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Estimating Resource Requirements for Scaling up Antiretroviral Therapy in Uganda

October 2005

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Mission

Partners for Health Reformplus is USAID's flagship project for health policy and health system strengthening in developing and transitional countries. The five-year project (2000-2005) builds on the predecessor Partnerships for Health Reform Project, continuing PHR's focus on health policy, financing, and organization, with new emphasis on community participation, infectious disease surveillance, and information systems that support the management and delivery of appropriate health services. PHRplus will focus on the following results:

- ▲ *Implementation of appropriate health system reform.*
- ▲ *Generation of new financing for health care, as well as more effective use of existing funds.*
- ▲ *Design and implementation of health information systems for disease surveillance.*
- ▲ *Delivery of quality services by health workers.*
- ▲ *Availability and appropriate use of health commodities.*

October 2005

Recommended Citation

Chandler, Rudolph and Stephen Musau, October 2005. *Estimating Resources Requirements for Scaling-up Antiretroviral Therapy in Uganda*. Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates Inc.

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Contract/Project No.: HRN-C-00-00-00019-00

Submitted to: USAID/Kampala

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Abstract

Partners for Health Reform*plus* (PHR*plus*) estimated the resource requirements of the antiretroviral therapy (ART) care package for Uganda for the period 2005 to 2012. The ART care package includes Highly Active Antiretroviral Therapy, voluntary counseling and testing, prevention of further HIV transmission through information, education and communication, treatment of sexually transmitted infections and opportunistic infections, prevention of mother-to-child transmission, home-based care (including palliative care), and chemo-prophylaxis against TB. It also includes the costs of training. The package of ART services is estimated to cost \$60 million in 2005, rising to \$92 million annually in 2012.

A large number of doctors, nurses, lab technicians, counselors, community health workers, and pharmacy technologists will be needed to provide the ART care package alone (on top of the regular non-ART needs of the health program). The numbers needed for the program will more than double between 2005 and 2012 in some staff categories.

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Acronyms

ART	Antiretroviral Therapy
ARV	Antiretroviral (drug/s)
ATC	AIDSTreatCost
HAART	Highly Active Antiretroviral Therapy
GOU	Government of Uganda
JCRC	Joint Clinical Research Center
HBC	Home-based Care
HC IV	Health Center IV
IEC	Information, Education and Communication
IMCI	Integrated Management of Childhood Illnesses
MAP	Multi-sectoral AIDS Program (World Bank)
MOH	Ministry of Health
NGO	Non-governmental Organization
OI	Opportunistic Infection
PEP	Post-exposure Prophylaxis
PEPFAR	President Emergency Plan for AIDS Relief
PHR^{plus}	Partners for Health Reform ^{plus}
PLWHA	People Living with HIV/AIDS
PMTCT	Prevention of Mother-to-Child Transmission
STI	Sexually Transmitted Infection
TASO	The AIDS Support Organization
TB	Tuberculosis
USAID	United States Agency for International Development
VCT	Voluntary Counseling and Testing

Acknowledgments

This report was funded by the United States Agency for International Development, Uganda. It was conducted by the Partners for Health Reform *plus* project (PHR *plus*) in collaboration with the Ministry of Health, the Uganda AIDS Commission, and the ARV Policy Committee's Financing Subcommittee.

The execution of this study was made possible by the valuable support provided by the many stakeholders to the ART scaling-up program. Among these, the authors wish to thank Dr Elizabeth Namagala of the Uganda AIDS Control Programme; various other Ministry of Health staff including Dr Onyango, Mrs Muwonge, Dr Akol Zainab, Dr Ssesubi, Dr Maurice Seru; Jane Nabalonzze of the H.R./Training Division; Sam Engnyu of the Health Promotion and Education Division; Dr Jesca Nsungwa, Dr Peter Waiswa, and Dr Jeremiah Twa-Twa of the IMCI program. The following people and organizations also offered much valuable information: Dr Jessica Oyugi and Diego Angemi of the Academic Alliance; Muyengo Sowedi of the UNAIDS Drug Access Initiative; Martha Rabwonie, Tom Duku, Fatiah Kiyange, and Dr Dalsone Kwarisima of Hospice Uganda; Dr Balam of the AIDS Information Centre; Dr Francis Ssali, Dr Kabuye, and Joyce Nalugwa of the Joint Clinical Research Centre; Dr Carla Simmons of Kitovu Center; Dr Bosco, Dr Larry Pepper, and Dr Andia of Mbarara Teaching Hospital, Dr Julia Dowson of Mildmay Clinic; Dr Margrethe, Udey and Lynn of Mbuya-Reach Out Programme; Dr Christine Nabiryo and Dr Aloysius Kakia of the AIDS Support Organization; Ken Heise, Dr Samson Haumba, and Dr Edward Semafumu of the AIM Project; Cordelia Kituka and Lucianna Bassana of Nsyambya Hospital. The authors are particularly grateful for the cost data provided by the DELIVER Project, from their drug quantification work, through Steve Wilbur, Yolanda Mikaele, and Dr Moses Muwonge. The authors are grateful for the support by USAID/Kampala, especially Suzzane McQueen. Finally, the authors wish to acknowledge the technical reviews and contributions provided by Susan Scribner, Marty Makinen, and Dr Gilbert Kombe of PHR *plus*.

Executive Summary

The government of Uganda (GOU) estimates that antenatal HIV prevalence in Uganda is 6.1 percent and approximately 1.1 million people are living with HIV/AIDS (PLWHA). Given mounting pressure for countries to provide improved health care (including antiretroviral drugs [ARVs]) to PLWHA, projecting resources required for HIV/AIDS health care – and estimating the costs of those resources – are becoming increasingly important to country-level strategic planning and resource mobilization.

The purpose of this study was to assist the GOU, in particular the ARV Policy Committee, to estimate the costs of scaling-up the ARV therapy (ART) care package from 23,000 patients in 2004 to 150,000 in 2012. This package includes Highly Active Antiretroviral Therapy (HAART), voluntary counseling and testing (VCT), information, education and communication (IEC) for the prevention of further HIV transmission, treatment of sexually transmitted infections (STIs) and opportunistic infections (OIs), prevention of mother-to-child transmission (PMTCT), home-based care (HBC) (including palliative care), and chemo-prophylaxis for tuberculosis (TB). Costs of ART-related training were also calculated. Data for the costing activities were collected at both public and private facilities that are involved in various aspects of the ART service delivery as well as at the Ministry of Health and its health care financing partners. Human resources requirements for scaling up national ARV programs were also estimated.

Tables ES1 and ES2 summarize the cost and human resource projections.

