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Uganda's AIDS Crisis

Its Implications for Development

Jill Armstrong

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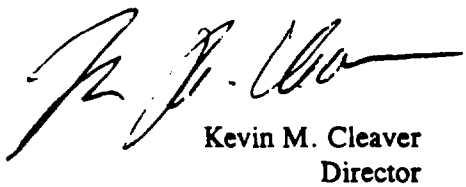
FOREWORD

In 1988 the Africa Region of the World Bank adopted an agenda for action on the Acquired Immunodeficiency Syndrome (AIDS) epidemic in Africa. By 1990 it was increasingly apparent in countries hardest hit by AIDS the epidemic was not solely a health sector issue. Consequently, this study was undertaken to begin to explore the economic and social channels through which AIDS would likely have an impact on Uganda's development prospects. The report was updated and revised in 1993 to incorporate the 1991 Population Census results.

This study postulates that AIDS will have far-reaching impact on the social and economic fabric of Ugandan society and poses a serious threat to Uganda's development agenda. Because of this, the study recommends that key policymakers outside ministries of health—such as finance and planning—must factor in the consequences of AIDS when considering development strategies. The study also draws attention to the increasingly evident trend that HIV is spreading rapidly into rural areas, which has implications for agricultural sector strategy.

Developments since this study was completed reflect the thrust of its recommendations. In Uganda, a Ugandan AIDS Commission was set up in 1991 to facilitate and coordinate AIDS activities from a multisectoral perspective. Operationally, an IDA credit for US$50 million was approved in April 1994 to support a project that focuses on preventing transmission of HIV and other sexually transmitted diseases, mitigating the personal and social costs of AIDS and supporting institutional development to manage HIV prevention and AIDS care. Finally, this and other studies led in 1992 to a revised agenda for the Africa Region to address the AIDS epidemic. The revised agenda called for World Bank assistance to countries in preparing additional country-specific multisectoral AIDS strategies to prevent further HIV infection and to mitigate the social and economic consequences. It also highlighted the significance of HIV as a sexually transmitted disease.

This paper recommends that much more study on the nature and magnitude of the epidemic is needed in order to better anticipate its consequences. More information about the complex interrelationship between AIDS and economic activity is also needed to better understand the epidemic's impact and to better inform policy decisions. Addressing such research needs is the focus of recently initiated studies sponsored by the Africa Region of the World Bank and governments in over 15 Sub-Saharan countries.



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ABSTRACT

Uganda was one of the first African countries to confront the seriousness of the HIV/AIDS epidemic. AIDS is not solely a health problem, nor can it be dealt with as such. This paper traces the social and economic channels through which the AIDS epidemic is likely to make its impact on Uganda's development prospects. In particular, it examines the impact on health expenditures, given projections of essential drugs that would be needed to treat persons with AIDS. It also looks at the impact of the epidemic on agricultural production from both a household and farming system perspective. Finally, the study explores the ramifications on the labor force. Recommendations and areas for further research conclude the study.

ACKNOWLEDGEMENTS

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GLOSSARY OF TERMS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome, characterized by unusual opportunistic infections in otherwise healthy individuals resulting from a compromised immune system.
ACP	AIDS Control Programme, Ministry of Health.
Asymptomatic	Phase during which an individual is infected with the virus, which eventually causes AIDS, but has not yet shown major symptoms of AIDS.
CBR	Crude Birth Rate, the number of births per 1,000 population in one year.
CDR	Crude Death Rate, the number of deaths per 1,000 population in one year.
CMR	Child Mortality Rate, the probability of dying between ages one and five aged under 15 and over 64 ("dependent population") divided by the population aged 15 to 64 ("productive population").
GIS	Geographic Information System.
GPA	WHO's Global Programme on AIDS.
HIV	Human Immunodeficiency Virus, a retrovirus that damages the human immune system, which then permits opportunistic infections to cause eventually fatal diseases. The causal agent for AIDS.
IMR	Infant Mortality Rate, the number of deaths to infants (children under age one) in a given year per 1,000 live births in the same year.
Incidence	An epidemiological term that refers to the number of new cases of a disease occurring in a population during a given period of time, usually a year.
Life Expectancy	The number of years from birth that an individual on average can expect to live.
MOH	Ministry of Health.
Opportunistic Infections	The many parasitic, bacterial, viral, and fungal infections that are able to cause disease once the immune system has been damaged. These are the most common clinical manifestations that establish the diagnosis of AIDS. They are characterized by an aggressive clinical course, resist therapy and have a high rate of relapse.

Orphan	In Uganda an orphan is defined as any child under the age of 18 who has lost one or both parents.
Prevalence	An epidemiological term that refers to the number of persons with a given condition at a point in time.
Prevalence Rate	Proportion of a specified population that exhibits a disease at a specific point in time (often expressed per 1,000).
Serological	Of or pertaining to blood. In the context of HIV/AIDS, blood tests are performed to determine whether an individual is carrying either the virus or has antibodies to the virus.
STDs	Sexually Transmitted Diseases.
TB	Tuberculosis.
TFR	Total Fertility Rate, defined as the average number of children that would be born alive to a woman during her lifetime given current age-specific fertility rates.
UAC	The Ugandan AIDS Commission, established in 1992 as the multisectoral agency responsible for policy and coordination of the multisectoral AIDS program.
WHO	World Health Organization.

EXECUTIVE SUMMARY

UGANDA: The Economic Impact of AIDS

The AIDS epidemic has dominated the attention of the international medical community for just over a decade. The disease spread quickly, beginning in Eastern Africa. In 1993, an estimated 15 percent of Uganda's adult population —1.3 million of almost seventeen million people—is infected with the human immunodeficiency virus (HIV), the causative agent for AIDS. To many, AIDS is a problem that affects an individual's health status and poses additional strains on national health care systems. But as Uganda and other countries have realized all too quickly, AIDS is not solely a health issue and cannot be dealt with as such. Rather, the epidemic will have far-reaching impacts on the economic and social fabric of Ugandan society. This study begins to explore the channels through which AIDS will not only affect the health and longevity of the population but might affect key sectors of the economy, growth prospects, and the attainment of national development objectives.

The effects of AIDS in Uganda will be felt on many fronts—human, economic, and social. First and foremost, *human resource development* is already being threatened. As the virus affects the health status of adults and children, important gains in quality of life indices (such as life expectancy and infant mortality) are being reversed. The gains of the child survival revolution have already been reversed. Scarce resources available in the health sector are diverted from preventable and curable ailments to treat AIDS patients. Implications for massive resurgence of tuberculosis will threaten further the health status of Ugandans. Investments in education and the accumulation of precious human capital are also compromised. Not only is the current stock of the educated elite being reduced, but the future quality and quantity are likely to be reduced, both because teachers are among the age groups most highly infected and because affected families will have reduced financial resources to pay for school fees. The AIDS epidemic will have *adverse economic implications* for Uganda, not merely because of its magnitude, but more important because, unlike other illnesses, it selectively affects adults in their most sexually active ages, which coincide with their prime productive years. The main channel through which the epidemic will affect the Ugandan economy is the size and quality of the labor force. Because AIDS has a long latent period (up to ten years), the serious longer-term macroeconomic implications will be gradually revealed. Finally, although many of the *social consequences* cannot be measured, large-scale disruption of family and social structures, stigmatization, mourning, and grieving also constitute significant social costs. One of the most visible and immediate impacts of AIDS is the rapidly growing number of orphans, in 1993 estimated at three-quarters of a million children.

Concerning the magnitude of the epidemic and its demographic impact, the study found that:

- HIV prevalence in Uganda increased from about 9 percent of adults in the late 1980s to about 15 percent by 1993 or 1.3 million adults. By the year 2020, the number of infected adults could range anywhere between 200,000 and 2.8 million depending on the effectiveness of prevention campaigns.

- Although infection rates in rural areas are less than in urban areas, because 90 percent of Ugandans still live in rural areas, the absolute number of people infected there is very high.

- The incidence of new infections between 1989 and 1990 was found in one predominantly rural district (Rakai) to be over 3 percent per year, even in the more remote agricultural villages.

- As of December 1992, about 38,500 cumulative AIDS cases had been reported officially. as in most countries, however, this figure is grossly underreported; a more accurate estimate is approximately 163,000 *cumulative* AIDS cases as of 1993. By 1995 earlier infections will have generated nearly 200,000 *annual* AIDS cases—more than double the number in 1990.

- In 1995 an estimated 110,000 adults and children will die from AIDS. The annual number of AIDS deaths will only peak in 2003. Cumulatively, even under the most optimistic scenario that a vaccine is developed, more than 2 million adults would die of AIDS by 2020; without effective interventions, that figure is nearly double.

- Age distribution of adult AIDS cases shows a high frequency and bunching in the sexually most active years of 15–49, with an overall mean age of 30 for adults with AIDS. On average, men with AIDS are older than women, 32 years compared to 28 years old, implying that women are infected earlier.

- Not only are women infected earlier (during peak childbearing years), but HIV prevalence levels are higher among women than men. Women are 1.3 times as likely to be infected as men. In 1993 an estimated 15.8 percent of women were infected compared with 13.7 for men. If present infection rates continue, it is projected that, by 2020, 20.6 percent of women will carry the virus after peaking at nearly 23 percent in 2010. The percentage of men infected rises from 13.7 percent in 1993 to 16.5 percent by 2020.

- The fact that more women are infected earlier presents grave implications for perinatal transmission and increased challenges to improving maternal and child health status.

- Under an optimistic scenario, Uganda's population would be nearly 15 percent less by 2020. The effect of AIDS mortality will also reduce population growth by 0.5 to 1.1 percentage points annually through 2020. Nevertheless, population growth will remain high (by more than 2 percent even under the most pessimistic scenario) and, even with AIDS, Uganda's population size will double between 1993 and 2020.

- The AIDS epidemic has caused a deterioration in many recent gains in standard quality-of-life indices. In the absence of AIDS, the crude death rate (CDR) is projected to decline almost linearly to 11 per thousand by 2020. With AIDS, the CDR rises above late 1980s levels and, only under an optimistic scenario, will it drop back to the late 1980s "no AIDS" level after the year 2010. Without AIDS, mortality in children under five would have dropped from 182 per thousand in 1990 to about 117 per thousand by 2020. With AIDS, child mortality rates can be expected to be between 150 to 170 percent higher through 2020.

- If no AIDS were present, life expectancy at birth would have been projected to increase from about 49 years (male and female combined) in 1993 to about 55.5 years in twenty years. Instead, AIDS mortality has already brought an eight-year decline in life expectancy at birth.

- Although AIDS mortality is often expected to change significantly the dependency ratio, in fact, it is affected only slightly because of the offsetting effects of pediatric and adult AIDS deaths.

In terms of impact on the health sector, the study finds the following:

- The emergence of AIDS has significantly altered the disease pattern in Uganda. Hospital records in 1990 indicated that AIDS was the second leading cause of inpatient deaths after malaria; two years earlier, AIDS ranked only sixth.

- In major urban hospitals, approximately 70 percent of patients in medical wards and an even higher percentage in tuberculosis wards are HIV-positive.

- The impact of HIV/AIDS on the health sector will be reflected by a significant increase in the demand for health care and further stretch already constrained inputs such as hospital beds, laboratory services, drugs, and skilled personnel.

- The epidemic will also require increased health care expenditures, including for essential drugs needed to treat the large number of illnesses that an AIDS patient is likely to encounter.

- On average, the lifetime cost of drugs required per adult AIDS case was estimated at $13.80[1] (in 1990 prices) compared to about $3.00 per capita, which the public sector actually spent for all health care (including drugs) in the same year.

- Given limited government and household budgets, the cost of essential drugs required for treating the opportunistic infections of terminal AIDS patients is compared with the cost of treating other curable illnesses. A treatment course for malaria—the leading cause of death in major hospitals—using chloroquine would cost on average less than 20 cents; the cost of vaccines to immunize a child fully against the main childhood diseases would cost just under $2. Assuming that only 35 percent of AIDS patients ever seek treatment, the value of those drugs used by them could have bought vaccines to immunize one-third of infants or 2.5 million cases of malaria.

- In aggregate terms, it was estimated that in 1991 an incremental $1.4 million would have been spent if all AIDS patients sought medical care and the drug was 100 percent available. This would be equivalent to 15 percent of Uganda's public sector expenditures for all drugs. By 1995, the cost of treating all AIDS patients could escalate to almost $2.3 million (in 1990 prices), consuming as much as 23 percent of a constant public sector drug budget.

The study's preliminary findings indicate that the AIDS epidemic will have adverse implications for the Ugandan economy. More specifically:

- The impact of AIDS on the economy will be felt through its effect on two key inputs into economic activity—labor and capital. The most immediate impact will be through changes in both the productivity and size of the labor force.

- AIDS is significantly different from other fatal illnesses because it selectively affects adults in their most sexually active ages, which coincide with their prime productive years.

- By causing premature mortality to a significant number of workers between the ages of 15 and 60, AIDS will reduce both the size and growth of the labor force. By the year 2010, there will be about 2 million fewer in the labor force age group or approximately 12 percent less than without AIDS.

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[1] Unless otherwise indicated, dollar amounts in this document are given in U.S. currency.

- AIDS will also affect the productivity of the labor force as debilitating and reoccurring episodes of various HIV-related illnesses impair productivity through reduced functional capacity. In the household, other family members (including children) will reallocate some of their time to care for the patient, potentially reducing overall household allocation for productive activities in the home, school, field, or market. In the workplace, other workers may be required to assume responsibilities of ill coworkers. In addition to morbidity, the premature death of persons with AIDS affects productivity by robbing the economy of experienced workers, many of whom are difficult and expensive to replace. The loss of women—who are key to production in both the home (food preparation and child raising) and in agriculture—will be particularly devastating because they are infected at critical ages, that is, when their children are young.

- Three key features of the Ugandan economy and labor market make Uganda particularly vulnerable to the potential effects of the epidemic. First, the bulk of economic activity and production takes place in rural areas. Second, agricultural production is labor-intensive. Third, despite rapid population growth, labor is a relatively scarce factor of production. The increasing spread of HIV infection in rural areas combined with the intensity and relative scarcity of labor in agricultural production suggests that the AIDS epidemic is likely to have a negative impact on both overall production and per capita income.

