Assessing the Macroeconomic Impact of HIV/AIDS in Uganda

Summary Report

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Abbreviations

AGM	Aggregate Growth Model
AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral therapy
BoU	Bank of Uganda
CGE	Computable General Equilibrium
CHOGM	Commonwealth Heads of Government Meeting
ETOs	Extra-territorial organisations
FY	Financial Year
FX	Foreign Exchange
GDP	Gross Domestic Product
GOU	Government of Uganda
HIV	Human Immunodeficiency Virus
IEC	Information, Education and Communication
IMF	International Monetary Fund
LICs	Low Income Countries
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MICs	Middle Income Countries
MoFPED	Ministry of Finance, Planning and Economic Development
MOH	Ministry of Health
MTEF	Medium Term Expenditure Framework
NGOs	Non Governmental Organisations
NSP	National Strategic Plan
ODA	Official Development Assistance
OLG	Overlapping Generations Model
OVC	Orphans and Vulnerable Children
PEAP	Poverty Eradication Action Plan
PEPFAR	President's Emergency Plan for AIDS Relief
PMTCT	Prevention of Mother-To-Child Transmission of HIV
REER	Real Effective Exchange Rate
RoW	Rest of the World

SAM	Social Accounting Matrix
TFP	Total Factor Productivity
UAC	Uganda AIDS Commission
UGX	Uganda shilling
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNHS	Uganda National Household Survey
USAID	United States Aid for International Development
USD	United States Dollar
UTTA	Uganda Think Tank on AIDS
WHO	World Health Organisation

Assessing the Macroeconomic Impact of HIV/AIDS in Uganda: Summary Report

Introduction

Over the past few years, dealing with HIV/AIDS and its effects has become one of the major public policy issues in many countries in Southern and Eastern Africa. While it is fundamentally a health issue, the impact of HIV/AIDS goes far beyond health because of its widespread human, social and economic effects. Southern and Eastern Africa have the highest HIV prevalence rates in the world, and in many countries in the region HIV and AIDS have spread throughout the general population, rather than being concentrated in specific sub-groups of the population as tends to be the case elsewhere in the world. As a result, it is estimated that nearly two-thirds of all HIV positive people in the world live in sub-Saharan Africa, while South Africa, along with India, has the highest number of HIV positive people of any country in the world.

Uganda was one of the first countries in Africa to experience a widespread HIV and AIDS epidemic, and has also been one of the most successful in dealing with the problem and bringing down HIV prevalence and incidence rates. Although HIV prevalence rates are not as high as in some Southern African countries, where prevalence rates of over 15% of the adult population are typical, it nonetheless has a large number – estimated at around 1 million – of HIV positive people, with associated problems of ill-health, death and orphanhood.

The economic impact of HIV and AIDS operates through a number of channels. These include direct impacts on GDP growth through labour supply, productivity and savings/investment channels. To a certain degree, these impacts can be offset through the provision of treatment programmes which ameliorate the health, social and economic impacts of HIV and AIDS. Such programmes are, however, expensive, which raises questions regarding competing demands on resources, both public and private, and potential fiscal impacts. Increasingly, poor countries have access to donor financing to meet a substantial portion of these costs, which changes the potential fiscal impact but raises additional issues regarding monetary and exchange rate implications that can have indirect effects on competitiveness, inflation and economic growth. Concerns regarding these indirect impacts of HIV and AIDS, and spending on treatment, have in some countries, including Uganda, raised issues regarding the optimal rate at which donor funds should be utilised. There has been uncertainty over the level of investment that should be made in responding to HIV and AIDS, as well as a lack of understanding as to whether the benefits of a rapid scale-up of treatment would be primarily economic, or social, or both.

Rationale for the Study

Although there is awareness of the general economic impacts of HIV and AIDS in Uganda, little work had previously been done on quantifying these impacts, and particularly on quantifying the impact of programmes undertaken to deal with HIV/AIDS. This has hindered macroeconomic planning and the formulation of an appropriate HIV/AIDS response. While there is awareness that there is a need for a scaling up of the response to HIV and AIDS, and that donor funds to do so are largely available, there is concern that macroeconomic instability could potentially result, and that this could

undermine the great strides that Uganda has made in achieving macroeconomic stability over the past 15 years. Hence there has been uncertainty over the level of investment that should be made in responding to HIV and AIDS in Uganda.

The need for a study to assess the macroeconomic impact of HIV and AIDS in Uganda has been under discussion since early 2005, when it was raised in meetings between UNAIDS and the Ministry of Finance, Planning and Economic Development (MoFPED). The need was further discussed by the Uganda Think Tank on AIDS (UTTA) and the AIDS Partnership Forum, and the UN system was requested to spearhead the process. As a result, Terms of Reference for a study on the Macro-Economic Assessment of HIV/AIDS in Uganda were drawn up by a Technical Working Group comprising UNDP, MoFPED and other stakeholders.

The Terms of Reference for the study indicate that it should be conducted in three phases, as follows:

Phase I: conduct a literature review from Uganda and the region on existing micro economic and macroeconomic studies and models, detailed methodology and scope of work for phase two;

Phase II: carry out a selected number of microeconomic studies/surveys;

Phase III: carry out an aggregated macroeconomic analysis, production and validation of report.

This report summarises the results of each of the three phases of the study.

Phase I – Literature Review

The literature review was produced as the first part of the study on Assessing the Macroeconomic Impact of HIV/AIDS in Uganda. The Terms of Reference for the Study specified that Phase I should include a "Familiarisation and review of existing economic/sector impact studies in Uganda or in the region". The review contains the following sections:

- The Evolution of HIV/AIDS in Uganda, Interventions and Policy Responses
- Channels of Macroeconomic Impact of HIV/AIDS
- Economic Sector Studies, Household and Poverty Impact Analysis, Health and Education sector impacts in Uganda and the Region
- Country Studies
- Fiscal Impact, the Role of Official Development Assistance (ODA) and Macroeconomic Policies
- Methodological Approaches to Analysing the Macroeconomic Impact of HIV/AIDS
- Recommendations for Phase II of the study

The introductory chapter on the evolution of HIV/AIDS in Uganda details the wide-ranging response to HIV/AIDS that has been adopted in the country, at both institutional and clinical levels. Interventions are perceived as having been effective given the reduction in HIV prevalence, although there are concerns that prevalence is now rising. This may be due to complacency over past successes which may in turn be exacerbated by the increasing availability of Anti-Retroviral Therapy (ART), which can be effective at markedly prolonging survival for those who are HIV positive. It is also noted that HIV prevalence is higher in urban than in rural areas, and rises with household wealth.

The economic impact of HIV/AIDS can be divided into the following areas:

- Impact on key macroeconomic variables (growth, average incomes etc.)
- Household level impact (household incomes, poverty, income distribution)
- Micro-level impact on firms, enterprises (output, productivity, profitability)
- Fiscal impact (revenues, spending, fiscal balance)

The impact on GDP works through a variety of channels, including:

- Smaller population and labour force
- Changed age structure (and experience) of labour force
- Reduced labour productivity (sickness, time off work)
- Intensified skills shortages
- Diversion of expenditure (health care, funerals, sick pay, training, recruitment)
- Reduced savings (due to increased consumption)
- Reduced investment (lower savings, diversion of public spending, reduced firm profitability, increased risk and uncertainty)

Household impacts result from reduced income (due to lost work from sickness and care-giving, and perhaps the eventual death of a breadwinner), and additional expenses. Income and expenditure may be affected by changed household structures, such as taking in orphans, different employment opportunities, and the impact of support structures from family, community or the state.

The impact on firms and enterprises is wide-ranging, as HIV/AIDS can affect labour productivity, expenditure demands, investment, skill needs and availability, wage levels, capital intensity of production, recruitment & training costs, profitability and return on investment, and market size and growth. For farming households, HIV/AIDS affects the time allocation between productive and household tasks. Given that one of the main channels of impact of HIV/AIDS is through labour supply, sectors (and economies) that are labour intensive are particularly vulnerable.

Fiscal impacts result from additional expenditure (on health care, social support costs (e.g. orphans) and education. Revenues will be impacted by inflows of donor funds (ODA), as well as indirect impacts (resulting from changed GDP, population size). Both affect the budget balance and financing, resulting in a larger fiscal deficit, with financing implications (through debt, money or donors).

The review covered a large number of studies of the macroeconomic impact of HIV/AIDS, although there are none for Uganda. Approximately 25 reports/publications/studies were identified from the early 1990s to 2007, covering other countries in sub-Saharan Africa (Tanzania, Kenya, Malawi, SA, Botswana, Zambia) (see Table 1). They used a variety of modelling approaches with differing complexities and data requirements. The results showed a consistently negative growth impact ranging from -0.5% to -4.5% on annual GDP growth, although most were in the range of up to -2%. The growth impact depends on many factors, including the productivity impact of HIV/AIDS, the means of financing of increased spending (out of consumption or savings), the sectoral composition and capital intensity of economy, the availability of treatment, and HIV prevalence across skill categories. A few recent studies noted that treatment (ART) can significantly reduce the negative economic impact, although at a cost.

Table 1: Studies Evaluating the Macroeconomic Impact of HIV/AIDS

Authors	Country	Method	Period Covered	Impact on Growth Rates	
				GDP	GDP per cap.
Over (1992)	30 sub-Saharan African countries	Econometric estimation & simulation	1990-2025	-0.56% to -1.08%	0.17% to -0.35%
	10 most advanced epidemics			-0.73% to -1.47%	0.13% to -0.60%
Kambou, Devarajan & Over (1992)	Cameroun	CGE	1987-91	-1.9%	n/a
Bloom & Mahal (1995)	51 countries	Econometric estimation	1980-92	-ve but small	
Cuddington (1993a,b)	Tanzania	Aggregate growth model	1985-2010	-0.6% to -1.1%	0.0% to -0.5%
Cuddington & Hancock (1994a,b)	Malawi	Aggregate growth model	1985-2010	-0.1% to -1.5%	-0.1% to -0.3%
BIDPA (Jefferis, Greener & Siphambe) (2000)	Botswana	Aggregate growth model	1996-2021	-0.8% to -1.9%	+0.4% to -0.5%
Bonnel (2000)	70 developing countries	Econometric estimation	1990-97	up to -2.8%	up to -1.4%
Quatteck/Ing Barings (2000)	South Africa	Macro-econometric model	2001-2015	-0.3%	+ve
Arndt & Lewis (2000)	South Africa	CGE	2001-2010	-1.6%	– 0.8%
MacFarlan & Sgherri (2001)	Botswana	Aggregate growth model	1999-2010	-3.5% to -4.5%	0% to -1%
Laubscher et al/BER (2001)	South Africa	Macro-econometric model	2001-2015	-0.33% to -0.63%	+0.7% to +1.0%
Zerfu (2002)	Ethiopia	Macro-econometric model	1981-1999	-2% total	n/a
Haacker (2002)	Nine southern African countries	Aggregate growth model	10-15 years	n/a	-10% to +4% (total, not p.a.)
Bell, Devarajan & Gersbach (2004)	South Africa	Overlapping-generations model	1990-2080	n/a	-0.2% to -2.5% (†)
Lofgren, Thurlow & Robinson (2004)	Zambia	CGE	2001-2015	-0.4% to -0.9%	+0.2%
Masha, I (2004)	Botswana	Aggregate growth model	1991 – 2016	-0.8% to 2%	n/a
BER (2006)	South Africa	Macro-econometric model	2000-2020	-0.4% to -0.6%	+0.3% to +0.4%
Jefferis, Kinghorn, Siphambe & Thurlow / Econsult (2007)	Botswana	Aggregate growth model CGE Household simulation model	2001-2021	-1.2% to -2.0%	-0.4% to -0.9%

Source: updated from Table 4 in BER (2006)
Notes: † real income per family, derived from figures in paper

HIV/AIDS has an uncertain impact on GDP per capita, as it depends on the balance between the GDP and population impacts. In principle, average incomes can rise if population growth falls faster than

economic growth, but generally the impact on income growth is negative. In the labour market conflicting effects take place: the labour supply impact (smaller population and labour force) is positive for wages and employment, whereas the labour demand effect (reduced investment, output growth) is negative. More recent studies generally show reduced employment growth and higher unemployment (with demand effects dominant).

While different modelling approaches are used, the macroeconomic findings are fairly consistent across model types. The main modelling approaches are: (i) Econometric estimation; (ii) Aggregate macroeconomic growth models; (iii) Computable General Equilibrium (CGE) models; and (iv) Large-scale macroeconomic simulation models. Each has differing data requirements, complexity, expertise and resource requirements, and ability to project forward. Aggregate growth models are the most widely used, have manageable data and analytical requirements, although CGE models are increasingly being used in countries where they have been developed, although they do have very specialised data and programming requirements.

With regard to sectoral assessments, the review identified several cross-sector business impact studies (in South Africa and Botswana), as well as individual firm-level or regional-level case studies. There are a number of fiscal impact studies (again, in South Africa and Botswana), household/poverty impact studies (Botswana, Ghana, Kenya, Swaziland, Zambia), and health & education sector impact studies.

The cross-sectoral studies find that the HIV impact varies across sectors, depending on the skill & demographic composition of workforce; HIV prevalence rates may vary across skill categories and demographic groups, and HIV-related costs (e.g. training) depend on skill levels. The impact also depends on the nature of employment (migrant; permanent vs. temporary), the capital intensity of production, the nature of demand for products, and linkages to other sectors (whether firms produce final or intermediate goods). Generally, sectors dependent upon investment spending are most affected. The impact is less in sectors with high skill needs, because of lower HIV-prevalence rates amongst skilled/educated workers, and early access to ART (through private medical insurance). The most heavily affected sectors are found to be mining and manufacturing, and the least affected, finance and trade. Other relevant conclusions are that large companies more proactive in responding to HIV than SMEs; that the HIV-related increase in labour costs is generally less than 3% of the wage bill; that treatment is often a good investment for employers, and that little is known about the HIV/AIDS impact on productivity.

A variety of studies were identified of agricultural and fishing communities in Uganda, Tanzania, Kenya, Malawi, Zambia, Zimbabwe and Swaziland. These are mostly community-based case studies, showing a reallocation of labour away from farming towards household labour and care-giving; a change in crop production patterns, with less variety, more subsistence crops, and lower incomes due to reduced cash crops and lower productivity. While there are widespread negative impacts, quantitative results difficult to generalise due to differences in social structures and farming techniques and products across communities.

With regard to fiscal impact, HIV/AIDS has a consistently negative impact on fiscal positions and government operations, due to the expenditure implications, especially health care and social needs (orphans), the undermining of the tax base, and reduced capacity to implement policies and programmes (due to personnel shortages, lack of experience, quality of decision-making). Some studies looked at the provision of treatment (ART) by government, and found that this may worsen the fiscal position. However, the fiscal impact of ART provision depends on the extent of external

donor financing (it is limited in South Africa & Botswana where studies have been most thorough). There may be significant offsetting cost-savings from ART provision, although this depends on the extent to which needs from HIV-related illnesses (in absence of ART) are being met by the health system. However, broader economic impacts – notably higher growth – are likely to make ART a worthwhile investment in economic terms, independently of the health and social benefits.

Analysis of the household and poverty impact of HIV/AIDS includes a mixture of community-level case-studies and national modelling/simulation approaches. Modelling approaches typically combine household survey data (on incomes and expenditure) with sero-prevalence data and macroeconomic projections to simulate HIV impact on household income and expenditure, and then calculate the impact on poverty levels. These simulations uniformly predict an increase in the poverty rate due to HIV of between 3% -10%, depending on the HIV prevalence rate and distribution across population and income scales, labour market efficiency (how quickly are workers replaced?), and the existence of social insurance mechanisms and ART provision.

Micro-level studies are problematic because they are location-specific and of limited general relevance. They are also very expensive & resource-intensive, and the HIV/AIDS impact is intertwined with many other factors and difficult to separate.

The review also considered issues relating to the scaling-up of treatment (ART) and related programmes, which has historically been resource-constrained. ODA is now available to fund much of this, but there are concerns about absorptive capacity, the breaching of fiscal expenditure ceilings, the impact on the domestic budget balance, and long-term fiscal sustainability. There are also a number of potential macroeconomic (Dutch Disease) impacts of resource inflows, including exchange rate appreciation, monetary expansion and inflation if inflows taken into reserves, fiscal costs and higher interest rates if the reserves are sterilised, and real exchange rate appreciation and loss of export competitiveness.

No empirical economic analyses were identified of scaling-up issues around HIV (although there are some medical/institutional studies). There are many general studies on scaling up/ODA issues, but very little that is HIV-specific; there is also a substantial Dutch Disease literature regarding mineral-related inflows.

For South Africa and Botswana (the countries that have been most extensively studied from an HIV perspective), an ART scale-up is taking place, but most treatment is funded domestically and ODA financing is small in fiscal and financial terms, so that ODA-related Dutch-disease concerns are non-existent. There is no consensus in the scaling-up/ODA literature on impacts or how much can be accommodated. The Dutch Disease literature identifies real adjustment problems and focuses on the accumulation (saving) of mineral revenues. Ultimately the impact of resource inflows depends on how much of expenditure is domestic and how much on imports; the size of inflows relative to exports and government spending; and the flexibility of the economy and its ability to adjust. It is also important to consider supply side responses – such as improved infrastructure and human capital that may be financed with aid inflows – which may enable productivity gains than can offset some of the negative macroeconomic impacts of scaled up aid inflows. In the case of HIV/AIDS, which has a negative impact on economic growth that operates in part through reduced investment and more intensified skilled labour constraint, provision of ART can be effective in relieving this constraint and boosting growth rates.

Overall, there is very little quantitative economic material on the HIV/AIDS impact in Uganda. There are some sector/community studies but nothing on the macroeconomic impact, poverty impact or

on the economic aspects of scaling-up issues, or the analysis of different scenarios. There is a need for detailed work on all of the above to inform the macroeconomic policy debate and facilitate decisions regarding the allocation of resources.

Phase II – Mini-Studies

Following Phase I, it was agreed that Phase II of the study would comprise five mini-studies, as follows:

1. Modelling the household and poverty impact of HIV/AIDS
2. Modelling of sectoral HIV-vulnerability/risk exposure
3. HIV costing, financing and expenditure
4. Preparation of demographic projections
5. Analytical (econometric) studies on macroeconomic relationships between aid flows, inflation exchange rates and exports.

The methodology and results of studies 1-4 are summarised below; study 5 is included in the macroeconomic analysis of Phase III.

The Impact of HIV/AIDS on Poverty

While there has been a considerable amount of research on the macroeconomic impact of HIV/AIDS in various countries of sub-Saharan Africa, there has been less analysis of the household level impact. The work that has been done comprises a mixture of community-level case studies and economy-wide modelling of the household impact of HIV/AIDS, typically based on actual household survey data (see Jefferis *et al* 2007 for a discussion). This part of the study estimated the impact of HIV/AIDS on household poverty in Uganda, through modelling the household income and expenditure effects. It did not consider the impact on poverty of macroeconomic developments, which are analysed further in Part III of the Report.

The approach follows a now well-established methodology first used in BIDPA (2000) and more recently in Haacker and Salinas (2006). The latter was the most comprehensive effort to model the impact of HIV/AIDS on household poverty and considered the impact in four sub-Saharan African countries: Ghana, Kenya, Swaziland and Zambia). The basic approach, which was followed in this case for Uganda, is to use pre-existing household survey data on income and expenditure, and then to hypothetically model the impact of HIV/AIDS on each household through income and expenditure effects, and hence on households' poverty status.

Approach followed in this study

In the effort to estimate the magnitude of the impact of HIV/AIDS on the household level, the key focus was its impact on poverty. The following procedure was taken to arrive at these estimates.

Simulating HIV/AIDS

The analysis made use of person-level and household data from the 2005/2006 UNHS. Using the HIV/AIDS Sero-Behavioural Survey data of 2004/2005, each person in the UNHS data was assigned an HIV status in accordance to the age, sex, and region, level of education attained, employment status and marital status of the individual. This resulted in a pattern of infection which resembled very closely that observed in the Sero-Behavioural survey. The person-level information was then aggregated back to household level in order to simulate the household impacts. Using certain assumptions about costs of HIV/AIDS to the affected households, the income effects, and expenditure effects we simulate the impact of HIV/AIDS on poverty, income and expenditure per

adult equivalent under different scenarios. Note that there can be more than one HIV+ person in each household (indeed this is quite likely to be the case).

The objective of the analysis was to combine the most recent sources of information about household structure, sources of income and expenditure patterns and HIV prevalence. The validity of the analysis rests on a number of key assumptions. First, in the absence of ART, a person will die in 10 years time from the time he/she gets infected with HIV. This was taken as an average, since some people with low incomes, poor dietary habits and general poor health conditions may die before the 10 years, while others may have better access to health facilities and food, and may live more than 10 years. There are also differences in the way that individuals respond physiologically to infection.

Whether or not the household has an HIV-positive member, household composition, structures and income sources would change. Natural factors of population growth (death and birth) will still bring about population increase, and new households would be formed as people marry and get married, people will be growing and those currently not working will have started to work because of their advancement in age and this will add to household income while others will die leading to loss in income. All these have been assumed to roughly cancel out in terms of impact of HIV/AIDS impact on household income distribution.

Within ten years, changes in the population distribution by age and sex are assumed to be insignificant, since changes in overall demographic structure are comparatively slow. The analysis here essentially assumes that the population structure will be in a steady state, apart from the effects of HIV/AIDS. This assumption isolates the impact of HIV/AIDS from the impact of other demographic changes taking place at the same time.

The economic impact of HIV/AIDS on the households is assumed to arise out of increased household expenditure and reduced income due to morbidity and mortality. With regard to household expenditure, it is assumed that a person will begin to develop AIDS symptoms in his/her 8th year from the time of infection with HIV[1]. Hence, more frequent illnesses may be experienced, and this will increase medical and related household expenses (these include direct medical expenses such as consultations, laboratory tests, medication, hospital admission as well as indirect expenses such as transport costs, special dietary requirements etc). However, the total expenditure in actual terms may depend on the household's income, though the proportion may fall in a given acceptable range. In Uganda where the health insurance is at its very minimal, most of these costs are financed from household's own sources, and some households may have to sell off assets and properties like land in order to meet these costs. These costs are assumed to increase by 50% in rural areas and 25% in urban areas due to the easiness or difficulties faced in accessing health services and differences in actual incomes[2].

The second associated cost is funeral-related expenses when a person dies of AIDS. Due to feeding of many people (relatives and friends) in some cultures it is done for many days, and purchasing of other requirements like caskets, announcements, transport etc, such costs tend to be high. Also, the actual amount spent will depend on the social status and level of income of the household that has

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[1] Again, this does not mean that all HIV+ individuals will develop AIDS in the 8th year after infection. Some will develop it earlier, others later. The figure is intended as a representative average, and has been used in other, similar studies.

[2] These parameters are the same as those used in Salinas and Haacker (2006), and derived from the detailed household study of the impact of HIV/AIDS in South Africa (Steinberg et al, 2002)

lost a member, though the proportion may fall in a given range. It was assumed that funeral expenses would be equivalent to 4 months of household expenditure[3].

Since these expenditures are almost indispensable to the household, we reflect them as additions to their minimum expenditure or Poverty Datum Line (PDL) (following Salinas and Haacker, 2006). The approach taken here was to add these additional expenditure requirements to the package of basic needs of a household. In other words, there is an addition to the PDL of households affected by HIV/AIDS. The effect of this is to re-define the level of income which constitutes poverty - a family affected by HIV/AIDS is therefore more likely to be classified as poor, due to these additional expenses.

These are short-term expenses, which apply in the period up to the tenth year when the HIV-positive individual is assumed to die. The longer-term impact is therefore different, as the household no longer has to meet their expenditure requirements. This has the opposite effect to the additional expenditures described above, and makes it less likely that an HIV affected household will be classified as poor (as the household is now smaller and has lower expenditure requirements, and household income has to be spread across fewer members).

However, expenditure effects are not the only effects on household poverty levels. There are also income effects, which are discussed below.

Income Effects

The incomes of individuals and households in general also are affected by HIV/AIDS through higher mortality and morbidity. In the short-term, while one or more household members is sick, household income will be reduced, because a breadwinner may be unable to work due to illness or the need to care for other household members[4][5].

In the long-term, the worst scenario that the household can face is that a breadwinner dies of AIDS. If the household member who dies is an income earner, it will mean the income of the household goes down, and even though it is divided between fewer members, the per capita income of the household is likely to be lower because of the lost income. Some family members may respond by looking for jobs, and if they are successful this may lead to some or all of the lost income being replaced; in Salinas and Haacker (2006), having an efficient labour market which enables the unemployed to find jobs relatively quickly when others die of AIDS plays an important role in offsetting the negative poverty impact of HIV/AIDS. However, in Uganda this is likely to be a less important channel. The vast majority of the workforce is already occupied and unemployment is low, at 1.9% of the labour force in 2005/06, hence there are few people who can readily move into vacancies created when others die[6]. This is especially so in the case of skilled or professional jobs, when it is difficult to have the same skills, and even then, a person with skills does not wait for someone to die in order to look for a job. The majority of Ugandans – 74% of the labour force - are employed in the agricultural sector, and reduced labour availability is likely to lead to reduced agricultural output and incomes, although there may be some scope for those who are underemployed (12.6% in the rural areas in 2005/06) to make up for some of the loss.