Table ES1. Cost Projections (US\$ millions)

ART Component	2005	2006	2007	2008	2009	2010	2011	2012	Total	% of total
HAART	24.0	31.2	38.1	40.9	43.7	46.5	49.3	52.1	325.8	56%
HBC – recurrent	10.0	15.1	18.3	20.4	22.8	25.3	28.0	31.0	170.9	30%
Training	0.5	2.2	3.1	2.3	2.4	2.6	2.7	2.8	18.7	3%
VCT	0.8	1.0	1.3	1.6	2.0	2.5	3.2	4.0	16.3	3%
HBC – capital	9.2	6.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	3%
Facility capital costs	10.3	1.7	0	0	0	0	0	0	11.9	2%
IEC	3.7	1.0	0.5	0.5	0.5	0.5	0.6	0.6	7.9	1%
STI	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	5.4	1%
OI	1.3	0.5	0.6	0.3	0.3	0.3	0.3	0.4	4.0	1%
Chemoprophylaxis (TB)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.6	0%
PMTCT	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.5	0%
Total costs per year	60.3	59.3	62.4	66.8	72.6	78.7	85.1	92.0	577.1	100%
Number of patients on ART ('000)	60	80	100	110	120	130	140	150	890	

The results of this costing study aim to inform the broader policy discussion on alternative financing strategies for scaling-up and sustaining ARV delivery:

- ▲ HAART and related services is the largest cost component, accounting for 56 percent of total costs over the projection period, rising from \$ 24 million to \$ 52 million between 2005 and 2012. HAART includes ARV drugs, laboratory tests to monitor patients, and staff costs.
- ▲ Within HAART, the cost of ARV drugs is the largest component. The baseline (2004) cost composition per patient per year is drugs \$321 (78 percent), laboratory tests \$74 (18 percent), and staff \$16 (4 percent). The price of ARV drugs has been assumed to decline at 5 percent per year over the projection period.
- ▲ Recurrent costs of HBC are also a significant cost item, increasing from \$10 million in 2005 to \$31 million in 2012. The study projected the costs of a HBC support unit in all the 56 district hospitals and all 214 HC IVs. Fifty-one percent of the recurrent cost of HBC is for food rations, which may be donated by donors to ARV patients and their families. Without the cost of food rations, the costs of HBC and of the ART package would decrease by between \$5 million and \$17 million a year.
- ▲ The cost of palliative care drugs, also provided through HBC, ranges from \$5 to \$11 million per year during the period. Morphine is included in the package.

A large number of doctors, nurses, laboratory technicians, counselors, community health workers, and pharmacy technologists will be needed to provide the ART care package alone (on top of the regular non-ART needs of the public health sector). The numbers needed for the ART program will more than double between 2005 and 2012 in some staff categories (e.g., doctors, nurses, and pharmacy technologist); community health worker numbers will need to increase by approximately 65 percent over the period. Reconfiguring staffing patterns for ART (such as replacing doctors with lesser-trained cadres) would reduce costs but not in a significant manner, as wages are low compared to other costs of the ART care package. However, apart from the cost issues, it still needs to be determined whether reconfiguring the staff roles would make it feasible to meet the human resource requirements without jeopardizing quality of care.

The estimated numbers of each category of health worker needed for the ART care package, beyond other needs of the health sector, are shown in Table E2.

Table ES2. Human Resource Requirements

	2005	2006	2007	2008	2009	2010	2011	2012
Doctors	151	217	252	269	286	303	320	338
Nurses	452	631	712	783	864	958	1,067	1,194
Lab technicians	146	187	230	262	297	336	381	431
Counselors	691	970	1,089	1,195	1,316	1,456	1,619	1,808
Comm. health workers	196	324	324	324	324	324	324	324
Pharmacy technologists	43	58	72	80	87	94	101	109

In 2005 staff numbers for the above cadres are shown in Table ES3:

Table ES3. Required Increase in Staff Numbers

	Existing staff	Required for ART	Required increase
Doctors	946	151	16%
Nurses	7472	452	6%
Lab technicians	451	146	32%
Counselors	Data not available	691	-
Comm. health workers	157	196	125%
Pharmacy technologists	177	43	24%

It is clear that substantial numbers of health workers will need to be recruited, especially laboratory technicians, community health workers, and pharmacy technologists. The 16 percent needed to increase in the number of doctors may also be a challenge depending on the ability of the country to train doctors in its medical schools or recruit from other countries. In addition to the 946 doctors, the country has 1,766 clinical officers.

The authors make the following recommendations:

- ▲ ARV and other drug prices should be monitored, as the cost of drugs is one of the largest components of the HAART package. If drug prices change significantly, it may be worth re-estimating resource requirements for the ART program. To reduce the prices of drugs, the GOU should continue negotiations with local and international pharmaceutical companies. However, even if ARV drug prices were reduced to zero, this would still leave an annual cost of \$42 million to \$60 million during the period 2005-2012; thus, lower drug prices should not be seen as a panacea.
- ▲ Once additional guidelines for other ART services are finalized (e.g., nutrition, pediatric AIDS care, palliative care, and post-exposure prophylaxis), it may also be worthwhile to re-estimate these costs and see how they affect resource requirements.
- ▲ The data projected show that mobilization of substantial resources will be required. The GOU should pay particular attention to the human resource requirements and training. Currently, very few health care providers have received adequate clinical training on HAART.
- ▲ It is recommended that the GOU conduct additional analysis of scenarios for different levels of subsidies and financing. Resources for ART may become scarce, even though donor support appears to be plentiful in the near term. The very likely scarcity of resources in the long term may require that some difficult choices be made about how to generate more resources locally, whether and how much to ask those able to pay to contribute to meeting the costs, and how to prioritize people in need when demand is greater than supply. The ARV Policy Committee and the Financing and Sustainability Subcommittee should not only consider proposing policies but should also monitor the impacts of those that do get implemented related to scaling-up the ARV program, especially concerning human resources, coverage, subsidies, rationing/selection criteria, and other equity issues.

1. Background and Purpose

Uganda is at the forefront of sub-Saharan African countries in terms of declining incidence of HIV/AIDS as a result of effective leadership, prevention, education, and treatment over the past two decades. The first cases of AIDS were reported in 1982. Since 1986, the government of Uganda (GOU) has provided a high level of commitment and public support to fighting the spread of HIV/AIDS through strong information, education and communication (IEC) campaigns and stakeholder participation in planning and delivering services. Antiretroviral drugs (ARVs) have been available, at a small scale, since 1992, when the first clinical trials were initiated by the Joint Clinical Research Center (JCRC).

These policy initiatives have resulted in significant achievements. Since the mid 1990s, the HIV sero-prevalence has been decreasing both in the Kampala area and outside major urban areas. Annual surveillance surveys show a robust declining trend in HIV rates, significant changes in sexual behavior, and an increase in knowledge of prevention practices. The GOU is also actively guarding against complacency by mobilizing all constituencies, including political leaders at central and decentralized levels.

Despite the progress, with the current (2004) HIV-infected population estimated at 1.1 million and with the burden of an adult prevalence rate of 5 percent (among 15–49 year olds), Uganda remains vulnerable to the negative impact of HIV/AIDS. In 2002, AIDS was responsible for 12 percent of total annual deaths and a leading cause of death among people 15–49 years (Ministry of Health 2002b). Currently, it is estimated that 100,000 Ugandans are living with AIDS and in need of ARV therapy (ART). Although ART has been available in the country since 1998, provision has been mostly limited and through the private sector (primarily non-governmental organizations [NGOs], research/pilot projects, and, to a lesser extent, by the commercial sector). An estimated 23,000 people are currently receiving ART through the public and private sectors. Most of these patients live in urban areas and pay out-of-pocket or through employment-based medical schemes, and/or receive subsidized or free ARVs from the institutions piloting research projects.