- In addition, AIDS will have longer-term negative consequences for capital formation, which in turn influences the overall productivity of the labor force and ultimately economic growth. Society's ability to invest in the human capital of their children today and firms' ability to invest in physical capital will both be reduced as expenditures are diverted to meet increased health care and other expenditures related to AIDS.

Turning to specific sectors of the Ugandan economy, the study found that:

- *In agriculture,* the bulk of production is concentrated almost exclusively on smallholder farms and tends to be very labor-intensive. At the farm level, AIDS will affect two key farm production parameters. First, household labor quality and quantity will be reduced, with a high probability that more than one adult per family is infected. Second, AIDS will reduce the availability of disposable cash income used to purchase agricultural inputs, such as occasional extra labor or other complementary inputs (for example, new seeds or plants, fertilizer, pesticides, or oxen power). Family assets might also be depleted.

- The response of a smallholder household faced with these changes will be to first produce enough to cover household subsistence and only then to grow small and varying amounts of marketable surplus. The composition of crops may be gradually altered, shifting back toward subsistence crops, the area under cultivation reduced, and husbandry levels (for example, weeding and pruning) curtailed.

- At the farming system level, the impact of AIDS will be felt more where labor is a already a relatively scarce factor of production and where the duration of the rainy season limits flexibility in phasing peak cropping seasons to minimize the bunching of labor demand. Some areas where HIV prevalence is particularly high and where labor is relatively scarce coincide with farming systems where traditional labor-intensive exports crops (such as coffee and cotton) are presently grown.

- Labor costs can be expected to increase, reflected in both market wage rates and the shadow wage rate implicit in family farm operations. This, in turn, could lead to a reversal in migration from urban areas or increased migration from other regions with surplus labor.

- At an aggregate level, the composition of agricultural output is likely to change reflecting farm households' response to labor shortages by altering cropping patterns, most likely in favor of less labor-intensive staple crops. This could undermine the government's strategy for fostering agricultural growth by shifting away from food production for domestic markets toward production of raw materials for processing and/or direct export and for increasing production of traditional export crops.

- AIDS will also restrict the capacity of smallholder farmers to respond to producer incentives in the agricultural sector. The ability to take advantage of the recommendations of agricultural extension services may also be impaired, as AIDS families will have less cash available for the purchase of improved seeds and/or fertilizer. At one extreme, some AIDS-fragmented families may virtually withdraw into subsistence food production, while others, such as female-headed households, may lack access to rural credit or agricultural extension services.

- Food security and nutrition will also be affected by AIDS. Farming systems that are already unable to provide sufficient protein and/or energy requirements are susceptible to increased malnutrition. The disruption of the family as an economic unit due to AIDS in turn undermines household food security. Such households face reduced levels of productive capacity, purchasing power, and food availability per household member.

- In the *formal sector,* AIDS threatens the expansion of industry and the private sector, which is critically reliant on skilled workers, entrepreneurs, and managers. Firms are facing increased turnover of experienced workers because of increased mortality attributable to AIDS.

- Profits are negatively affected due to reduced productivity of infected workers and to increased costs of employee health care benefits, funeral costs, and recruitment and retraining of lost workers.

Based on the portrayal of the epidemic in the Ugandan setting, the study suggests the additional following measures to enhance both prevention of new infection and to mitigate the economic consequences:

- The design of any AIDS prevention program needs to be based on the high payoffs of the synergistic effects of behavior change—including not only a reduction in the number of sexual partners but also increased condom use—coupled with an effective STD treatment and control program.

- Because women are increasingly disproportionately infected and are transmitting the virus to their infants, programs for maternal and child health cannot ignore AIDS.

- Average drug costs for AIDS are sensitive to the choice of treatment regimen. Treatment protocols for individual opportunistic infections should be reviewed in terms of the cost-effectiveness of existing and alternative interventions, particularly tuberculosis, which, although expensive to treat, has significant positive externalities.

- Pharmaceuticals must be efficiently and effectively utilized. Standard treatment guidelines should be revised based on cost-effectiveness considerations and widely distributed to health personnel. An educational campaign on the rational prescription and use of drugs contained in the guidelines should be considered.

- For farming systems for which AIDS will have significant negative consequences because of labor scarcity, agricultural research should explore labor-saving technology and hybrid varieties that require

less fertilizer or pesticide. Disseminating such research (as well as existing knowledge) through extension services should be broadened to include women. Extending credit to smallholder farmers, in particular to women and other vulnerable households, should also be considered.

- Severely affected households will need special targeted assistance to ensure food security. Orphan households, for example, with limited or no extended family support could benefit from not only emergency relief but from technical training and basic implements.

- In the formal sector, firms can begin by monitoring the impact of the epidemic in terms of increased costs and by considering explicit company policy on HIV/AIDS. The formal workplace should also serve as an important venue to help prevent the further spread of HIV (for example, through the dissemination of educational messages).

Because the study only scratches the surface of the complex interrelationship between AIDS and economic activity, more in-depth investigation is recommended in particular areas to better inform policy decisions. These include:

- To predict the potential demographic and economic impact more accurately and to refine appropriate programs and policies further, more certainty is needed on the epidemiological parameters (and their interactions) used to model the spread of the epidemic.

- Although the impact of HIV/AIDS on the health sector extends beyond drugs (for example, health personnel, hospital beds, and laboratory facilities), major information gaps exist about its magnitude. Moreover, families and communities also face increased challenges in caring for AIDS patients. More information is needed on the costs and benefits of alternative strategies for caring for AIDS patients (for example, home-, community-, and facility-based care).

- It has been argued that the AIDS epidemic in Uganda will have negative consequences for economic growth prospects; however, the impact has yet to be quantified. Macroeconomic modeling, including in particular the adjustment of labor and capital parameters, can provide an order of magnitude for the impact on output and per capita income.

- In agriculture, the magnitude of the impact that AIDS will have on farming systems and aggregate agricultural output will depend on variables such as migration and wage levels as well as coping mechanisms adopted by individual production units. More information is needed on the effects of AIDS on the rural labor market (which should be monitored especially for the effects of migration and the division of labor along gender lines) and on microeconomic-level production decisions.

Among the countries in Sub-Saharan Africa, Uganda has been one of the most forthright in admitting the seriousness of its AIDS problem. It has also been one of the first to take concrete steps to confront the issue. The growing realization that the AIDS epidemic is a multisectoral issue prompted the Government of Uganda to establish the National AIDS Commission. The mandate of the commission is to facilitate and encourage the involvement of as many actors as possible to both prevent the further spread of AIDS and to mitigate its consequences.

Finally, in light of the far-reaching implications of AIDS in sectors beyond health, the study recommends that international aid agencies and bilateral donors acknowledge these potential ramifications when considering development strategies and project design.

CHAPTER 1.

INTRODUCTION

The AIDS epidemic began to spread in Uganda during the mid-1970s on the shores of Lake Victoria. "Slim," as it was first known there, predominantly affected adults, who gradually wasted away and did not respond well if treated for common illnesses. It was not until 1984 that SLIM was diagnosed as AIDS, the final and fatal stage of infection with the human immunodeficiency virus (HIV). In the decade since HIV was discovered and AIDS diagnosed, the disease has spread to global proportions.[2] The search for a cure presents one of the greatest challenges to modern science. To many, AIDS is a problem that affects an individual's health status and poses additional strains on national health care systems. But, as Uganda and other countries have come to realize, AIDS is not solely a health issue and cannot be dealt with as such. Rather, the epidemic will have far-reaching impacts on the economic and social fabric of Ugandan society.

The pattern of the epidemic in Africa is distinct from that found so far in more developed parts of the world. Specifically, the predominant mode of transmission is heterosexual with roughly equal numbers of women and men infected. Because large numbers of women carry the virus, increasing numbers of infants and young children are infected. On average, there is a one in three chance of an infected pregnant woman passing the virus onto her child. Out of a population of approximately 17 million, 1.3 million adults were estimated in 1993 to be infected with HIV. This translates into a nationwide average of just over one out of every eight adults. Wide variations exist, however, among regions and between urban and rural areas. In the capital city of Kampala, one-third of pregnant women attending antenatal clinics are estimated to be HIV-positive. Although prevalence rates are lower in rural areas, there are signs that these are catching up with levels in urban centers. Lower *rates* of infection in rural areas may be misleading in terms of impact. Because most Ugandans live in rural areas, the absolute numbers of infected persons are by implication much higher.

The effects of AIDS in Uganda will be felt on many fronts—human, economic, and social. First and foremost, *human resource development* is already being threatened. As the virus affects the health status of adults and children, important gains in quality of life indices (such as life expectancy and infant mortality) are being reversed. Scarce resources available in the health sector are diverted away from preventable and curable ailments to treat AIDS patients. Highly trained health personnel are themselves in age groups at risk of infection and face additional occupational exposure to infected blood. Investments in education and the accumulation of precious human capital are also compromised. Not only is the current stock of educated elite being reduced, but their future quality and quantity is likely to be reduced. In the first instance, it is because teachers are in the age groups most highly infected. At the same time, affected families who have either lost an adult or have taken in orphans may be less able to pay for school fees. It is widely recognized that fostering human resources through improved health, nutrition, and education contributes greatly to the *economic growth* process. In the long term, lower levels of human capital because of AIDS will no doubt have an effect on growth prospects. Because AIDS has a long latent period—ten years on average—these serious longer-term economic implications for productive sectors have yet to be felt on a macroeconomic scale. The main channel through which the epidemic will affect the economy is the size and quality of the labor force.

[2] The World Health Organization's (WHO's) Global Programme on AIDS (GPA) conservatively estimates that, as of December 1993, the number of people infected globally with HIV is 15 million; of these, two-thirds or 10 million are in Africa.

The expansion of industry and the private sector is critically reliant on skilled workers, entrepreneurs, and managers. Loss of these individuals to AIDS will have consequences for productivity and profitability; replacement and retraining costs will be significant. Shortages of able-bodied adults in the agricultural sector may lower overall agricultural production. Many of the *social consequences* cannot be measured—large-scale disruption of family and social structures, stigmatization, mourning, and grieving. One of the most visible and immediate impacts of AIDS is the rapidly growing number of orphans. In 1993, Uganda has an estimated 784,000 orphans. Some lost their parents during the civil war in the 1970s and 1980s, but an increasing number are attributable to AIDS.

This study was originally undertaken in 1990 to explore the complex channels through which the AIDS epidemic in Uganda will affect selected sectors of the economy. The demographic and epidemiological projections were revised in 1993 to include the findings of the 1991 Population Census. The study is by no means a complete or quantitative treatment, due largely to severe data limitations. It is intended to encourage discussion about the multisectoral impact of this devastating disease and to stimulate creative and innovative ideas to both prevent its further spread and to mitigate its consequences.

Based on epidemiological information, *chapter 2* presents demographic projections taking AIDS into account. Given the great deal of uncertainty on key epidemiological and demographic parameters, alternative scenarios are offered, which are intended to illustrate simulations and not predictions.

In *chapter 3* the issue of the cost of caring for AIDS patients is examined. While information on the full costs of AIDS to the health sector is critical for determining resource allocation, gathering such data is an enormous undertaking. Instead, estimates of the most essential drugs needed to treat AIDS patients are given here and provide a general order of magnitude to demonstrate the fiscal impact on the health sector and to highlight the opportunity costs associated with the AIDS epidemic.

Chapter 4 analyzes the macroeconomic effect of AIDS by focusing first on the labor force. Following a description of Uganda's labor force, the relationships among occupation, residency, sex, and HIV status are explored using data from the national serosurvey. Unlike many other illnesses afflicting Ugandan adults, AIDS cuts across socioeconomic boundaries. Initially, it selectively affected the urban elite, but the disease appears to be spreading rapidly through rural areas, partly attributable to urban/rural migration flows. A discussion of the channels through which AIDS affects capital formation closes the chapter.

Chapter 5 looks at the potential effects of AIDS on selected sectors, notably agriculture. While it is much too early to detect large-scale loss of adult labor, this chapter builds on the previous chapter's portrayal of the labor force and suggests that AIDS is likely to have a significant impact on agricultural output because of the relative scarcity of labor in rural areas. The chapter highlights those farming systems in Uganda that are already constrained by availability of labor and in high prevalence areas. It also traces the impact of AIDS on rural households. The consequences of AIDS deaths on the formal sector are described based on a series of interviews conducted with a small group of employers.

Chapter 6 concludes by briefly outlining Uganda's response to the epidemic to date, including the establishment in 1991 of a National AIDS Commission, which reflects the government's efforts to develop a multisectoral approach to prevent further spread of HIV and to cope with the impact of the existing epidemic. Based on the study's findings, the chapter closes with recommendations for

measures to enhance prevention and mitigate the consequences of the epidemic as well as areas for more in-depth investigation.

CHAPTER 2.

EPIDEMIOLOGY AND DEMOGRAPHIC IMPACT

Since the advent of AIDS during the 1980s much has been learned about this new disease, but there are many aspects about which knowledge is still scanty. This chapter begins by summarizing the general state of that knowledge and proceeds to describe the epidemiological situation in Uganda and its impact on demographic variables.

AIDS is the fatal and final stage of infection with the human immunodeficiency virus (HIV). In effect, the body's immune system breaks down, leaving it vulnerable to "opportunistic" infections that are otherwise treatable but with AIDS eventually fatal. Common manifestations in Africa have been extreme weight loss, chronic diarrhea, prolonged fever, and increasingly tuberculosis. Progression from the time of infection with the virus to the onset of full-blown AIDS[3] is not immediate. In fact, there is a long incubation period—a median of ten years[4]—when individuals are infectious but show little or no signs of being ill (this is known as the asymptomatic phase). In a given infected adult population, it can be assumed that roughly half will develop AIDS after ten years. For children, however, the time from infection to developing AIDS is much shorter, almost always fewer than five years. Average survival after the onset of AIDS for both adults and children is about one year.

The ways in which the virus is transmitted are now well understood. The predominant mode is by *sexual* intercourse. HIV is also passed by infected blood or blood products. This includes blood transfusion, contact with contaminated needles, and from an infected mother to her child (*perinatal* or vertical transmission). The patterns and prevalence of these three modes of transmission vary by geographic region. In Africa, about 80 percent is acquired through heterosexual contact; pediatric cases account for another 10 percent and the remainder can be traced to transfusions and skin piercing instruments with infected blood. Although the origin of the disease still puzzles scientists, knowing how transmission occurs helps to account both for its rapid spread and to plan effective interventions to reduce new infections. High numbers of sexual partners is a significant risk factor. In addition, it is known that sex without the use of a condom in the presence of other sexually transmitted diseases (STDs) increases the probability of contracting HIV.