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[3] As in Salinas & Haacker (2006)

[4] This study models only the income loss from breadwinners who become sick, due to lack of information regarding care relationships within the household.

[5] The study by Steinberg *et al* in South Africa found that two-thirds of AIDS-affected households experienced a fall in income

[6] Data from UBOS *Report on Labour Market Conditions in Uganda*, December 2007

Due to the above arguments, it is assumed a person who dies is hard to replace, and the lost income is lost for that household. Other incomes earned thereafter would meet the day to day household expenditures since those households still have to live within limited income.

By comparison, if a household member without income dies, the income is simply divided amongst fewer household members, hence such a household is less likely to be poor and the per capita income of the household may increase.

Results

In estimating the impact of HIV/AIDS on household poverty levels, we considered a range of different impacts:

Short-term impact:

- Health and related costs;
- Funeral costs
- Income effect

Long-term impact:

- Income effect
- Household composition effect

Income and Expenditure Effects Combined

In this scenario, the health and funeral costs effects were incorporated through a higher poverty line while the income adjustments affected disposable income for household consumption. Incorporating all these factors in the model made the household poverty level increase from 26.8% to 28.2%, which is a 1.4 percentage point increase. This was more felt in central and western regions, with much smaller effects in the eastern and northern regions, as can be noted in Table 2. Rural households were more effected (1.6 pp) than urban households (0.9 pp). It is clear that the simple headcount of households that are poor or not shows that regions with higher poverty rates (Northern and Eastern regions) experienced less increase in head count of poor households than those with lower poverty rates (Central and Western regions). This will be more clarified in the estimations of P1 and P2 which help to measure the depth of poverty. The overall magnitude of the changes in poverty levels (5.2% nationally) is comparable with that found by Salinas and Haacker (2006) for Kenya, with a similar HIV prevalence level, which varied between 2.7% (for a $2/day poverty line) and 10% (for $1/day).

Table 2: Poverty levels incorporating income adjustments, health and funeral costs effect

Region	% Without HIV/AIDS			% With HIV/AIDS		
	Rural	Urban	Overall	Rural	Urban	Overall
Central	17.7	4.3	14.3	19.9	6.0	16.4
Eastern	33.4	11.8	28.8	34.7	12.1	29.8
Northern	57.5	33.4	52.4	58.3	34.0	53.2
Western	18.5	7.8	15.9	20.5	8.7	17.7
Overall	**31.0**	**12.8**	**26.8**	**32.6**	**13.7**	**28.2**

Table 3: Changes in poverty levels (percentage points and %)

Region	Change (pp)			Change (%)		
	Rural	Urban	Overall	Rural	Urban	Overall
Central	2.3	1.7	2.1	12.4%	39.5%	14.7%
Eastern	1.3	0.2	1.0	3.9%	2.5%	3.5%
Northern	0.8	0.6	0.7	1.4%	1.8%	1.5%
Western	1.9	0.9	1.7	10.8%	11.5%	11.3%
Overall	**1.6**	**0.9**	**1.4**	**5.2%**	**7.0%**	**5.2%**

Long term HIV/AIDS impact

As already pointed out in the assumptions, the major factor considered was that all people who are HIV+ will die by their 10th year, and households will therefore lose incomes earned by such members who are working. In the long-run the impact of funeral and health costs, which are transient, will have passed. However, the effect of lost income from working household members who die will be permanent. Also considered was the fact that the size of household will be reduced by the number of deaths in that household, and hence the total adult equivalent value of that household will change.

Taking account of these combined effects (income and household composition), poverty rates are estimated to rise from 26.8% to 27.3%, an increase of 0.5 percentage points, with similar changes in urban and rural households.

Table 4: Long term changes in poverty level: Income adjustments due to death of HIV+ income earners

Region	% Without HIV/AIDS			% With HIV/AIDS			% Change		
	Rural	Urban	Overall	Rural	Urban	Overall	Rural	Urban	Overall
Central	17.7	4.3	14.3	18.4	5.0	15.0	0.7	0.7	0.7
Eastern	33.4	11.8	28.8	33.7	12.1	29.1	0.3	0.2	0.3
Northern	57.5	33.4	52.4	58.0	33.7	52.9	0.5	0.3	0.4
Western	18.5	7.8	15.9	19.1	8.3	16.5	0.6	0.5	0.6
Overall	**31.0**	**12.8**	**26.8**	**31.5**	**13.3**	**27.3**	**0.5**	**0.5**	**0.5**

Conclusions

It is evident from the above modelling that HIV/AIDS is likely to increase household poverty levels. In absolute terms rural households are more affected than the urban households, with a 1.6 percentage point increase in headcount poverty rates. In proportionate terms, however, urban households are more affected.

Regions with high poverty rates tend to experience a smaller impact in terms of increased poverty, simply because a high proportion of households are already in poverty anyway regardless of HIV/AIDS. Both proportionately and in absolute terms, it is the better-off regions with lower poverty rates that experience a larger impact. In general, at the HIV prevalence rate of 6.3%, its impact on household poverty rate estimated to be an increase of 1.4 percentage points. The magnitude of poverty impact is comparable with that estimated for Kenya.

The modelling has shown that the major impact on poverty comes from HIV/AIDS health related costs (1% increase in headcount poverty), especially in rural households. Other modelled impacts

are smaller, with loss of income due to AIDS contributing 0.5% and funeral costs only 0.1%. However, the impact of health costs on household expenditure is derived from survey work in South Africa, and may not be accurate in Uganda; hence a more appropriate estimate of poverty impact could be obtained from a Uganda survey of expenditure patterns in households with HIV-positive members. This is both a limitation of this study, and an indication of where further research is needed.

The long term impact of HIV/AIDS on household poverty rate was estimated to be smaller than the short-term impact, at about 0.5%. This is because in the long-term, once household members have died, the household does not bear additional health costs.

Other than the increase in poverty rate (head count index P0 which shows the number of households living below the poverty line), the poverty gap (P1) measurements revealed that HIV/AIDS makes the position of poor households even worse since they are pushed deeper into poverty. The scenario that had such a big impact as measured by P1 were health costs due to AIDS, and to some extent loss of income due to the same while the funeral costs had the lowest effect of pushing households into more poverty. The average poverty gap P1 index for all the scenarios combined was estimated to be 9.04%, up from 8.86%.

While this analysis does not address the impact on poverty of ART provision, the fact that additional health care costs are the main contributor to increased poverty levels indicates that ART provision would have a beneficial impact. This is because ART has a significant positive effect on health and well-being, and will therefore reduce health-related expenditure and increase income levels. However, this will be offset to the extent that ART provision requires regular visits to health facilities, which has implications for both household expenditure and time available for work. Further research evaluating the level of health expenditure in households with HIV-positive members and the impact of ART provision would therefore be worthwhile.

The Sectoral Impact of HIV/AIDS

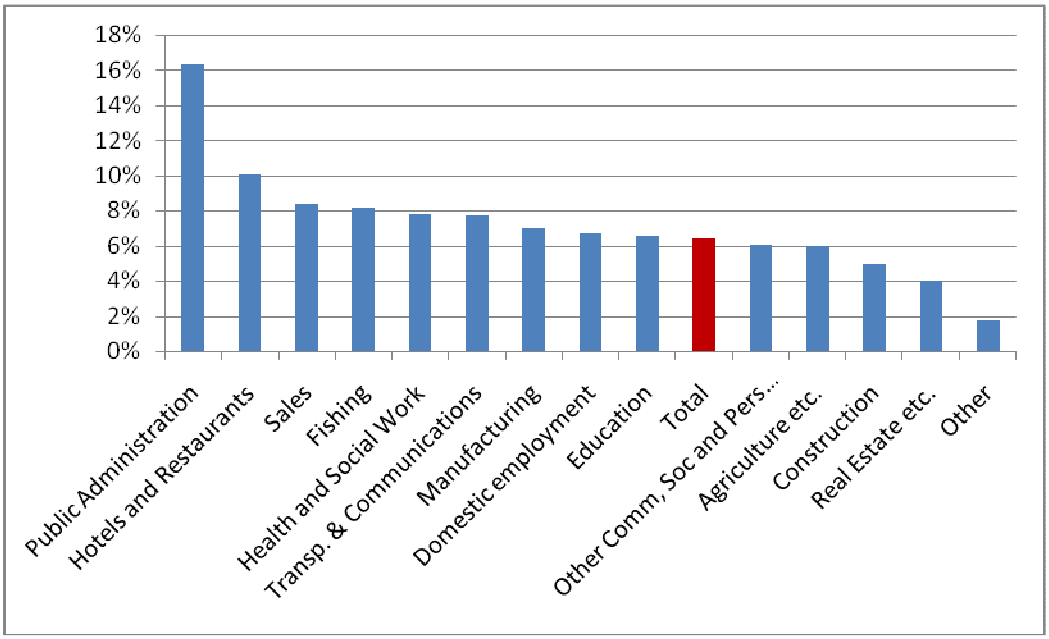
HIV/AIDS will have a varying impact across different sectors of the economy. The impact depends on many factors, including the occupational and gender structure of a sector, and the level of skills of the workforce. The extent of the impact varies because HIV prevalence is not uniform, and depends on occupation, gender and skill level. Furthermore, the cost of replacing a worker that becomes sick or dies due to HIV/AIDS will vary depending on the cost of educating and training that worker. This study assesses how the sectoral impact of HIV and AIDS varies in line with these determinants.

This study firstly makes use of the results of the 2004/05 sero-prevalence survey which records HIV prevalence across arrange of individual and household characteristics. The results show that although the overall adult (15-49 years) prevalence rate was 6.4%, there are considerable variations around this total by gender, location and wealth status. In summary, urban HIV prevalence is higher than rural; there is some evidence of rising HIV prevalence as education increases; prevalence is higher amongst those working than amongst those not working; there is a clear positive relationship between HIV prevalence and level of wealth; and female prevalence is higher than male prevalence.

The survey also provides data on sero-prevalence across economic sectors (see Figure 1). This shows major variations in the HIV prevalence rate between sectors. By far the highest is public

administration, with a prevalence rate of 16.3%. Agriculture has a relatively low prevalence rate of 6.0%, with prevalence being higher in most non-agricultural sectors of the economy[7].

Figure 1: HIV Prevalence by Sector

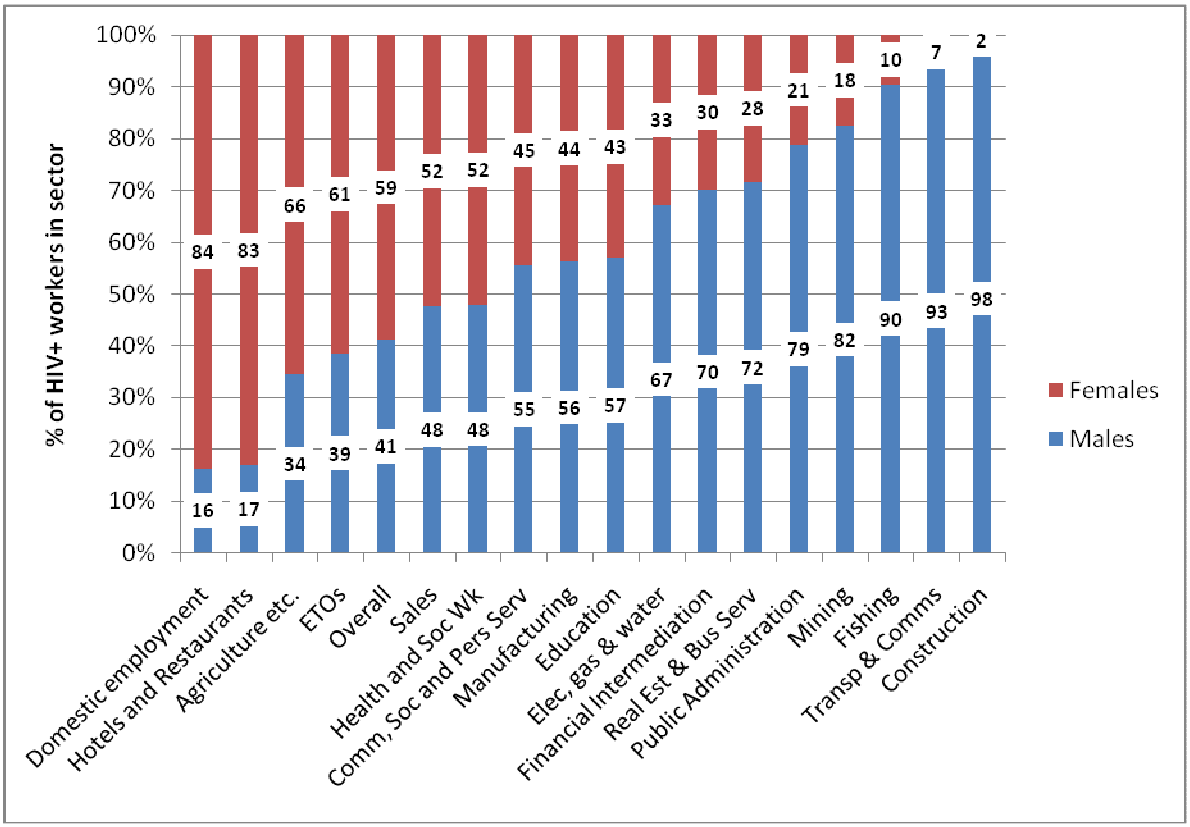


Source: Calculations based on Sero survey data (MoH, 2006)

With regard to the absolute numbers of HIV+ workers in each sector, the picture may differ to that of prevalence rates, since some sectors may be dominated by men and others by women. The distribution of male and female HIV+ workers in each sector is shown in Figure 2. Therefore, in construction, transport & communications, fishing, mining and public administration, where the workforce comprises predominantly males, the latter account for more than 75% of the HIV+ workforce in each sector. By contrast, in domestic employment and hotels & restaurants, females make up the majority of the workforce, and more than 80% of the HIV+ workers in these sectors. Similarly in agriculture, two-thirds of the HIV+ workers are women.

[7] Note that the sample size was very small in mining, financial intermediation, extra-territorial organisations and electricity, gas & water, and these sectors are grouped together as "other".

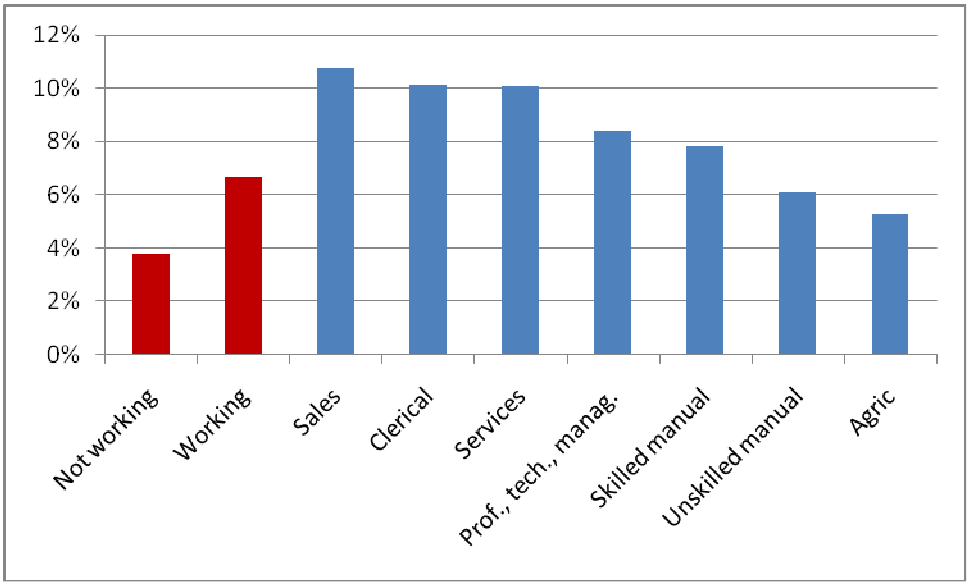
Figure 2: Distribution of HIV+ workers by sector and gender



Source: Calculations based on Sero survey data (MoH, 2006)

The sero survey also provides information on HIV prevalence by occupation. As noted earlier, there is a higher prevalence rate amongst working adults than non-working adults. Amongst working adults, there is some evidence that HIV prevalence varies across occupations (Figure 3). The prevalence rate is relatively high amongst sales, clerical and service sector workers, who might generally be classed as semi-skilled. There is a slightly lower, but above average, prevalence rate for skilled professional and manual workers. The lowest prevalence rates are for the unskilled categories of manual and agricultural workers. These results confirm that unskilled workers have lower HIV prevalence rates than semi-skilled and skilled workers, in contrast to the findings in Southern Africa.

Figure 3: HIV Prevalence by Occupation

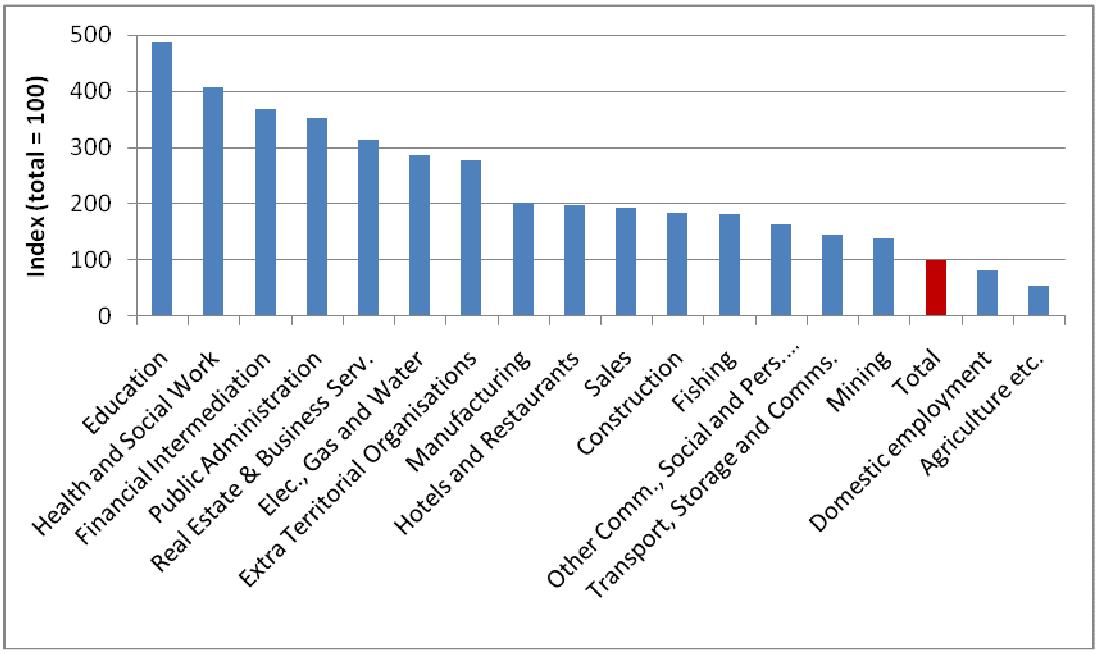


Source: Calculations based on Sero survey data (MoH, 2006)

The above data take account only of the occupational composition of different sectors and occupational prevalence rates. We can also incorporate the varying importance of different labour occupations to the output of each sector, i.e., reflecting the fact that a skilled worker makes a greater contribution to output than an unskilled worker, and is more difficult to replace. Hence, losing a skilled worker is likely to be more disruptive to production than losing an unskilled worker. While the direct contribution of different labour categories cannot be directly measured, we can approximate this from the relative wage rates, which are available from the 2005/06 UNHS.

Taking this into account, the relative sectoral vulnerabilities are shown in Figure 4. These primarily reflect each sector's dependence on skilled labour, as well as the variations in HIV prevalence across occupational categories. The most vulnerable sectors are education, health & social work, finance and public administration, because of their high dependence upon skilled workers.

Figure 4: Index of Sectoral Vulnerability

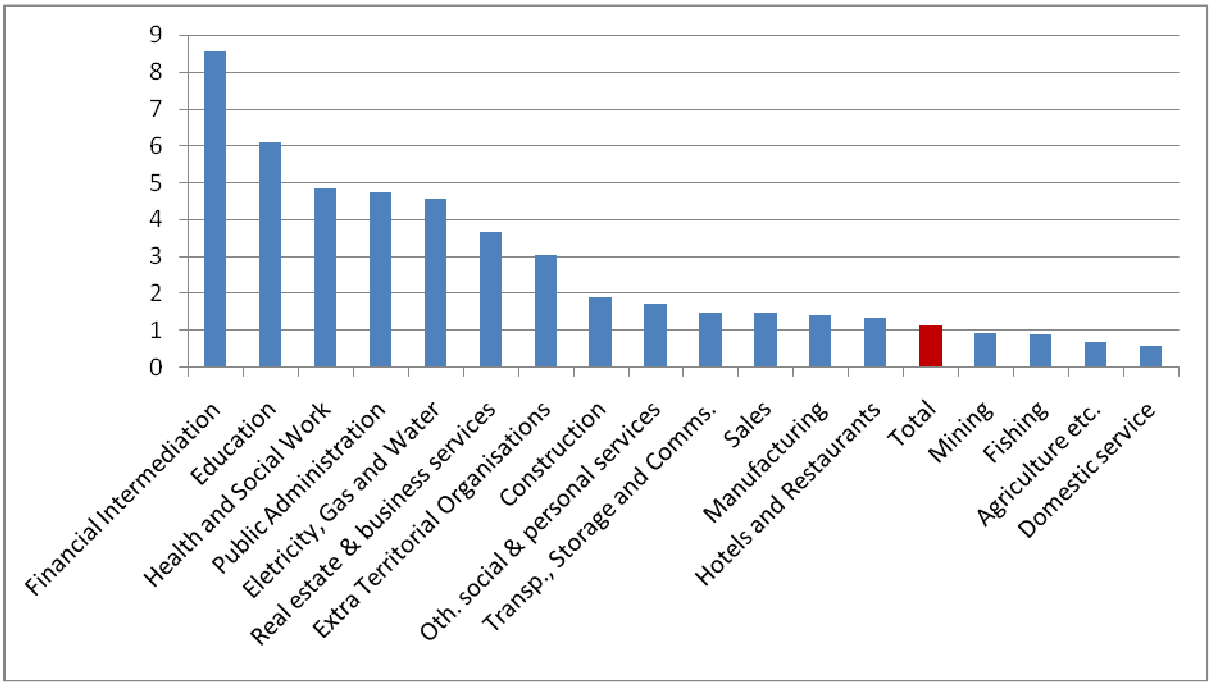


Source: own calculations

An alternative approach to evaluating sectoral vulnerability is to consider the cost of educating and training workers at different levels. To the extent that HIV-positive workers will die, in the absence of treatment, and would have to be replaced, then the cost of educating and training these workers represents a burden on the economy.

Information on the level of education of workers in different sectors is available from the 2006 Labour Market Conditions Report. Using this information, a more accurate assessment of the cost burden can be obtained by considering the average cost of educating a worker in the sector (see Figure 5).

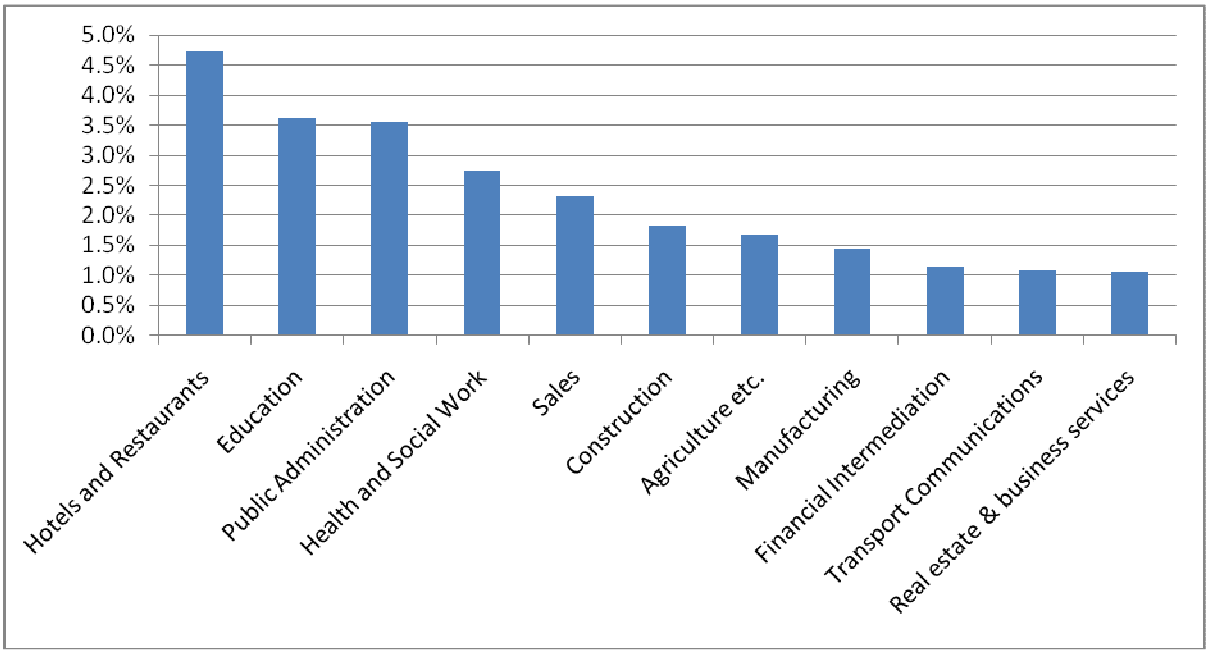
Figure 5: Cost of Education of Average Worker, by Sector (Shs mn)



Source: Own calculations

This cost can be further related to the wage bill in the sector, i.e., the cost of replacing HIV+ workers as a proportion of the annual wage bill. On the assumption that HIV+ workers live on average ten years, the burden is shown in Figure 6. The greatest burden is in the Hotels & Restaurants sector, which mainly represents the impact of relatively low wages in the sector combined with a high HIV prevalence rate. The next highest burdens are in Education, Public Administration and Health & Social Work, reflecting the high level of education of workers in these sectors and relatively high prevalence rates. While the Financial Services sector has both a relatively high prevalence rate and highly educated workers, it also has the highest wage levels of any sector so the relative cost of educating workers is reduced.