The GOU plans to scale up ART access nationwide. As a strategy, the GOU has developed the National Strategic Framework for Expansion of HIV/AIDS Care and Support in Uganda 2001/2–2005/6. In June 2004, Uganda became the second African country to distribute, free-of-charge, generic HIV drugs through a program that intends to eventually treat all of the country's people living with AIDS (PLWHA). The framework also describes a package of services that complements the delivery of ARV drugs; the package comprises voluntary counseling and testing (VCT), prevention of mother-to-child transmission of HIV (PMTCT), treatment of opportunistic infections (OIs), palliative care, and pediatric AIDS care. Together with the provision of ARVs, these services comprise the ART package of care. Thus ART falls within a comprehensive care and support strategy.

To manage the ART process and the development of guidelines, the Ministry of Health (MOH), through its AIDS Control Programme, established an ARV Policy Committee with five subcommittees: policy, advocacy, clinical care, logistics/procurement, and financing. Representation on the subcommittees is cross-disciplinary and involves representatives of the private sector, public sector, and civil society, including external technical advisors.

The government works in conjunction with various NGOs and bilateral and multilateral projects. These partners provide resources and technical assistance to help build the HIV/AIDS capacity of the country. Major partners are Global Fund to Fight AIDS, Tuberculosis, and Malaria, the World Bank's Multi-Country HIV/AIDS Program for Africa (MAP), and the U.S. Agency for International Development (USAID), including activities through the President's Emergency Plan for AIDS Relief (Emergency Plan, or PEPFAR). Each of these partners contribute funding and other resources toward the ART program but there has not been an overall estimate of the magnitude of how much it will cost to scale up activities nationally.

In 2003, the Financing and Sustainability Subcommittee requested assistance from USAID's Partners for Health Reform*plus* project (PHR*plus*) to estimate the annual per patient ARV resource requirements for Uganda. PHR*plus* collected data and used its AIDSTreatCost (ATC) software to generate the estimate. The PHR*plus* team also assisted the ARV Policy Committee to coordinate the draft of Uganda's ART policy document and the MOH in the preparation of its second proposal for the Global Fund, focusing largely on support for ART provision.

The current study updated the ARV, OI, and sexually transmitted infection (STI) cost information from the 2003 PHR*plus* study. It also includes the costs of other components of the ART care package: chemoprophylaxis for tuberculosis (TB), home-based care (HBC) (including nutrition/food rations and palliative care), IEC, and training. All of this information is used to project financial and human resource requirements for the planned scale-up of government-provided ART services for 2005-2012.

2. Methodology

This section describes the methodology used for defining the boundaries of the study, collecting data, and projecting costs.

The study computes the resource requirements and total costs for the ART package of services. The following items were costed: Highly Active Antiretroviral Treatment (HAART), PMTCT, VCT, OIs, STIs, chemoprophylaxis for TB, IEC related specifically to ART, HBC (including palliative care), and capital costs to support the upgrading of facilities to support the ART scale-up. For cost components that are driven primarily by the volume of patients (e.g., HAART, VCT, PMTCT), a per patient cost was calculated and multiplied by the number of patients expected to receive the care to arrive at the total cost for that component of the ART package. IEC and training costs were calculated using a budgeting approach, i.e., how much it would cost to conduct these programs per year? The cost of HBC was computed per HBC unit, but also taking into account the number of patients expected to receive nutritional support and palliative care. The cost of donated commodities – mostly food donated as part of the HBC programs – was included. Assumptions regarding the different variables (e.g., numbers of patients; treatment protocols; the split between adults and children; number of facilities offering ART) were made after discussions with MOH staff and other stakeholders and reviewing relevant documents. These assumptions are presented in Annex A of this report.

The following costs were not included:

- ▲ General information, IEC and behavior change and communication related to HIV prevention (the study does include the costs of IEC specifically related to ART)
- ▲ Condom distribution and promotion
- ▲ Costs to patients (travel time, transportation, and family caregiver's time)
- ▲ Central-level management of the program
- ▲ Donor costs in managing/monitoring the ART package
- ▲ Logistics of delivering and warehousing drugs and equipment (an allowance of 6.5 percent was built in to cover transportation costs to ensure delivery of drugs from the central warehouse to facilities).

2.1 Selection of ART Interventions to be Costed and Approval of Costing Approach

A meeting was held with the ARV Financing and Sustainability Subcommittee to agree on the interventions to be costed. The subcommittee identified the key elements for a strong response in ART care as outlined in the *Implementation Guidelines for ART in Uganda* (MOH 2003) for cost

estimation. These are: HAART, PMTCT, VCT, pediatric ART, palliative care, HBC, treatment for OIs and STIs, chemo-prophylaxis, training, and IEC. The MOH was also particularly interested in the human resource projections for ART policy implementation.

It was agreed that the costing would estimate the resource requirements for the ART package of services over a projection period of eight years, 2005–2012. The subcommittee also proposed sources of data and contacts for the different components of the ART policy.

2.2 Data Collection Process

PHR*plus* collected data in April and May 2004. Costing parameters were informed and updated from the previous per patient costing done by the project in April 2003 (Smith and Makinen 2005). Data were collected through interviews with senior staff from the MOH and from several public, parastatal, and NGO health facilities providing ART services (see Annex B), and review of program and project documents (see Annex C). The DELIVER Project made their drug quantification spreadsheets available for this study providing invaluable data on costs, treatment protocols, and assumptions regarding the proportions of patient receiving the different drug combinations.

2.3 Costing Principles for ART Services: Unit Costing

Cost estimates for the different components of the ART care package were based primarily on:

- ▲ Number of patients projected to be on ART each year. The number of patients was the key cost driver for cost of ARVs, laboratory tests, x-ray exams, STI and OI treatment, and chemo-prophylaxis.
- ▲ Number of people receiving VCT services, based on discussions with the head of the VCT program in the MOH.
- ▲ Estimated costs of treatment of OIs and STIs including drugs, labs, and staff time. They do not include depreciation of facility and equipment costs. Costs related to hospitalization include only staff time, drugs, and food.
- ▲ Number of patients receiving PMTCT services were based on the Global Fund application documents.
- ▲ Cost of HBC was based on data collected from the Reach Out Mbuya Parish and adaptation of data from PHR*plus*' work in Rwanda. Estimates were made of the capital and running costs of a HBC support unit operating from a hospital or health center IV (HC IV).

The priority in this costing exercise was to compute the direct service costs, i.e., the costs that can be directly associated with the ART component in question. Staff costs were calculated from estimates of time required to perform various services for a patient (obtained from interviews with service providers). The costs include all inputs (staff, drugs, laboratory and radiology tests, and medical equipment) necessary to provide complete treatment/service. It should be noted that, for the majority of the ART care components, the study first calculated a per patient or per episode cost, which was then applied to the estimated number of patients/episodes. IEC and training costs were calculated in total from a program budget perspective because the costs do not depend on the number of patients covered.