Current Situation and Recent Trends of HIV/AIDS in Uganda

HIV. In late 1987 and early 1988, a serological (blood) survey was carried out in Uganda with the intention of producing nationally representative estimates of the extent of HIV infection by age and sex, as well as to provide information on risk factors. Political instability in the country prevented the survey from being done in most of the northern and eastern regions. As a result, only 61 percent of the population was ultimately represented by a sample of 3,426 adults. Based on the survey, a weighted

[3] A standard clinical definition of full-blown AIDS has been developed by the World Health Organization, but the kinds and numbers of criteria are often modified by developing countries where diagnostic facilities are not widely available or where some symptoms are more commonly found.

[4] This estimate is based on a cohort of homosexual and bisexual men in San Francisco. It is uncertain whether this is likely to be true in an African setting. Some have argued that it is shorter—eight years—given both higher prevalence of tropical diseases, which may wear down the immune system faster, and the lower overall quality of health care.

adult HIV prevalence level of 9 percent was estimated;[5] this translated into approximately 780,000 adults carrying the virus. Wide variations existed, however, among regions and between the urban and rural areas sampled. For example, infection rates among adults in urban areas were 21.1, 29.1, and 7.7 percent, respectively, in the Central, Western, and West Nile regions. Rates in rural areas—where roughly 90 percent of the population still resides—were found to be lower but still significant (12.1, 5.7, and 6.6 percent respectively).

In the five years since this survey was carried out, it is believed that HIV prevalence levels have continued to rise, especially in rural areas. For example in the largely rural district of Rakai, the annual rate of new HIV infection among adults aged 15–39 was over 3 percent between 1989 and 1990; even in the more remote rural villages in Rakai, the annual rate of new infections was nearly 3 percent.[6] HIV prevalence in the same district ranged from 8.6 percent in rural villages to 25 percent in trading villages near secondary roads to 38 percent in trading centers located on main roads.[7]

To estimate the current level of HIV infection, numerous small-scale studies conducted in particular provinces, towns, rural areas, and individual hospitals, as well as for specific populations (such as pregnant women visiting antenatal clinics or persons donating blood[8]) were examined. HIV prevalence rates were extracted from over seventy studies conducted during 1989–92 with a sample size of 100 or greater and drawn from the general population, blood donors, and pregnant women.[9] Studies of population subgroups such as STD and tuberculosis patients, prostitutes, and truck drivers (known to have much higher infection rates than the general population) were excluded for estimating overall prevalence. The median value for all these studies was about 15 percent seropositive, suggesting that in the five years since the serological survey, HIV prevalence in Uganda has increased significantly.

A collaborating source of epidemiological information is data for pregnant women taken from sentinel surveillance sites located at antenatal clinics. Table 2.1 shows trends from 1989 and 1992 at six clinics. With the exception of the Jinja site, prevalence has increased everywhere, further suggesting that HIV prevalence has risen in Uganda. At the Nysambya clinic, located in the capital city of Kampala, prevalence has increased from about 25 in 1989 to 30 percent in 1992, highlighting high urban rates of infection. More disturbing however is the spread to areas outside the main urban area. Mbale, on the Kenyan border, has shown an increase in infection rates from 3.3 percent in 1989 to 14.8 percent in 1992—almost five times higher.

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[5] A careful distinction needs to be made between prevalence and incidence. *Prevalence* refers to the proportion of persons with a given condition at a point in time, in this case a year (a stock concept). *Incidence* refers to new cases during a given time period (a flow concept).

[6] Wawer, M. J. and others 1994.

[7] Wawer and others, 1991.

[8] The U.S. Bureau of the Census HIV/AIDS Surveillance Database maintains a listing of all known studies for many countries, including Uganda.

[9] Although these may not be entirely representative—pregnant women are likely to have higher and volunteer blood donors to have lower infection rates than the general population; together they probably provide a reasonable approximation of the country's adult population.

Table 2.1: Estimates of HIV Prevalence at Antenatal Clinics, 1989-92

Site	1989	1990	1991	1992
Nsambya	24.5	25.0	27.8	29.5
Rubaga	-	-	27.3	29.4
Mbarara	21.6	23.8	24.5	30.2
Jinja	24.9	15.8	22.0	19.9
Tororo	-	4.1	12.8	13.2
Mbale	3 3	11.0	12.0	14.8

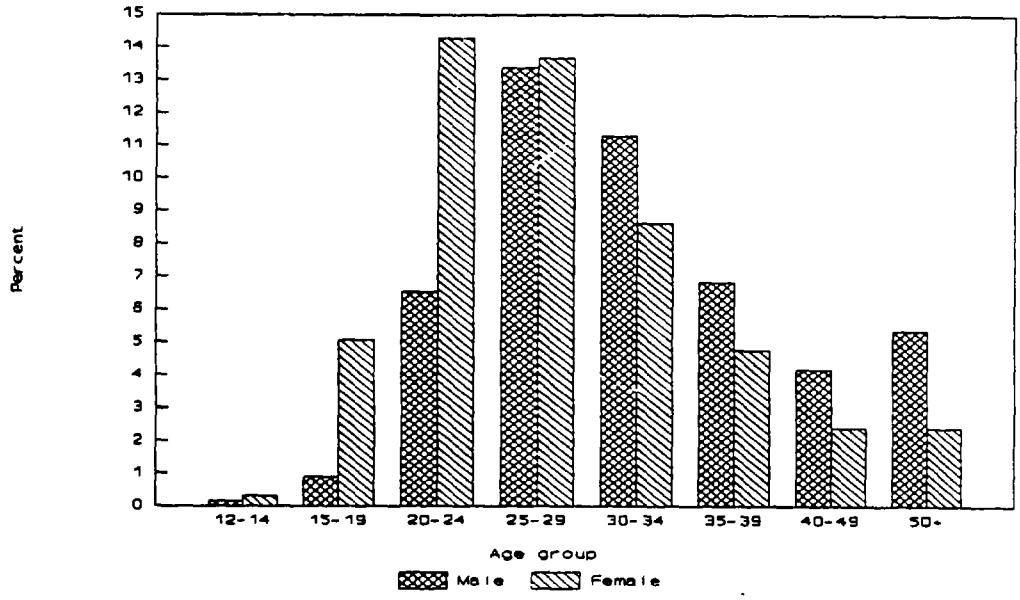
Source: Uganda AIDS Control Programme, HIV/AIDS Surveillance Report, December 1992.

Based on selected studies and surveillance sites at antenatal clinics, this report estimates that HIV prevalence in Uganda increased from about 9 percent of adults in the late 1980s to about 15 percent by 1993 or 1.3 million adults. This perhaps is a conservative estimate; the Uganda AIDS Control Programme in the Ministry of Health estimated in June 1993 that adult HIV infection was 20 percent or about 1.9 million adults.[10]

AIDS. The numbers of persons who have developed full-blown AIDS is officially compiled by the Ministry of Health every quarter based on reports sent by physicians, nurses, laboratory staff, and hospital administrators. As of December 1992, about 38,500 *cumulative* cases of AIDS had been reported, of which approximately 35,500 were adult cases and 3,000 pediatric. As in many other countries, this figure is grossly underreported. Based on the HIV infection rates and assuming that there is a progression from time of infection to AIDS as discussed above, the estimated prevalence of AIDS in 1993 is approximately 163,000 (table 2.2). While actual adult cases are two to three times greater than reported, pediatric cases are even more seriously underreported (3,000 compared to an estimated 50,000–60,000). Discrepancies such as these are not surprising considering the likely number of persons who actually make contact with the formal health care sector. According to mission hospital staff running mobile AIDS clinics in rural areas, only a small fraction of those with full-blown AIDS are ever visited. Moreover, many others in rural areas may prefer to seek treatment from traditional healers and are therefore not captured by the reporting system. Diagnostic facilities are also limited in Uganda, making confirmation of clinical signs of AIDS exceedingly difficult and contributing to misdiagnosis; for children, a clinical case definition does not yet exist for AIDS.

[10] Documentation on the derivation of this estimate was not available to this study.

Figure 2.1: Distribution of AIDS Cases, Cumulative, December 1992



Source: Ministry of Health 1993.

While the magnitude of AIDS cases reported to the Ministry of Health is unrealistically low, the age and sex distribution of reported cases corresponds closely to that reported by other sources. The age distribution of adult AIDS cases provides useful information for mortality projections, assuming that underreporting is uniform across age and sex. Figure 2.1 shows the age and sex distribution of reported AIDS cases as of December 1992. Noticeable is the high frequency and bunching in the sexually most active years of 15–49. As of December 1992, the overall mean age of adults with AIDS was 30 years old. Adolescents and the elderly are for the most part spared, and education prevention campaigns are increasingly targeted toward adolescents. *On average, men with AIDS are older than women*, 32 years compared to 28 years old, implying that women are infected earlier. Data from the serosurvey confirm the underlying age/sex pattern of infection. Not only are women infected earlier (during peak childbearing years), but recent studies have found higher HIV prevalence levels among women than men. In Rakai, a 1989 sample of 1,292 adults found that 25 percent of women and 15 percent of men were HIV-positive.[11] The national serosurvey data also suggested that *women are 1.3 times as likely to be infected as men*. The combination of these two effects—more women infected earlier—presents grave implications for perinatal transmission and increased challenges to improving maternal and child health status. Of the reported pediatric cases (here classified as 11 years old and under), 78 percent were below 2 years of age. For children, the overall mean age of reported AIDS cases was 1.46 years.

[11] M. J. Wawer and others, 1991.

Table 2.2: Estimated and Projected Annual AIDS Cases, 1985–98
(in thousands)

Year	Adults*	Children	Total
1985	8.7	4.9	13.6
1986	14.2	8.4	22.6
1987	21.3	13.3	34.6
1988	30.0	19.3	49.3
1989	40.8	26.3	67.1
1990	53.6	33.9	87.5
1991	68.4	42.2	110.6
1992	85.0	50.9	135.9
1993	102.7	59.9	162.6
1994	120.9	67.1	188.0
1995	139.0	73.6	212.6
1996	156.5	81.3	237.8
1997	173.0	89.0	262.0
1998	188.4	96.3	284.7

* Adults defined as those over 15 years of age.
Source: World Bank Staff Projections 1993.

Modeling the HIV/AIDS Epidemic and Its Demographic Impact

Due to the long incubation period, an accurate assessment of the number of currently infected persons by age and sex (along with estimates of the incubation period and survival time) is sufficient to project the number of deaths from AIDS in the near future. Longer-term projections of AIDS, however, must estimate new HIV infections. To do this requires making assumptions not only about key biological parameters but also about sexual behavior. Biologically, the likelihood of transmission depends on the mode of transmission. For example, the probability of infection by receiving a transfusion of infected blood is almost certain. On the other hand, the chances of contracting AIDS from a single sexual contact with an infected person is less than 1 percent. It is now believed that the stage of infection of the person carrying HIV affects the probability of spreading the virus, but these parameters are not known with certainty. Evidence has also shown that the presence of other sexually transmitted diseases (STDs), especially those with genital ulcerations, increases greatly the chances of infection with HIV and also increases the infectiousness of an HIV-positive person.[12] Condoms, however, have been shown to effectively reduce transmission of HIV and other STDs, but regular supply and consistent use are needed. Least known, but probably most important for modeling future interventions, are the behavioral aspects through which the disease has spread. Data on sexual behavior are necessarily speculative, even more so for assumptions on projected *changes* in behavior, given ongoing prevention campaigns.

[12] P. Piot and others 1988.

A numerical simulation model has been developed at the World Bank and is used here (see box 2.1). The following parameters are considered in the model:

- Number of sex partners for given risk groups
- Number of sexual acts per sex partner
- Probability of condom use
- Mixing patterns between risk groups
- Probability of blood transfusion
- Presence of genital ulcers (STDs)

The simulation of the epidemic begins in the mid-1970s and incorporates the 1988 HIV prevalence level from the serosurvey and more recent estimates as described in the above section. Selected parameters in the model have been modified based on existing knowledge of epidemiological variables in Uganda (see annex II). Key assumptions include: condoms are 80 percent effective in protecting against HIV infection; the presence of other STDs increases the transmission risk 50 times; and 50 percent of blood used for transfusions is screened and safe by 2000 and 70 percent by 2010.

To project the consequences of the AIDS epidemic on demographic indicators, both the mortality and fertility effects of AIDS are required. In addition, demographic data for a recent point in the past are needed, including underlying figures for vital rates (that is, crude birth and death rates). The results of the most recent Population Census, conducted in January 1991, form the basis for the demographic projections shown later in this chapter. The population growth rate in the intercensal period from 1980 to 1991 was low relative to the level of fertility because of high emigration, estimated at about 1 million people. The projections assume that net migration will be insignificant in the 1990s and beyond, resulting in a growth rate that is equal to the rate of natural increase (that is, the crude birth rate minus the death rate).

Unfortunately, vital registration statistics used to determine birth and death rates are very incomplete in Uganda; therefore, fertility and mortality schedules used in the projections are extrapolations of the 1988–89 Demographic and Health Survey (DHS). The DHS estimated under-five mortality at 180 per 1,000 live births for the period 1983–88 (when AIDS mortality was still relatively insignificant). Combined male-female life expectancy in the mid-1980s was about 48 years. Model life tables were used to estimate a mortality schedule and life expectancy based on the DHS. Future AIDS mortality was not assumed to affect mortality from other causes.

Box 2.1: Modeling the HIV/AIDS Epidemic: The World Bank Model

The spread of HIV and AIDS is simulated using an epidemiologic-demographic model developed at the World Bank (Bulatao and Bos 1992). It simulates three processes: the spread of HIV from infected to noninfected individuals, the development of AIDS among those infected with HIV, and the progression from AIDS to death. The three processes are modeled separately for children and adults (those aged 15 and over). The model allows HIV to spread between sexual partners, through blood transfusions, infected needles, and perinatally between mother and child.