Figure 6: Cost of Replacing HIV+ Workers (as % of annual wage bill)



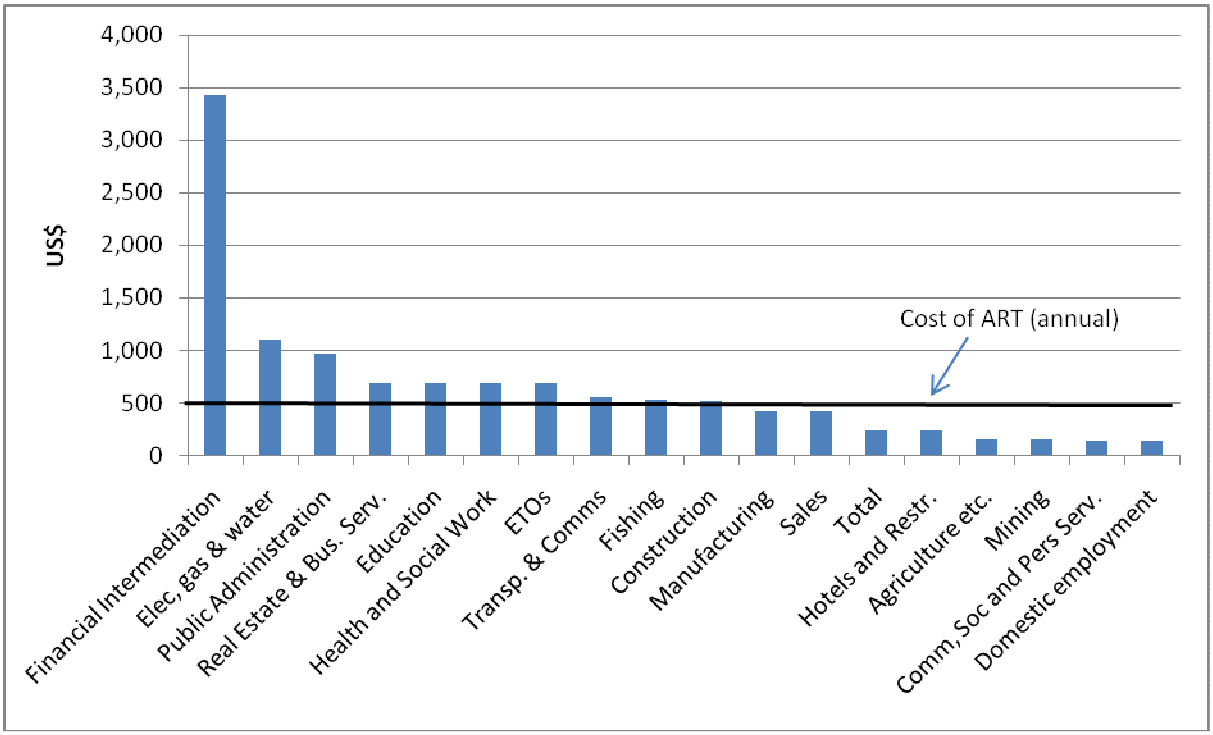
Source: Own calculations

Cost of Providing Anti-Retroviral Therapy (ART)

Using the above information, we can compare the cost of education of workers in different sectors with the cost of providing ART. Education costs across sectors are shown in Figure 5 above, and varies from UShs 590 000 in domestic service to UShs 8 561 000 in financial intermediation. In US dollar terms, the cost of education varies from approximately $350 to $5 000. This compares with the cost of providing ART, which is in the range of $500-1000 a year per person. If we assume that the average (median) additional life-years resulting from ART is ten, then the minimum total cost of providing ART to an HIV+ person is $5000. In straightforward financial terms, therefore, ART is not a good investment when compared to the cost of educating workers, as the cost of the lost education is less than the cost of providing ART in all sectors except for finance. While the total cost of providing trained, experienced and educated workers is greater than the cost of education used here (the study is limited by lack of information on the costs of on-the-job training and the value of experience), this example nevertheless illustrates that ART may not be a good investment in purely financial terms, at least not for all workers.

An alternative perspective on this issue can be gained by considering the cost of ART relative to wage costs; if we assume that the value of a worker's contribution to output is approximately equal to the wage he or she receives, then this provides a crude comparison of the costs of ART with the value of output provided by a worker who continues to contribute to produce. Wage costs by sector are shown in Figure 7. Only in a few sectors (financial services, electricity gas & water, and public administration are average wages significantly above the annual $500 cost of ART, although in several other sectors are just above $500. This again suggests that the cost of providing ART may not be justified in financial terms in many sectors of the economy.

Figure 7: Average wage by sector ($/year)



Source: Own calculations

Summary and Conclusion

This study presents an analysis of the impact of HIV/AIDS on different economic sectors, measured by the impact on the labour force in each sector. This impact was assessed primarily through the level of education of workers in each sector, and the cost educating replacement workers to make up for those who die as a result of HIV/AIDS. These costs therefore depend on the level of education of workers in each sector, and differences in HIV prevalence by level of education and across sectors.

The study does have some limitations. First, the costs relate specifically to educating workers at different levels and do not take account of the loss of experience gained while working. Therefore the costs of replacing workers in the agricultural sector may be under-estimated, given that they generally have low levels of education but significant skills acquired through experience. The second limitation is that the costs of recruitment and on-the-job training could not be quantified and are therefore omitted from the analysis. This could lead to under-estimate of the cost of replacing people that die of HIV/AIDS, especially in sectors such as financial services and public administration where there are high levels of job-specific training, and potentially lengthy recruitment processes, especially for senior staff.

Subject to these limitations, the overall results of the sector vulnerability analysis can be summarised as follows:

- The HIV prevalence rate (measured directly) is highest in Public Administration, followed by Hotels & Restaurants, Sales, and Fishing. When measured indirectly, the prevalence rate is highest in Hotels & Restaurants, followed by Sales, Finance and Public Administration.
- The total number of HIV+ workers is highest in Agriculture, followed by Sales

- The cost of educating a worker is highest in Financial Intermediation (at P8.6 million shs), followed by Education (at Shs 6.1 mn), Health (at Shs 4.9 mn) and Public Administration (at Shs 4.7 mn).
- The total cost of replacing HIV+ workers (through the investment needed in their education) is highest in Agriculture (34% of the total), followed by Education (19%) and Sales (16%).
- The cost burden of replacing an HIV+ worker, as a proportion of the wage bill, is highest in Hotels & Restaurants, Education and Public Administration.
- Relative to the costs of educating workers, or average wages (as an approximation of the value of output produced), providing ART may not be a good investment in purely financial terms.

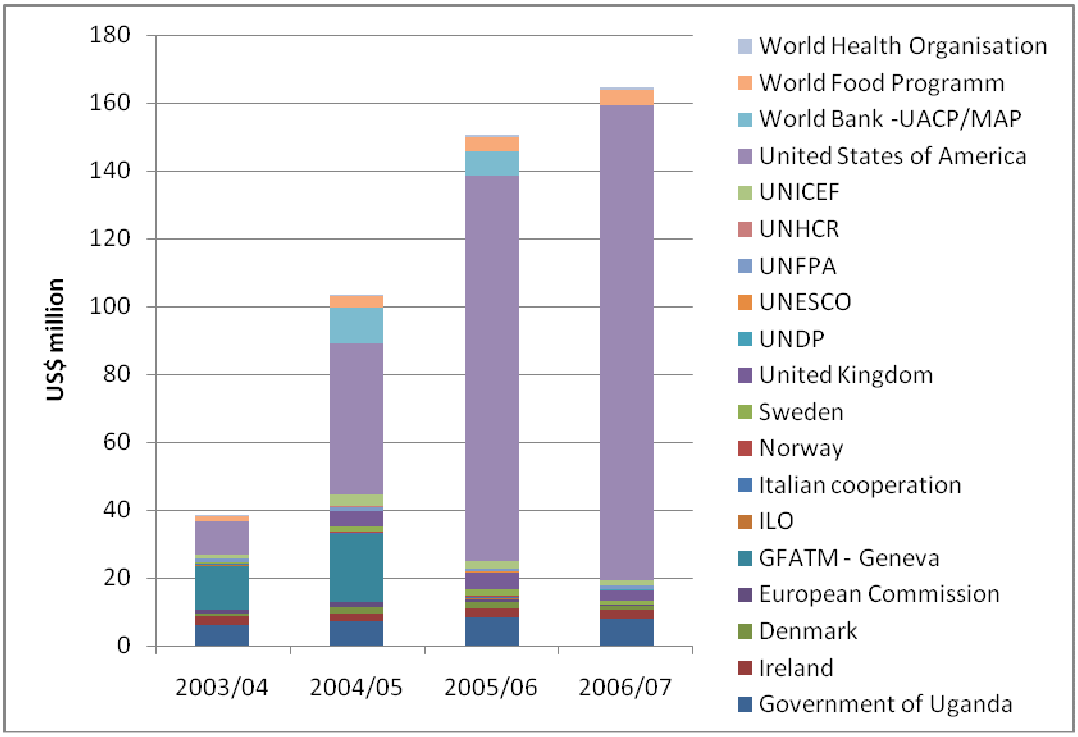
HIV costing, financing and expenditure

One of the major determinants of the macroeconomic impact of HIV/AIDS expenditure is the extent to which that spending is sourced domestically (from the Government budget) or externally (from donor funds). A second important aspect is whether the funds are spent externally (on, for instance imported drugs) or domestically (e.g., local salaries or purchase of locally-produced inputs). Most of the concerns about the expenditure impact of HIV/AIDS stems from concerns that large amounts of external funds flowing into the country and boost aggregate demand, which in turn cause inflation and real exchange rate appreciation (and loss of international competitiveness), and destabilise the macroeconomic achievements that have been secured over the past 15 years. However, this effect is reduced, the greater the proportion of spending that is devoted to imported goods and services, as domestic aggregate demand is less affected.

While there is some information on the sourcing of HIV/AIDS funding, there is little or no information on how the money is spent, or what it is spent on. The objective of this assignment is to track the flows of resources received through to spending, to determine what HIV/AIDS related funds are spent on, and in particular, whether that expenditure is on domestic or imported goods and services.

High level data on overall HIV/AIDS spending and financing from 2003/4 to 2006/7 were collected by Lake & Mwijuka (2006) (see Figure 8). This focused on overall spending levels and sources of financing, and illustrated the rapid increase in overall spending on HIV/AIDS programmes over this period - rising from US$38 million to US$164m in four years. As the chart illustrates, this was largely driven by greatly increased funding from the USA. Almost all spending was financed externally – domestic funding from the Government of Uganda (GoU) increased from US$6m to US$8m over this period, but at the same time the GoU's share of total spending fell from 16% to 5%.

Figure 8: Financing of HIV/AIDS-related spending, 2003/4 - 2006/7



Source: Lake & Mwijuka (2006)

Methodology

The focus of this study was not on overall funding levels but on providing more detail on spending. The methodology followed has been to gather information from resource providers (donors and the GoU) relating to the sources of funds, and from entities involved in spending those resources. Information has been sought on the main categories of expenditure, and on whether that expenditure was mainly domestic or external. The emphasis has been on tracking the main financial flows, rather than all financial flows. It is in the nature of an exercise such as this that information is messy and incomplete, but the objective is to isolate the main flows in order to ascertain the macroeconomic magnitudes.

The categories of spending identified were:

- Salaries
- Allowances
- Technical Assistance
- Drugs & medical services
- Information, Education and Communication (IEC)
- Monitoring & Evaluation (M&E)
- Training
- Transport/vehicles
- Misc. Supplies
- Other

An instrument was developed to collect the necessary data from donors and implementing agents, and results were obtained from range of financing agencies and implementing agencies. Information was requested for the years 2004/05, 2005/06 and 2006/07. Spending entities were identified by the

PEPFAR list of Prime Partners and other sources. PEPFAR is by far the dominant funder of HIV/AIDS-related activities in Uganda, with budgeted spending increasing from US$135m in FY2005 to US$236m in FY2007.

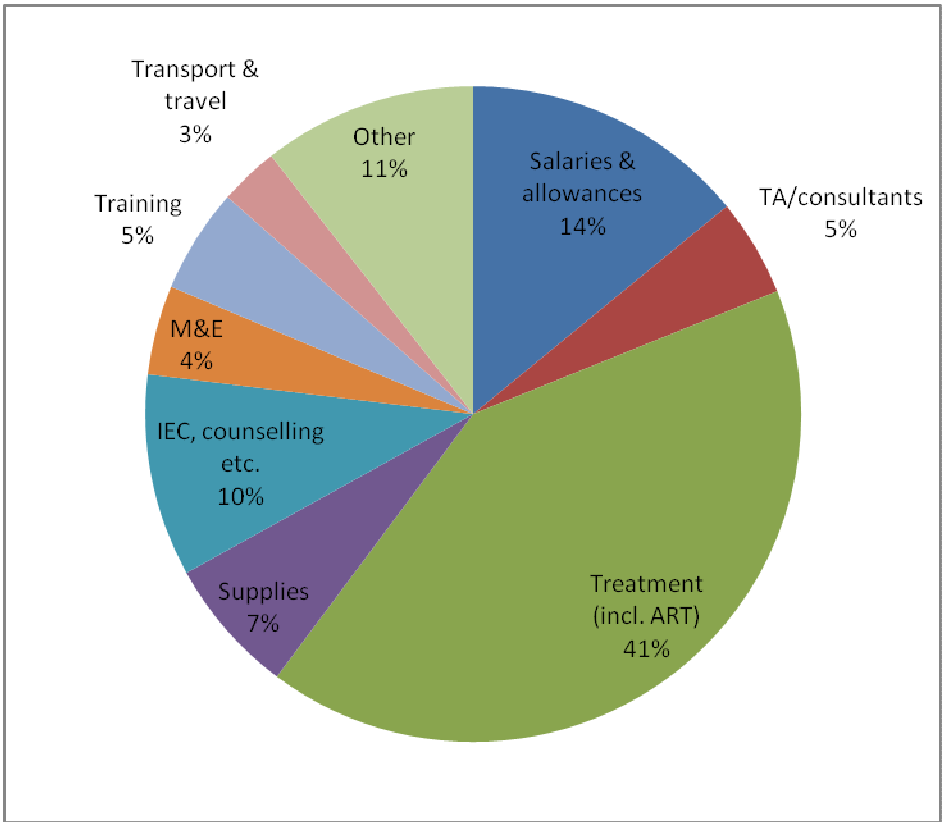
Results

Unfortunately, it was not possible to get the data in as consistent a form as desirable, due to variations in the quality of information across agencies. In particular, many agencies did not keep information in a form which enabled the disaggregation of spending into the categories required by the project, especially with regard to domestic vs. external spending, while others were unwilling to provide such information even where it was available.

In the public sector, expenditure on HIV/AIDS was not well distinguished from expenditure on other health activities. For instance, expenditure on blood transfusion services to ensure provision of safe blood to patients includes expenditure on ensuring that blood is free from HIV but also free from hepatitis B, malaria, syphilis, etc. It is therefore difficult to know what proportion of the money is spent on HIV at blood transfusion services. The same situation applies to other goods and services e.g. human resources, vehicles, infrastructure, etc.

Information on HIV/AIDS-related spending over the period 2004/05 – 2006/07 was obtained from the following institutions, covering two-thirds (estimated at 67%) of total spending over the relevant period.

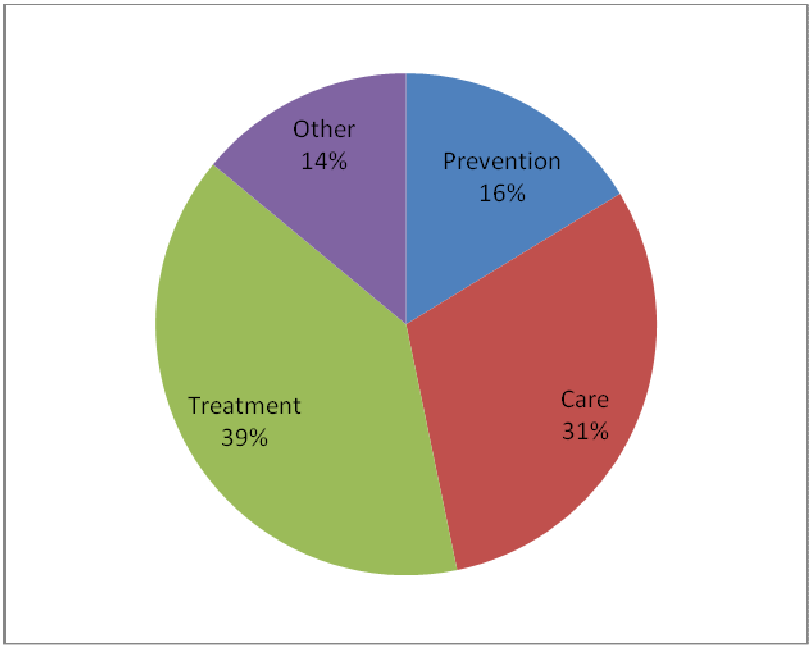
Figure 9: Breakdown of HIV/AIDS Spending 2004/5 - 2006/7



Source: own calculations from study data

Separate, but less detailed data have been obtained regarding PEPFAR funds, which are by far the largest source of funding for HIV/AIDS-related spending. The breakdown of PEPFAR spending over the period 2005-7 is shown in Figure 10.

Figure 10: Breakdown of PEPFAR Spending, 2005-7



Source: own calculations from PEPFAR data

The quality of information regarding the breakdown of expenditure between domestic and external spending has not been up to expectations. However, applying estimated proportions of external spending to the various categories of expenditure (ranging from 95% of treatment costs, which are primarily imported drugs, to 10% for IEC and training, which are mostly carried out by local staff), enables an estimate of the external spending. As a result it is estimated that almost 60% of total spending goes (directly or indirectly) on external goods and services, while 40% is spent domestically. The high proportion of donor receipts spent externally significantly reduces the potential macroeconomic impact of aid inflows[8].

[8] These estimates include both the direct and indirect external spending components.

Table 5: External Component of HIV/AIDS-related spending (2004/5 – 2006/7, USD)

Category		External	
Salaries & allowances	39,083,272	33%	13,027,757
TA/consultants	13,392,253	50%	6,696,127
Treatment (incl. ART)	114,963,905	95%	109,215,710
Supplies	18,658,002	67%	12,438,668
IEC, counselling etc.	27,869,863	10%	2,786,986
M&E	12,242,485	10%	1,224,248
Training	14,328,063	10%	1,432,806
Vehicles, transport & travel	8,097,254	50%	4,048,627
Other	29,381,760	33%	9,793,920
Total	**278,016,857**	**58%**	**160,664,850**

Source: own calculations from study data

Conclusion

Although the response to requests for data was disappointing, the study has nonetheless yielded some useful results. Specifically, we have derived some plausible – albeit uncertain – estimates of the split between domestic and foreign spending in HIV/AIDS programmes. The conclusion that approximately 60% of total spending is devoted to imported goods and services indicates that the net macroeconomic impact - on the balance of payments, exchange rate, money supply etc. – is considerably less than the gross impact. If the same proportion applies to total spending (and the fact that data was received on two-thirds of spending suggests that the aggregate figure would not be much different) this means that then of the total estimated spending for HIV/AIDS programmes of US$418 million over the period 2003/4 – 2006/7, some $243 million was spent on externally-sourced goods and services, while an estimated $176 million was spent domestically.

Going forward, the proportion of total expenditure that will be spent externally is likely to increase, given that spending on ART drugs is set to rise sharply under the National Strategic Plan 2007/08 – 2011/12, and this has the highest import component of any component of HIV/AIDS programmes. However, to the extent that ART drugs are produced locally, the import content would be reduced, and this would tend to worsen the adverse macroeconomic impacts.

Given the concerns expressed by policymakers that the inflow of donor funding for HIV/AIDS programmes may cause macroeconomic disturbance, specifically by causing the exchange rate to appreciate or potential inflationary pressures, these results show that any such adverse developments would be substantially less than that suggested by the "headline" spending numbers. Furthermore, it is important that analysis of the macroeconomic impact of HIV/AIDS inflows takes account of the offsetting effect of external purchases of goods and services.

The Demographic Impact of HIV/AIDS in Uganda

The preparation of demographic projections is an essential component of modelling the macroeconomic impact of HIV and AIDS. A significant component of the macroeconomic impact results from the impact of HIV and AIDS on the population, and hence on the size and growth of the labour force. The labour force is in turn one of the main long-term drivers of economic growth, and also impacts on relevant indicators such as wages, employment, and the relative growth of different economic sectors.

The Spectrum model[9] was used to prepare demographic projections for this study. Spectrum has a number of advantages for this purpose, including its ease of use, and the relatively limited range of data that is needed to calibrate the model. It also has a module dedicated specifically to modelling the impact of HIV and AIDS (the AIDS Impact Module – AIM), and can produce a range of relevant outputs relating to the impact of HIV and AIDS on the population. It can also accommodate treatment interventions, such as the provision of Anti-retroviral Therapy (ART).

Spectrum is widely used to make projections of population and resource needs in the context of HIV and AIDS. Amongst others, the Spectrum AIDS Impact Model (AIM) is used by UNAIDS to make the national and regional estimates which are released every two years. In Uganda, UBOS has prepared national population projections using the same model.

Projections were prepared for five different scenarios:

1. No AIDS
2. AIDS with no ART provision
3. AIDS with "low" ART provision
4. AIDS with "medium" ART provision
5. AIDS with "high" ART provision

The "No AIDS" scenario provides hypothetical population projections for Uganda in the absence of HIV and AIDS.

The "AIDS with No ART" scenario introduces HIV and AIDS into the projections, but does not include the impact of any treatment interventions.

The "AIDS with Low ART" scenario also includes the impact of HIV and AIDS on the projections, but also includes the impact of the introduction of ART. It assumes that ART provision remains at relatively low levels.

The "AIDS with Medium ART" scenario also includes the impact of HIV and AIDS on the projections, but also includes the impact of the introduction of ART. It assumes that ART provision grows from current levels but does not achieve universal coverage.

The "AIDS with High ART" scenario also includes the impact of HIV and AIDS and ART provision on the projections. However, it assumes that ART provision continues to grow steadily from current levels to eventually achieve near universal coverage.

All scenarios include population projections through to 2025.

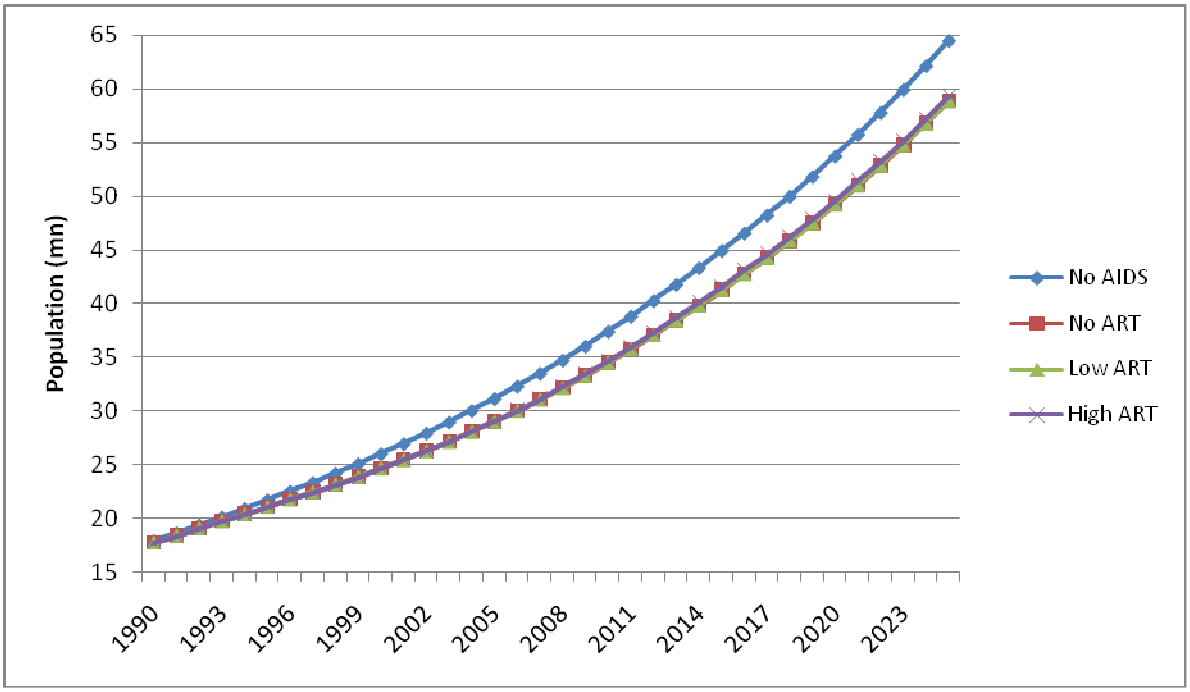
Population estimates

The estimates of the total population in the four scenarios (No AIDS, AIDS with No ART, Low ART and High ART) are shown in Figure 11 below.