2.4 Food Rations: Inclusion in HBC Costs

There are currently no published guidelines for nutritional support in Uganda. A few institutions (Centers for Disease Control and Prevention/Tororo and The AIDS Support Organization [TASO]) have just started implementing small-scale nutrition programs. Nevertheless, several HBC programs have started providing nutritional assistance through the distribution of food rations to PLWHAs, one of the items in the HBC component of the ART package. The food rations are donated by USAID and the World Food Program; they provide supplemental nutrition to a family of up to five members where at least one member is an AIDS patient on the ART program. This report uses a per household cost of \$6.30 per month based on a *PHRplus* study of the cost of HBC in Rwanda (Chandler, Decker, and Nzigiyiye 2004); this figure is the cost to donors and has been applied to Uganda on the assumption that it would not significantly differ from what it is in Rwanda. The total monthly costs of food rations were arrived at by multiplying this figure by the number of patients on ART.

2.5 Exchange and Inflation Rates

Unless provided in dollars by program managers, program costs were calculated in Uganda shillings and converted to US dollars using the December 2003 exchange rate of US\$ 1.00 = 1800 Uganda shillings. The calculations include an inflation rate of 5 percent per year on all items except ARV drugs where it has been assumed that prices fall at the rate of 5 percent per year.

2.6 Limitations of the Data

The authors recognize that the numbers presented in the results are not precise given the numerous assumptions, limited ART experience in the public sector on which to base costing estimates, and uncertainty about many elements in the future. Nonetheless, the authors are confident that the results present reliable estimates of the order of magnitude of the costs and are a reasonable indication of the actual costs unless the underlying assumptions are significantly altered.

The results provide an estimate of the costs to the government and partners of scaling-up ART in Uganda and are subject to the following limitations:

- ▲ The human resource requirements are based on self-estimated time declared by service providers and may be over- or under-estimated; there are no time and motion studies to verify these estimates.
- ▲ Hospitalization costs are only included for patients admitted with pneumonia (PCP) or cryptomeningitis. The average length of stay for PCP patients is seven days and 14 for cryptomeningitis. There are non-ART AIDS patients who are admitted in hospitals and the cost of their treatment is not calculated in this report.
- ▲ Staff costs are based on salaries currently paid to MOH staff since the cost estimates are for ART care within the public sector.
- ▲ The costs projected are for eight years and do not take into account any changes in productivity that may result as ART is being scaled up – for example, the time taken to treat patients may decline with provider experience.

- ▲ The estimations also do not take into account the cost of the HIV/AIDS prevention programs such as condoms promotion and distribution and of behavior change communication programs.
- ▲ At the request of the Finance and Sustainability Subcommittee, the costs of the logistics of the ART drugs and medical supplies are not included in the study and will be estimated by the DELIVER project. However, the cost estimates of drugs do include an additional 6.5 percent to cover their transport from central warehouses in Kampala to the health facilities.
- ▲ The study estimates the costs of scaling-up ART care in the public sector. The ART resource requirements for the private sector were not included in this study.

3. Results

This section presents the resource requirement and cost projections of the ART care package from 2005 to 2012. The first two subsections present a summary of the costs projections and of the human resources requirements. The other subsections present the cost results for each of the component of the ART care package.

3.1 Summary of Costs Projections

Table 1 provides the summary cost projections. The computation of these costs is explained in the sections that follow.

Table 1. Summary Cost Projections for 2005–2012 (in US\$ million)

	2005	2006	2007	2008	2009	2010	2011	2012	Total	% of total
HAART	24.0	31.2	38.1	40.9	43.7	46.5	49.3	52.1	325.8	56%
HBC – recurrent	10.0	15.1	18.3	20.4	22.8	25.3	28.0	31.0	170.9	30%
Training	0.5	2.2	3.1	2.3	2.4	2.6	2.7	2.8	18.7	3%
VCT	0.8	1.0	1.3	1.6	2.0	2.5	3.2	4.0	16.3	3%
HBC – capital	9.2	6.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	3%
Facility capital costs	10.3	1.7	0	0	0	0	0	0	11.9	2%
IEC	3.7	1.0	0.5	0.5	0.5	0.5	0.6	0.6	7.9	1%
STI	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	5.4	1%
OI	1.3	0.5	0.6	0.3	0.3	0.3	0.3	0.4	4.0	1%
Chemoprophylaxis (TB)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.6	0%
PMTCT	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.5	0%
Total costs per year	60.3	59.3	62.4	66.8	72.6	78.7	85.1	92.0	577.1	100%
Number of patients on ART ('000)	60	80	100	110	120	130	140	150	890	

Note: All programs with \$ 0 million figures are programs whose annual costs are under \$ 0.5 million.

The cost of the ART service package starts at \$60 million in 2005 and climbs to \$92 million in 2012. Table 1 also shows that HAART and the recurrent costs of HBC are the major costs of the ART care package in the projection period; together they account for 86 percent of the total costs of the package. The key determinant for the increase is the number of PLWHA who will be enrolled in the ART service package. Starting at 60,000 in 2005, the study uses the number of people receiving HAART that is assumed to increase by 20,000 each year up to 2007 to reach the government target of 100,000, and increase by 10,000 annually thereafter. It should be noted that the 150,000 people under ART in 2012 represent less than 15 percent of those HIV positive in 2004, all of whom can be expected to become clinically eligible for ART at some point in the period covered by the study.

Further, additional people will be infected over the eight years and some of them will be clinically eligible for ART during projection period.

Capital costs are included in the year they are incurred and not spread over the expected useful lives of the capital items. This was done in order to capture the timing of the expenditures needed. Training and HBC were also more meaningful to estimate in total at an institution level rather than trying to capture them on the basis of expected volume of patients; they are driven by the number of institutions involved rather than by the volume of patients. However, included in HBC are the costs of palliative care and nutrition that are calculated per patient.

3.2 HAART

Cost estimates of HAART were built upon the work that was done in 2003 when PHR^{plus} first assisted the GOU with cost estimates of ARV treatment. The most significant change has been in the prices of drugs as fixed dose combinations. They are now offered at significantly lower prices under the Clinton Foundation agreement. The base scenario presented in Table 1 is based on the Clinton Foundation prices as this gives the lowest cost of drugs per patient per year. These prices are lower than those obtained by most current (2004) non-governmental ART providers in Uganda. It is likely that non-Clinton Foundation prices will fall and therefore projections can reasonably be based on the lowest currently available source.

Prices and assumptions regarding the mix of patients on ARV (adults/children; first/second line; treatment protocols) were obtained from the DELIVER Project's drug quantifications working papers. The HAART regimen used is the combination of three ARV drugs. The adult/pediatric mix was assumed to be 92.5 percent to 7.5 percent. Ninety percent of all patients were assumed to be on first-line and 10 percent on second-line treatment. The mix of patients is a policy variable that the government can change, for example, to accommodate different access and coverage objectives for specific populations. This may be particularly so in the early years of the scale-up process.