The first process differentiates between sexual and nonsexual transmission. For sexual transmission of HIV, men and women are assigned to one of four risk groups, depending on an assumed level of sexual activity, as indicated by the number of new partners. The probability of infection in a given year is a function of the number of new contacts, the number of sexual contacts who are infected, the average number of sex acts per contact, and the transmission rate of the virus. The probability of infection is increased when genital ulcers are present and decreased when a condom is used. These cofactors are assumed to vary by risk group. For perinatal transmission, the number of infected newborns is the product of the number of women of reproductive age, the proportion of women infected, and the general fertility rate. Nonsexual transmission through infected blood and needles depends on the proportion of blood or needles infected and the assumed frequency with which individuals receive transfusions or injections.

In the second process, the number that progress to AIDS is determined by applying schedules that depend on years since initial infection, after excluding mortality from other causes. A logistic function similar to the one illustrated in figure 1 is applied to generate the schedule, which has a median of nine years for adults, and one year for children. Third, progression from AIDS to death is handled in a similar manner, using a logistic pattern with a median survival time of one year.

Finally, deaths resulting from AIDS are then added to mortality from other causes to construct overall mortality schedules that are applied to the population by age and sex. Demographic projections are run accordingly.

Source: World Bank 1993.

Fertility was estimated at 7.3 children per woman in the DHS, reflecting high demand for children, low use of contraceptives, and an early marriage pattern. Fertility is assumed to remain high during the 1990s, after which a gradual decline in the total fertility rate is projected. Future AIDS mortality is not assumed to affect fertility rates even though it is very likely that the behavioral effects of widespread HIV will affect fertility decisions. Unfortunately, little research has explored the interaction between AIDS and fertility, and it is not clear in which direction fertility may be influenced. Some indications are that couples marry earlier to avoid the chances of an infected partner. Earlier age at marriage is known to be associated with higher fertility rates. On the other hand, women who know they are HIV-positive may consciously decide not to have more children for fear of exposing them to the virus. Yet, in many African cultures, high fertility is still desirable, and women may opt to have more children, even while knowing they are infected. It is also not certain what the fertility effect of increased condom use for purposes of HIV prevention will be; presently most condom use is believed to be in commercial sexual contacts. Nevertheless, under these projections, assuming AIDS has no effect on fertility, the number of births and the birth rate will vary because of the mortality rate of women of childbearing ages.

Scenario assumptions. Given the uncertainty of projecting the future course of HIV infection, alternative scenarios are run to show the course of the epidemic under different assumptions about

future behavior and the effect of interventions at various levels of intensity. All scenarios are projected to the year 2020 and are distinguished as follows:

- **Scenario I, No AIDS.** A hypothetical projection of the population of Uganda without AIDS mortality, based on the 1991 census and standard assumptions regarding trends in fertility and mortality.

- **Scenario II, No Change (15 percent).** Shows the course of the epidemic (assuming 15 percent HIV seropositive among adults in 1993) and its effect on demographic indicators with the assumption that *behavior will not change* with regard to the number of new sex partners, sexual behavior, or condom use. The prevalence of genital ulcers is also assumed not to change. This and all subsequent scenarios assume that donated blood has been screened partially since 1985 and that the blood supply will become increasingly HIV-free.

- **Scenario III, Condoms.** Assumes that *condom use* will gradually increase from 5 percent in 1993 to 40 percent of all sexual acts by 2000. As a result, the prevalence of *genital ulcers* is assumed to start declining from 1995 by 5 percent annually. This scenario assumes no change in the number of new contacts.

- **Scenario IV, Behavior Change.** Assumes an annual decline of 5 percent in *new sexual partners* from 1995 onward, but no changes in condom use or genital ulcers.

- **Scenario V, Combination.** Assumes that the number of new contacts will decline as in scenario IV and that condom use will increase as in scenario III. As a result, the prevalence of genital ulcers will decline more than may be expected from condom use alone. Namely, a 20 percent annual reduction in the prevalence of ulcers from 1995 is assumed.

- **Scenario VI, Vaccine.** Assumes the introduction of a 100 percent effective vaccine starting in 2000, reaching half of the population not covered in the previous year (that is, 50 percent of all adults will be covered in 2000, 75 percent in 2001, and so on). Vaccination is assumed to be independent of risk status.

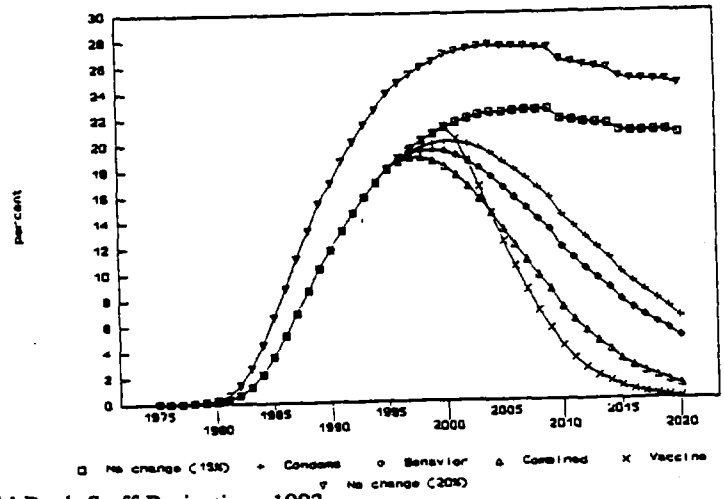
- **Scenario VII, No change (20 percent).** Assumes that the adult prevalence rate in 1993 is 20 percent rather than 15 percent as assumed in scenarios II–VI and that the sexual behavior that has produced this prevalence will continue. No interventions involving condom use or genital ulcers is assumed.

Results: the Epidemic

The simulated and projected course of the epidemic are shown in figures 2.2-2.7. Adult HIV prevalence reaches 15 percent in 1993 for scenarios II through VI. Figure 2.2 shows the effect of the interventions on future HIV prevalence. Without any effective interventions (scenario II), HIV prevalence will increase until about 2005, when it will reach 22 percent, before leveling off when the highest risk groups become a smaller proportion of the total adult population. Scenario III (increase in condom use) is somewhat less effective than scenario IV (reduction in the number of new partners). The combined effect of fewer partners and more condom use (scenario V), however, is shown to be almost as effective as a vaccine (scenario VI). Even under the vaccine scenario, with a rapid decline in

new HIV infection after 2000, it would still take twenty years to eradicate all HIV. Under the most pessimistic assumption of a 1993 adult HIV prevalence level of 20 percent (scenario VII), infection will continue to spread until about 2005 when it will reach 27 percent.

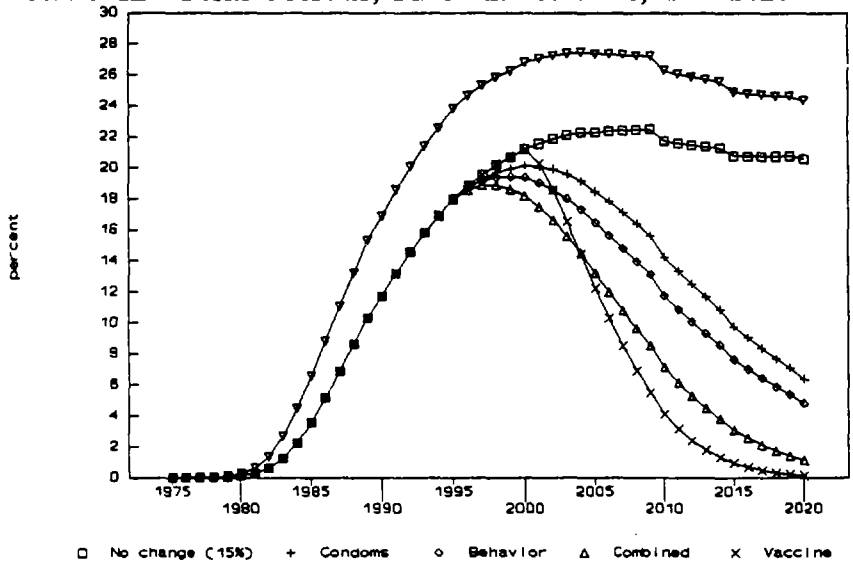
Figure 2.2: Adult HIV Prevalence, Different Scenarios, 1975–2020



Source: World Bank Staff Projections 1993.

Figure 2.3 translates the HIV prevalence levels shown in figure 2.2 into the number of people infected. About 780,000 adults (or about 9 percent) were HIV-positive in 1988 but had not yet progressed to AIDS. By 1993, the number of infected adults was about 1.3 million, with an increase of about 230,000 new infections in just one year. The scenarios become distinguishable only after 1995. *By 2020, under scenario II (no change), 2.8 million adults will be carrying the virus*. Scenario III, which involves increased use of condoms and STD control, reduces the number of infections to just under 1 million, slightly more effective than changing sexual behavior. Clearly, though, the synergistic effects of inducing change in all three variables has the greatest impact in slowing the spread of the epidemic. Under the combined intervention scenario, the pool of infected adults drops to just over 200,000 by 2020.

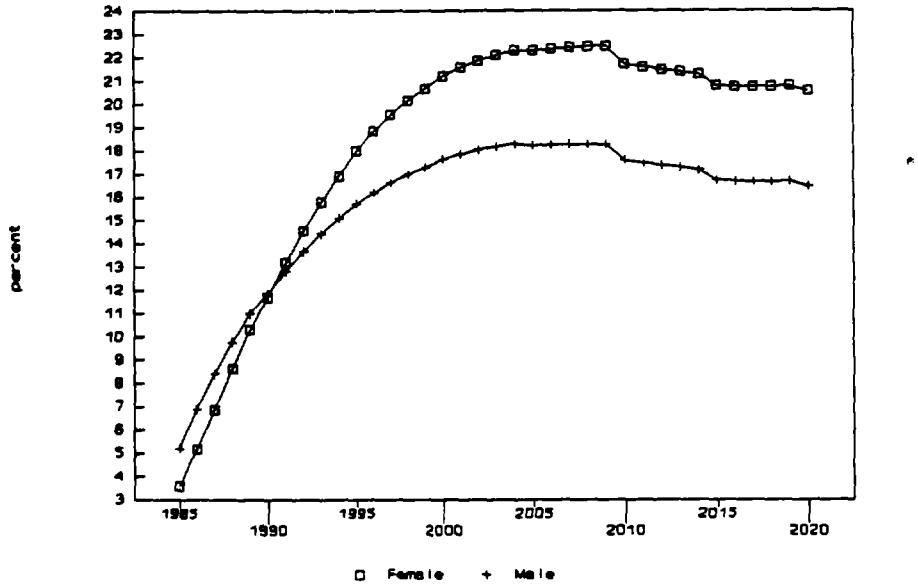
Figure 2.3: Numbers of HIV Positive Adults, Different Scenarios, 1975–2020



Source: World Bank Staff Projections 1993.

Of more concern, however, is the discrepancy between the percentages of women versus men infected with HIV (figure 2.4). In 1990 an estimated 11.7 percent of women were HIV-positive compared with 11.9 percent of men. Scenario II (no interventions) projects that over time, prevalence among women not only increases but exceeds that among men. In 1993, 15.8 percent of women are infected and, by 2020, 20.6 percent will carry the virus after peaking at nearly 23 percent in 2010. The percentage of men infected rises from 13.7 percent in 1993 to 16.5 percent by 2020. The underlying reasons are both biological and social; not only is the virus more easily transmitted from male to female, but women tend to have less power in protecting themselves from infected partners or husbands. This trend highlights the sober implications for women's health, perinatal transmission and numbers of children that are likely to be infected. In 1993 an estimated 70,000 children were HIV-positive. By 2020 their numbers could rise to 120,000 under scenario II.

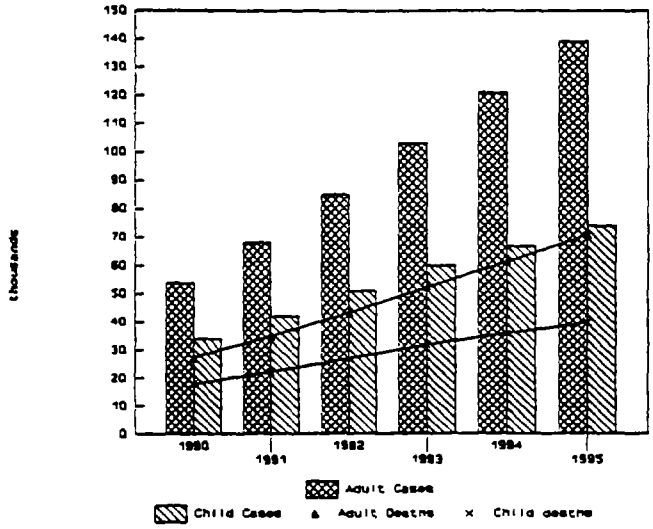
Figure 2.4: Adult HIV Prevalence, By Sex, Scenario II, 1985–2020



Source: World Bank Staff Projections 1993.

Figure 2.5 focuses on the current (1990–95) impact of the epidemic and shows the number of expected AIDS cases. Given the long incubation time between infection and development of AIDS, these numbers mostly reflect infections dating back to 1985 or earlier. *By 1995, those earlier infections will have generated nearly 200,000 annual AIDS cases—more than doubling over the five-year period.* AIDS deaths lag behind the number of AIDS cases by about one year; in 1995 over 110,000 adults and children will die from AIDS.

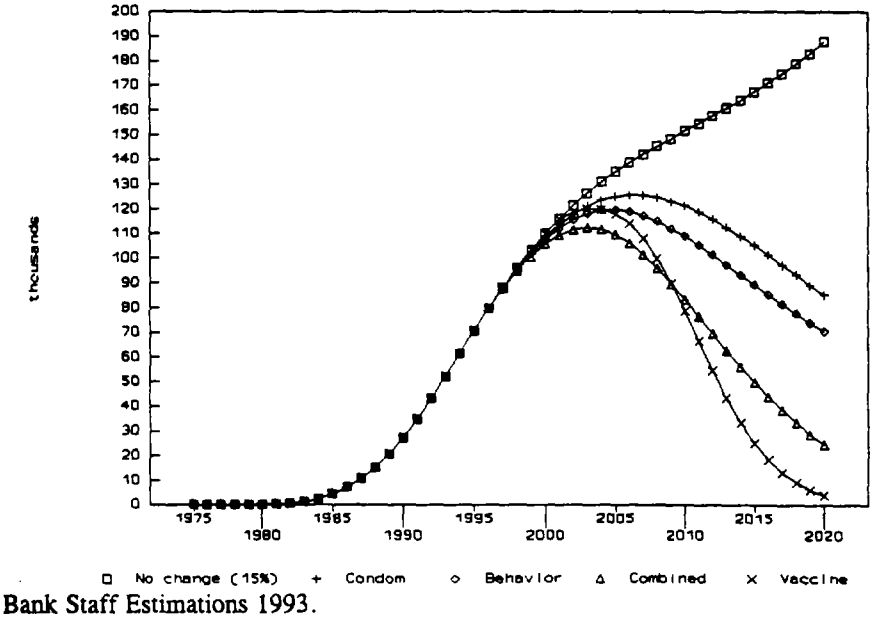
Figure 2.5: Annual AIDS Cases and Deaths, Adults and Children, 1990-95



Source: World Bank Staff Estimations 1993.