These show that there was little difference in the projected population in the different scenarios through the 1980s (which may indicate that the model projections are somewhat delayed in incorporating the initial impacts of HIV and AIDS, as AIDS-related deaths in the model during the 1980s are few).

[9] The Spectrum model is freely available at www.constellagroup.com/international-development/resources/software.php. Further details on Spectrum are provided in the Phase II report.

Figure 11: Total Population

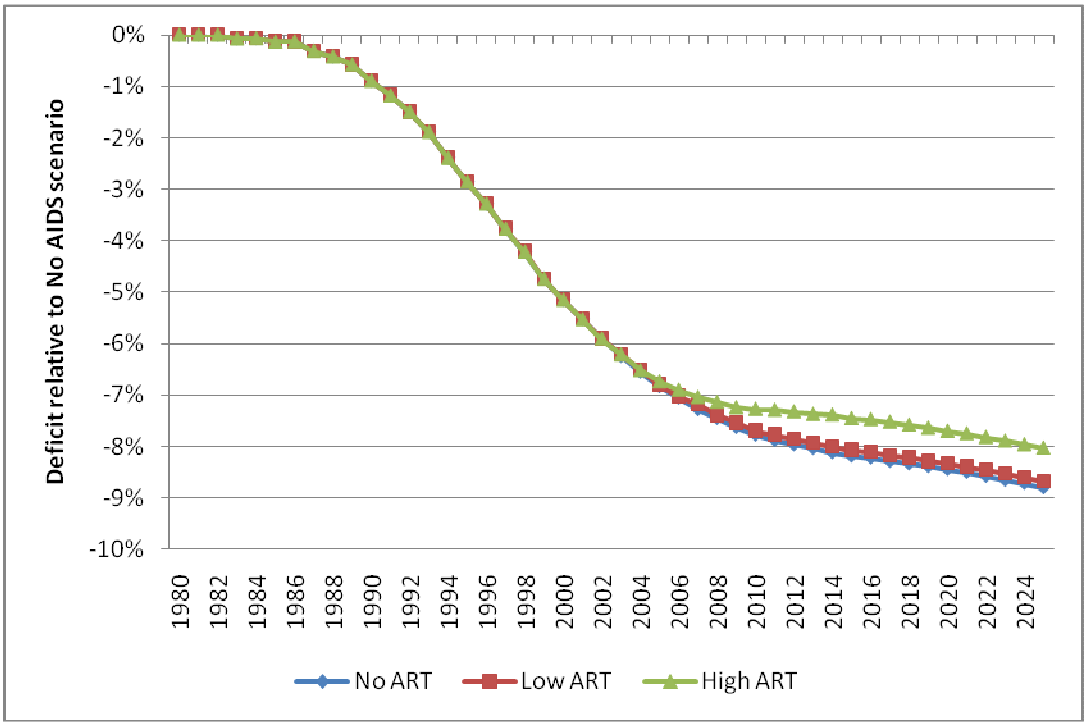


Source: model projections

The "no HIV/AIDS" scenario puts Uganda's total population in the year 2025 at 64.5 million. The age- and gender-specific projections are as shown in Table 5 below. Putting HIV/AIDS into the projections, without ART, a lower population of 58.8 million is estimated for 2025.

There are reasons to believe that Spectrum may be over-estimating the population. Under the "with-AIDS" scenario, the projections show a total population of 26.3 million for 2002. This compares with the observed census result for 2002, of 24.2 million people. It is not clear why this is, but suggests (if the census results are correct) that Spectrum is over-estimating the population by some 10%. However, the main purpose of the present exercise is to compare projections under the different scenarios (with/without AIDS etc.), and there is no reason to believe that comparative projections are misaligned. These suggest that by 2002, HIV/AIDS had caused the Ugandan population to be some 6% smaller than it would have been without HIV/AIDS, while by 2025 the difference would be 9% (see Figure 12).

Figure 12: Population Deficit due to HIV/AIDS

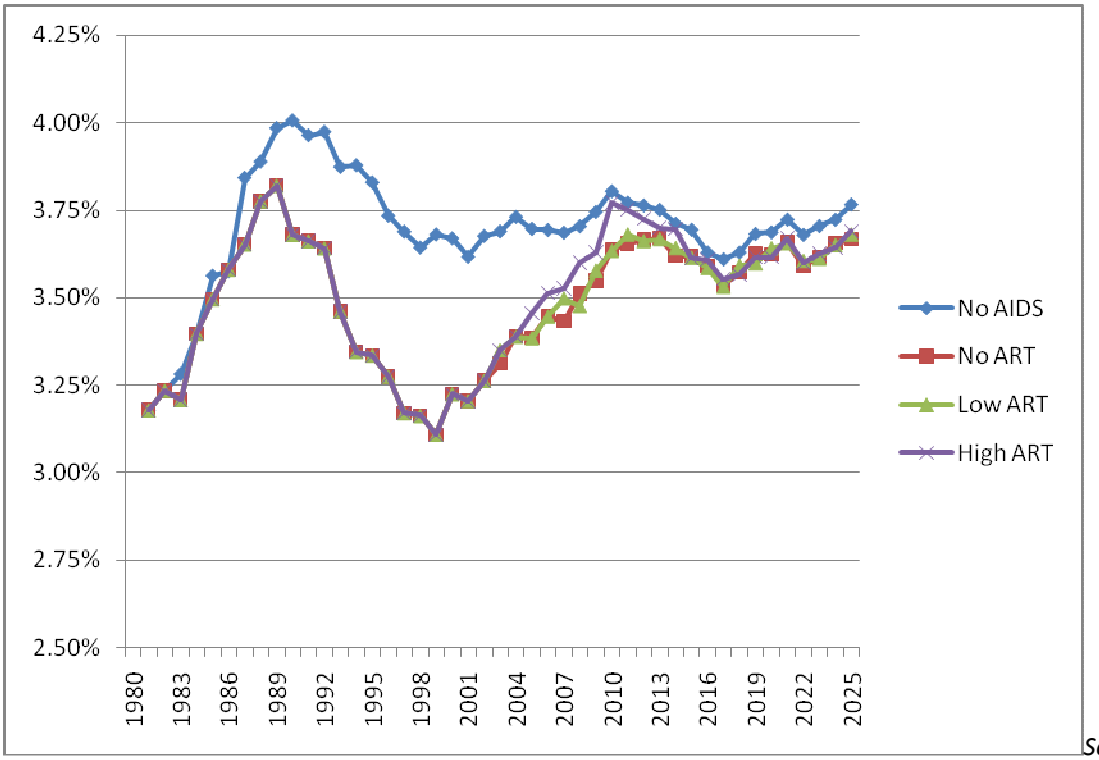


Source: model projections

Population Growth: the projections also show the impact of HIV/AIDS on population growth (see Figure 13). These show that the main impact of HIV/AIDS was felt during the 1990s, when prevalence rates were relatively high. As prevalence rates fell during the late 1990s, population growth is estimated to have risen, such that in the "High ARV" scenario, it is almost up to the growth rate projected for the "without AIDS" scenario.

The projections show that even in the absence of HIV/AIDS, population growth declined during the 1990s. This is due to a combination of factors, including disruptive internal population movements and out-migration, as well as the expected natural decline in fertility from very high rates.

Figure 13: Population Growth Rates



Source: model projections

Table 6: Population projections by Age for 2025 (million)

	No HIV/AIDS	HIV/AIDS (No ART)	HIV/AIDS (Low ART)	HIV/AIDS (Med ART)	HIV/AIDS (High ART)
Age group					
0-4	12.22	11.24	11.25	11.27	11.31
5-9	9.94	9.20	9.21	9.22	9.25
10-14	8.49	7.89	7.90	7.91	7.94
15-19	7.09	6.59	6.59	6.61	6.61
20-24	5.68	5.27	5.27	5.27	5.27
25-29	4.66	4.33	4.34	4.34	4.35
30-34	3.84	3.60	3.60	3.61	3.63
35-39	3.09	2.86	2.87	2.88	2.91
40-44	2.43	2.19	2.20	2.21	2.25
45-49	1.95	1.68	1.69	1.70	1.74
50-54	1.55	1.27	1.27	1.27	1.29
55-59	1.20	0.91	0.91	0.91	0.92
60-64	0.87	0.64	0.64	0.64	0.64
65-69	0.62	0.46	0.46	0.46	0.46
70-74	0.42	0.32	0.32	0.32	0.32
75-79	0.25	0.21	0.21	0.21	0.21
80+	0.21	0.19	0.19	0.19	0.19
Total	**64.50**	**58.82**	**58.90**	**58.99**	**59.31**

Source: model projections

The projections also show the impact of providing ART on the total population. As Figure 12 above shows, the provision of ART – even in the "High ART" scenario – only closes part of the population gap between the "No AIDS" and "with AIDS" scenarios. In the "Low ART" scenario, the population in 2025 is only 0.1% higher than in the "No ART" scenario, while in the "High ART" scenario the population is 0.8% higher than in the "No ART" scenario.

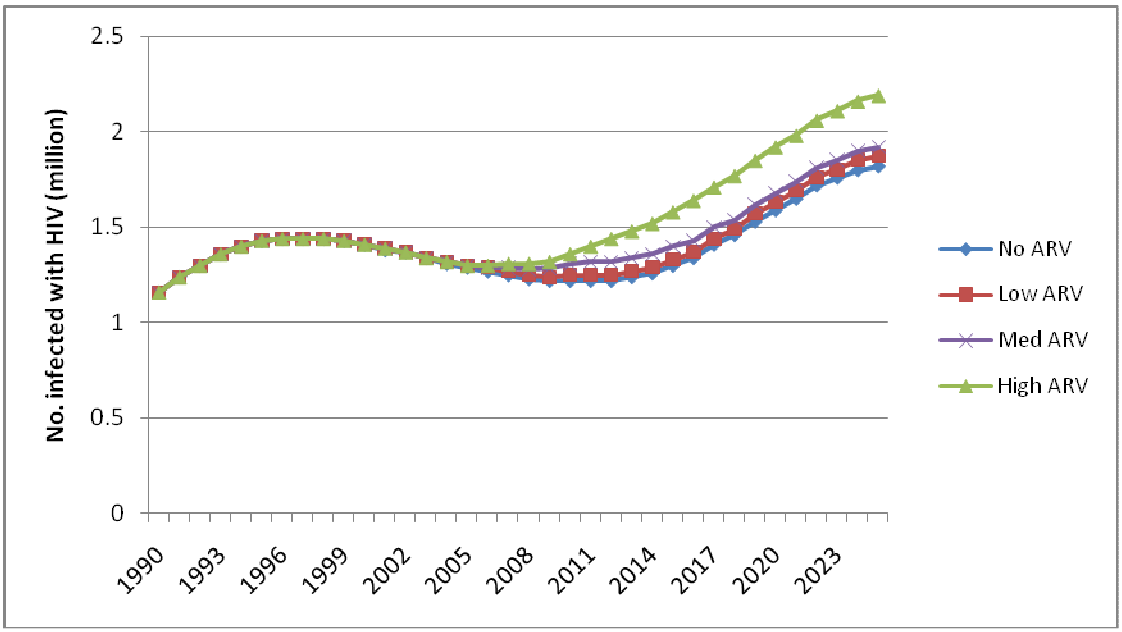
The reason for the apparently small impact of ART provision is that a large proportion of the impact on the total population was felt during the late 1980s and the 1990s, where high HIV-prevalence rates and death rates had a permanent effect, making the population smaller. The projections also show that unless ART is widely provided, it pays little demographic dividend.

Further analysis of the impact of HIV/AIDS and the provision of ART

HIV Population: as can be seen in Figure 14, the number of people infected with HIV is estimated to have peaked at about 1.4 million in 1996, before falling slowly. Without ART, the number of HIV+ people would continue to decline through to about 2012, following which time it would start to rise. This reflects a number of factors. Firstly, population growth – even with a constant prevalence rate, if the population is growing then the *number* of those infected with HIV will rise. Second, there are indications that the prevalence rate has been rising slightly (see Figure 15), which reinforces the upward trend in numbers infected.

With ART, the increase in the numbers of HIV+ people is even more dramatic, especially in the "High ART" scenario. The rollout of ART increases the number of HIV positive people, as those who would have earlier died are now living longer. The striking impact of this is shown in Figure 14; by 2025 there are projected to be 2.2 million HIV+ people under the High ART scenario, but only 1.8 million in the absence of ART.

Figure 14: Number of people infected with HIV/AIDS

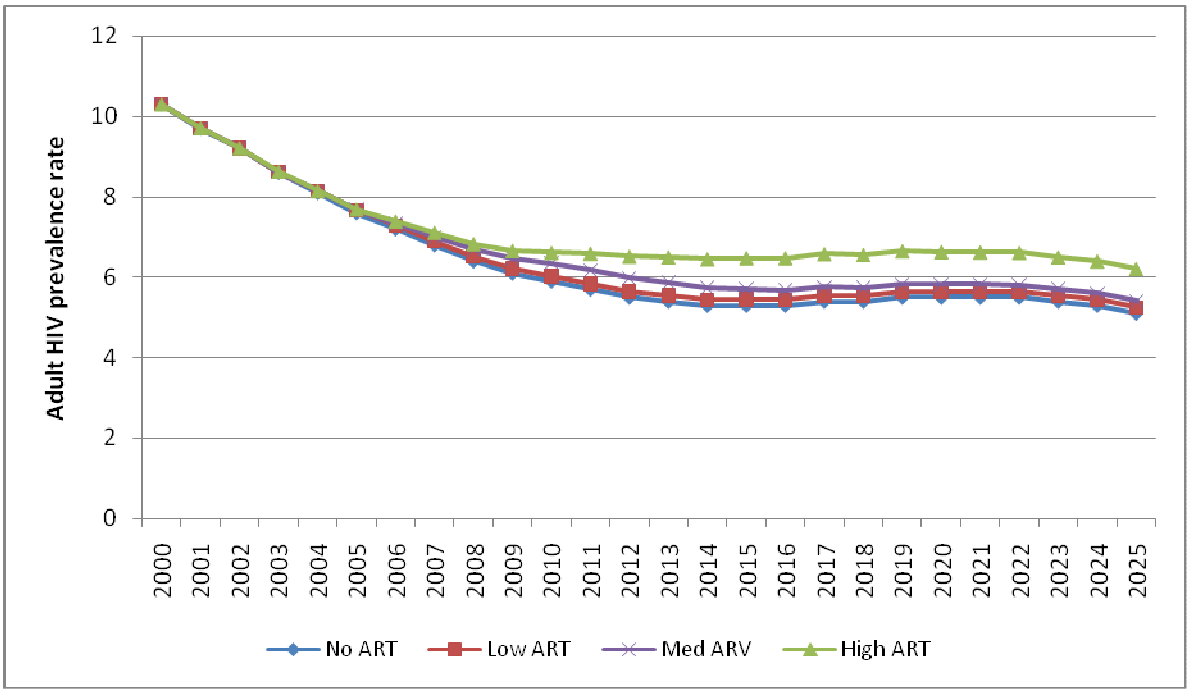


Source: model projections

HIV Prevalence: Figure 15 shows the impact of ART provision on HIV prevalence. Although there is projected to be an underlying trend of declining prevalence, the impact of ART provision on keeping

people alive raises the overall prevalence rate. In the absence of ART provision, the adult HIV prevalence rate is projected to fall to 5.1% in 2025. With ART, however, the prevalence rate is projected to be higher, at 6.2%.

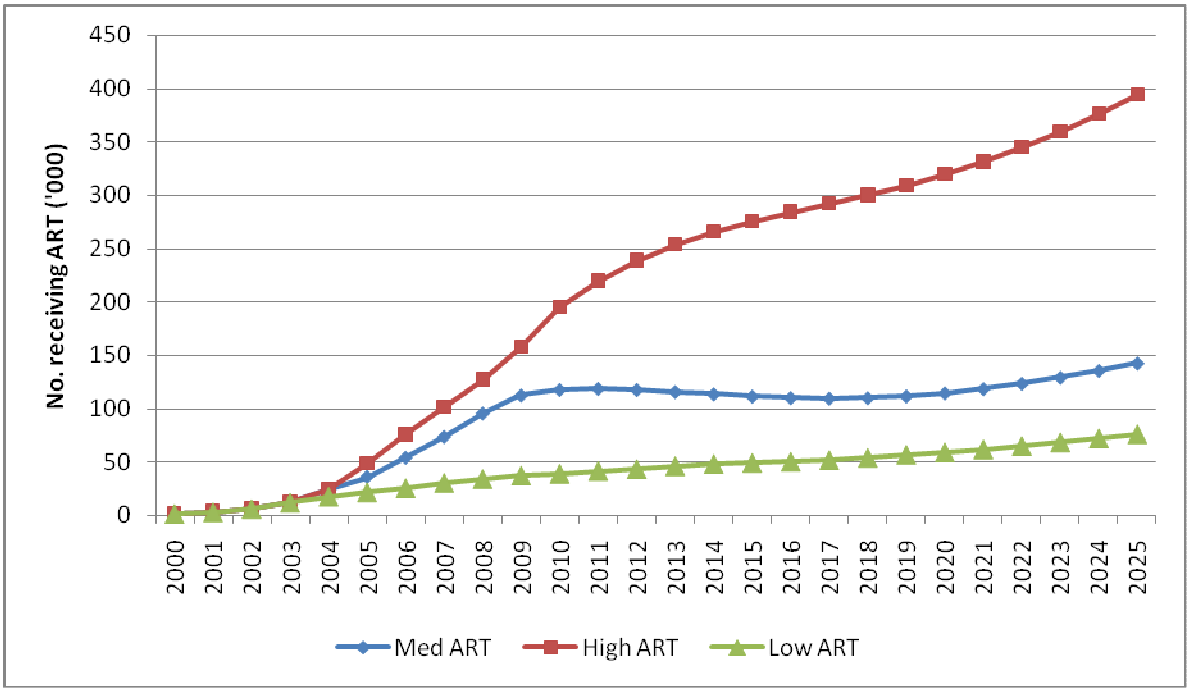
Figure 15: Adult HIV Prevalence



Source: model projections

Number receiving ART: The number of people receiving ART continues to rise in all of the ART scenarios, although much more dramatically in the High ART scenario (see Figure 16). The number receiving ART in the High scenario is close to, but somewhat below the projections contained in the National Strategic Plan (NSP). This may indicate that the model is under-projecting the number of HIV+ people, or that the NSP envisages earlier treatment of HIV+ people with ART than the protocols embedded in the Spectrum model. It is unlikely to reflect a faster rollout of ART in the NSP, as the High scenario envisages a very rapid rollout of ART.

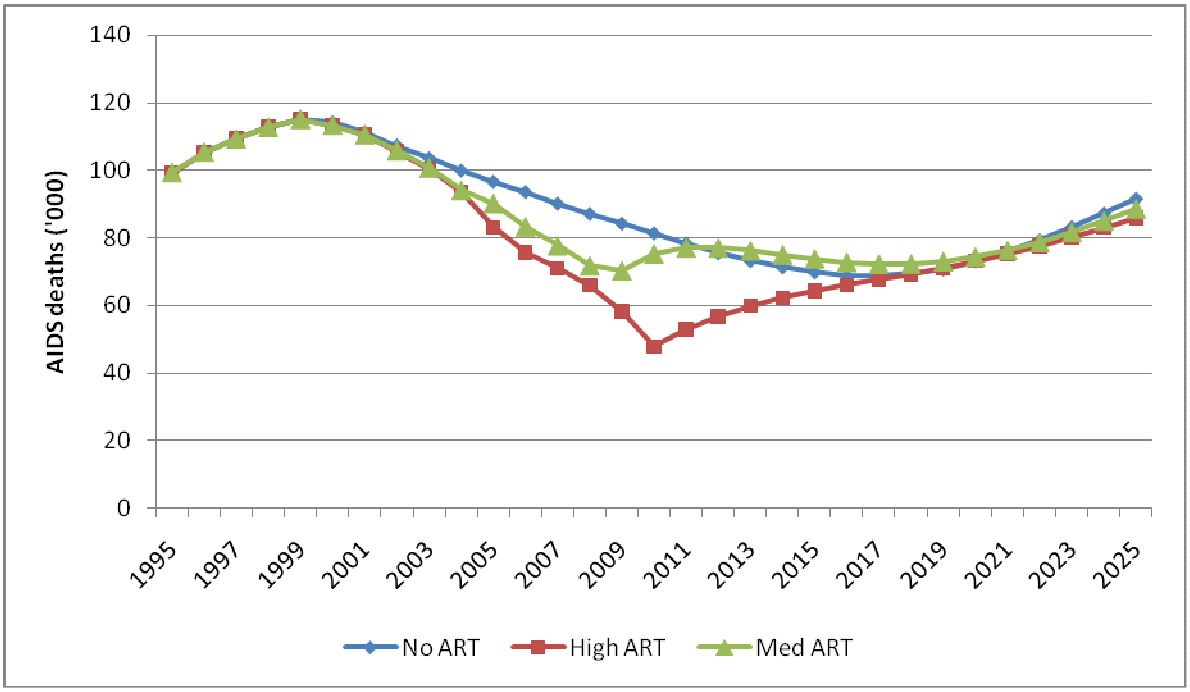
Figure 16: No. of Adults Receiving ART



Source: model projections

AIDS Deaths and Life Expectancy: Figure 17 shows that the number of AIDS deaths is estimated to have fallen since the late 1990s, reflecting the earlier decline in HIV prevalence. Going forward, the number of projected AIDS deaths is highly dependent upon the rollout of ART. Under the "High ART" scenario, the number of AIDS deaths is projected to keep falling steadily until around 2011, when ART provision levels out at 90% of the relevant eligible population. During this period, the rapid rollout of ART dramatically cuts the number of AIDS deaths. After 2011, the number of AIDS deaths starts rising again. It should be noted that the provision of ART *delays* AIDS-related deaths but does not *prevent* them, due to various factors associated with ART, including adherence lapses by patients and the emergence of drug resistance. In the medium term, however, it is clear that ART leads to a significantly reduced death rate and hence improved life expectancy. Without ART (or in the low ART scenario) the number of deaths is projected to decline much more slowly, reflecting only the earlier decline in prevalence. Eventually, however, the number starts rising, following the increase in the number of HIV+ people in the population.

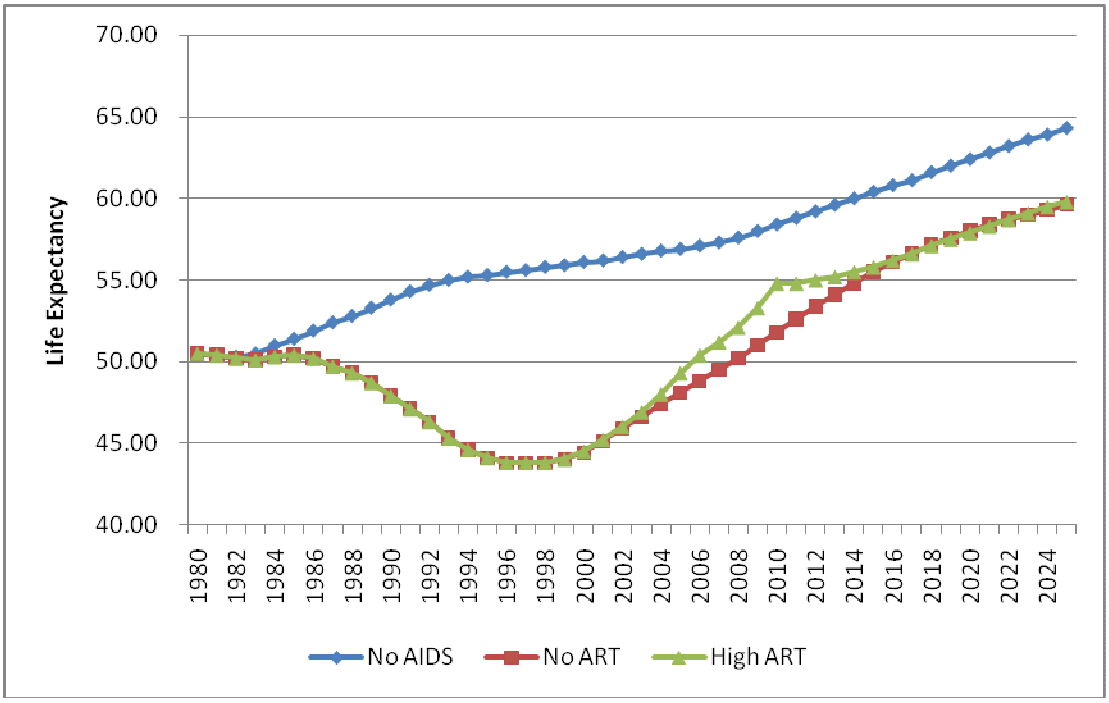
Figure 17: AIDS Deaths



Source: model projections

The overall impact of HIV/AIDS on life expectancy is shown in Figure 18. This shows that by the late 1990s, life expectancy had fallen to an estimated 44 years, compared to 56 years without HIV/AIDS. However, going forward the gap declines, reflecting the decline in the HIV prevalence rate and, in the High ART scenario, the availability of treatment that prolongs survival times for HIV+ individuals. By 2025, life expectancy is projected to be 60 years in the with-AIDS scenarios, compared to an estimated 64 years without AIDS.