The HAART regimen used in the costing is the standard treatment currently required by the Uganda *National Antiretroviral Treatment and Care Guidelines for Adults and Children* (August 2003) that include the following laboratory monitoring: two hemoglobin tests, two blood count + differential, two liver function tests, two renal function tests, two CD4 counts, and zero viral loads.

Table 2 shows the per patient annual HAART costs used in the projections. The cost per patient for HAART is \$ 412, including the tests necessary to monitor patients. ARV drugs constitute 78 percent of the total cost whereas staff and laboratory costs account for 4 percent and 18 percent respectively.

Table 2. Annual Per Patient HAART Costs

	Costs	Percentage
Drugs	\$ 322	78%
Staff	\$ 16	4%
Laboratory	\$ 74	18%
TOTAL	\$ 412	100%

3.3 Other ART Components: OI, VCT, STI, TB Chemoprophylaxis, and PMTCT

Table 3 shows the costs per patient per year that were used to compute the estimates in Table 1. Sections 3.3.1 to 3.3.5 describe the calculation of each of these projections.

Table 3. Unit Costs for OI, VCT, STI, TB Chemoprophylaxis, and PMTCT

Component	OI	VCT	STI	TB C/prophylaxis	PMTCT
Unit of measurement	Per episode	Per person tested	Per episode	Per patient/ per year	Per patient/ per year
Cost	\$67	\$2	\$5	\$17	\$3

The estimation of costs for OIs and STIs made assumptions about the HIV co-infection rates based on information obtained from the AIDS Information Center (AIC) and other providers. TB co-infection was taken as 23 percent with re-current TB affecting 3 percent of ART patients. Together with PCP and meningitis, the number of episodes of any OI was estimated at 0.36 per patient in the first year of joining the ART program; once patients are on ARVs, the incidence of OIs falls significantly and the costs have been assumed to be negligible. The STI co-infections are also different for each STI but when all were taken together, it was estimated that each ART patient would have one episode of an STI. The unit costs shown above are weighted average costs taking into account the relative incidence rates of each disease.

3.3.1 Opportunistic Infections

Treatment for OIs accounts for only 1 percent of the total ART package. OI treatment costs start at \$1.3 million in 2005 when the largest number of new patients is expected to join the ART program. Costs are about \$0.5 million for 2006 and 2007 when 20,000 new patients are expected to enter the program. Thereafter the costs hover around \$0.3 million annually when 10,000 patients are estimated to enter the program per year. The estimations include all the costs of medications, laboratory tests, food for inpatients, and staff time consumed in the treatment of the most common HIV-related infections: new episode of TB, recurrent TB, PCP, and cryptomeningitis.

Table 4 shows the estimated cost of treatment of each OI. The most expensive is for cryptomeningitis because of the 14-day inpatient treatment.¹ The current practice for TB (both new and recurrent) is not to have patients hospitalized. However, there is a cost for staff time because of visits to doctors and nurses during the long treatment course.

¹ Only the costs of food, drugs, laboratory tests, and staff time are included in the costs.

Table 4. Unit Costs of OIs

Disease	Staff	Lab tests	Drugs	Inpatient care (food)	Total costs per episode	Relative incidence within group of OIs	Weighted cost per patient per year
	\$	\$	\$	\$	\$	%	\$
New TB	11.06	8.59	32.95		52.61	64%	33.67
Recurrent TB	10.86	8.59	37.52		56.97	8%	4.56
PCP	8.20	2.86	5.45	5.6	22.12	14%	3.10
Cryptomeningitis	16.27	52.15	106.40	11.20	186.01	14%	25.83
Weighted average cost per patient per year							67.26

The weighted average cost takes into account the relative occurrence of each OI among patients on ART. OIs were taken into account only in the first year that a patient is on the ART program because their incidence tends to reduce significantly once patients are on ARVs.

3.3.2 Sexually Transmitted Infections

Similar to OIs, the total cost of treating STIs makes up only 1 percent of the total costs of the ART package, starting at \$0.3 million and rising to \$1.0 million. The cumulative cost over the projection period is \$5.4 million. STI costs include all the costs of medications, laboratory tests, and staff time consumed in the treatment of one episode of the following STIs: genital ulcers, gonorrhea, syphilis, urethral discharge, vaginal discharge, and lower-abdominal pain.

For each STI, average staff time and costs of laboratory tests and medications were taken and multiplied by the number of cases weighted by the co-infection rates.

Data for the cost estimates for STIs were obtained from Mulago Hospital and JCRC. Table 5 shows that the amount of staff time required for STI treatment is nearly the same for all STIs except for syphilis, which requires less time than others. Most of the STIs are treated syndromically, and so no laboratory costs are incurred, except for syphilis. It was estimated that a patient on ART would have one STI episode per year.

Table 5. Unit Costs per Episode of STI

Category	Costs			Total costs per episode
	Staff	Lab Tests	Drugs	
	\$	\$	\$	\$
Genital ulcers	2.9	-	5.1	8.0
Vaginal discharge (pregnant)	2.9	-	2.0	4.9
Vaginal discharge (non-pregnant)	2.9	-	8.2	11.1
Syphilis	1.6	0.1	0.6	2.3
Gonorrhea	3.0	-	0.4	3.4
Lower abdominal pain	2.9	-	0.5	3.4
Urethral discharge	2.9	-	0.2	3.1

3.3.3 Prophylaxis for Tuberculosis

Prophylaxis for TB is not at all a significant cost in the ART package and accounts for less than 1 percent of total costs. Currently, the AIC is the only organization doing TB prophylaxis. The guidelines for post-exposure prophylaxis (PEP) and pneumonia prophylaxis are currently being developed. There were no reasonable estimates available for projected numbers of cases per year and it was considered unlikely that this would be a significant cost in the context of the ART program. For this study, only the costs of TB prophylaxis were calculated. Once guidelines are developed for other OI prophylaxes it may be useful to do a more comprehensive costing at that time.

The estimated cost of TB prophylaxis, shown in Table 6, is based on data provided by AIC. The cost is estimated to be \$17.19 in 2004, with the cost of laboratory tests being the most important element, as sputum tests are done repeatedly during the eight-month preventive course.

Table 6. Unit Cost for TB Prophylaxis

Category	Cost			Total costs per patient
	Staff	Tests	Drugs	
Cost per patient per year	\$ 5.35	\$ 10.76	\$ 1.08	\$ 17.19

3.4 Home-based Care

The HBC component of the ART package contributes 33 percent of the total costs of the ART package: 30 percent represents recurrent costs while 3 percent is capital costs of setting up HBC units. HBC recurrent costs start at \$10 million in 2005 and rise to \$31 million in 2012. There are at present no agreed standards for HBC and the scale-up plans are not yet finalized. The programs implementing HBC in Uganda are at different stages and many have not been totally weaned from the pilot-style interventions where resource use is still heavier than can be replicated. The study used the Mbuya Reach Out model (combination of a health unit using community volunteers for community outreach) to estimate the cost of a typical HBC program serving approximately 1000 PLWHAs.² Mbuya's staff (medical, management, and administration) support the HBC team that comprises itinerant Mbuya nurses, community health workers, and volunteers. Total and recurrent monthly costs were estimated from Mbuya's financial records and discussions with Mbuya's management.