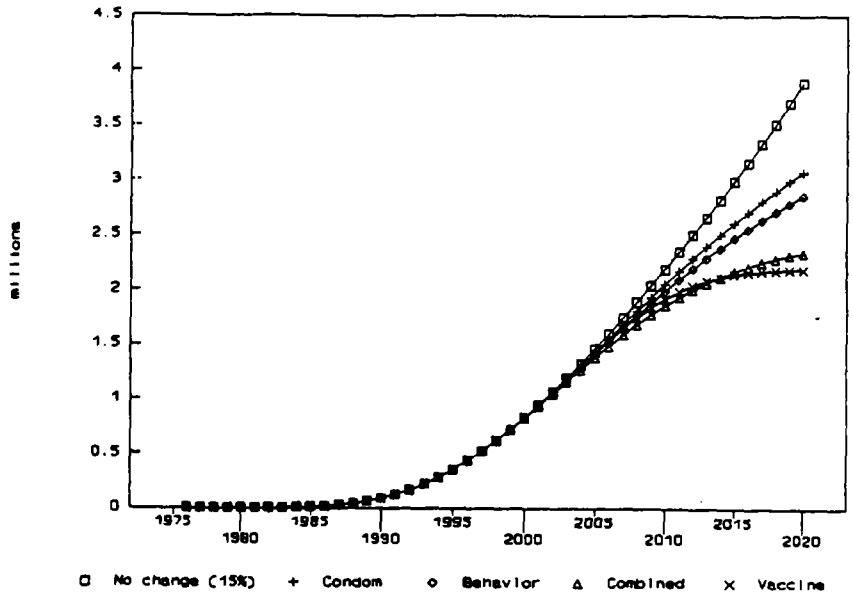
Figures 2.6 and 2.7 show the longer-term mortality impact of AIDS. Because of the long incubation period of HIV, adult AIDS deaths by the turn of the century are hardly affected by any intervention taken between 1993 and the year 2000. The projected number of adult AIDS deaths then is shown to exceed 100,000 in all of the scenarios. Under the most optimistic scenarios of either combined interventions or a vaccine, the annual number of AIDS deaths will only peak in approximately 2003. Without any effective interventions, the number of annual AIDS deaths will continue to climb to over 160,000 by the end of the projection period (2020). Figure 8 shows cumulative deaths from AIDS since the start of the epidemic. Even under the vaccine scenario, more than 2 million adults would die of AIDS by 2020; without any interventions, that figure is nearly double.

Figure 2.6: Annual Adults AIDS Deaths, Different Scenarios, 1975-2020



Source: World Bank Staff Estimations 1993.

Figure 2.7: Cumulative AIDS Deaths, 1975-2020



Source: World Bank Staff Estimations 1993.

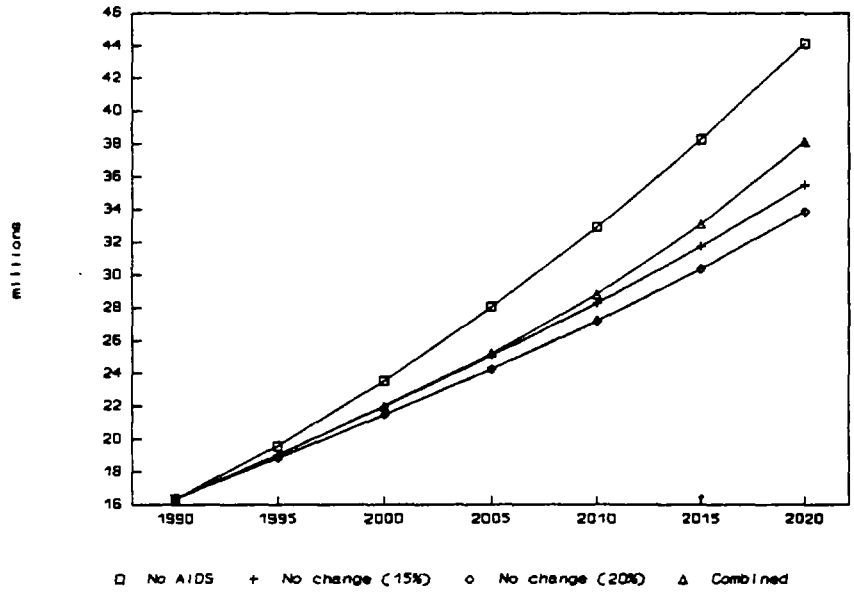
Results: Demographic Indicators

Figures 2.8 to 2.13 summarize the effects of the AIDS epidemic on demographic indicators, as projected under scenario I (no AIDS), scenario II (no change, 15 percent prevalence in 1993), scenario V (combined interventions) and scenario VII (no change, 20 percent prevalence in 1993). Other scenarios are generally intermediate in their effects. Detailed output may be found in annex II.

Figure 2.8 shows that Uganda's population would reach 44 million by 2020 without AIDS mortality. If the combined intervention scenario prevails, the population would be nearly 15 percent less or 38 million. If either of the no-intervention scenarios (II or VII) were realized, there would be about 10 million fewer Ugandans due to AIDS deaths. Figure 2.9 shows the effects of AIDS on population growth rates. Assuming that 20 percent of the adult population was infected in 1993, the effect of AIDS mortality could reduce population growth by 0.7 to 1.1 percentage points annually during the projection period; however, it is important to note that in Uganda, population growth will remain high. Even under the most pessimistic scenario, the population will continue to grow by more than 2 percent per year until 2020. And, under all scenarios, Uganda's population size will double between 1993 and 2020 because of an early marriage pattern, low contraceptive use, and high fertility level. In spite of AIDS, serious consideration of family planning is warranted given high fertility rates, high infant and maternal mortality rates, the desire for fewer children, and to give HIV-positive women the choice of not having additional children.[13]

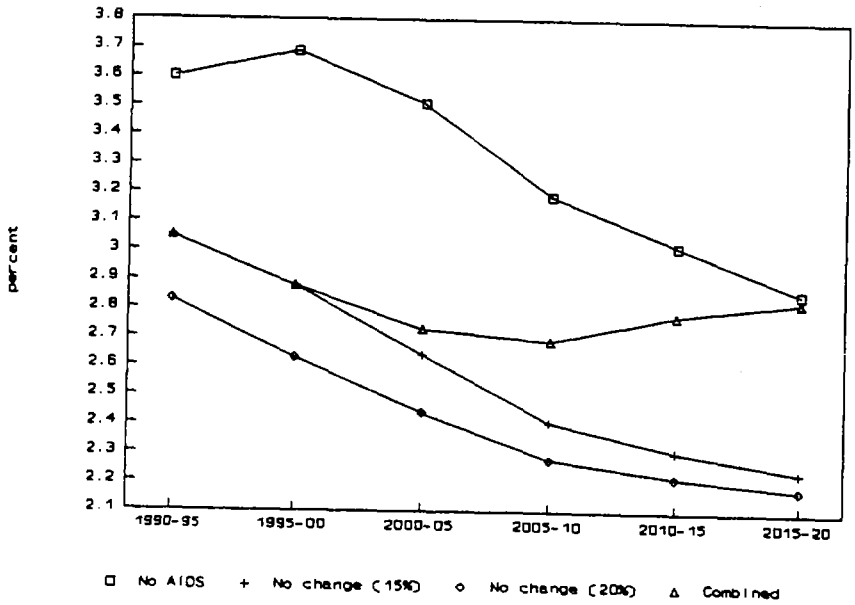
[13] See also World Bank 1993c.

Figure 2.8: Projected Population Size, Different Scenarios, 1990–2020



Source: World Bank Staff Estimations 1993.

Figure 2.9: Project Population Growth Rate, Different Scenarios, 1990–2020

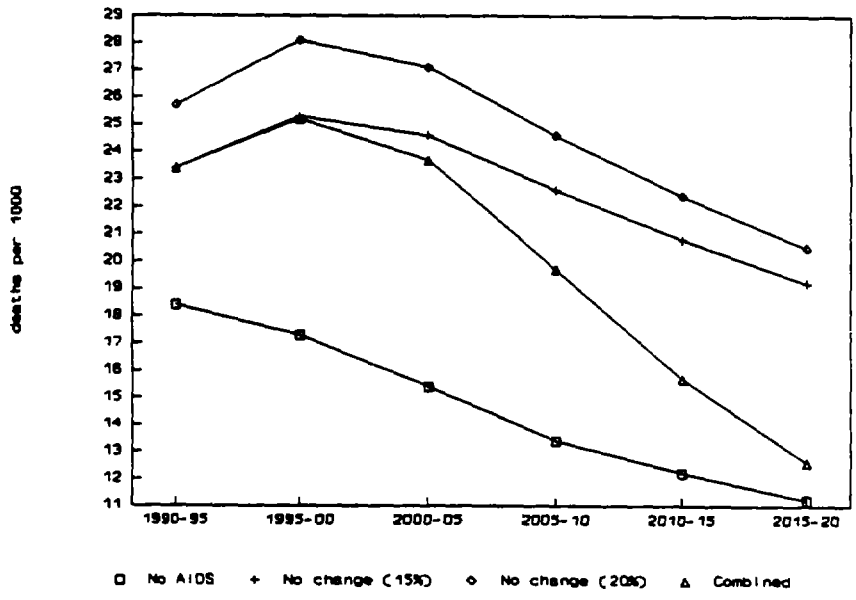


Source: World Bank Staff Estimations 1993.

The effects of the AIDS epidemic are even more visible when *mortality indicators* are considered. Overall, an AIDS epidemic of this scale has caused a deterioration in many recent gains in standard quality-of-life indices as measured by mortality rates and life expectancy. In the absence of AIDS, the *crude death rate* is projected to decline almost linearly to 11 per thousand by 2020 (figure 2.10). Assuming adult prevalence levels of 20 percent in 1993, the crude death rate increases from 26 in 1990–95 to 28 per thousand in 1995–2000. By 2020, the CDR (21 per thousand) remains above levels in the late 1980s and roughly one time higher than without AIDS. Even under the combined intervention scenario, it is only after the year 2010 when the CDR will drop back to the late 1980s "no AIDS" level.

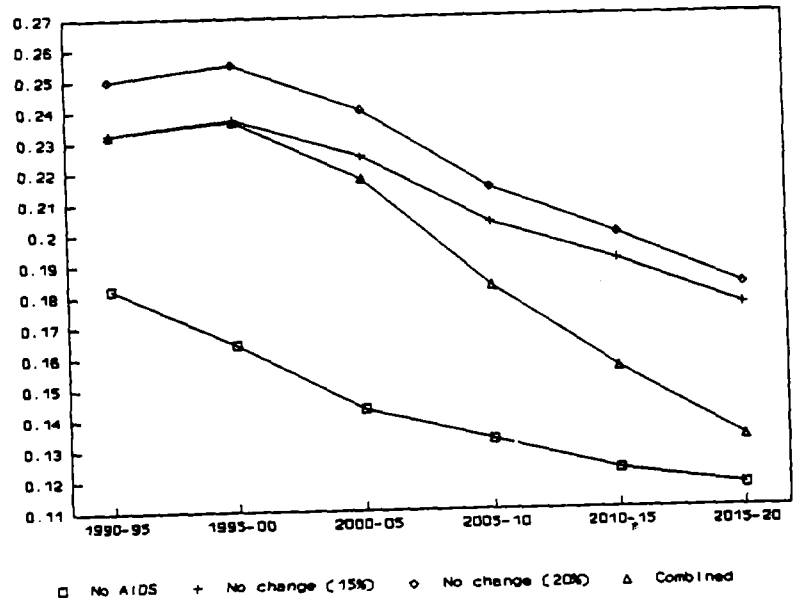
Mortality for children under five is expressed as the number of children for every thousand live births that will die before their fifth birthday (figure 2.11). The differential between the trends reflects the mortality of children infected perinatally. Without AIDS, mortality in children under five would have dropped from 182 per thousand in 1990 to about 117 per thousand by 2020. With AIDS, child mortality rates can be expected to be between 150 to 170 percent higher during the projection period. These projections, however, assume no interactions between AIDS and mortality from other causes. It is likely that the loss of primary caretakers—mothers—will have a negative effect on the welfare of uninfected children and orphans as well. It is therefore conceivable that child mortality even as modeled here may be underestimated. What is clear, however, is that the effects of AIDS (not allowing for compounding effects) will hamper reaching child survival targets.

Figure 2.10: Crude Death Rate, Different Scenarios, 1990–2020



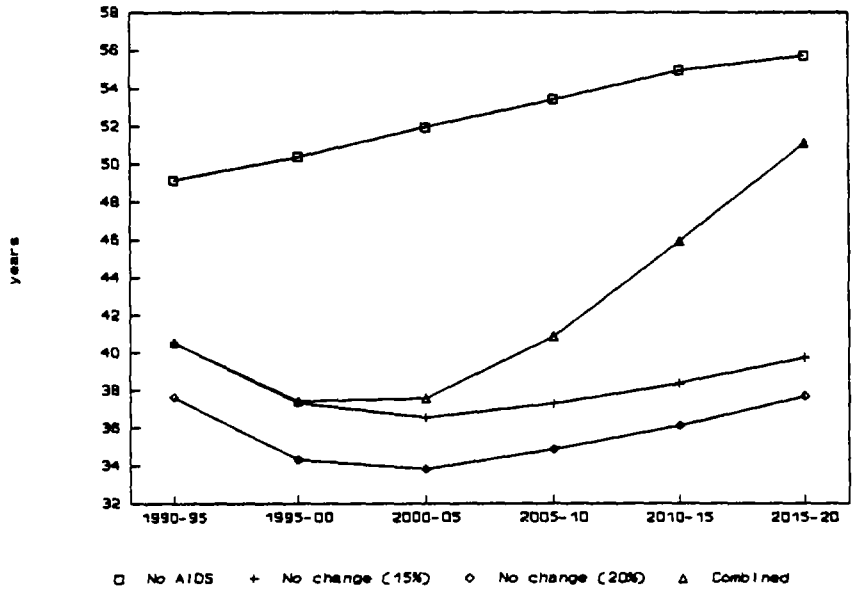
Source: World Bank Staff Estimations 1993.