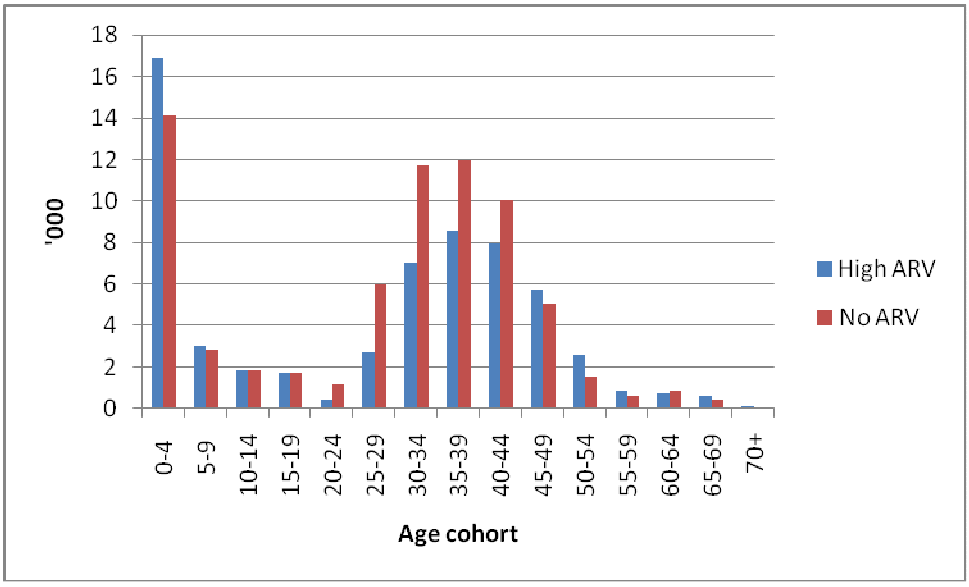
Figure 18: Life Expectancy



Source: model projections

Aids Deaths and the Labour Force: in populations without HIV/AIDS, death rates tend to be higher for the elderly and very young children that for the population as a whole. This largely reflects the impact of disease relative to levels of health and bodily resistance to infection. However, HIV/AIDS changes the pattern of deaths, and the age pattern of death rates are quite different in a population that has high HIV prevalence than one without. HIV/AIDS tends to raise the numbers of deaths amongst young and middle-aged adults, i.e. those who are economically most productive and who are more likely to be skilled and employed. Hence investments made by the government and other agencies to sustain the lives of the infected persons will to some degree be balanced by the economic contributions of the same people. As shown in Figure 19, provision of ART will have a significant effect on reducing AIDS-related deaths among the economically productive age group of 15-59 years.

Figure 19: Age-specific AIDS deaths in 2015



Source: model projections

AIDS-related deaths are therefore concentrated on people of productive age, such that Uganda has been losing a large number of the country's potential labour force (15-59 year old) since the late 1980's[10]. A sharp increase in these deaths was recorded in the 1990s, when the HIV prevalence was at its peak. Thereafter, the death rate started declining as HIV prevalence declined.

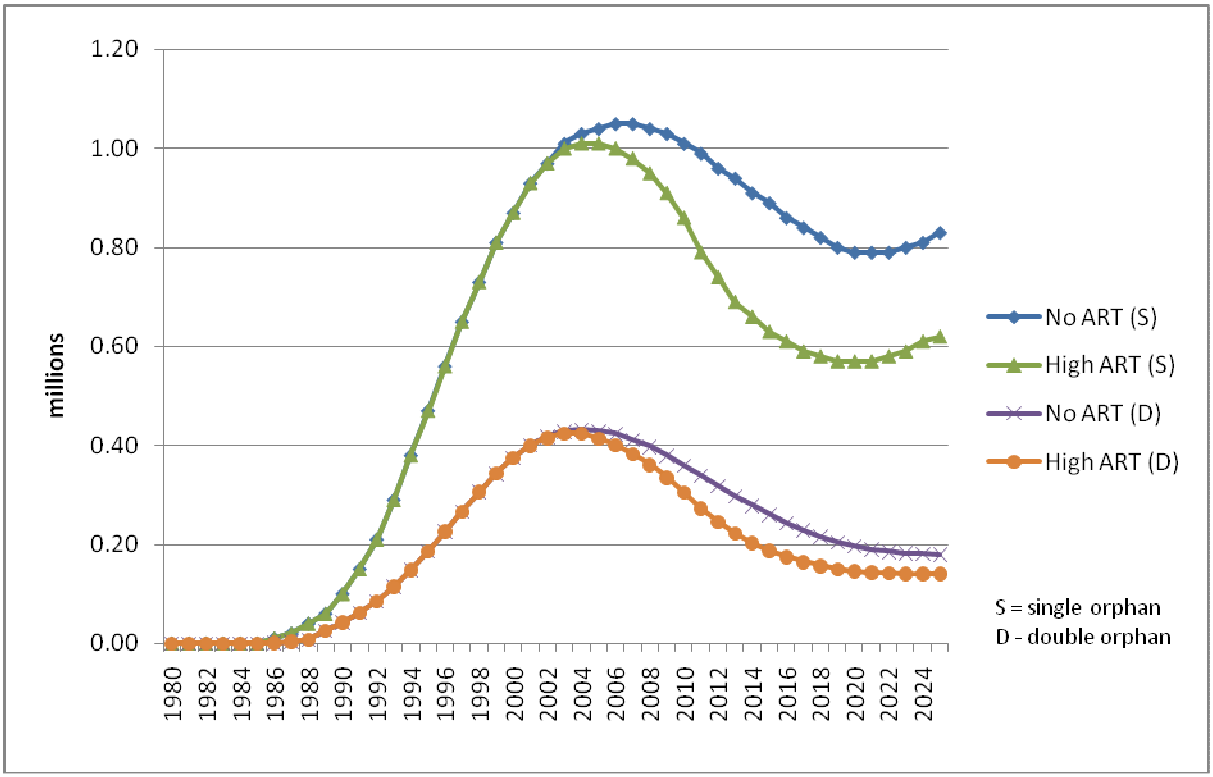
In view of the potential economic impact of losing the most productive age group of the population, the model been used to make projections of the likely loss of labour force that the country may face in the period to 2025. Under the different scenarios modelled, in the absence of ART, the country will have lost 8.5% of the labour force (compared to the No-AIDS scenario) by 2025. However, this can be reduced slightly (8.4%) in the low case scenario of ART. A bigger impact is visible (7.7%) in the High-ART scenario.

Orphans: The number of children orphaned to HIV/AIDS (both double and single orphans[11]) started rising in the late 1980's and steadily increased through the 1990s. However, the rate of increase tended to decrease in late 1990s, which could be attributed to decline in the HIV prevalence rate at the time. The number of orphans has recently peaked at just over 1 million. Without the intervention of ART, the total number of HIV/AIDS-orphaned children is estimated to be 830,000 in 2025. With ART, the number of orphans will be lower. The Low ART scenario only leads to small difference in the number of orphans, which would be 800,000 in 2025, whereas in the High ART scenario the number would be much lower, at 620,000 (see Figure 20). For double orphans, the numbers are much lower, peaking at around 400,000 and declining to under 200,000 by 2025.

[10] Though the model has looked at the 15-59 population, this is driven by the model and international conventions regarding the definition of the labour force. It does not mean that people do not engage in economic activities before they are 15 years or when they are 60 years and above.

[11] Double orphans have lost both parents to HIV/AIDS while single orphans have lost either their mother or father.

Figure 20: Orphan Projections (Double & Single)



Source: model projections

Conclusions and Implications

The population projections detailed here do have some limitations. In particular, there is little gender disaggregation related to the provision and uptake of ART, even though in practice the behaviour of men and women may be quite different. This issue can be dealt with in future once more disaggregated data are available and the Spectrum model can generate projections on this basis. A further limitation is that the impact of ART on fertility is not accommodated, but again this can be reflected in future once reliable data are available based on empirical research.

The main findings of this demographic study of HIV/AIDS in Uganda are as follows:

- The main demographic impact of HIV/AIDS has already occurred, i.e. during the 1980s and 1990s when HIV prevalence was very high, and there were large numbers of AIDS-related deaths. As a result, the differences between the various scenarios going forward (e.g. in terms of population deficit) are not very large.
- Going forward, however, there are differences between the High-ART and No/Low ART scenarios, in terms of the size of the population, the numbers of HIV+ individuals, and the numbers of AIDS-related deaths. However, the differences between the Low ART and No ART scenarios are minimal, and in some cases indistinguishable, which indicate that a Low ART approach will yield few demographic benefits (or social and economic benefits). The medium ART scenario lies somewhere between the No/Low ART scenarios and the High ART scenario.
- In the High ART scenario, the number of AIDS-related deaths is cut over a fifteen year period from around 2003 to 2018. Towards the end of the projection period, however, the number of AIDS-related deaths is similar in both the High-ART and No-ART scenarios, essentially as a

"catch-up" process takes place. It is important to realise that ART does not keep all HIV+ individuals alive indefinitely, and that problems of insufficient adherence to treatment regimens and emerging drug resistance will mean that eventually, many of those taking ART will eventually die of AIDS-related illnesses – importantly, however, they will have enjoyed many extra years of healthy fulfilling life in the meantime.

- The widespread provision of ART (as in the High-ART scenario) is a long-term, open-ended commitment, which continues to grow during the period of the projections. Hence it is important that efforts to prevent the spread of HIV/AIDS and reduce new infections (incidence) are pursued, as this is the only long-term solution to the epidemic. It is especially important that the heightened focus on treatment does not detract from the long-term need for effective prevention.
- Life expectancy is higher in the High-ART scenario, but does not recover to the levels that would have been experienced without HIV/AIDS.
- The number of orphans (who have lost one or both parents to AIDS) peaked at just over 1 million, or around 3% of the population. Providing ART cuts the number of orphans by around one-quarter by 2025.
- By keeping HIV+ individuals alive for longer, the High-ART scenario will lead to a higher HIV prevalence rate, reinforcing the point that trends in HIV prevalence are not a good indicator of the success or otherwise of HIV-prevention efforts in an environment of widespread ART provision, and the focus has to be on incidence (not prevalence) rates.

Phase III – Aggregate Macroeconomic Impact Analysis

Phase III of the study comprises a number of modelling exercises to quantify the impact of HIV/AIDS on the Uganda economy, and of the impact of interventions related to the provision of Anti-retroviral Therapy (ART). It draws upon some of the results of the Phase II studies, particularly the demographic projections, HIV costing and financing, and the econometric studies.

The Macroeconomic Impact of HIV/AIDS – Overview of the Issues

Macroeconomic Background

Uganda has achieved a highly respectable and steadily improving economic growth performance over the past two decades. Revised GDP data show that real growth has been impressive in recent years, averaging 9.5% a year from 2005/6 to 2007/8. Several factors explain this good growth performance, including macroeconomic reforms which have helped to create a favourable and stable macroeconomic environment. As policy has intended, much growth has been export-led, with the ratio of exports to GDP rising steadily. In the recent past, improved regional stability and reconstruction activity in neighbouring countries, and CHOGM stimulus for construction sector, have also contributed to higher growth.

Strong GDP growth has supported rising average real incomes, even though population growth has also remained very high. Rising income levels have in turn contributed to progress in dealing with poverty, which has fallen from an estimated 56% in 1992 to 31% in 2005/06. At the same time there has been reduced dependence upon agriculture. The share of agriculture in GDP has fallen rapidly, from 42% in 1997/98 to 29% in 2006/07, with declines in the shares of both monetary and non-

monetary agricultural production, as the agricultural sector has been growing more slowly than non-agricultural sectors of the economy. This has contributed to rising incomes, as employment has shifted from (low-income) agriculture to other sectors which are characterised by higher average incomes.

The economy has benefited from extensive structural reforms, including improved public finance management, debt reduction (and debt relief), disciplined monetary policy focused on achieving sustainable low inflation, and an improved environment for private sector investment and activity. Fiscal sustainability has been targeted through improved domestic revenue generation[12], expenditure control and the reduction of the fiscal deficit and public debt; however, the budget is still heavily dependent upon donor funding, especially for development (investment) projects.

Overall, the economy has been characterised by improved macroeconomic balance, particularly with regard to fiscal sustainability and balance of payments stability. While the balance of trade remains heavily in deficit with imports substantially exceeding exports, the situation has been helped by exports growing faster than imports in recent years, large increases in private remittances, and significant donor grants both to government and non-government entities. Capital inflows have been strong, supporting an overall surplus on the balance of payments, which has in turn supported the accumulation of foreign exchange reserves. Considerable efforts have been devoted to maintaining international competitiveness and a stable real effective exchange rate (REER), so as to underpin export-led growth. At times this task has been made more difficult, ironically, by the strength of inflows from donor funds and inward investment, which has tended to put upward pressure on the exchange rate.

Macroeconomic challenges posed by HIV/AIDS

Countries with high HIV and AIDS burdens have had to be aware of the potential macroeconomic impact of the disease. All of the countries with HIV prevalence rates high enough to have a potential macroeconomic impact are in sub-Saharan Africa, where the problem has been compounded in some cases by weak economic performance, low levels of per capita income and macroeconomic instability.

In Uganda, the burden of HIV/AIDS was at its highest during the 1980s and 1990s, when reported HIV adult prevalence rates reached nearly 19%[13]. By the 2004/05, however, the recorded prevalence rate was down to 6.4%[14]. Despite this considerable success in reducing the HIV prevalence rate, there are now concerns that the prevalence rate is rising again. This may in part reflect the rollout of ART which, by keeping HIV-positive people alive for longer, will tend to raise the prevalence rate. But the real concern is that HIV prevalence is rising even apart from the impact of ART.

HIV/AIDS can have macroeconomic impacts through a wide range of channels. The most obvious direct impact is on labour supply: by reducing population growth, HIV/AIDS leads to a smaller labour force. This is potentially important in a country such as Uganda (and many other sub-Saharan African countries), which has a highly labour-intensive production structure. HIV/AIDS also affects the *composition* of the labour force, in that there tends to be fewer older (and hence more skilled and experienced) workers. HIV/AIDS may also affect labour productivity (and hence growth), due to ill-health and absenteeism. HIV/AIDS also causes an increase in costs, for households, firms, and

[12] The IMF notes that revised GDP data make the increase in the tax-to-GDP ratio less impressive (IMF, 2008).

[13] Although there is uncertainty over the accuracy of these early data and how representative they were for nationwide prevalence.

[14] Uganda Sero-Survey, 2004/05 (MoH, 2006).

governments. This can indirectly affect incomes and growth; depending on how these additional costs are financed, they may lead to reduced savings and investment. Private sector investment may also be affected by reduced profitability. Besides the overall macroeconomic impact, HIV/AIDS may have different impacts across economic sectors, increasing demand and growth in some sectors and reducing it in others.

It is generally expected that due to reduced labour supply, productivity and investment, HIV/AIDS will have a negative impact on economic growth. However, the impact on average (per capita) incomes is less well defined; as both economic growth and population growth will be reduced, if the magnitude of the impact on the economy is less than the impact on the population, then conceivably per capita incomes could rise.

The main channel for this seemingly perverse result is through unemployment: if deaths due to AIDS result in formerly unemployed members of the labour force finding employment, then the unemployment rate could fall. In the Ugandan context, reduced labour supply could lead to labour being drawn from low productivity (and low income) agriculture to higher productivity (and higher income) non-agricultural sectors of the economy.

This is not necessarily the case, however, as overall labour demand may fall and could dominate labour supply effects (the reduction in labour demand could be greater than the reduction in labour supply, leading to higher unemployment). There is also a potential problem with the availability of skilled labour, which cannot readily be replaced.

More recently, concerns about the macroeconomic impact of HIV/AIDS have changed. In the early days of the epidemic, prevalence rates were rising to much higher levels in sub-Saharan Africa than had been seen in other parts of the world. Furthermore, the cost of effective treatment through Anti-retroviral therapy (ART) was extremely high, and was only available to a small minority of the population who could afford private treatment. Dealing with HIV/AIDS focused on prevention, information, education and communication (IEC) programmes, dealing with opportunistic infections and the impact of this on health systems, and dealing with orphans and vulnerable children (OVCs). However, over the past decade, the overall HIV prevalence rate has dropped in many countries – in part due to the success of prevention and IEC initiatives - so the direct economic impacts are likely to be smaller. Furthermore, the cost of effective treatment (ART) has dropped, and it is now a realistic option to treat widely. The rollout of ART has also meant that HIV+ people are healthier and live longer, and hence the negative economic impacts are again reduced.

Nevertheless, the availability of treatment has raised new challenges. In middle income countries, the cost of ART and other HIV/AIDS programmes can now be largely funded from domestic resources, albeit assisted with donor contributions. In many poorer countries, the cost of ART and HIV programmes cannot be predominantly financed from domestic resources, but donor funds are now available to meet most of the costs.

These two funding scenarios raise different sets of challenges. In middle-income countries (MICs), the main issue is ensuring budget sustainability in the context of stepped up HIV/AIDS spending, and dealing with the trade-offs between competing expenditure priorities. In low-income countries (LICs), this issue also arises – given that part of the costs of ART and other HIV programmes will be met from domestic resources – but the main macroeconomic issues are different. The key macroeconomic challenges arising from HIV/AIDS treatment in LICs are:

- The sustainability and stability of donor funding (HIV/AIDS treatment is a long-term commitment);
- The extent of the local funding contribution and the impact on government budget sustainability;
- The impact of donor inflows on the real exchange rate, money supply, inflation, competitiveness, diversification, growth, incomes and poverty;
- The extent to which these negative impacts are offset by the beneficial impacts on growth (e.g. reducing labour shortages) and poverty, or justified in social/human terms regardless of negative economic impacts;
- The extent to which spending on HIV/AIDS creates demand for goods and services that are inconsistent with productive capacity of the economy, perhaps causing supply bottlenecks and inflation;
- How central banks should respond to increased inflows of foreign exchange resulting from donor funding.

The Phase III report presents the results of analysis of these issues in the Uganda context.

The Magnitude of Expenditure Related to HIV/AIDS

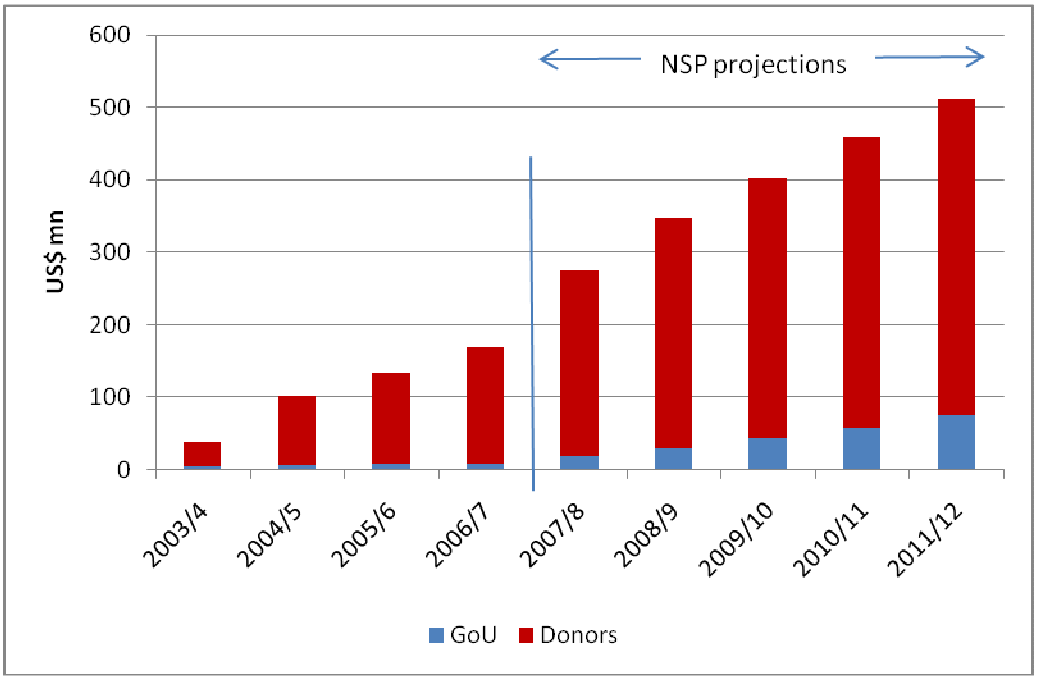
Total Spending and Donor inflows for HIV/AIDS in context

Spending on HIV/AIDS programmes in Uganda has increased sharply in recent years, up from $38.4mn in 2003/4 to an estimated $170mn in 2006/7 (Lake & Mwijuka, 2006). Of these total spending amounts, the contribution from the Government of Uganda (GoU) rose from $5.9mn to $8m over this period, but this represented a decline from 16% to 5% of total spending.

The National Strategic Plan (NSP) for 2007/08 to 2011/12 envisages further steady increases in spending on HIV/AIDS programmes, rising to $511mn in 2011/12, and for the GoU share to increase to 15% ($77mn) (see Figure 21)[15].

[15] Uganda AIDS Commission, National Strategic Plan 2007/08 – 2011/12. These data reflect the "high funding" scenario.

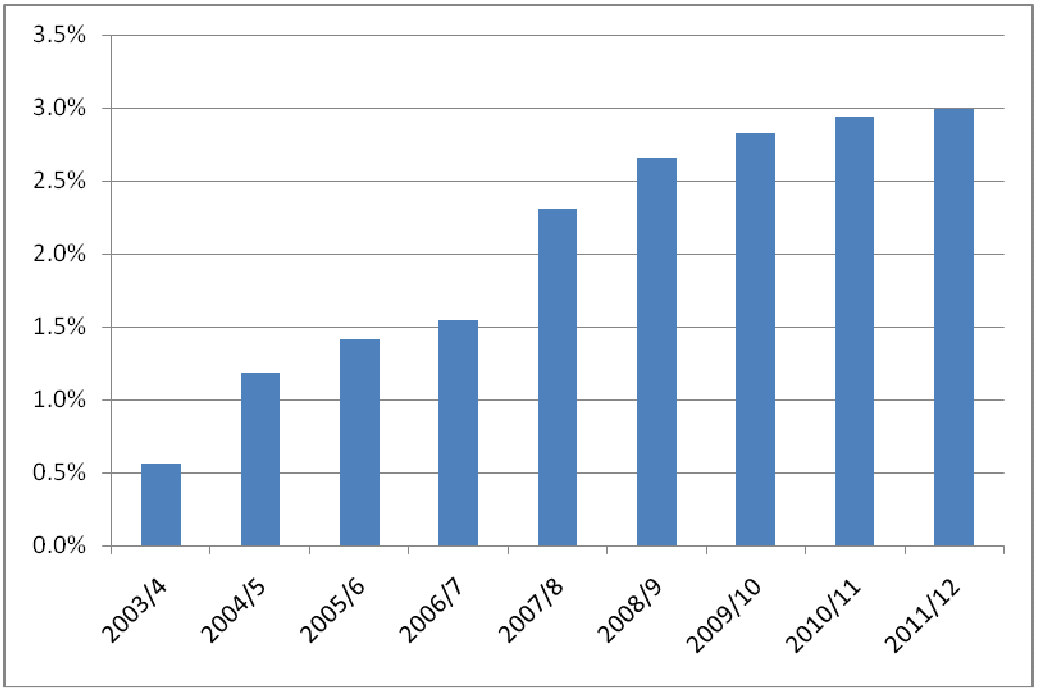
Figure 21: Total Spending on HIV/AIDS Programmes ($mn)



Source: Lake & Mwijuka (2006); UAC (2007)

The increase in spending on HIV/AIDS programmes also represents a steady increase relative to GDP (see Figure 22). Already, spending has risen from around 0.6% of GDP in 2003/04 to an estimated 1.5% in 2006/07. It is set to increase further, to 3.0% of GDP in 2011/12. While this increase is large, one of the issues addressed in this paper is whether it is likely to be a problem.