For 2005 and 2006, the study included capital costs for setting up one HBC unit in each district hospital and half (107) of the HC IV in 2005. In 2006, the other half of the HC IV will set up HBC units. It is assumed that the set-up costs for district hospital and HC IV are the same.

Capital costs include two vehicles in each facility, 10 bicycles for volunteers, initial training, and equipment. No HBC units have been programmed beyond HC IV levels from 2007 to 2012. It is assumed that the upgrading of these health facilities (including the equipment) will not need to be repeated during the period 2005–2012.

The study included the cost of palliative care as the MOH is contemplating channeling the provision of the majority of palliative care through HBC. Palliative drugs costs were calculated using

² In April 2004, Mbuya was providing HBC services to 960 people.

the five most commonly used drugs (including morphine, which will become a standard palliative drug by the end of 2004). Drugs costs in HBC do not include HAART, OI, and STI drugs, as the study assumes that drugs for all three will be provided during the HAART visits to the health facility.

Nutritional supplement rations for PLWHAs were included in HBC. This may become the principal avenue for improving the nutritional needs of PLWHAs. Estimates of food rations costs were based on the results of a study done by *PHRplus* in Rwanda that estimated costs of \$6.3 per PLWHA per month. Food rations distributed in Uganda are the same as those in Rwanda and are priced similarly. The food rations are not purchased by the HBC programs but are donated by the World Food Program in Uganda. Food distribution is not yet a general HBC practice in Uganda but it appears to be growing.

Finally, the costing assumed that volunteers will be paid a stipend, and this cost was included in the projections.

The cost estimates in Table 7 are based on the assumption that from 2005 there will be a HBC unit in each of the 56 district hospitals. HBC units will be established in the half (107) the HC IVs in 2005 and the other half in 2006.

Table 7. Costs of HBC per Site: Recurrent and Capital Costs (in 000)

	2005	2006	2007	2008	2009	2010	2011	2012	Total
Recurrent costs	\$	\$	\$	\$	\$	\$	\$	\$	\$
Staff	847	1,473	1546	1,623	1,705	1,790	1,879	1,973	12,836
Volunteer stipends	610	1,061	1114	1,170	1,228	1,290	1,354	1,422	9,249
Short-term training	363	631	662	695	730	767	805	845	5498
Per diem/transport	296	514	540	567	595	625	656	689	4482
Drugs	1,746	2,445	3,209	3,706	4,245	4,829	5,461	6,143	31,785
Overhead	1,344	2,337	2,454	2,576	2,705	2,840	2,983	3,132	20,370
Subtotal recurrent costs before food rations	5,205	8,460	9,525	10,338	11,209	12,141	13,138	14,205	84,222
Donated food rations	4,763	6,668	8,752	10,108	11,578	13,170	14,893	16,754	86,686
Total with food rations	9,968	15,128	18,277	20,448	22,787	25,311	28,031	30,959	170,908
Capital costs	9,166	6,018							15,184

Table 7 shows the details of the projected HBC costs. As mentioned earlier, HBC recurrent costs are a large share of the ART care package, accounting for 30 percent of total ART costs for 2005–2012. Food ration costs account for about 51 percent of HBC total recurrent costs. The second largest cost element is drugs for palliative care, which accounts for about 19 percent of total recurrent costs.

3.5 Training

The study uses the *National Framework for Capacity Building for Comprehensive HIV/AIDS including ART* (Namagala 2004) as the basis for estimating the costs of ART-related training.

Training costs are not significant in the ART package though the activity itself is critical to the success of the ART implementation; they account for 3 percent of total costs. The framework corresponds to the different phases of the ARV scale-up plan. The framework states that each facility will have a core of six staff trained in ARV and comprehensive AIDS care and treatment. Training cost data were provided by TASO and the MOH. These costs include staff time, materials, per diem and transport costs of the institutions providing the training. The training modules were assumed to be the same irrespective of the facility level. Since all referral hospitals have been trained, the study estimated the training costs for the 56 district hospitals, 214 HC IV, and 200 lower-level facilities. Refresher courses for all facilities were estimated to be at half of the TASO and MOH basic training costs. Costs of refresher courses were included once in the period for the already-trained staff of the 11 referral hospitals.

Table 8 shows the training costs for the ART scale-up. All district hospital staffs will be trained in 2005, all HC IV in 2006, and all lower-level facilities in 2007. In each year after the initial training, all institutions will receive refresher training and updates on ART technology.

Table 8. ART Training Costs

Category	2005	2006	2007	2008	2009	2010	2011	2012
	\$	\$	\$	\$	\$	\$	\$	\$
Regional hospitals	50,815	53,356	56,023	58,825	61,766	64,854	68,097	71,502
District hospitals	498,064	260,374	273,393	287,063	301,416	316,487	332,311	348,926
HC IV	-	1,903,316	995,002	1,044,752	1,096,989	1,151,839	1,209,431	1,269,902
Other facilities	-	-	1,778,800	929,908	976,403	1,025,224	1,076,486	1,130,309
TOTAL	548,879	2,217,046	3,103,248	2,320,547	2,436,574	2,558,403	2,686,323	2,820,639

3.6 Information, Education, Communication

This study targeted only IEC activities that are specific to the ART program scale-up. Costs of IEC were determined through discussions with the senior health educationalist of the Health Promotion and Education Division. The division plans to develop a new campaign for the promotion of messages related to ART. The campaign will focus on the following key areas:

- ▲ Breastfeeding during ART
- ▲ Adherence to ARV regimen
- ▲ Continued protection in sex during the ARV treatment.

Table 9 shows the projected costs of the ART IEC campaign. The cost for the first year (2005) of the campaign is the most expensive, with a startup cost of \$3.7 million. This includes the development of materials and a heavy communication campaign (with monthly district-level activities). In 2006, the communication activities drop to quarterly activities both at the district and national levels. There are further declines in communication activities from 2007, with semi-annual district-level activities and with national airtime.

Table 9. ART IEC Costs (in 000)

	2005	2006	2007	2008	2009	2010	2011	2012
Category	\$	\$	\$	\$	\$	\$	\$	\$
Material development	25.0	-	-	-	-	-	-	-
Radio air time (national level)	25.0	6.6	3,4	3.6	3.8	4.0	4.2	4.4
District-level communications	3,696.0	970.2	462.0	485.1	509.3	534.8	561.6	589.6
TOTAL	3,746.0	976.8	465.4	488.7	513.1	538.8	565.8	594.0

3.7 Capital Costs

The study included the costs of refurbishing facilities and purchase of equipment to allow them to provide ART. These costs were included in the year they are purchased and not spread over their expected useful lives since the primary objective of the costing is to see what resources will be required each year of the projection period. There were no readily available data on the types and costs of laboratory equipment that the MOH will need to acquire in readying for the ART scale-up. Investment in capital items includes the purchase of specialized laboratory equipment (CD4 and viral load for selected hospitals) and general laboratory refurbishment. Some renovation will also be required for patients' areas to include space for counseling. It was assumed in the costing that all 56 district hospitals and half (107) of the HC IV will be renovated in 2005, with the remaining half of HC IV completed in 2006.