Figure 2.11: Projected Under-Five Mortality Rate, Different Scenarios, 1990–2020



Source: World Bank Staff Estimations 1993.

Figure 2.12: Projected Life Expectancy At Birth, Both Sexes, 1990–2020

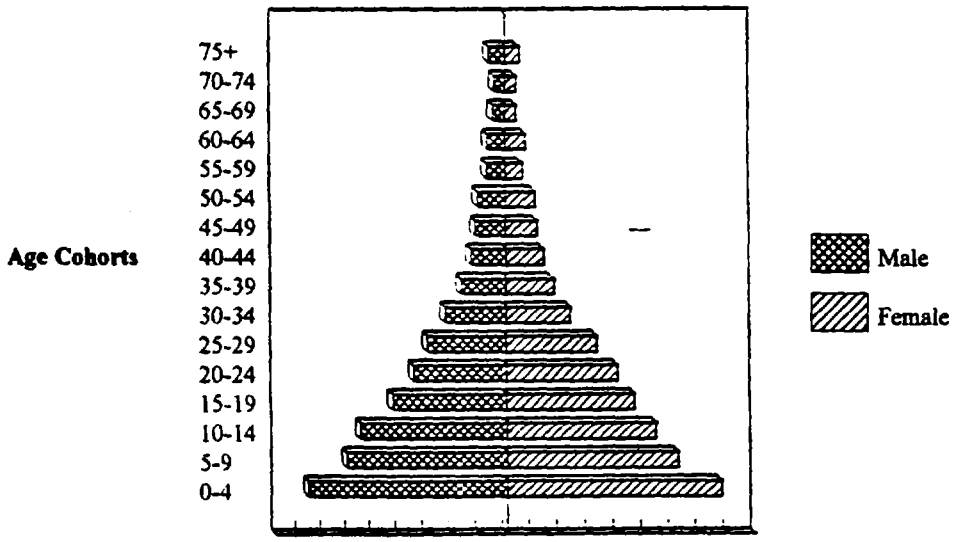


Source: World Bank Staff Estimations 1993.

If no AIDS were present, *life expectancy* at birth would have been projected to increase from about 49 years (male and female combined) in 1993 to about 55.5 years in twenty years (figure 2.12). Currently, however, AIDS mortality has resulted in an eight-year decline in life expectancy at birth. If HIV prevalence is actually 20 percent, life expectancy may already have dropped to below 40 years. In all scenarios, the situation will get worse before getting better. The decline in life expectancy is projected to continue until past the year 2000, after which it bottoms out and life expectancy gradually increases because of the assumed decline in mortality from causes other than AIDS.

AIDS mortality is often expected to change the dependency ratio significantly.[14] In fact, the dependency ratio is affected only very slightly because of the offsetting effects of pediatric and adult AIDS deaths. Figures 2.13 and 2.14 show age pyramids for 1995 and 2020, illustrating that mortality from AIDS by 2020 has reduced most age groups. Although initially the age groups with the highest infection rates are reduced, such effects move through the age structure because of the aging of the population. Males are shown on the left, females on the right. The 2020 pyramid shows the projected age structure from scenario I as dark bars, and the projected age structure in the no-AIDS scenario as slashed bars, visible at the fringes.

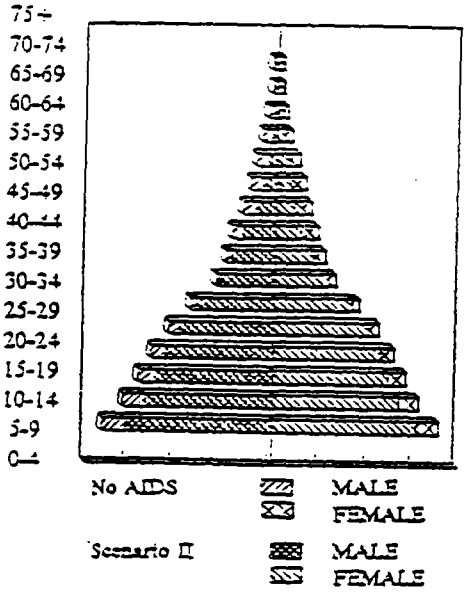
Figure 2.13: Population, 1990, No AIDS



Source: World Bank Staff Estimations 1993.

[14] The dependency ratio is defined as the population aged 0–14 plus 65 years and above as a percentage of those aged 15 to 64.

Figure 2.14: Population, 2020, No AIDS and Scenario II



Source: World Bank Staff Estimations 1993.

Policy Implications and Recommendations

The scenarios developed above are based on epidemiological data currently available for Uganda and assumptions based on the prevailing state of knowledge about the epidemic. Although the scenarios are intended to be illustrative and not necessarily predictive, several implications do emerge that will have a bearing on policy and programs to prevent the future spread of HIV and to deal with its impact.

First, it is evident that AIDS is already having serious detrimental effects on improvements in standard of living indices. Previous gains in reducing infant and child mortality and in increasing life expectancy are being erased. AIDS now poses a serious threat to attaining child survival targets as proposed by such agencies as UNICEF and WHO.

Second, it is clear that behavior change—including not only a reduction in the number of sexual partners but also condom use—coupled with an effective STD treatment and control program can significantly reduce the spread of HIV. In fact, in the long term, this combination of interventions has nearly as large an effect on reducing HIV prevalence as the introduction of a vaccine by 2000. The implications for designing a prevention program coincide with current recommendations of the international health community.

Third, even without 100 percent effectiveness or coverage in key interventions, prevention programs can still have a significant impact. For example, in the case of condoms, it is assumed that 65 percent of all risk groups will use them effectively by the year 2020, up from only 40 percent by the year 2000.

percent of all risk groups will use them effectively by the year 2020, up from only 40 percent by the year 2000.

Fourth, women are increasingly disproportionately infected and are transmitting the virus to their infants. Programs for maternal and child health cannot ignore AIDS, both as a potential threat and as a consequence. Special counseling for HIV-negative women whose husbands are infected should encourage the use of condoms.[15] Women already infected should be given information on the likelihood of infecting yet unborn children.

Finally, as stated at the outset of this chapter, much more certainty about the parameters (and their interactions) used to model the spread of the epidemic is needed to predict more accurately the potential demographic and economic impact. Uganda is a country that already has a wealth of information in the form of ongoing longitudinal studies, sociological inquiries into behavior associated with HIV infection, and well-established sentinel surveillance sites. Information from these studies can provide important insights for understanding the newly unfolding course of the HIV/AIDS epidemic; however, as the information becomes available, it should be systematically incorporated as inputs into models such as the one illustrated in this chapter. The results of such simulations would be of enormous benefit not only to Ugandan policymakers but for the international community.

[15] It should go without mentioning that their husbands should also be counseled.

CHAPTER 3.

IMPACT ON THE HEALTH SECTOR: DRUG COSTS

The impact of HIV/AIDS on the health sector will be reflected by an increase in the demand for health care above and beyond health care needs in the absence of AIDS. At the same time, AIDS will have an impact on the supply side of the health sector. Inputs such as hospital beds, laboratory services, drugs, and skilled personnel will be further stretched. There is particular concern about the vulnerability of highly skilled health personnel who are also at risk of HIV infection, both as members of an age group at higher risk and as professionals exposed to blood. Overall, this epidemic implies an increase in health care expenditures; however, budgets—either government or household—are not rapidly expandable, suggesting that increasingly hard choices will need to be made among competing demands. Among such demands in Uganda is the daunting task of rebuilding the fragile health system, which suffered the effects of nearly twenty years of civil war.

Although it would have been desirable to consider the full cost implications of treating AIDS patients, basic cost data were not available.[16] To demonstrate the impact of this epidemic on the health care sector, this chapter selectively focuses on the essential drug requirements needed to treat the "opportunistic infections"[17] related to AIDS. Drugs are a substantial component in Uganda's public health budget—about a third of recurrent expenditures—and consume scarce foreign exchange. And, drug availability in health facilities is one of the major determinants of attendance. Using projections of the evolving AIDS epidemic over a five-year period from chapter 2, the impact on the health care system is measured in terms of the increased cost of essential drug requirements. Quantification of essential drugs for AIDS also highlights trade-offs of treating the opportunistic infections of terminal AIDS patients compared to treating others with curable illnesses.

The Manifestation of HIV/AIDS on the Health Care System

Although Uganda is still reconstituting its health information system and district coverage is not yet complete, it is evident that *the emergence of AIDS has significantly altered the disease pattern in Uganda*. Data from twenty reporting hospitals indicated that in 1990 AIDS was the second leading killer after malaria, accounting for 9.3 percent of all inpatient deaths.[18] Two years earlier, AIDS ranked only sixth. Another indication has been the noticeable change in the age profile of hospital populations. A shift toward younger ages and increased numbers of tuberculosis cases are indicative of high HIV prevalence. A one-day census of inpatients in the national tertiary hospital, Mulago, was taken in April 1990 (table 3.1). Even allowing for obstetrical and gynecological patients, the age band 20–29 appear to be disproportionately represented. High HIV prevalence in these age groups described

[16] Readers are referred to *Tanzania: AIDS Assessment and Planning Study*, World Bank, 1992, which explores the cost implications and policy choices for treatment of AIDS patients.

[17] Opportunistic infections refer to illnesses that take the opportunity to strike individuals whose immune systems are particularly weakened, in this case, by the human immunodeficiency virus—HIV.

[18] World Bank 1993 (c), Volume I, page 52.

in chapter 2 could help to explain such figures. Table 3.2 shows the ten most frequent diagnoses during the census. Although AIDS appears sixth among them, the figure undoubtedly does not reflect the true number of HIV-related conditions in the hospital.

Table 3.1: Mulago Hospital One-Day Census: Patient Age Distribution

Age group	Male	Female	Total
Unknown	14	10	24
>1	33	48	81
1-9	98	78	176
10-19	62	109	171
20-29	134	201	335
30-39	96	84	180
40-49	61	41	102
50-59	34	24	58
60-69	29	21	50
70-79	27	11	38
80+	3	2	5
Total	591	629	1,220

Source: J. Shaw 1990.

Given estimated HIV prevalence levels, it is likely that there are unidentified HIV-positive patients included among many of the other diagnoses, particularly tuberculosis and some of the cancers such as Kaposi's sarcoma—known opportunistic infections associated with AIDS. By late 1990, over two-thirds of eighty-five sequential admissions at Mulago were HIV-related.[19] Other hospitals have also reported very high levels (up to two-thirds) of HIV-positive patients occupying beds. The 200-bed Kitovu mission hospital serving Masaka and Rakai districts functions at over 100 percent occupancy. Overall, 40 to 50 percent of their admissions are HIV-related, but 70 percent of medical wards and nearly everyone in the TB ward is HIV-positive.[20] Nsambya Hospital, a mission-run 360-bed institution in Kampala, also functions at more than 100 percent capacity. Around 70 percent of patients on their general medical wards are HIV-positive and the conviction is growing that non-HIV patients are being displaced by HIV-related conditions.[21] Although hospitals are increasingly receiving a higher proportion of HIV-positive patients, health units below the hospital level are also under increasing pressure from HIV-related symptoms and illnesses. Based on the estimated number of AIDS cases and of the number of times they are likely to suffer from any one of a variety of opportunistic infections, the incremental burden on the health care system is bound to be significant.

[19] J. Shaw, personal communication.

[20] Sister Ursula Sharpe, Kitovu mission, personal communication.

[21] Dr. M. Duggan, hospital administrator, personal communication.

Table 3.2: Mulago Hospital One-Day Census, Ten Most Frequent Diagnoses

Diagnosis	Number of Patients
Pulmonary TB	176
Cancers	113
Malaria	64
Normal Delivery	54
Complications: labor	36
AIDS	24
Puerperal infection	23
Cystitis	16
Measles	15
Malnutrition	49

Source: J. Shaw 1990.

Estimation of Needs and Costs of Essential Drugs for AIDS [22]

AIDS is not an epidemic of a single disease but a heterogeneous mosaic of potentially large numbers of illnesses, arising because of a weakened immune system. It is difficult to portray an "average" person from the time of full-blown AIDS to death and thus calculate average drug costs.[23] There is great variability in the frequency and severity of AIDS-related conditions across patients. In the absence of reliable health information and data from longitudinal studies, assumptions and estimates must be made. An algorithm is outlined and then applied to Uganda. The first piece of information required is a *list of the types of opportunistic infections and average number of episodes per AIDS case.* Once the proportion of AIDS patients with a given single condition is known, the next step is to apply probable *treatment*, ideally based on a standardized protocol and clinical management guidelines, which assumes rational prescription practices. The treatment given will also depend on *currently available drugs* in the system. From this, a *cost per treatment episode* is derived. Because many opportunistic infections associated with AIDS will reoccur, the likely *number of treatment episodes* that the patient will have until death is needed. The *number of AIDS cases* is then applied to yield an estimated total drug cost. Finally, because it is likely that not all AIDS cases will seek care in the formal health care sector, a range of utilization assumptions is offered.

Frequencies of AIDS symptoms. AIDS cases reported to the Ministry of Health indicate major signs and symptoms. Based on this, the proportion of HIV-related conditions requiring treatment

[22] The calculations that follow were based on data and prices collected during a December 1990 visit to Uganda. While the figures have not been updated, the methodology and relative magnitude remain valid.