Figure 22: Spending on HIV/AIDS Programmes as % of GDP



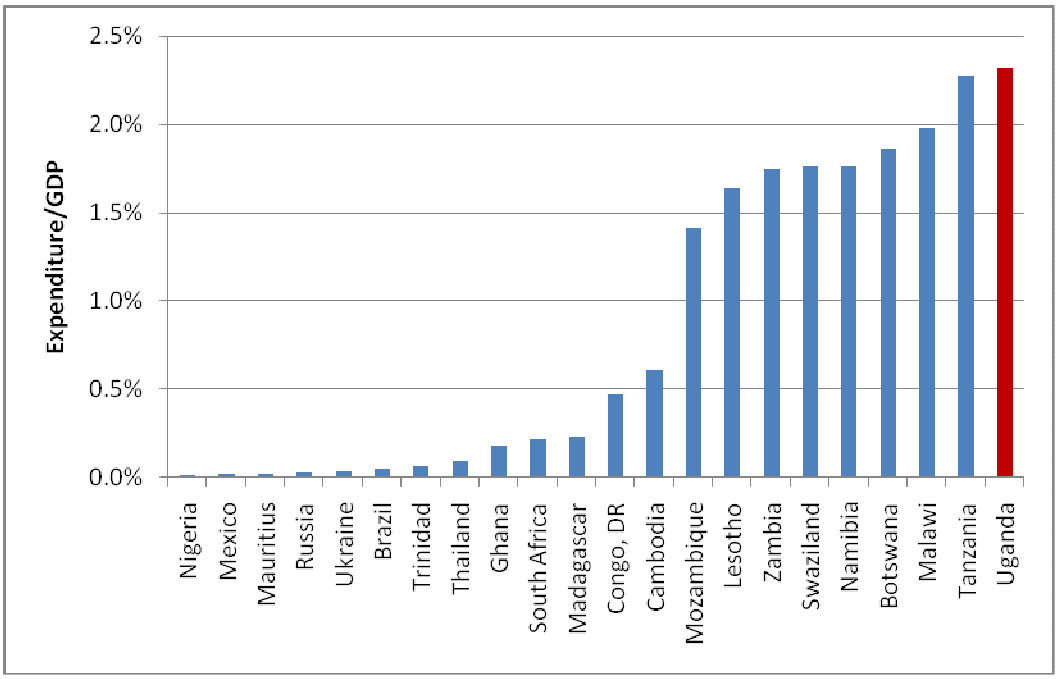
Source: own calculations

It should be noted that this level of spending on HIV/AIDS, relative to GDP, is high but not out of line with other countries. Total spending on HIV/AIDS programmes is estimated to peak at 2.5% - 3% of

GDP in Botswana (Jefferis et al, 2006) – where a much higher prevalence rate (approximately four times the level in Uganda) is balanced by a much higher GDP per capita (approx US$5500).

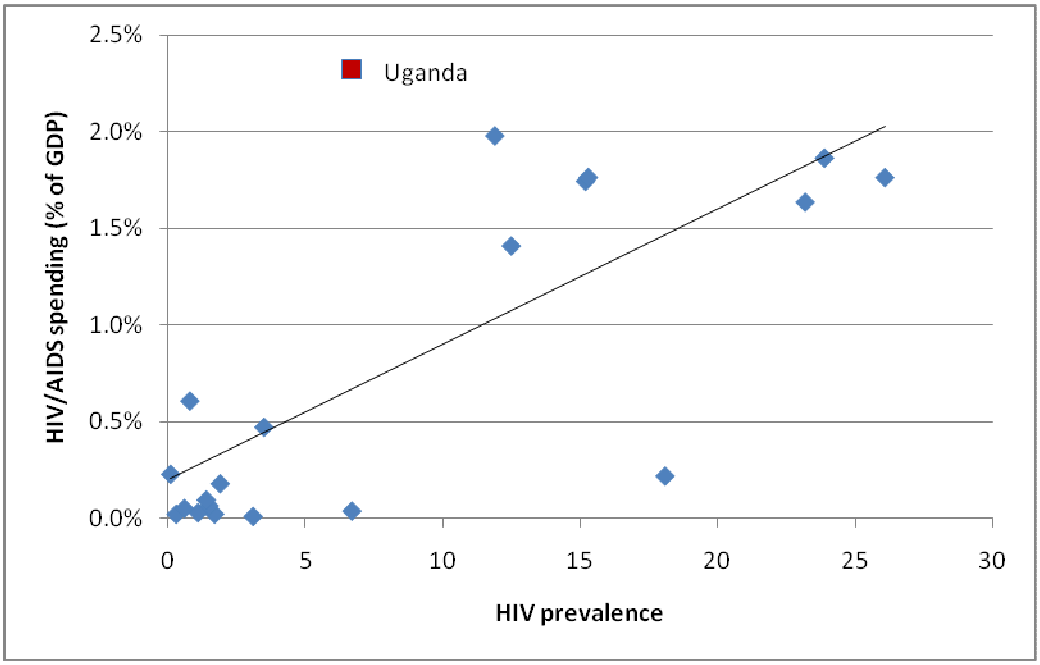
Across a range of countries, Uganda's spending on HIV/AIDS is relatively high as a proportion of GDP (Figure 23), especially when the level of HIV prevalence is taken into account (Figure 24).

Figure 23: Spending on HIV/AIDS (% of GDP) - International Comparisons, 2007



Source: own calculations based on data from UNAIDS (2008) and IMF (www.imf.org)

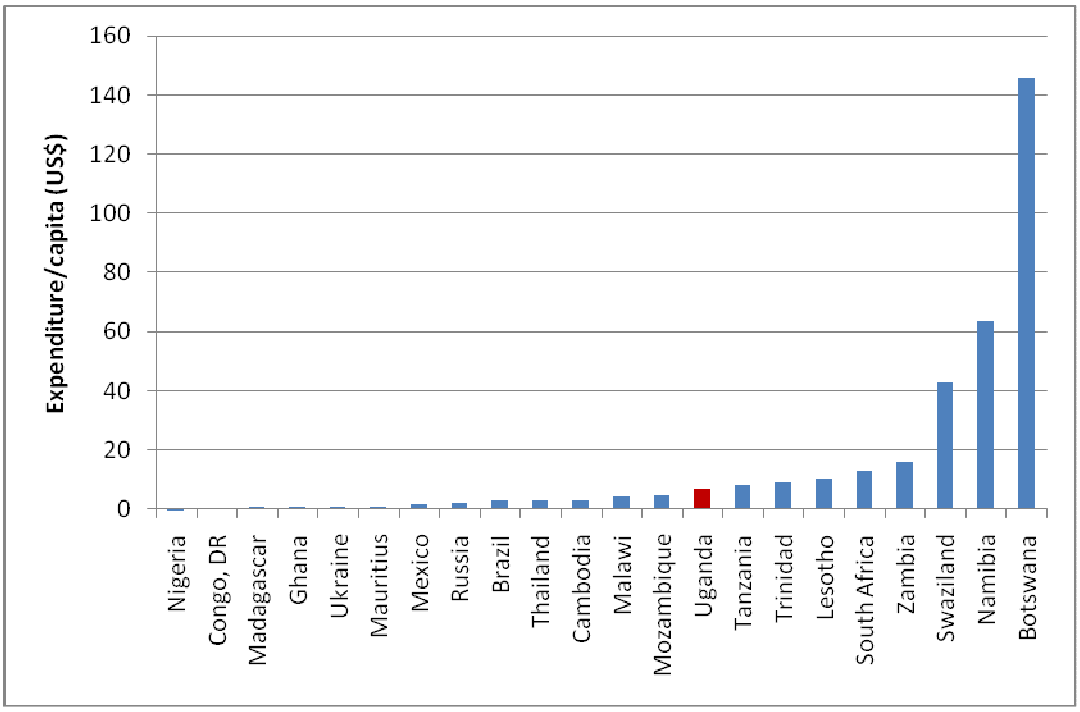
Figure 24: HIV/AIDS Spending (% GDP) and HIV Prevalence



Source: own calculations based on data from UNAIDS (2008) and IMF (www.imf.org)

In terms of HIV/AIDS spending per capita, Uganda's level of expenditure is similar to that of low-income countries (Tanzania, Mozambique) but much below the middle-income, high prevalence countries of southern Africa (Figure 25).

Figure 25: Spending on HIV/AIDS ($ per capita) - International Comparisons



Source: own calculations based on data from UNAIDS (2008) and IMF (www.imf.org)

Domestic budget implications

Under the NSP, the majority of spending on HIV/AIDS will continue to be externally financed, but the NSP envisages an increase in the GoU share from 5% of the total in 2006/7 to 15% in 2011/12, i.e. from US$8mn to US$75mn. As a share of domestic revenues (assuming the ratio of domestic revenues to GDP remains unchanged), government spending on HIV/AIDS would increase from 0.6% of total spending to 2.3% - a large increase, but still not to a very high level - or from 0.1% to 0.4% of GDP. Even if this entirely goes through to the budget deficit – and is not compensated by cuts in spending elsewhere – this would only increase the deficit by 0.3% of GDP, which is unlikely to present a major problem. Alternatively, such spending could be funded by an increase in taxes of 0.3% of GDP, approximately a 3.5% increase in total taxation.

However, this comes at a time of other fiscal pressures (extending health and education services, road infrastructure etc.). For instance, the 2008/09 Budget envisages an increase in development spending from 3% to 5.5% of GDP, much larger than the anticipated GoU spending on HIV/AIDS programmes. In practice, increased domestic spending on HIV/AIDS would require some tradeoffs, with reduced expenditure in other areas.

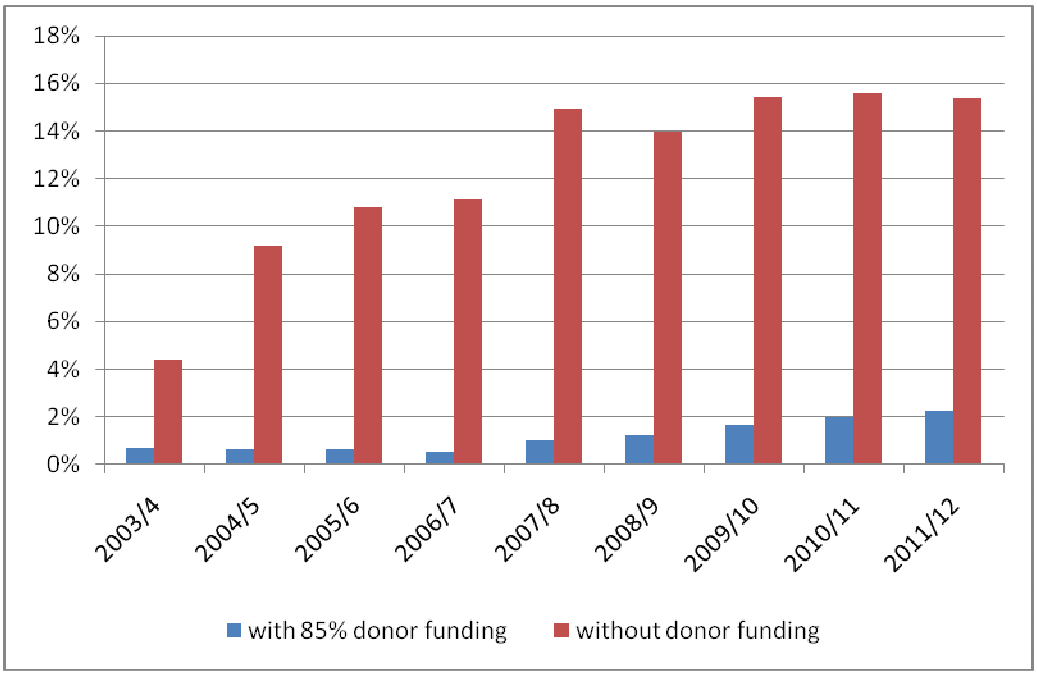
The above refers to the domestically-financed portion of GoU spending on HIV/AIDS programmes. Of course total spending is much larger, and concerns have been raised about the donor-financed portion of GoU spending, and the impact that increased GoU spending would have on budget ceilings. Increasingly, however, spending on HIV/AIDS programmes is being conducted through non-government agencies, so this issue is less relevant. Data on government spending on HIV/AIDS programmes is not readily available as a distinct category, as it is spread across a number of

ministerial budgets. If we assume, however, that one-third of total HIV/AIDS spending goes through the GoU, then this would approximately double the impact on the budget, taking spending from 0.2% to 0.8% of GDP between 2003/4 and 2011/12 – still a relatively small amount.

Even though HIV/AIDS programmes would have a relatively small impact on the budget, the spending through non-government agencies would still have a macroeconomic impact, and this is discussed below.

The major impact on the government budget would come if donor funding were not available but expenditure was kept at the same level. This would take total spending to around 15% of domestic revenues – a level that would be extremely difficult to sustain as it would require either sharp cutbacks in other important spending areas, tax increases, or unsustainable deficit funding and public borrowing.

Figure 26: GoU Spending on HIV/AIDS Programmes (as % of domestic revenues)



Source: own calculations

Monetary and Exchange Rate Impact.

Concerns about the monetary and exchange rate of HIV/AIDS spending impact stem primarily from the magnitude of donor currency flows, the impact on the exchange rate and competitiveness, and the required policy responses. Under the NSP projections, HIV/AIDS-related donor funding would increase from 18% of ODA in 2004/05 to an estimated 50% in 2011/12, assuming that non-HIV/AIDS ODA remains static in real USD terms[16].

Exchange Rate

If the intended proportions of financing from the GoU are met, HIV/AIDS-related donor inflows will increase from $32m in 2003/04 to $436mn in 2011/12. On the face of it, this would represent a significant addition to foreign exchange receipts. Estimated donor flows amounted to 4.6% of non-

[16] Non-HIV/AIDS-related ODA has been steady at around USD400m in recent years.

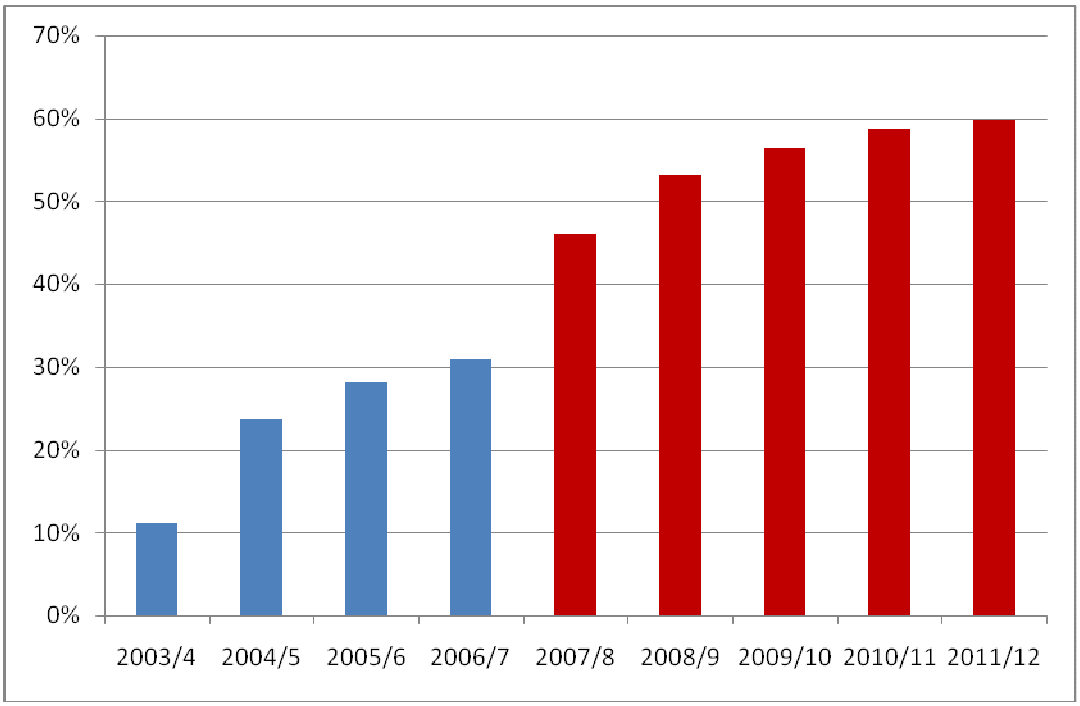
HIV current account receipts in 2006/7, rising to an estimated 7.2% in 2011/12[17]. Donor funds would represent an increase of 50% in transfers (excluding remittances) to government and the private sector from 2006/07 levels, and these additional inflows could put upward pressure on the currency, causing appreciation and a loss of competitiveness.

However, the net inflows are likely to be much smaller. It is estimated that that 60% of HIV/AIDS programme expenditure goes on imports (see Phase II report). Taking this into account, while gross donor flows would rise from $162mn in 2006/7 to $436m in 2011/12, net flows would only rise from $68m to $200m over the same period. The magnitude of the relative impact on the balance of payments and the currency would therefore be much smaller.

However, we can also compare the net inflows to the overall balance of payments (BoP), as this arguably is best indicator of likely currency pressures. Over the period 2001/02 to 2006/7, the overall balance on the BoP averaged 2% of GDP. Taking this as the average going forward, the net flows from HIV/AIDS programmes would rise from 11% of the overall balance in 2003/4 to 60% in 2011/12. Clearly the impact on the foreign exchange market would be substantial; as the value of the currency is determined by the balance between inflows and outflows, and even taking account of major import component of HIV spending, the remainder would add considerably to net foreign exchange inflows and hence change the balance, causing upward currency pressures.

Net inflows have already risen from 11% of the BoP in 2003/4 to 30% in 2006/07, and this may have contributed to currency appreciation pressures, which would increase further (see Figure 27).

Figure 27: Net HIV/AIDS flows as % of BoP



Source: own calculations

[17] This assumes that the ratio of current account receipts to GDP stays the same – in fact it is likely to increase, which would make impact of donor funds less in relative terms.

Monetary Impact

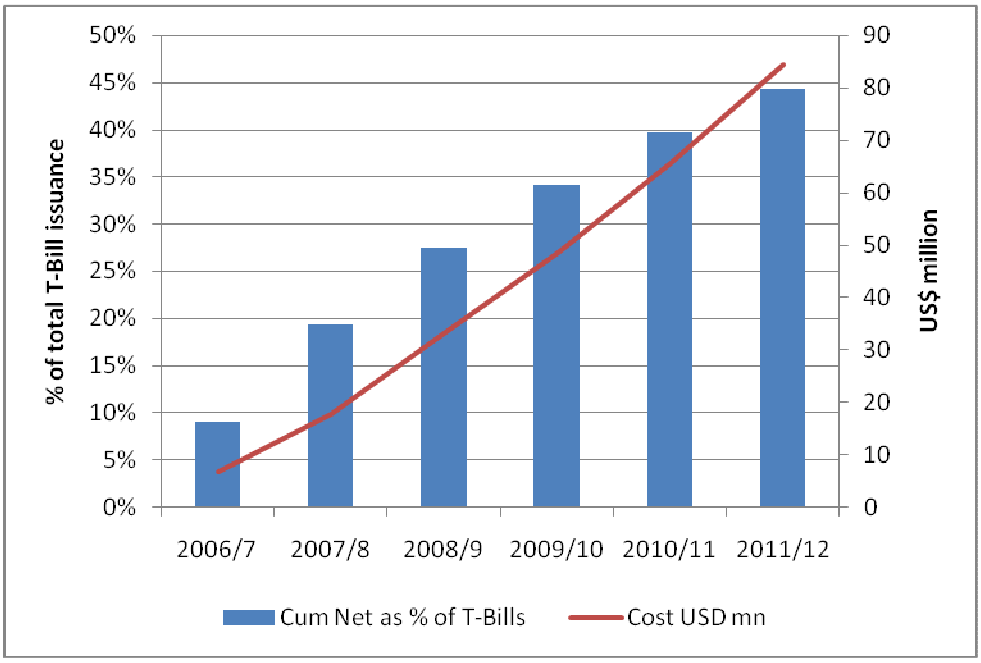
The monetary impact of donor inflows depends on the policy response adopted. Donor inflows of foreign currency may be purchased by the central bank to offset currency pressures, but in this case there will be a monetary expansion, which may in turn be offset by monetary sterilisation operations in order to prevent inflation. This will be discussed further below in the context of options regarding the absorption and spending of donor inflows. The Phase II report of this study noted that aid flows had not led to inflation, because additional inflows resulting from purchase of donor foreign exchange by the Bank of Uganda (BoU) – resulting in creation of local currency - had been sterilised by monetary operations.

Looking forward, if the entire additional net foreign exchange inflows resulting from donor funds are purchased by the BoU, this would result in money creation that would have to be sterilised and offset by the sale of an equivalent volume of BoU/GoU bills. At projected exchange rates, this would result in sterilisation rising from UGX 121bn in 2006/07 to UGX 365 bn in 2011/12. This compares with a total issuance of UGX1340bn in Treasury Bills in June 2007. However, as the sterilisation would be cumulative, the total would rise quickly. The additional issues required would represent an estimated 44% of total Treasury Bill issuance in 2011/12, compared to an estimated 9% in 2006/07 (see Figure 28).

The additional cost to government of this Treasury Bill issuance, at a 10% interest rate, would be substantial, amounting to approximately US$85mn a year. This would be larger than the cost of the Government's share of HIV/AIDS programmes. Furthermore, it is likely that the impact on interest rates would be large, leading to a crowding -out effect on private investment.

However it is important to note that sterilisation would only be necessary to the extent that the GoU/BoU decided not to absorb the additional foreign currency inflows, but to use them to add to foreign exchange reserves. This is a policy option that is discussed further below.

Figure 28: Cumulative net inflows relative to total Treasury Bill issuance



Source: own calculations

Policy Choices

Before considering the policy options relating to dealing with foreign exchange inflows, it is important to note that the macroeconomic implications depend on both the scale of inflows and also how those aid inflows are used; to the extent that inflows are used to purchase imported inputs of goods can services, the magnitude of the impact will be reduced, i.e. there will be less currency appreciation and/or crowding out of the private sector through higher real interest rates.

Absorption and Spending

The policy choices for dealing with donor foreign exchange inflows can be conveniently conceptualised in the Absorption and Spending framework[18].

Absorption is the extent to which aid flows from external donors result in additional imports and a widening of the (non-aid) current account deficit. Absorption captures both direct and indirect increases in imports financed by aid, which represent the real transfer of resources financed by aid. It reflects the aggregate impact of the macroeconomic policy response to higher aid inflows, including the impact of monetary, exchange rate and fiscal policies. To the extent that aid inflows are *not* absorbed, and do not result in additional imports, they are added to the country's foreign exchange reserves.

Spending – in the context of aid flows accruing to government - refers to the extent to which the non-aid fiscal deficit increases as a result of the aid. Aid can be used by government to increase spending or reduce taxation. Aid is fully spent if total spending increases by the same amount as the aid received; with the incremental spending financed by aid, the non-aid fiscal deficit is increased.

The macroeconomic effects of aid inflows vary depending on which combination of absorption and spending is adopted.

Table 7 lays out the four possible absorption/spending combinations (in practice of course there an infinite number of intermediate solutions possible, with different degrees of absorption and spending).

Table 7: Absorption/Spending Combinations

	Spend	Don't Spend
Absorb	Additional imports/No accumulation of reserves Additional government spending + higher fiscal deficit	Additional imports/No accumulation of reserves No net new government spending/fiscal deficit unchanged
Don't Absorb	Accumulation of reserves/No additional imports Additional government spending + higher fiscal deficit	Accumulation of reserves/No additional imports No net new government spending/fiscal deficit unchanged

Table 8 lays out the implications for economic impacts and policy responses for the various combinations[19].

[18] For further details, see IMF (2005)

[19] Much of this discussion is taken from IMF (2005).

Table 8: Absorption/Spending Combinations - Economic Impacts[20]

	Spend	Don't Spend
Absorb	Real transfer of resources from RoW Nominal (and real) exchange rate appreciation (Dutch Disease) Reduced competitiveness and exports, leading to reduced aggregate demand Additional government spending/higher fiscal deficit, leading to higher aggregate demand Output and growth may be positively or negatively affected Long-term effects may be more favourable if government spending leads to relieving capacity constraints Inflation if scale-up too rapid *Appropriate in most circumstances. However, shifts resources from private to public sector*	Real transfer of resources from RoW Nominal (and real) exchange rate appreciation (Dutch Disease) Reduced competitiveness and exports, leading to reduced aggregate demand No net new government spending/fiscal deficit unchanged Growth negatively affected *Rarely appropriate*
Don't Absorb	No transfer of resources from RoW Nominal exchange rate unchanged Money supply expansion resulting from foreign exchange purchases and fiscal deficit **Either***:* inflation, real exchange rate appreciation and reduced competitiveness **Or**: sterilisation of money supply expansion and higher interest rates, leading to crowding out and switch from private investment to government consumption/investment Additional government spending/fiscal deficit is financed domestically, not by aid *Least appropriate option. Shifts resources from private to public sector and does not allow benefits of real transfer of aid-financed resources*	No transfer of resources from RoW Nominal exchange rate unchanged Government balances at central bank increased (proceeds of aid inflows) which sterilises increased money supply from foreign exchange purchases No pressure exchange rate or prices *Appropriate in short-term if foreign exchange reserves are very low and/or aid flows are volatile. Not appropriate in long-term unless Dutch Disease concerns are very serious and fully outweigh the benefits of absorption of aid inflows*

[20] Assumes floating exchange rate.

With respect to absorption, if the additional foreign exchange inflows are absorbed, this means that there is a net transfer of resources from abroad, manifested in a widening current account deficit (excluding aid transfers). The central bank will sell the foreign exchange received to the private sector, which will use it to finance additional imports. This in turn will put downward pressure on the price of foreign exchange, hence representing an appreciation of the domestic currency, and potential competitiveness and Dutch Disease problems.

If the additional flows are not absorbed, the foreign exchange receipts are retained by the central bank and added to foreign exchange reserves. However, this leads to domestic money creation, which is potentially inflationary, which would lead to real exchange rate appreciation (but through inflation rather than appreciation of the nominal exchange rate). This monetary impact can be offset by sterilisation through sale of T-Bills by the central bank, but this has a fiscal cost, and pushes up nominal and real interest rates.