For the purposes of these cost projections, data on laboratory renovations were obtained from the MAP project. It was also assumed that laboratory equipment and other facility renovations would cost \$100,000 per hospital and \$10,000 per health center. These capital expenditures will account for 2 percent of the total cost of the ART package and will only be incurred in 2005 and 2006. Beyond 2006, it is expected that there will be no further significant capital investment. The study did not include the cost of upgrading lower-level health facilities, as is it not part of the plans for renovations.

3.8 Human Resource Requirements

Staff requirements for the implementation of the ART policy are shown in the Tables 10 and 11. These are based on the estimates of time required to provide services to patients by the different categories of staff and an estimate of the volume of services likely to be required annually.

Two scenarios are presented. Table 10 shows a first scenario that assumes that treatment of STIs and OIs, and chemoprophylaxis for TB is provided at the same time ("combined visit") as the monthly ARV monitoring and drug re-supply visit. This means that the patient does not need to see staff from the health facility beyond the regular visit for ART.

Table 10. Staff Requirements: ARV, STI, OI, and TB Chemoprophylaxis, Combined Visits

Staff category	2005	2006	2007	2008	2009	2010	2011	2012
Doctors	151	217	252	269	286	303	320	338
Nurses	452	631	712	783	864	958	1,067	1,194
Lab technicians	146	187	230	262	297	336	381	431
Counselors	691	970	1089	1195	1316	1456	1619	1808
Comm. health workers	196	324	324	324	324	324	324	324
Pharmacy technologists	43	58	72	80	87	94	101	109

Table 11 below shows the second scenario that assumes that the monthly monitoring and drug distribution ARV visit is separate from the visits for treatment of STIs and OIs, and for TB chemoprophylaxis, meaning that the ART patient has more contact with staff in a year.

Table 11. Staff Requirements: ARV, STI, OI, and TB Chemoprophylaxis, Separate Visit

	2005	2006	2007	2008	2009	2010	2011	2012
Doctors	202	285	336	362	388	413	439	465
Nurses	508	706	805	886	976	1,079	1,198	1,334
Lab technicians	149	191	235	267	303	343	387	438
Counselors	691	970	1,089	1,195	1,316	1,456	1,619	1,808
Comm. health workers	196	324	324	324	324	324	324	324
Pharmacy technologists	54	72	91	100	109	118	127	136

For both scenarios, the number of projected staff necessary for ART scale-up continues to increase between 2005 and 2012. The increases are based on the increasing number of patients entering and staying on ARV treatment. Between 2005 and 2012, there is a doubling, and at times tripling, of the number of medical staff providing ART treatment. The increase varies between close to 200 percent (lab technicians) and 65 percent (community health workers) in each of the two scenarios. Both scenarios show that the staff requirements for overall program and per each type of staff will need to increase significantly to meet the challenge of the scale-up.

Table 12 compares the staff numbers required under scenario 1 above (Table 10) to the existing staff establishment in 2005.

Table 12. Required Increase in Staff Numbers

	Existing staff	Required for ART (Scenario 1)	Required increase
Doctors	946	151	16%
Nurses	7472	452	6%
Lab technicians	451	146	32%
Counselors	Data not available	691	-
Comm. health workers	157	196	125%
Pharmacy technologists	177	43	24%

Source: MOH Personnel Department

It is clear that substantial numbers of health workers will need to be recruited, especially laboratory technicians, community health workers, and pharmacy technologists. The 16 percent increase in the number of doctors may also be a challenge depending on the ability of the country to train or recruit from other countries. In addition to the 946 doctors, the country has 1,766 clinical officers.

Table 13 shows the hours and minutes per patient per year for all ART-related services. The times shown are average after taking into account the relative proportions of patients likely to receive any of the services in the package.

Numbers of staff of different categories were based on interviews with providers at Mbarara District Hospital, Mulago Hospital, Nsambya Hospital, and the AIDS Information Center, who provided estimates of the length of time it takes to provide care to patients. It should be noted that these estimates could be improved by performing time and motion studies. (Staff tend to over-estimate the time they spend with patients.) The patient contact times used represent the average of all the estimates provided by staff in different institutions. The estimates do, however, provide an order of magnitude of the staff requirements.

Given the estimated co-infection rates, patients are expected to present with any of the OIs at the rate of 0.36 episodes per patient per year and 1.0 episode of an STI per patient per year.

Table 13: Human Resource Requirement for ART Services, in Hours

	Doctors	Nurses	Lab & X-ray technicians	Counselors	Community health workers	Pharmacy technicians/ technologists
HAART (per patient/yr)	2.33	2.42	1.87	3.58	-	1.00
OI (per patient/episode)	0.50	0.50	0.16	-	-	-
VCT (per test)	-	0.50	0.17	0.75	-	-
PMTCT (per patient per year)	0.17	0.67	-	0.75	-	-
STI (per patient per episode)	0.50	0.50	0.02	-	-	0.25
HBC (staff per HBC site)	0.30	1.00	-	1.60	1.20	-

Table 13 shows that all the ART services use doctors and nurses, except the VCT program. For OIs and STIs, the average patient uses the same amount of time and cadres of medical staff. For STIs, lab technicians are only used for confirmation of the syphilis test as the other STIs considered in the study (gonorrhoea, vaginal and urethral discharges, lower-abdominal pain, genital ulcers) are diagnosed syndromically without a lab test to confirm the infections. For OIs and STIs, the laboratory technicians' time shown above is weighted by the relative incidence rates of each disease.

Human resource requirements calculated for the HBC programs show that counselors and community health workers are the main staff involved to support HBC activities. Time spent with patients by doctors and nurses for HBC support is to provide supervision of counselors as well as direct time with very sick patients who require clinical care that community health workers cannot provide.

4. Conclusions and Recommendations

These estimates intend to inform policy discussions and decisions on ART care and to strengthen the GOU's response to the epidemic. Besides some possible costs reductions (see below), scaling-up the ART program in Uganda to reach 150,000 people will cost between \$60 million and \$92 million per year between 2005 and 2012.

The data show that 56 percent of the ART scale-up costs will be attributable to HAART care. Within HAART, the cost of ARV drugs is the largest component. Although ARV drug prices have been declining in the recent past, drugs will continue to be a major cost component of ART care, not just in Uganda but also for other countries. Cost projections were based on services being delivered by a combination of medical cadres that reflects current practice in Uganda. This combination could (with adequate training) be changed to make use of other caregivers in place of the more scarce doctors. The primary achievement of this approach would be to reduce the strain on doctors rather than to reduce costs, as staff costs make up only 4 percent of total HAART costs. Thus, even a change in the staffing mix that would cut staff costs in half would reduce total costs by less than 3 percent. However, the MOH and the ARV Policy Committee should investigate whether the approach is feasible in terms of quality of care and of recruiting and training lower cadres of health staff.

