%	0%	0%	0%	0%
	Gene Xpert	\$12,223	0%	0%	100%	0%	0%
	Other	\$16,924	0%	0%	100%	0%	0%
	Sample transport	\$1,440	0%	0%	100%	0%	0%
Imaging		\$1,679	52%	0%	0%	48%	0%
Subtotal: Direct clinical costs		\$89,255	24%	14%	38%	23%	0%
Contact tracing		\$0					
Loss-to-follow up tracing		\$0					
Other direct activities		\$1	0%	100%	0%	0%	0%
Training, mentoring, and supervision		\$203	96%	0%	0%	0%	4%

Service / Cost category	Item	Amount	Percentage of line item				
			RGC	US Government (CDC / PEPFAR)	Global Fund	Facility resource	NGOs and Other
Vehicles		\$852	100%	0%	0%	0%	0%
Subtotal: Direct costs		\$1,056	99%	0%	0%	0%	1%
Total		\$113,338	40%	11%	30%	18%	0%

ANNEX G: HUMAN RESOURCES PRODUCTIVITY

VCCT

Facility type	Average number of FTE staff working on VCCT (Range)	Average number of visits for VCCT	VCCT visits per FTE (Range)
Health Center	0.56 (0.05 to 1.23)	1,059	1,650 (511 to 6,484)
Clinic	3.00	3,284	1,095
Referral Hospital	0.84 (0.80 to 1.10)	979	1,123 (260 to 2,455)
Provincial Hospital	2.50 (2.00 to 3.00)	2,517	1,113 (582 to 1,644)

FTE: Full time equivalent staff. One person working full time is equal to 1 FTE staff; 2 staff working 50 percent of the time is also equal to 1 FTE.

ART

Facility type	Average number of FTE staff working on ART (Range)	Average number of NGO FTE staff working on ART	Average number of visits for ART	ART Visits per FTE	Average number of patient-years	ART patient-years per FTE (Range)
Clinic	11.3	11.3	5,292	468	1,106	98
Referral Hospital	5.7 (0.6 to 10.0)	3.6	1,981	651	382	117 (212 to 1,992)
Provincial Hospital	24.8 (16.6 to 33.0)	8.5	16,397	784	3,079	138 (412 to 1,156)

FTE: Full time equivalent staff. One person working full time is equal to 1 FTE staff; 2 staff working 50 percent of the time is also equal to 1 FTE.

TB

Facility type	Average number of FTE staff working on TB (Range)	Average number of TB patients	TB patients per FTE (Range)
Health Center	0.22 (0.02 to 0.58)	131	1,146 (174 to 8,988*)
Referral Hospital	1.22 (0.2 to 2.6)	1,099	1,639 (90 to 5,072)
Provincial Hospital	7.75 (4.5 to 11.0)	2,201	308 (250 to 366)

FTE: Full time equivalent staff. One person working full time is equal to 1 FTE staff; 2 staff working 50 percent of the time is also equal to 1 FTE.

*Likely an estimation error of the amount of staff time spent on TB. The next highest is 2,436.



BOLD THINKERS DRIVING
REAL-WORLD IMPACT