So, there will be a negative economic impact of donor foreign exchange inflows, whether exchange rate appreciation, higher inflation or real interest rates. However, the key question is to what extent this can be offset by growth-enhancing measures through expenditure on removing constraints to growth (including HIV/AIDS itself)?

With respect to spending, if the aid is absorbed but not spent, there are no growth benefits. If aid is not absorbed, but spent, this is equivalent to domestic financing of the increased spending, which is likely to be inflationary, making monetary policy response even tighter (with a higher real interest rate). If aid is not absorbed and not spent, then there is no transfer of resources to the economy and no additional spending (on consumption and investment), just an accumulation of foreign exchange reserves and government balances at the central bank. If aid is both absorbed and spent, then there is a real transfer of resources to economy, plus additional domestic demand, so aid has a real economic impact, although there are also offsetting costs (from reduced competitiveness).

The conclusions drawn by the IMF and other commentators on the basis of this analysis are that the most appropriate combination of absorption and spending depends on many factors, including the level of official reserves, the existing debt burden, the level of inflation and the degree of aid volatility. However, in normal circumstances – where there are no major problems relating to the four factors above – the most appropriate response would be to both absorb and spend the aid. Only if inflation was a major problem and reserves were precariously low, or aid likely to be very volatile, would other approaches be optimal. However, it is also important to note that when aid receipts are spent, this should be done in a way that is growth-enhancing, and addresses constraints to growth.

Modelling the Macroeconomic Impact of HIV/AIDS

The Phase I report of this study reviewed various different approaches to evaluating and modelling the macroeconomic impact of HIV and AIDS, and their application across a range of different African countries[21]. The modelling approaches used in these studies can be classified into various categories:

(i) econometric estimation, where HIV/AIDS is one of a range of factors hypothesised to determine economic growth rates, and the relative impact and significance of these different factors is estimated econometrically (statistically) in a conventional growth model;

[21] Outside of Africa, overall HIV prevalence rates are too low to have a macroeconomic impact.

(ii) aggregate macroeconomic equilibrium growth models, where a simple simulation model is constructed and calibrated to a particular economy, and the growth path of an economy is simulated under different scenarios (e.g. "with AIDS" and no-AIDS);
(iii) computable general equilibrium (CGE) models; these are like aggregate growth models in that they simulate the equilibrium behaviour of an economy under different scenarios, but are more disaggregated and can take into account labour, capital and commodity markets;
(iv) large scale macroeconomic models, where an economy is represented by a number of econometrically estimated equations that can be used to forecast economic trends, and which can incorporate HIV/AIDS-related factors (e.g. impact on productivity growth) into model-based forecasts;
(v) overlapping generations (OLG) models, which focus on the impact of HIV/AIDS on long-term human capital formation. Whereas other models have generally had a time horizon of up to one generation (15-25 years), the OLG focuses on the impact of HIV-related deaths of parents on the ability of children to participate in education and accumulate human capital.

These approaches have various advantages and disadvantages, which are also reviewed in the Phase I report. This review has several implications for the methodology to be employed in the current study to assess the macroeconomic impact of HIV/AIDS. First, the aggregate growth function approach is an accepted one in the literature, and indeed is probably the most widely used approach to modelling the macroeconomic impact of HIV and AIDS. It has relatively modest data requirements, which can be satisfied even in countries with limited data availability, and does not require any specialised software or programming skills[22].

A second implication of the review is that, if CGE modelling is feasible, it can provide a broader and richer range of outputs, in that it can more thoroughly trace the impact of HIV/AIDS and ART provision through the economy, and permit a more detailed analysis of the impact on different production, labour market and household sectors. It should be noted that the CGE approach is not fundamentally different to the growth function approach – in that a similar production function is central to the CGE model – it is just much more disaggregated in terms of economic sectors and markets, and labour and household categories. However, the data requirements of CGE modelling are much more demanding than that of an aggregated growth function approach; besides requiring a (recent) Social Accounting Matrix (SAM), it requires suitably disaggregated data on national accounts, the labour market, and the government budget, as well as information on HIV prevalence across labour market categories.

Finally, while the macro-econometric modelling approach has been used successfully in South Africa, this is dependent upon the use of an existing macro-econometric model. There is no such model currently in existence for Uganda, and the task of producing one is beyond the scope of this study. Hence this approach was not pursued in this study, but both the aggregate growth model and the CGE approaches were used. The outputs of both were used for the final economic impact projections.

The results of the various studies are summarised in Table 1 above.

Conclusion

This overview indicates that the financial flows associated with HIV/AIDS are likely to be large relative to key macroeconomic aggregates in Uganda, and that there are potential concerns

[22] The model can be built using a spreadsheet programme

regarding large donor-funded inflows. In principle, however, the absorption-spending framework suggests that the "absorb and spend" approach is preferable. However, if the likelihood is of a rapid scale up of inflows, then this may have to be countered with a partial "don't absorb and don't spend" approach.

The following two chapters show the results of the analysis of the macroeconomic impact of HIV/AIDS using the Aggregate Growth Model and CGE Modelling approaches. These provide some quantification of the macroeconomic magnitudes involved. However, it is important to realise that these cannot quantify all of the macroeconomic impacts, especially those that occur through social rather than directly economic processes (such as the impact of HIV/AIDS on the coherence and stability of households), or which impact on economic processes that are not captured in the national accounts (such as household labour). Hence these models may underestimate the overall macroeconomic impact of HIV and AIDS.

Results of Macroeconomic Modelling

The macroeconomic modelling exercises described in detail in chapters two and three of the Phase III report provide extensive analysis and projections of the likely impact of HIV/AIDS on the Ugandan economy, and of the economic impact of interventions, specifically the provision of Anti-retroviral Therapy (ART). Below we summarise of these results, and the associated policy recommendations.

The purpose of the two macroeconomic modelling exercises was to quantify some of the macroeconomic impacts described earlier, and to provide analytical support for important policy decisions. In particular, it addressed the extent to which HIV/AIDS has had and is likely to have an impact on Uganda's economic growth, and the extent to which expenditure on HIV/AIDS programmes is likely to boost growth through alleviating some of the negative impacts.

Impact of HIV/AIDS on Economic Growth

Analysis of the effect of HIV/AIDS on economic growth was addressed in two different ways: (i) through an aggregate growth model (AGM), and (ii) through a Computable General Equilibrium (CGE) model.

Results of the Aggregate Growth Model

The AGM analyses the impact of HIV/AIDS on growth, incomes and employment over the twenty years from 2005 to 2025. The economy is considered at a high level, with a division only into agricultural and non-agricultural sectors. It analyses the impact of HIV/AIDS only (through labour and capital cannels), but not at other, indirect macroeconomic impacts such as exchange rate effects.

The results of the AGM modelling exercise show that[23]:

- AIDS will have a negative impact on the rate of economic growth in Uganda; if investment is strongly negatively affected, the rate of GDP growth will fall from a projected 6.5 percent a year without AIDS to an estimated 5.3 percent under the "AIDS-without-ART" scenario, and by 2025 the economy will be 39 percent smaller than it would have been without AIDS;
- however, most of the negative economic impact of HIV/AIDS has already been incurred – of the 39 percent reduction in the size of the economy by 2025 due to HIV/AIDS, the majority of this had been incurred prior to 2005;
- the impact on the growth of average real incomes (per capita GDP) is also negative, if investment is strongly affected, averaging 1.7 percent a year under the "AIDS-without-ART"

[23] For full details see Chapter 2 of the Phase III report.

scenario, compared to 2.7 percent a year without AIDS, and would be 33 percent lower by 2025 (this contrasts with the results of some other studies, which found that GDP per capita could plausibly rise as a result of HIV/AIDS, on the basis that the reduction in GDP growth could be smaller than the reduction in population growth);

- due to the sharp drop in investment (and hence weak demand for labour), wage growth is slower;
- the economy remains more agricultural as a result of HIV/AIDS; without AIDS, the agricultural sector would have accounted for 16 percent of GDP and 59 percent of employment in 2025, whereas under the AIDS-without-ART scenario, it accounts for 22 percent of GDP and 68 percent of employment at that time; this is because the reduced investment due to HIV/AIDS and lower economic growth and demand for labour in the non-agricultural sector as a result of HIV/AIDS forces more people to remain in the agricultural sector;

It is important to note that although both GDP and average income growth rates may fall as a result of AIDS, *they both remain positive*. In other words, in the scenarios chosen here, neither GDP nor average incomes will be lower in 2025 years than they are now - they may simply be lower than they would have been without AIDS.

While HIV/AIDS has had and will continue to have a negative impact on the economy as a result of slower growth, much of this has already been incurred and it is too late to avoid it. However, the extent of provision of HIV/AIDS is a policy decision that is current, and the model also analyses the impact of ART provision on economic growth. The results show that although all of the with-AIDS scenarios are less favourable than the without-AIDS scenario, the widespread provision of ART has a number of positive economic impacts (compared to the AIDS-without-ART scenario); in particular:

- economic growth is higher (averaging 5.7% rather than 5.3%);
- real per capita GDP growth is higher (averaging 2.0% rather than 1.7%)
- economic activity and employment is shifted towards the (more productive) non-agricultural sector
- average wages in the non-agricultural sector are higher.

The negative economic effects of HIV/AIDS are therefore considerably offset by the provision of ART.

Macroeconomic Analysis: Results of Phase II

The macro-econometric study component of Phase II considered some of the broader macroeconomic impacts related to HIV/AIDS, which are not directly considered in the AGM. In particular, the study considered:

- the determinants of Uganda's exports, with a focus on the role of the real exchange rate, so as to shed light on the potential dangers of real exchange rate appreciation resulting from inflows of donor funds;
- the linkages between aid flows and inflation in Uganda, so as to shed light on whether, historically, the monetisation of aid flows has had an inflationary impact.

Real Exchange Rate and Exports: the study considered the impact of the real effective exchange rate (REER) on total exports and six major Ugandan exports (coffee, tea, cotton, fish, maize and flowers) over the period 1994-2006. The findings did not indicate a relationship between the REER and total exports. However, the study did find that the REER would affect specific exports, namely, fish, flowers and cotton, which account for nearly a quarter of total exports. Thus, for fish, flowers and cotton, the findings indicate a possible Dutch Disease effect. Since a possible Dutch effect would

reduce some exports, it could have negative implications for poverty reduction in the long run. The impact of the REER was largest for flowers, where a 1% appreciation in the REER was associated with a 2.9% decrease in exports, and for fish (2.7%); the impact of the REER on cotton exports was much smaller at 0.04%.

These results suggest that even if there is some REER appreciation (as e.g. in the "Absorb and Spend" scenario, it would not have a major impact on overall exports, although it would have an effect in certain sectors.

Aid Flows, the Exchange Rate and Inflation: the study finds that an increase in aid flows is associated a long-term increase in the money supply, as expected. However, this does not lead to any long-term increase in prices or to real exchange rate appreciation, which suggests that the Bank of Uganda's monetary policy and sterilisation strategy has been successful. In the short run, an increase in aid is associated with greater volatility in both prices and the REER, though the impact is small. This could be damaging to private sector investment. Moreover, aid dependence led to high transactions costs (interest costs) through sales of securities by the monetary authorities. This would have negative implications for medium-term fiscal sustainability and domestic debt sustainability. One of the key conclusions arising from these results is the need to ensure stability and predictability in aid flows.

Results of the CGE Model[24]

The various different channels of impact are combined in the modelling carried out using the CGE model. This combines both the growth impacts of HIV/AIDS under the "with ART" and "without ART" scenarios, as well as some of the broader macroeconomic impacts. The CGE model, for instance, captures the effects of real exchange rate appreciation (although it cannot capture the effects of monetary impacts, interest rates or inflation). It is also highly disaggregated, and enables the impact on different sectors of the economy to be traced.

The CGE model includes a number of different scenarios as shown below:

Table 9: Scenarios Modelled - CGE

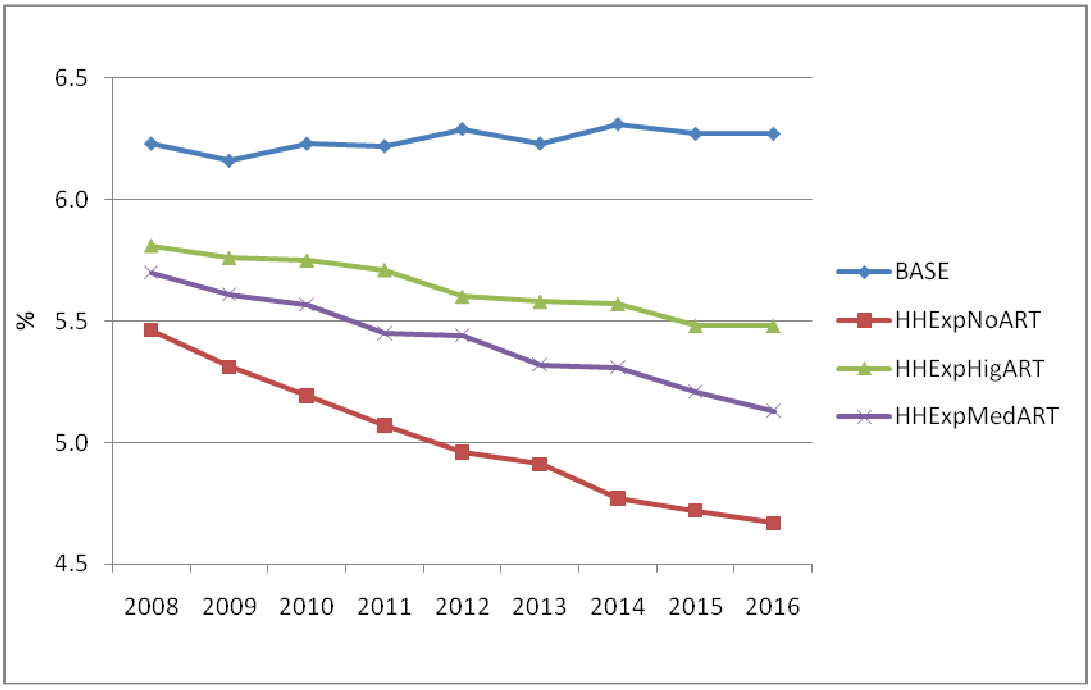
Scenario	Effects Modelled
Base case	No HIV/AIDS
ART Provision and Impact Modelling	
AIDS – No ART	Labour force effects, No ART
AIDS – ART	Labour force effects, with (high) ART
TFP AIDS – No ART	Productivity and labour force effects, No ART
TFP AIDS –ART	Productivity and labour force effects, with (high) ART
HH Exp – No ART	Household spending, productivity and labour force effects, No ART
HH Exp –med ART	Household spending, productivity and labour force effects, with (medium) ART
HH Exp –ART	Household spending, productivity and labour force effects, with (high) ART
Modelling of Financing Options	
D85G15NoART	Donor financing 85%, domestic financing 15%, No ART
D50G50NoART	Donor financing 50%, domestic financing 50%, No ART
D0G100NoART	Donor financing nil, domestic financing 100%, No ART
D85G15MedART	Donor financing 85%, domestic financing 15%, Med ART

[24] For full details, see Chapter 3 of the Phase III report.

D50G50MedART	Donor financing 50%, domestic financing 50%, Med ART
D0G100MedART	Donor financing nil, domestic financing 100%, Med ART
D85G15HighART	Donor financing 85%, domestic financing 15%, High ART
D50G50HighART	Donor financing 50%, domestic financing 50%, High ART
D0G100HighART	Donor financing nil, domestic financing 100%, High ART

The results of the CGE model are consistent with those of the aggregate growth model. The CGE results indicate that HIV/AIDS will reduce average growth from 6.2% a year to 5.0% a year over the period 2008 – 2016, a reduction of 1.2% a year (the AGM had growth falling by the same amount, from 6.5% a year to 5.3%, although over a longer period). The CGE model also simulates the impact of ART provision, which boosts growth by 0.6% (compared to 0.4% in the AGM). The CGE therefore gives a somewhat larger positive impact of ART provision (it compensates for 50% of the negative growth impact of HIV/AIDS, compared to around 30% in the AGM).

Figure 29: Real Growth of GDP – Labour Force, TFP and Household Effects



At a sectoral level, manufacturing registers the largest reduction in output. Part of the reason is that while the manufacturing sector is capital intensive, the labour input required for this sector tends to be more skilled. Loss of this labour is costly to manufacturing firms given retraining costs and advertising expenses and could lead to large output losses. Although the output losses in agriculture are lower in absolute terms, in proportionate terms they are larger as agriculture is generally slow growing. Hence the relative impact on the agricultural sector is larger.

The CGE model goes beyond the AGM by incorporating the impact of alternative financing macroeconomic mechanisms for HIV/AIDS programmes, i.e. assuming that the costs are not just met privately by households and firms. It also includes the negative growth impacts of REER appreciation as well as the positive growth impacts of ART provision. Where foreign aid is used to fund ART provision, there is REER appreciation which may negatively affect exports. Similarly, when domestic

financing is used, funded additional taxes or government borrowing, the CGE can incorporate the impact of this on the domestic economy.

The results show that financing mechanisms are crucial, and that in general foreign financing is far preferable to domestic financing. The analysis concludes that the positive effects of donor financing outweigh the negative effects. In particular, the positive aspects of the productivity effects as a result of treatment and the increased labour supply dominate the negative effects that are associated with the appreciation of the shilling due to the development assistance for AIDS programs. By contrast, the negative effects of higher taxation or borrowing are much greater than the negative effects of REER appreciation.

Growth Impacts

As Figure 30 and

Figure 31 compares average economic growth rates over 2008-2016 with the "No AIDS" (Base Case). This illustrates the beneficial impact on growth of ART provision. It also shows that donor funding of ART in both the Medium and High ART scenarios leads to improved economic growth, even if funding is only partial.

Figure 31 show, the way in which HIV/AIDS programmes are financed has a major impact on the growth impact of HIV/AIDS. Essentially, the provision of ART and the availability of donor financing provide positive support to growth, so that the highest growth scenario is that with donor-funded high-ART provision. By contrast, the lowest growth scenario is the government-funded No-ART scenario. These results show that financing options have potentially an even greater negative impact on the economy than do the other impacts of HIV/AIDS (labour supply, productivity and household expenditure).

Figure 30: Annual GDP Growth Rates - Financing Scenarios

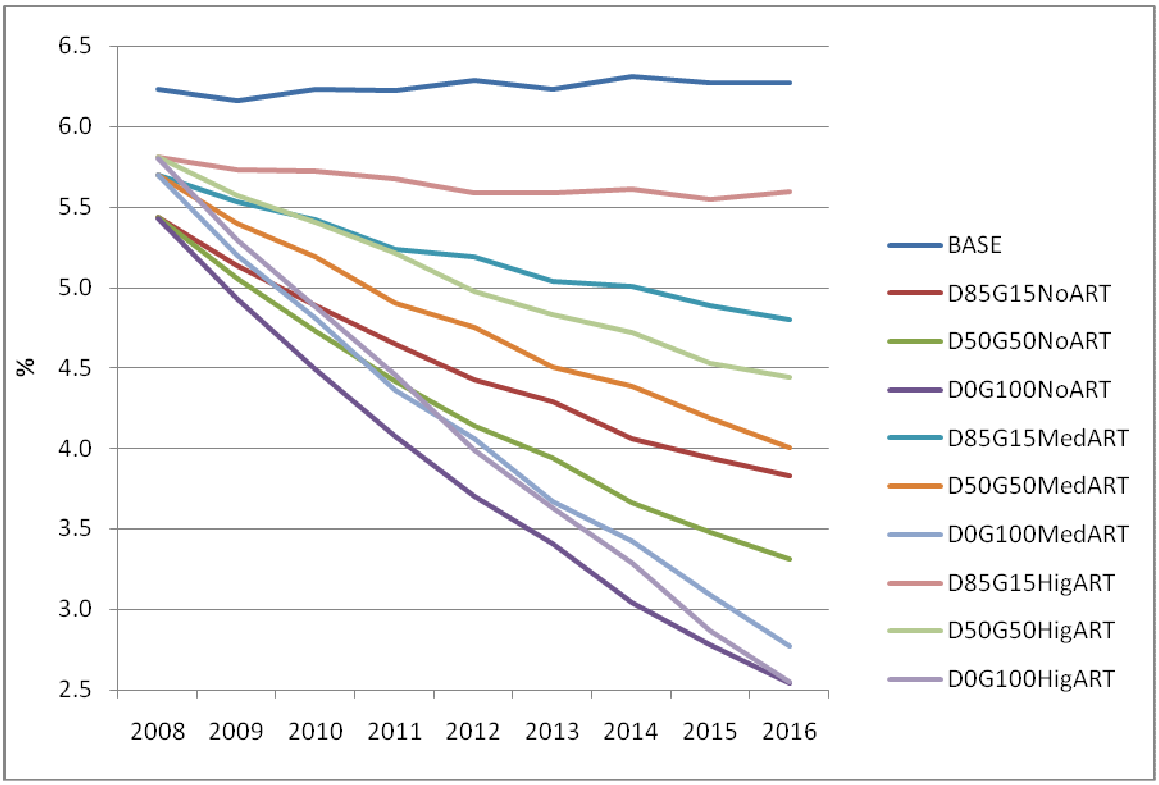
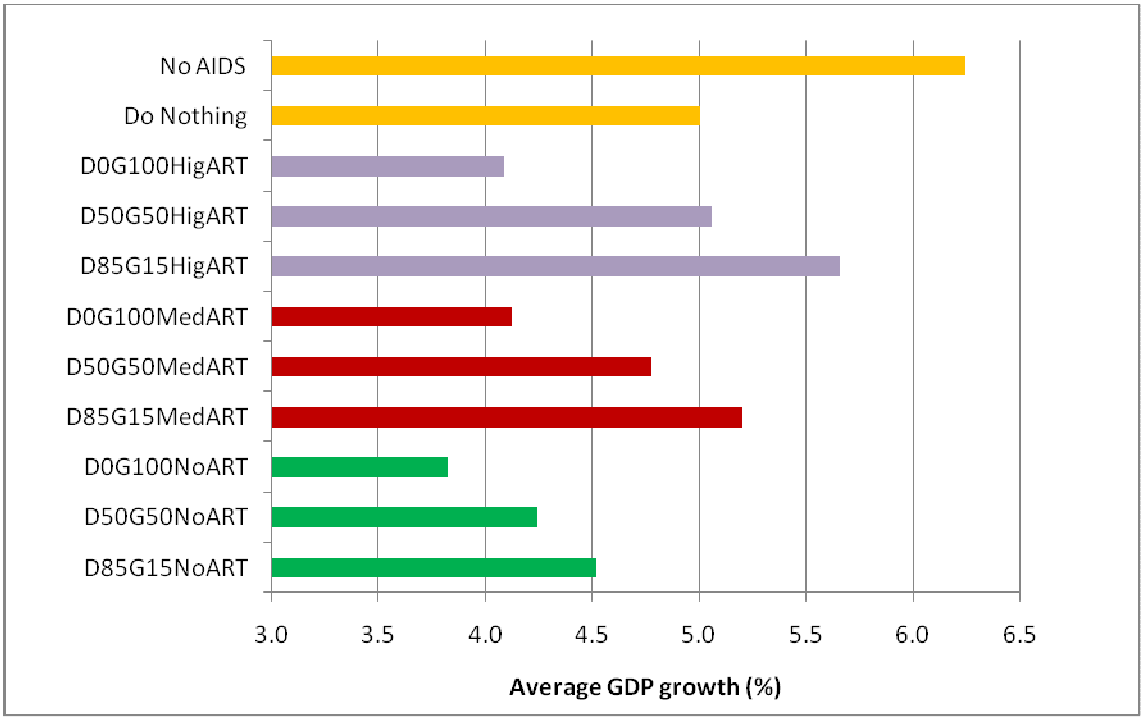


Figure 31 compares average economic growth rates over 2008-2016 with the "No AIDS" (Base Case). This illustrates the beneficial impact on growth of ART provision. It also shows that donor funding of ART in both the Medium and High ART scenarios leads to improved economic growth, even if funding is only partial.