[23] More specifically, medical treatment options for AIDS include both treatment of the opportunistic infections and attempts to treat the immunodeficiency itself by killing the human immunodeficiency virus (HIV) directly. For the latter, the drug costs are prohibitive and to date of unproven efficacy.

among AIDS cases has been estimated based on interviews with experienced health care providers and supplemented by an evaluation of the WHO clinical case definition in Uganda. Table 3.3 gives the estimated proportion of AIDS cases likely to experience selected conditions.[24] Although fever, weight loss, and lymphadenopathy are among symptoms frequently reported in AIDS patients, they have not been included. Chronic diarrhea and TB lead the list, with an estimated 60 percent of AIDS cases experiencing at least one bout of diarrhea lasting longer than one month, and half of cases suffering from pulmonary TB.

Table 3.3: Proportion of Adult AIDS cases with Selected Signs/Symptoms*

(percent)

HIV-Related Condition	Percent
Chronic diarrhea (>1 month)	60
Tuberculosis (pulmonary)	50
Body rash	40
Esophageal Candidiasis	35
Chronic cough (> 1 month)	30
Herpes zoster	10
Chronic or aggressive Herpes simplex	5
Dissem. Kaposi's sarcoma	3
Cryptococcosis	1

* AIDS cases will usually have more than one sign/symptom simultaneously.
Source: Based on ACP surveillance reports and clinician interviews.

Pediatric AIDS. Clinical signs and symptoms of HIV infection and AIDS are nonspecific in children. Prolonged fever, diarrhea, and cough are also symptomatic of other chronic diseases, such as TB and measles. With HIV infection, these symptoms are persistent and severe; however, failure to thrive despite an adequate protein/calorie diet is the most remarkable feature in children with AIDS (see also chapter 5). Management of the HIV-related manifestations in children is similar to that for adults with the appropriate modification of drug and dosage.

Adult treatment costs. Assuming the patient has had at least one occurrence of a given condition, the expected number of treatment episodes are shown in table 3.4, column B. More severe or prolonged conditions, such as TB and Kaposi's sarcoma, are likely to occur only once. The cost of drugs per treatment episode of an AIDS-related condition is shown in descending order in column C; the selection of drugs was based on the draft clinical treatment guidelines that were available at the time

[24] With the exception of chronic or aggressive Herpes simplex, sexually-transmitted diseases (STDs) do not figure among AIDS signs and symptoms. STDs, however, *do* play a paramount role in the spread of HIV. Treatment of STDs has therefore received considerable attention as a key to prevention efforts. Quantification of drug requirements for STDs has not been considered here.

in Uganda. The average treatment courses and the costs shown are indicative. Variability in cost will be introduced by the choice of treatment, which is determined in part by drug availability and clinical judgment. These figures do *not* include expenditures currently incurred by patients for traditional medicines or self-prescription with over-the-counter drugs.

The drug cost per illness episode for an adult case ranges from $13.20 (for an episode of Kaposi's sarcoma) to less than $0.10 (for an episode of Herpes simplex). Although treating one episode of Kaposi's sarcoma may be high, only a small proportion of AIDS cases will suffer from this and usually only once. As a result, the average cost per AIDS case (column D) is lower. Esophageal candidiasis tops this list at $4.20, afflicting 35 percent of cases, with about ten episodes per case. *The average lifetime drug cost per adult AIDS case is $13.80.* Of this esophageal candidiasis, tuberculosis and diarrhea together account for over three-quarters of the average drug cost.

Table 3.4: Summary of Drug Costs Per Treatment Episode of AIDS-Related Conditions
(1990 US dollars)

Symptom	Cases with Symptom (%) (A)	Treatment Episodes (B)	Cost per Treatment Episode (C)	Average cost/case (D)
Kaposi's sarcoma	3	1	13.20	0.40
TB (pulmonary)	50	1	6.94	3.47
Herpes Zoster	10	3	1.88	0.56
Body Rash	30	3	1.81	1.63
Chronic Diarrhea	60	4	1.21	2.90
Esophageal Candidiasis	35	10	1.20	4.20
Chronic Cough	30	3	0.72	0.65
Herpes simplex	5	3	0.08	0.01
Total Average Drug Cost per Case:				$13.80

Source: Staff calculations based on information collected during mission; see annex III.

Comparative costs of treatment regimens. The figures in table 3.4 were based on the use of the least expensive and routinely supplied essential drugs in Uganda and assume Uganda has procured these drugs at internationally competitive prices; therefore, the figures are probably conservative. To appreciate the sensitivity of price-to-treatment regimes, the representative Uganda regimen is compared with the drugs recommended by the WHO/GPA clinical management guidelines for HIV infections in adults. Table 3.5 shows the large divergence in cost, which is attributable mainly to the provision of acyclovir for herpes. A shorter and more expensive chemotherapy course for TB is also recommended, as is a costlier drug to treat oral candidiasis. Assuming the WHO/GAP guidelines were followed, drug outlays would increase twenty-fold compared with the estimates in table 3.4. Drugs that address the

immune system itself (such as zidovudine or AZT) are also not included in the WHO/GPA or Ugandan guidelines but would boost implied expenditures even further.[25]

Table 3.5: Comparison of Treatment Regimes

Symptom	Cost per Treatment Episode		Average cost per case	
	Uganda	WHO	Uganda	WHO
Chronic Diarrhea	1.21	1.21	2.90	2.90
Chronic Cough	0.72	0.72	0.65	0.65
Body Rash	1.81	3.59	1.63	3.23
Herpes Simplex	0.08	100.00	0.01	15.00
Kaposi's	13.20	13.20	0.40	0.40
Esophageal Candidiasis	1.20	34.44	4.20	120.54
TB (pulmonary)	6.94	39.36	3.47	19.68
Herpes Zoster	1.88	400.00	0.56	120.00
Total per adult case			$13.82	$282.40

Source: Staff calculations derived from *Guidelines for the Clinical Management of HIV Infection in Adults*, World Health Organization, Global Programme on AIDS, December 1991.

Projected numbers of AIDS cases. The final input required is the number of AIDS cases during any given year. Total annual AIDS cases for 1991–95 generated by the AIDS projection model in chapter 2 are used. The scenarios do not differ in numbers of AIDS cases before 1995 because of the long incubation period between infection with the virus and full-blown AIDS. Total annual costs, expressed in 1990 US dollars (table 3.6), assume all AIDS cases seek care and that pediatric cases are equivalent to half an adult in terms of dosage. In 1991 it was estimated that an incremental $1.4 million would have been spent if all AIDS patients sought medical care and there was 100 percent drug availability. These costs are estimated to escalate to almost $2.3 million by 1995 (expressed in 1990 prices). If WHO/GPA guidelines were followed, drugs costs in 1991 would have been nearly $29 million. These are, of course, orders of magnitude. Refined estimates of additional drug costs for AIDS treatment will require reliable data from the health information system and the ACP surveillance system, coupled with standard treatment protocols.

[25] This is an example of a drug used to attack the immunodeficiency itself; a six-month course of AZT is above $1,000.

Table 3.6: Annual Drug Costs for AIDS Treatment*

Symptom	1991	1992	1993	1994	1995
Chronic Diarrhea	297,370	347,318	395,089	439,230	477,708
Chronic Cough	66,355	77,501	88,160	98,010	106,596
Body Rash	166,810	194,828	221,625	246,386	267,971
Herpes Simplex	1,024	1,196	1,361	1,513	1,645
Kaposi's	40,550	47,362	53,876	59,895	65,142
Esophageal Candidiasis	430,080	502,320	571,410	635,250	690,900
TB (pulmonary)	355,328	415,012	472,094	524,838	570,815
Herpes Zoster	57,754	67,454	76,732	85,305	92,778
Total Costs	1,415,270	1,652,992	1,880,347	2,090,426	2,273,555

Source: Derived from tables 2.2 and 3.5.

** Expressed in 1990 US dollars. Assumes all cases are treated and that pediatric AIDS case dosage is equivalent to half an adult dosage.*

As demonstrated above, the estimated total drug cost depends on the treatment protocols used and the rational use of pharmaceuticals;[26] however, the utilization of health care facilities by AIDS patients for different opportunistic infections will also affect the overall magnitude of drug requirements. Utilization rates for health care facilities in Uganda are not known, but it is highly improbable that 100 percent of AIDS cases are receiving continuous, or any, attention from the formal health care system. Demand for health care (as reflected by utilization rates) depends on a variety of factors, including: distance, quality, price of services, degree of incapacity, and a household's income and ability to pay. Lower-level government and NGO health facilities are widely distributed with 57 percent of the population within 10 kilometers of a health unit,[27] suggesting that *proximity* is generally not a problem. A major proxy for the *quality of care* is the availability of drugs. Drug treatment is the most eagerly sought service offered by the health care system and is likely to be a major determinant of utilization; however, knowledge about the adequacy of drug supplies in health units depends heavily on anecdotal information from clinicians and other health care staff. While the drug supply has vastly improved, shortages of many drugs were reported in early December 1990 at all levels of the health care system and in the Central Medical Stores (CMS). *Fees* are collected at nongovernment facilities; although there is no official cost recovery for public facilities, it is a widely acknowledged that there is some fee collection at these service delivery points. According to a 1989–90 household survey, 1 percent of household expenditures were for medical care. In terms of *incapacity*, it is unlikely that an AIDS patient in the final stages could walk to a health facility, even if within 10 kilometers. Finally, as will be discussed in chapter 5, *household income* of families with one (or more) HIV-positive

[26] Self prescription practices with drugs of varying quality and efficacy is widespread in Uganda. Table 3.6 is based on standard recommended treatment protocols and does not attempt to estimate current drug consumption patterns (and hence expenditures).

[27] For a more detailed discussion, see World Bank (1993c).

individuals is likely to be seriously eroded. Although there is no hard evidence about the proportion of AIDS patients seeking care, an upper bound can be estimated by looking at the results of the 1989–90 household budget survey. Although not AIDS specific, the survey asked for information about choice of health care provider, if ill during the previous two weeks. Fifty-two percent of those asked indicated they had chosen a government, private, or NGO facility; the rest said they had sought care from traditional birth attendants, traditional healers, or friends. With this in mind, table 3.7 shows total yearly drug costs for different proportions of AIDS cases seeking care. If only 50 percent attended formal care facilities, drug requirements would drop by half.

Table 3.7: Annual Drug Costs for Selected Utilization Rates
(1990 US$)

	Annual cost given percent AIDS cases treated		
Year	100%	50%	35%
1991	1,415.3	707.6	495.3
1992	1,653.0	826.5	578.5
1993	1,880.3	940.2	658.1
1994	2,090.4	1,045.2	731.6
1995	2,273.6	1,136.8	795.7

Source: Derived from table 3.6.

Results

The magnitude of additional drugs required because of AIDS can be seen in several ways. First, total per capita public expenditure on health (including drugs) by the public sector in Uganda in 1990 was about $3.00. The estimated average drug costs for an adult AIDS case ($13.80) is over four times that amount. Second, average drug costs for AIDS cases are high compared with other illnesses or prevention programs. For example, a treatment course for malaria—the leading cause of death in many Ugandan hospitals—using essential drugs (chloroquine) would cost less than 20 cents on average. The cost of vaccines to fully immunize a child against the main childhood diseases would cost just under $2.00. Even assuming that only 35 percent of AIDS patients ever sought treatment, the drug cost in 1991 could have bought vaccines to immunize one-third of infants. With the same moneys, 2.5 million malaria cases could have been treated.

Third, Uganda's public sector spent approximately $10 million for drugs in 1990–91. Incremental drug requirements based on typical treatment regimes used in 1993 in Uganda would absorb between 5–15 percent in 1991 depending on utilization levels. *By 1995, drugs for AIDS patients could consume between 8 percent and 23 percent of a constant public sector drug budget.* Although projecting treatment regimens and costs beyond 1995 is difficult, what is certain is that the number of AIDS cases will continue to grow until at least the turn of the century. Under the most optimistic scenario, 207,000 adults and 100,000 children will require treatment in the year 2000.

Management of AIDS-related conditions. Experience with clinical management of AIDS patients has evolved in Uganda. Only a few years ago, AIDS patients were denied admission to hospitals, while those on wards subsequently identified as AIDS patients were ignored and remained untreated. Attitudes and opinions have shifted significantly. A manual for treatment strategies has been prepared as have standard treatment guidelines, but there are few indications of how widely they are

available or followed;[28] however, treating all AIDS patients for every opportunistic infection will significantly affect the national drug budget. Because the government has limited resources to spend on pharmaceuticals, decisions may need to be taken regarding case management for AIDS. Although AIDS is a fatal and incurable disease, there are several benefits of treating the opportunistic infections related to AIDS. Benefits can be classified into those which directly improve the comfort and well-being of the individual patient and those which could be considered to accrue to others. For individuals, treating opportunistic infections can lengthen the time between the onset of AIDS and death. Moreover, such treatment could partially restore a person's productivity, improve the quality of the patient's life, and give pain relief in the last few months. Of the second type, treatment of tuberculosis and other communicable diseases could reduce *their* spread among the non-HIV infected population[29] (see box 3.1). These benefits should be considered along with the relative cost and effectiveness if trade-offs do need to be weighed.

Box 3.1: The Case of TB.

It is estimated that more than 50 percent of the world's population is infected with the tuberculosis bacilli, creating a large reservoir of latent TB. Once active, TB is a highly contagious disease. In Uganda, this reservoir rests in the segment of the population most affected by AIDS, young adults between 15–49 years of age. A 1990 study in Uganda found that 68 percent of pulmonary TB patients were HIV-positive and that the number of TB cases was rising. The relationship between HIV and TB is strong—each person infected with both HIV and active TB could infect twelve other persons with TB each year. Among the treatments of opportunistic illnesses afflicting AIDS patients, that for TB could be very cost-effective, despite the high cost of drugs required. Fortunately, pulmonary TB cases who are also HIV-positive respond well to treatment and can be successfully rendered noninfective. Treating TB, therefore, has important externalities in the form of secondary infections, especially when contacts include children under three who are at particularly high risk of infection.

Source: *The 1993 World Development Report: Investing in Health*, World Bank, 1993d.