The data show that HBC is another large cost component, accounting for 30 percent of total costs. There are two major drivers of these costs. First, 270 facilities (56 district hospitals and 214 HC IV) are expected to set up and operate HBC programs. Secondly, the study has included the cost of food rations³ for PLWHAs and families. The costs could be lowered by a less-ambitious program either through the reduction/elimination of food rations and/or reduction of the number of facilities supporting HBC units.

There are other ART care package components that could benefit from further study when data become available, for example, nutrition (specific to PLWHAs and HAART patients) and the different types of prophylaxis, i.e., post-exposure and against OIs. Even palliative care is at an early stage of implementation. As guidelines are developed and implementation initiated, the cost projections for these elements should be re-examined.

The GOU has made significant progress in its strategy for the provision of ART services. This has led to a reduction in the infection rate from the high teens in the 1990s to single digits in early 2000s. The GOU will have substantial external financial support for the ART scale-up through the Global Fund, the U.S. PEPFAR, the World Bank MAP, and others in the near and possibly medium term. The sustainability of this support is uncertain beyond the next 5–10 years.

The authors make the following recommendations:

- ▲ ARV and other drug prices should be monitored constantly. If drug prices change significantly, it may be worth re-estimating resource requirements for the ART program. To

³ The World Food Program currently donates these rations.

reduce the high costs of drugs, the GOU should continue negotiations with local and international pharmaceutical companies.

- ▲ Once additional guidelines for other ART services (e.g., nutrition, pediatric AIDS, palliative care, post-exposure prophylaxis) are finalized, it may also be worthwhile to re-estimate these costs and see how they affect resource requirements.
- ▲ The data projected show that mobilization of substantial resources will be required. The GOU should pay particular attention to the human resources requirements and training. Currently, very few health care providers have received adequate clinical training on HAART.
- ▲ It is recommend that the GOU conduct additional analysis of scenarios for different levels of subsidies and financing. Resources for ART may become scarce, even though donor support appears to be plentiful in the near term. The very likely scarcity of resources in the long term may require that some difficult choices be made about how to generate more resources from national sources, whether and how much to ask those able to pay to contribute to meeting the costs, and how to prioritize people in need when demand is greater than supply. The ARV Policy Committee and the Financing and Sustainability Subcommittee should consider not only proposing policies, but should also monitor the impacts of those policies that do get implemented related to scaling-up the ARV program, especially concerning human resources, coverage, subsidies, rationing/selection criteria, and other equity issues.

Annex A: Key Assumptions

No. of new district/regional hospitals in ART	All district hospitals will be offering ART services by end of 2005
No. of new HC IV offering ART	All 214 HC IV will be offering ART by the end of 2005. We have assumed that only 50% will be doing so, and the rest will come in by the end of 2006.
No of persons tested (VCT)	Head of VCT in MOH estimates 500,000 for 2005. Annual increase of 10,000 thereafter
Average no. of STI per ART patient from 2005 to 2012	1.0
Average no. of OI (TB, PCP, and CM) per ART patient in 2005 to 2012	0.33
Laboratory refurbishment per hospital (per AIM)	US\$ 3,264 for refurbishment. Equipment plus any other facility renovations are estimated to cost an additional \$100,000
Laboratory refurbishment per HC IV (per AIM)	US\$ 5,599
Home-based care	56 district hospitals and 107 HC IV to start HBC programs in 2004; in 2006, the remaining 107 HC IV start to provide services.
No. of PMTCT patients	For 2005: 5,000; 2006: 7,500; 2007: 14,500 then annual increases of 2,500 patients from 2008 to 2012
No. of chemoprophylaxis TB patients (per AIC)	20% of all new ARV patients
Inflation (all except ARV drugs)	5%
ARV price "deflation"	-5%

	2005	2006	2007	2008	2009	2010	2011	2012
No. of ART patients	60,000	80,000	100,000	110,000	120,000	130,000	140,000	150,000
Net no. of patients joining ART	50,000	20,000	20,000	10,000	10,000	10,000	10,000	10,000

Annex B: Data Sources

Activity	Institutions	Contact Persons
ART	MOH; DELIVER Project	S. Wilbur, Y. Mikaele; Dr. Muwonge
PMTCT	MOH; Nsyambia Hospital; Masaka Hospital	Dr. Onyango; C.Kitu; L. Bassana
VCT	MOH; Masaka Hospital	Dr A. Zainab
HBC	MOH; Mbuya Reach Out; Hospice; Kitovu Mobile Clinic	Mrs. Mwenge; Dr. Margrethe Udey; Dr Carla Simmons
Prophylaxis	AIC; Medical Access; AXIOS	Dr.Mugisha; Mr Sowedi; D.Kimera
OIs	MOH; JCRC; DELIVER Project	Dr Zainab; Dr F. Ssali, Dr Kabuye; J.Nalugwa; Y.Mikaele
STIs	MOH; JCRC; Mulago Hospital	Dr.F. Ssali, Dr. Kabuye; J. Nalugwa; Dr. Kambugu; Dr Kyambadde
Training	MOH; Mildmay Clinic, TASO	J.Nabalone; J. Downing; Dr Aloysius Kakia
Palliative Care	MOH; Hospice Uganda	Dr Ssebesubi; Dr. Seru; Fatiah Kiyande; T. Duku; Dr. Kwariisima; M. Rabwoni
IEC	MOH	Dr S. Enginyu
Capital costs	AIM Project	Dr. Semafumu; Dr Haumba; K. Heise
Complementary information	MOH	Dr. E. Namagala

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Annex C: Bibliography

- Chandani, Yasmin, Moses Muwonge, and Fred Sebisubi. December 2002. Uganda: “Preliminary Assessment of Needs for HIV/AIDS: OI Drugs.” Draft For Comment. DELIVER Project, John Snow Inc.
- Chandler, Rudolph, Catherine Decker, and Bernard Nzigiye. June 2004. *Estimating the cost of providing home-based care for HIV/AIDS in Rwanda*. Bethesda, MD: Partners for Health Reformplus, Abt Associates Inc.
- Hospice Africa Uganda. April 2003. *Tenth Annual Report: April 2002–March 2003*.
- Ministry of Health. February 2002a. *The National Strategic Framework For Expansion of HIV/AIDS Care and Support in Uganda: 2001/1–2005/6*.
- . 2002b. MOH Annual Performance Report 2002.
- . ART Task Force. March 2003. *Implementation Guidelines for ART in Uganda*.
- . June 2003. “Uganda National Policy: Implementation Guidelines for HIV Voluntary Counselling and Testing Services.” Draft undergoing legal review.
- . ART Task Force. August 2003. *National ARV Treatment and Care Guidelines for Adults and Children*.
- Namagala, Elizabeth. 2004. *National Framework for Capacity Building for Comprehensive HIV/AIDS including ART*. Presentation made on June 4.
- Smith, Owen and Marty Makinen. March 26, 2003. “Memo to ARV Finance Subcommittee: Preliminary results from ATC in Uganda.” Bethesda, MD: Partners for Health Reformplus, Abt Associates Inc.
- World Health Organization and UNAIDS. 2000. “Key elements in HIV care and support.” Draft working document. Geneva: WHO.