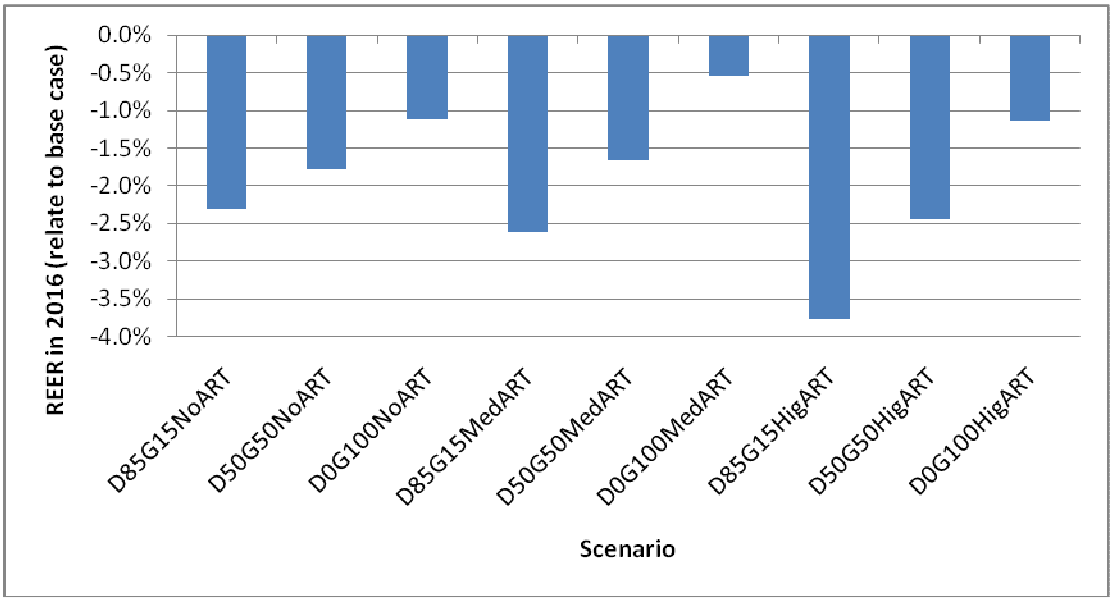
Figure 31: Average GDP Growth Rates 2008 to 2016 - Financing Scenarios



Real Exchange Rate

As noted earlier, concerns have been expressed that the inflows of donor financing of HIV/AIDS programmes would cause the real exchange rate to appreciate, thus hindering economic growth and diversification. This channel is accommodated within the CGE model. As shown in the figure below, the shilling does appreciate in value. As a result, exports grow at a slower rate than in the earlier simulations. However the extent of the appreciation varies considerably across the various scenarios. Furthermore, the overall degree of REER appreciation is small. As a result, the negative impact of REER appreciation on growth is smaller than the positive impact of ART provision and the real transfer of resources from the Rest of the World that results from donor financing. In addition, the negative impact of domestic financing is greater than the negative impact of donor financing. Therefore the arguments that increased HIV/AIDS-related inflows could hurt the economy are not supported by this simulation.

Figure 32: Real Exchange Rate in 2016 (relative to Base Scenario)



Poverty Impacts

The poverty analysis results in the CGE model are consistent with those produced in Phase II of this project. Without ART, HIV/AIDS has a negative impact on poverty, because of its effect on household spending for medical care, funerals etc., and on leading to reduced economic growth. Without ART, and without taking account macroeconomic financing implications, HIV/AIDS would lead to a poverty rate around 1% higher than the base case without HIV/AIDS (see Figure 34). However, the provision of ART offsets much of this negative impact, by leading to higher growth rates and a reduced burden on household spending, offsets this negative impact of HIV/AIDS on poverty.

However, these estimates do not take into account the impact of different financing options on poverty rates. Once financing is introduced, it can be seen that this can have an even greater impact on poverty rates than the provision (or not) of ART. Consistent with the earlier analysis, relying on domestic financing will reduce economic growth such that poverty rates will be higher, even in the high-ART scenario. Much lower poverty rates are projected where there is a high proportion of donor financing, because the adverse effects of domestic financing through higher taxes or crowding out of private sector borrowing are much reduced.

It should be noted that the main driver of poverty reduction is the real economic growth occurs over the simulation period, rather the impact of HIV/AIDS and ART provision.

Figure 33: Poverty Rates - all scenarios

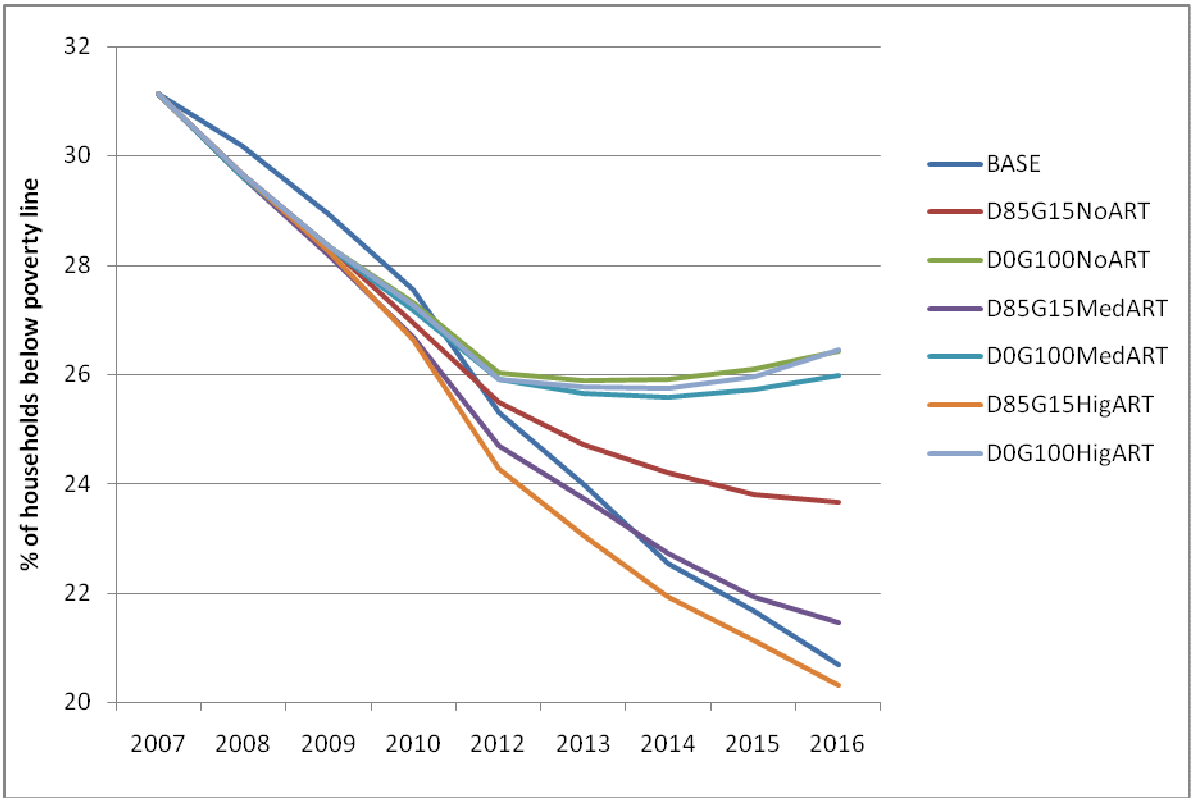
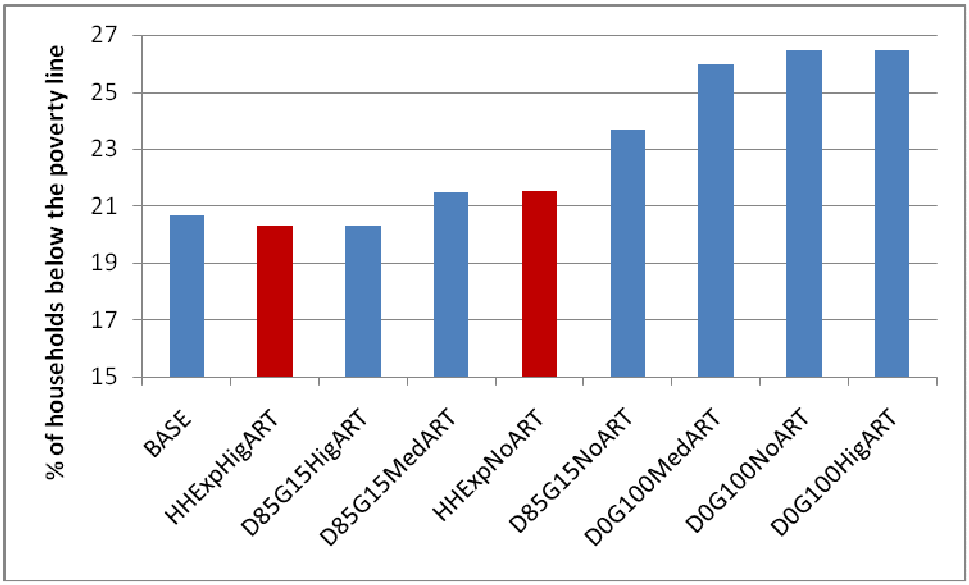


Figure 34: Poverty Rates in 2016



While the CGE results from different scenarios are not directly applicable to the absorb-spend scenarios outlined earlier (in that CGE modelling cannot incorporate monetary and inflation effects), they can be broadly approximated, as follows.

- Absorb & spend – accept foreign assistance and spend on ART and other HIV/AIDS programmes

- Absorb & don't spend – accept foreign assistance but don't spend on ART
- Don't absorb, but spend – use domestic funds to finance ART provision, take foreign exchange inflows (ODA) into reserves
- Don't absorb & don't spend - take foreign exchange inflows into reserves, don't provide ART

The CGE simulations provide estimated growth rates under each of these scenarios (see Table 10). Under the spend scenarios, both medium and high ART provision are reported. There is considerable variation in growth, and the relative impact of the different scenarios is instructive. Clearly, the donor-funded High-ART scenario has the highest growth rate, whereas the domestically-funded No-ART scenario has the worst.

Table 10: Growth rates in Absorb/Spend scenarios (average, 2008-2016)

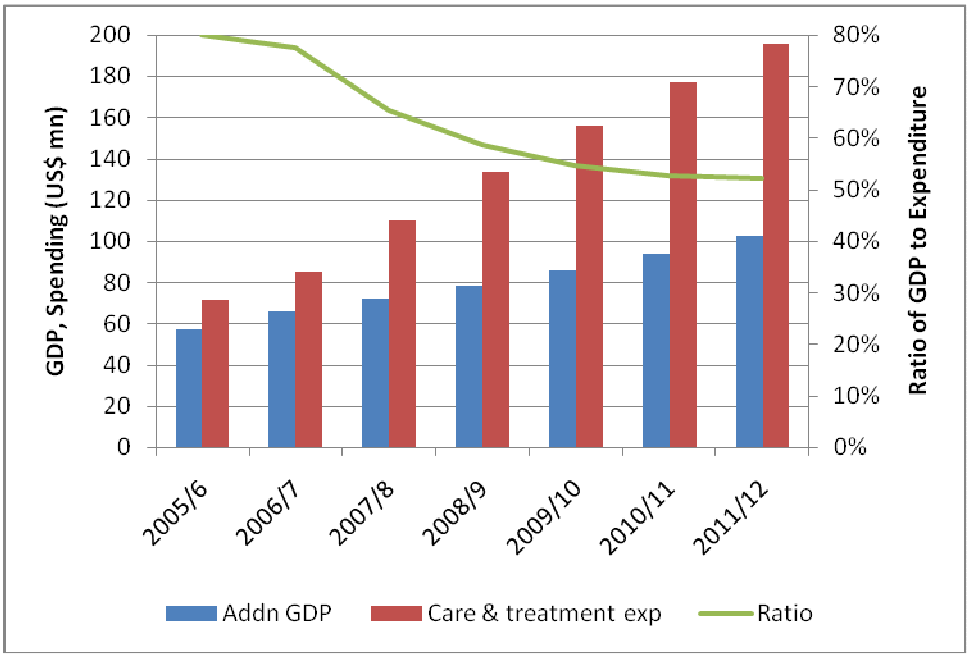
	Spend		Don't spend
Absorb	D85G15-HighART 5.7%	D85G15-Med ART 5.2%	D85G15-No ART 4.5%
Don't absorb	D0G100-HIghART 4.1%	D0G100-Med ART 4.1%	D0G100-No ART 3.8%

Source: own calculations

Economic Returns to Investment in ART

The economic modelling projections show that the provision of ART has a beneficial effect on the economy. However, they do not directly answer the question of whether expenditure on ART represents a good economic investment. As the modelling results show, the provision of ART should add around 0.6% a year to GDP growth; with total GDP of approximately $11 billion in 2006/07, this represents an additional $66 million of GDP, rising to an estimated $102 million in 2011/12. However, the expenditure required to achieve this extra GDP would be in excess of this amount; taking the "care and treatment" component of the NSP budget only (which relates mainly to ART provision), this amounted to $85 million in 2006/07, rising to $196 million in 2011/12. The analysis in this study suggests that the additional GDP generated by ART provision is only equivalent to around 50 percent of the cost of that provision (see Figure 35). However, the fact that the cost of ART is largely donor funded means that there is still a net economic benefit for Uganda.

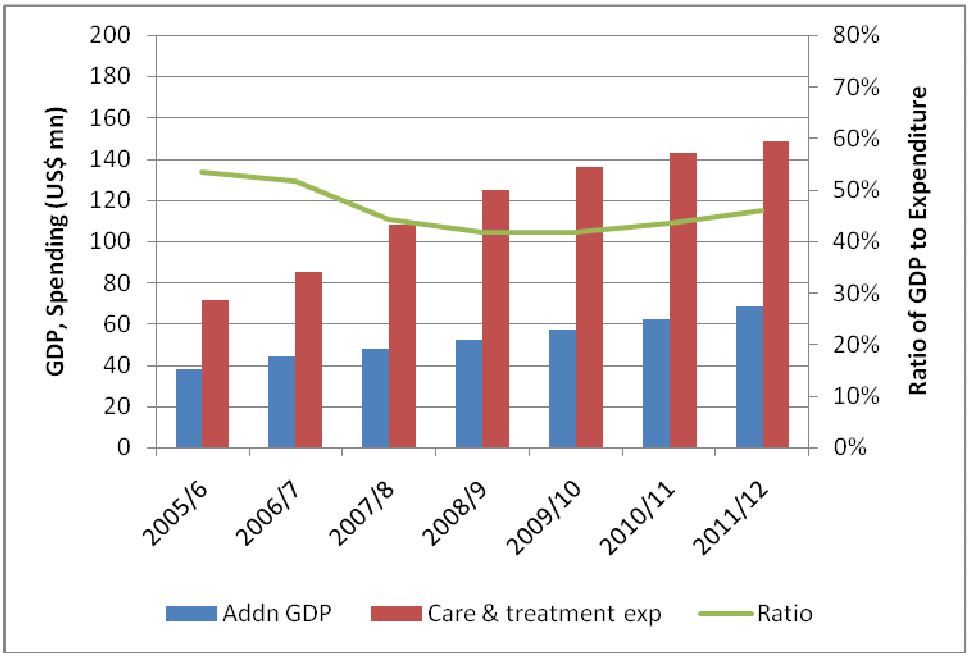
Figure 35: Spending on ART and additional GDP – High ART



Source: own calculations

Figure 36 shows a similar comparison for a lower level of ART provision (the medium ART scenario), which would add an estimated 0.4% to GDP growth, and involve a lower level of spending. The broad conclusion – that the additional GDP created would be significantly less than the expenditure required – remains unchanged. The results (in value terms) are presented in Table 11 below.

Figure 36: Spending on ART and additional GDP – Medium ART



Source: own calculations

Table 11: ART Spending and Additional GDP (Annual Average, 2007/08 – 2011/12)

Scenario	Spending ($m)	Addn. GDP ($m)	Ratio (GDP/Exp.)
High ART	155	86	56%
Medium ART	132	58	44%

Source: own calculations

Expenditure Choices: Treatment vs Prevention

The relatively poor economic return to spending on ART raises the question as to whether other forms of spending on HIV/AIDS programmes, such as prevention, might be more efficient in economic terms[25]. At a broad level, it is difficult to make comparisons between the efficiency of spending on prevention and treatment – treatment may still be justified once people are infected, even if it would have been better to prevent them from becoming infected in the first place. However, some comments on the relative prioritisation of limited resources for HIV/AIDS programmes may be justified.

This study has not made any estimates of the cost-effectiveness of prevention programmes. However, some information is provided in Stover, Mukobe and Muwonge (2007). This paper[26] notes that:

- The WHO considers health interventions to be very cost-effective if the cost per disability-adjusted life year (DALY) is less than Gross National Income per capita, and cost-effective if less than three times GNI per capita;
- Prevention spending in Uganda costs around $1275-$1500 per infection averted, resulting in a cost of approximately $50 per DALY gained;
- The total discounted cost (NPV) to treat a new infection is about $5900. Therefore, expenditure on prevention is extremely cost-effective.
- Treatment costs for ART drugs alone amount to amount to $1031 per patient per year for first-line therapy (anticipated to decline to $500) and $1897 for second-line therapy (anticipated to decline to $600).

From these and other data it can be concluded that:

- Prevention expenditure is very cost effective (comparing a cost of $50 per DALY with GDP per capita of around $400)
- Treatment is probably not cost-effective (using the 3xGNI per capita benchmark) at current cost levels, especially once additional (non-drug) costs are taken into account, but could become cost effective once anticipated cost reductions are achieved
- To the extent that a a choice had to be made between expenditure on prevention and on treatment, prevention is far more cost-effective.

However, the choice between “prevention” and “treatment” is becoming somewhat blurred. Given the failures of efforts to date to find an effective vaccine for HIV, attention is turning to the preventative benefits of widespread ART treatment. This is because ART reduces viral loads in HIV-

[25] Prevention programmes are wide-ranging, and include condom distribution, male circumcision, prevention of mother to child transmission (PMTCT) as well as information, education and communication.

[26] Supplemented by communications with John Stover

positive individuals, and hence makes them less likely to transmit the virus. In the long-term, it may be that having a large proportion of HIV+ people on ART may be an effective means of preventing transmission, and thus play a crucial role in containing the epidemic. Evaluation of the effectiveness of ART treatment as a form of prevention is at an early stage, and has not been quantitatively established. But if it does turn out to be effective, then the benefits of ART treatment will be greater than the narrow economic effects considered in this study.

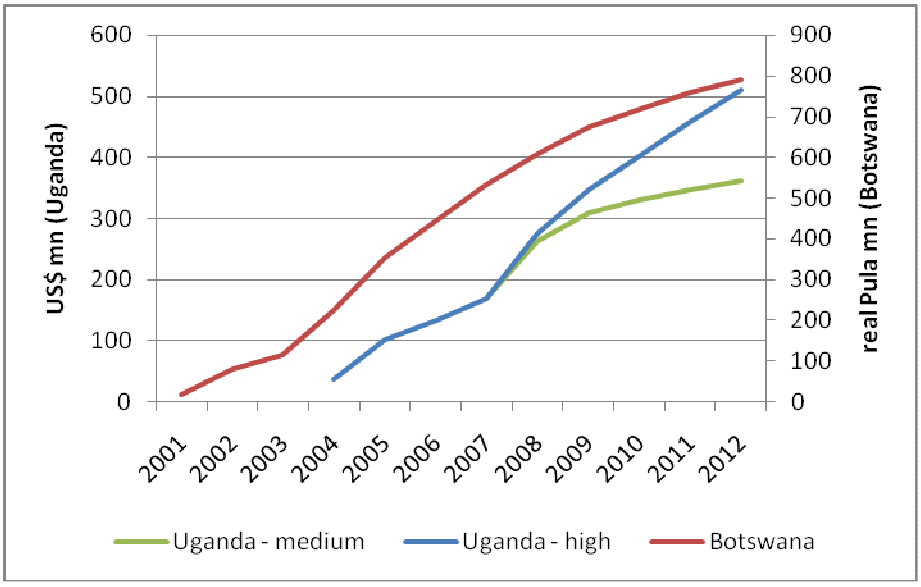
Scaling-up Issues

One important issue that it is not possible to address through the modelling process is that of how fast HIV/AIDS programmes can be scaled up. This is because the models used in Chapters 2 and 3 compare the economy at different points in time, but cannot address the dynamics of moving between those two points. The macroeconomic analysis does not deal with the optimal speed of scale-up in ART provision; it simply deals with the economic impacts once large-scale ART rollout is achieved. Nevertheless, there will be challenges relating to the speed of scale-up; the faster programmes are scaled-up, the more likely it is that the economy will face absorptive capacity constraints which will lead to inflation, reduce the effectiveness of expenditure, and reduce value-for-money in donor-financed spending. The speed of scale-up is important, because bottlenecks may arise that limit the ability to roll out new or expanded programmes quickly. This is a particularly important issue in Uganda. As discussed earlier, the country already spends a high proportion of GDP on HIV / AIDS programme, relative to HIV prevalence levels, and considerable further scale-up is envisaged.

In order to prevent such bottlenecks from reducing aid effectiveness, it will be necessary to assess resource needs and plan effectively for their provision (see ODI (2005) for how this was done in Botswana). In other words ART rollout is not just about ensuring sufficient funding, it is equally about ensuring that sufficient human resources (doctors, nurses, pharmacists, counsellors), physical resources (health and related facilities) and health information systems (for tracking and monitoring diagnoses, prescriptions, treatment adherence, drug resistance etc.) are in place. This in turn depends on a variety of factors, including the quality of health sector management, low level of corruption etc.

Botswana's experience does show that rapid scale up of HIV/AIDS programmes is feasible. As Figure 37 shows, Botswana increased real spending on HIV/AIDS programmes between 2003 and 2007. Uganda's "High Funding" scenario in the NSP envisages a similar speed of scale-up. However, it is questionable as to whether such a rapid scale-up is feasible. Uganda fares much worse than Botswana on international assessments of public sector capacity, governance, competitiveness and corruption. This suggests that bottlenecks would be encountered at an earlier stage of rollout of HIV/AIDS programmes, and that a more modest rate of scale-up, such as that in the alternative "medium funding" NSP scenario might be more cost-effective and less wasteful. Furthermore, it will be important to ensure that resources are devoted to growth-enhancing projects and interventions (which includes the provision of ART) and that the focus should be on removing implementation bottlenecks.

Figure 37: Projected Scale-up of HIV/AIDS spending in Uganda and Botswana



Source: Jefferis et al, 2007; UAC, 2008; Stover et al, 2007

A related issue concerns the sustainability of donor funding for a scaled-up HIV/AIDS programmes. Even though there are economic benefits for a scaled-up HIV/AIDS programme, this does not deal with long-term sustainability issues. The treatment of HIV/AIDS requires a long-term commitment of resources, which would pose an unsustainable burden on the Uganda economy for the foreseeable future. Hence credible long-term donor funding commitments are necessary for the programme to be sustainable.

In this context, a policy that incorporates a combined "Absorb and Spend" and "Don't Absorb and Don't Spend" response may be the most rational. First, it mitigates some of the negative impacts that may result from a too-rapid scale up of spending, or from volatility in flows of donor funding. It therefore supports a slower scale-up, which may be more effective in the long run. Second, it enables the accumulation of resources (in the form of foreign exchange reserves and government financial balances) that can be used to finance future resource needs when donor inflows decline (whether temporarily or permanently). Third, a partial "Don't Absorb and Don't Spend" approach minimises the monetary sterilisation costs that would arise from an "Absorb but Don't Spend" approach.

Ideally donor funds should be used to create a capital (financial) asset that could be used to draw a permanent (annuity) income for financing HIV/AIDS programmes, rather than being used to finance immediate spending. This would contribute to the long-term sustainability of HIV/AIDS programmes. Governance issues for such a fund would be important, although there are various ways in which it could be managed to ensure that income is only drawn down at a sustainable rate and for the purposes intended.

Conclusions

The macroeconomic analysis in Phase III has concluded that HIV/AIDS has had a considerable negative macroeconomic impact on Uganda, and will continue to do so for the foreseeable future. The main conclusions and policy implications are that:

- In terms of economic growth and incomes, this negative impact can be partially – but not completely – offset through the provision of appropriate treatment (ART);
- While there are high levels of expenditure associated with the provision of ART, these are likely to be largely funded by external donors;
- The bulk of the donor funds received –an estimated 60% - would quickly flow out of Uganda, thereby partially mitigating any potential adverse effects;
- On balance, the potential negative impacts from a scaled up treatment programme stemming from real exchange rate appreciation are more than offset by the potential positive impacts on productivity and economic growth;
- The economic benefits of ART provision are largely dependent on the programme being donor funded, and if not donor-funded the programme offers questionable economic returns and may not be sustainable in the long term at current costs. The need to fund ART provision from domestic resources would most likely have major negative effects on the domestic economy.
- Given that the overall economic returns to investing in ART are limited (in terms of additional GDP relative to costs), ART provision is justified in human and social terms, rather than only in economic terms;
- Amongst the social justifications for ART include the positive impact that ART provision will have on poverty (and the fact that ART goes some way towards mitigating the negative impact of AIDS on poverty);
- In economic terms, investment in prevention programmes probably yields greater long-term benefits. However, it is increasingly acknowledged that ART provision may play an important role in preventing the spread of HIV as well as treating it, and if this effect can be established, it would provide further justification for the provision of ART.
- ART provision requires a long-term commitment of resources that donors may be unable or unwilling to provide. One way of ensuring greater predictability and sustainability of ODA flows for HIV/AIDS programmes would be for donors to finance a capital fund, which could be drawn down on an annuity basis (primarily financed by income earned on the fund).
- The “high funding“ scenario in the NSP entails a very rapid scale-up of ART provision that may not be optimal due to bottlenecks that are likely to be encountered in health infrastructure, governance, personnel and organisational requirements, which could undermine the effectiveness of the programme. The “medium funding” scenario may be more realistic in terms of long-term availability of donor funds as well as feasibility of scale-up.

It should be noted, however, that HIV/AIDS is only one among a range of factors that can affect long-term economic growth rates, real income and poverty levels. These include macroeconomic stability, structural reforms, and growth in regional and international economies, all of which can have a larger impact than HIV/AIDS. Indeed, it is important to make progress in areas where domestic policies can have an impact so that the negative impact of HIV/AIDS can be ameliorated.

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