Drugs needed for AIDS-related illnesses, however, are only one cost imposed on the health system and on families and communities. A recent study in Tanzania (World Bank 1992) has estimated that drugs represent approximately a third of direct medical costs including nursing care. Other costs involved in caring for AIDS patients are significant and include direct costs such as medical manpower costs and hospital overheads. In addition, there are also opportunity costs of providing less care to non-AIDS patients with curable diseases. The total direct medical costs for treating AIDS patients, although not quantified here, are likely to consume major shares of the public budget for health care. For example, in Tanzania, treating AIDS patients represents about 40 percent of the public health budget; in Rwanda, it is equivalent to roughly 65 percent of its public health care resources.[30]

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[28] Two documents summarize approaches to the management of HIV-related conditions in Uganda: *Guidelines for the Care of HIV Infected People*. Recommendations of the 1st Integrated National AIDS Care Conference, Bishop Tucker College, Mukono, January 14–18, 1990. *AIDS Care: Diagnostic and Treatment Strategies for Health Workers*, Elly Katabira & Richard Goodgame, Department. of Medicine, Makerere University School of Medicine.

[29] See World Bank (1992) for a more detailed discussion.

[30] Source: Martha Ainsworth and Mead Over. 1992. "The Economic Impact of AIDS: Shocks, Responses and Outcomes," Technical Working Paper No. 1. Washington, D.C.: World Bank.

Implications and Recommendations

The advent of AIDS will have a serious impact on Uganda's public health budget, even if only the incremental drugs costs are considered. It is important, therefore, that pharmaceuticals be efficiently and effectively utilized. Although treatment protocols have been developed in Uganda to treat individual opportunistic infections, it is not known what the criteria were for their selection (that is, efficacy, cost, and availability). An examination of the existing and alternative treatment protocols on the basis of cost-effectiveness is warranted. An analysis of the cost-effectiveness of various interventions would weigh the costs and benefits gained. In the case of TB, for example, the externalities of reducing the spread of TB would offset the cost of drugs used. And, if data were available in Uganda on the cost-effectiveness of interventions for other illnesses, they should be considered along with those for opportunistic infections of AIDS when allocating health resources.

Once the treatment protocols have been selected on the basis of cost-effectiveness, standard treatment guidelines should be revised, if necessary, and widely distributed to health personnel. In addition, an educational campaign on the rational prescription and use of drugs contained in the guidelines should also be considered.

Finally, treatment protocols for AIDS that are disseminated and followed can also help reduce drug shortages for both AIDS and non-AIDS patients. Protocols combined with information about the numbers of persons with AIDS can provide valuable information to drug quantification exercises and lead to more efficient bulk procurement.

Improving the efficiency and effectiveness of drug treatment for AIDS patients must be viewed within the overall context of the health system. This chapter has scratched only the surface of the impact on the health sector. There are major information gaps about the impact of AIDS on other inputs of the health sector, such as the increased demand for health personnel and health infrastructure (beds) and so on. And, it is not only the health sector that faces increased challenges in caring for AIDS patients—families and communities are also coping with the burden of illness. More information is needed about the costs and benefits of alternative strategies for caring for AIDS patients (for example, home-, community-, and facility-based care). Only then can policy decisions be taken on how to best cope with the increased health care demands of this epidemic.

CHAPTER 4.

MACROECONOMIC IMPACT: THE LABOR FORCE

The AIDS epidemic will have adverse implications for the Ugandan economy, not merely because of its magnitude but, more important, because of the ways in which AIDS differs from other illnesses striking Ugandans (for example, malaria or diarrhea). First, AIDS remains a fatal disease and contributes not only to increased morbidity but also mortality, as demonstrated in chapter 2. The most critical feature that distinguishes AIDS from other life-threatening or fatal illnesses is that it selectively affects adults in their most sexually active ages, which coincide with their prime productive years.

The impact of AIDS on the economy will be felt through its effect on two key inputs into economic activity—labor and capital. The most immediate impact will be through changes in both the productivity and size of the labor force.[31] AIDS will also have longer-term consequences for capital formation—both human and physical—which in turn influences the overall productivity of the labor force and ultimately economic growth. Although it has not been possible to model empirically the Ugandan economy due to data limitations, this chapter describes qualitatively how AIDS is likely to affect these two inputs of economic production. Chapter 5 follows with a discussion of the impact (through these variables) on Uganda's agricultural and formal industrial sectors.

Because of the pandemic proportion of AIDS in Uganda, it can be reasonably expected that in the long run, output will be negatively affected. This hypothesis is predicated on the fact that roughly 15 percent of the adult population are thought in 1993 to be infected with HIV and that the age groups most affected are in their prime productive years (that is, not the elderly or very young). Chapter 2 demonstrated that baseline measures of adult mortality are doubled and sometimes tripled for selected adult age cohorts. Furthermore, AIDS is not an illness that afflicts only the poor—a characteristic of most adult illnesses in developing countries. This means that the highly skilled and most productive workers as well the cadre of managers and civil servants are among those infected; however, while it is likely that long-run output will be lower, determining the actual magnitude will require empirical modeling of the economy that is beyond the scope of this paper.[32] In addition to information about differences in HIV prevalence among workers in the different sectors, variables such as the capital/labor ratio, the sectoral composition of output, and technological change must also be introduced.

Output per capita. Perhaps a more revealing indicator of the effect of AIDS on welfare is output per capita. Although the same empirical modeling should also be conducted, the relative magnitude of infection in skilled and unskilled workers and their relative marginal product becomes a critical variable. Thus, although unlikely, it is theoretically possible that per capita income could

[31] Although it should be remembered that because of the lengthy gestation period between infection with the virus and full-blown AIDS, the effects of the epidemic at the macroeconomic level will be revealed only gradually.

[32] Estimates based on an application of the Solow growth model for Tanzania showed that for the period 1985-2010 the average real GDP growth rate could be reduced by between 15 to 28 percent with AIDS. Average annual GDP growth over the same period could be as much as one percentage point lower. See Cuddington, John. (1991) *Modelling the Macroeconomic Effects of the AIDS with an application to Tanzania,* Georgetown University.

perversely increase because of AIDS. For example, if the marginal product of an agricultural laborer is, say, close to zero, then the death of that person barely changes aggregate output but decreases the denominator (population), thus raising average per capita output. The issue is whether the magnitude of AIDS is such that the effects are no longer at the margin but instead affect average productivity. Although detailed data on HIV prevalence by sector employed are not available, the channels through which AIDS will affect labor as an input followed by a description of the Ugandan labor market is offered as a first step in understanding the significance of AIDS for output per capita. A brief discussion of the impact of AIDS on capital formation also suggests lower levels of per capita output in the long term.

The Impact of AIDS on the Labor Force

The potential contribution of labor as an input to production depends on both the absolute size of the labor force and its productivity. By causing premature mortality to a significant number of workers between the ages of 15–60, AIDS will reduce both the size and growth of the labor force. By the year 2010, there will be 2.1 million fewer in the labor force age group assuming that 15 percent of adults are currently infected and the epidemic continues unchecked (scenario II). Under the most optimistic scenario, there would still be 1.9 million fewer in the labor force by 2010 or approximately 12 percent less than the labor force would have had without AIDS.

Productivity. As with other illnesses, opportunistic infections related to HIV/AIDS will negatively affect an individual's productivity. Episodes of various HIV-related illnesses, even early on, are debilitating and impair productivity through reduced functional capacity.[33] Unlike other illnesses, however, persons with AIDS have little hope that their health will be fully restored, and instead can expect to experience continuous occurrences of opportunistic infections related to HIV.[34] In terminal phases of AIDS, individuals are often completely immobilized. In addition, there will be secondary effects on productivity due to morbidity caused by AIDS. Other household members will reallocate some of their time to care for the patient, potentially reducing overall household allocation for productive activities in the home, field, or market. Children may be withdrawn from school to compensate for the reduction in adult labor availability. The situation may be further compounded if several adults in a single household are infected, which is not unusual given that AIDS is predominantly transmitted heterosexually.

In addition to morbidity, the premature death of persons with AIDS affects productivity by robbing the economy of experienced workers, many of whom are difficult and expensive to replace. The loss of such accumulated experience can be detected by observing a younger average age of the labor force. The loss of women—who are key to production in both the home (food preparation and child raising) and in agriculture—will be particularly devastating because they are not only more likely to be infected than men but at critical ages when their children are young.

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[33] For example, TB, if treated, usually requires a two-month hospitalization period.

[34] HIV is here defined to include the entire spectrum from infection with the virus to the final and terminal stage with full-blown AIDS. The median period between infection and full-blown AIDS is thought to be around ten years; a person with full-blown AIDS is expected on average to live one year in Uganda.

Communities, too, are visibly affected by AIDS morbidity and mortality, particularly in districts such as Rakai where the epidemic first took hold. Time of extended family members and friends is diverted to help look after AIDS patients, assist with field work and attend funerals, which traditionally last three days in Uganda.

Characteristics of Uganda's Labor Force

Although Uganda does not have recent labor force statistics, a recent World Bank study derived estimates based on the 1991 Population Census results and the 1988–89 Household Budget Survey (HBS).[35] In 1992, the Ugandan labor force was approximately 6.57 million. This reflects an activity rate (ratio of labor force to total population) of about 45 percent if female "homemakers" are included in the labor force; if they are excluded, the labor force represents 38 percent of the population.

Sectoral composition of employment. Uganda is predominantly a rural economy, with 89 percent employed in rural areas. It is also an agrarian economy, providing employment to almost 80 percent of all Ugandan workers and to 87 percent of rural workers (see table 4.1). In fact, almost 18 percent of the urban labor force depends on agriculture compared with only 13 percent for urban industries.

Services generate employment for the next highest share of the total labor force. While 16 percent of the total labor force is involved in services, this is highly skewed toward urban areas: 65 percent of all urban workers as compared with only 10 percent in rural areas. The urban labor force active in services is predominantly employed by the public sector, which accounts for 80 percent of urban formal sector employment.[36] Also included in services are the urban informal sector engaged in trading and the numerically very small tertiary activities (such as banking, transport, and trade).

Industries provide only a very small portion of employment to the Ugandan labor force. Three percent of total workers are involved in industrial production, of which 13 percent are in urban areas and only 2 percent in rural areas. Of these, less than 1 percent are employed in what could be termed the formal manufacturing sector, implying that the rest earn a living through informal activities, which are characteristically low in output and income.

Finally, table 4.1 also indicates that unemployment is very low in Uganda. Overall, less than 1 percent of the workforce is unemployed, with much lower levels in rural areas. This supports the observation that despite rapid population growth, there is a relative shortage of labor in Uganda. As explained below, this is particularly true in rural areas where labor is relatively scarce compared with the availability of land.

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[35] World Bank, 1993, *Uganda: Growing out of Poverty*, Africa Country Department III.

[36] World Bank, *ibid.*

Table 4.1: Distribution of the Labor Force, 1992
(mid-year, in percentage of column totals)[*]

Category	Urban Uganda			Rural Uganda			Total Uganda		
Employed in:	Male	Female	Total	Male	Female	Total	Male	Female	Total
Agriculture	12.9	24.8	17.8	81.3	94.0	87.3	73.3	89.9	79.6
Services	63.4	66.6	64.9	15.2	5.1	10.5	20.9	11.4	16.5
Industry	20.1	4.3	13.3	3.2	0.6	2.0	5.2	1.0	3.2
Unemployed	3.4	4.7	4.0	0.3	0.2	0.2	0.7	0.7	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Column figures may not actually total 100 percent due to rounding.
Source: Derived from World Bank 1993b, p. 91.

Gender distribution of employment. According to international accounting conventions, the value of "household activities" of women are generally not included in the calculation of national income, nor are women, who are predominantly engaged in them, included in the tally of the labor force. If this convention is applied to Uganda, then 35 percent of women are members of the labor force, compared to 42 percent of men.[37] In Uganda, as elsewhere, these activities do produce welfare, even if they are difficult to quantify and evaluate monetarily. Moreover, in Uganda, women who are predominantly engaged in household activities most likely hold a second "job" as the backbone of family economic activity. If women who are principally engaged in household activities *are* included in the workforce, then 49 percent of women would be classified as engaged in productive labor. In this case, women are substantially more active than men (with a 43 percent activity rate). Table 4.2 shows the results of a 1985 survey of the division of labor in rural Uganda, which indicates that women bear a more intensive workload. For example, of total household time devoted to growing food, women accounted for 70 percent. Women also contribute much more social labor than men—as evidenced by the proportion of family time spent raising children or participating in community projects. And, carrying water is also a woman's work accentuated by the lack of appropriate domestic technology.

Agricultural labor market. Given the predominance of the agricultural sector in both output (comprising 54 percent of GDP and 90 percent of export earnings in 1990) and as a provider of employment, it is worth noting several characteristics of the rural labor market. First, most agricultural employment is on small, family household farms. The HBS showed that 62 percent of farm households had 1 hectare or less of land; 85 percent had 2 hectares or less; and just over 95 percent had less than 4 hectares. Large-scale commercial farms provide much less employment in rural areas and comprise relatively less land than small-scale peasant agriculture. Overall, distribution of land in Uganda is characterized by relatively universal access, if not ownership, to land.[38]

[37] World Bank, *ibid.*

[38] World Bank, *ibid.*

A second feature of the agricultural labor market is that smallholder agriculture is based on labor-intensive production techniques. The lack of complementary inputs (fertilizers, implements to help cultivate land) means that the returns to labor are modest. Nevertheless, the structure of agricultural production is such that smallholder farms produce practically all agricultural output.

Table 4.2: Division of Labor in Rural Uganda
(percent of total activity time)

Activities	Women	Men
Growing Food	70	30
Storing Food	50	50
Grinding, Processing Food	100	—
Caring for Animals	50	50
Selling, Exchanging Produce	60	40
Fetching Water	90	10
Fetching Firewood	60	40
Child Care	100	—
Cooking	100	—
Cleaning	100	—
House Building	30	70
House Repair	50	50
Community Projects	70	30

Source: *UN World Conference to Review and Appraise the Achievements of the United Nations Decade for Women: Equality, Development and Peace: Selected Statistics and Indicators on the Status of Women* (Report of the Secretary General), 1985. From Jarawan, 1991.

Third, because of the universality of access to land, most of the rural labor force are actively engaged in activities on their own farms. Because of this, there is not a large pool of wage labor in agriculture. Of the total amount of labor used in agricultural production, at most 20 percent would be hired; the figure is probably closer to about 10 percent.[39] Of the wage employment in rural Uganda, the bulk of it is either casual labor or short-term contract—largely drawn from farmers tied to their own farms—and not permanent workers.[40] Historically, permanent workers were migrant workers from neighboring countries and employed on large-scale commercial farms. In 1993, because of border hostilities, this supply is now insignificant.

Finally, the returns to labor from smallholder farms are the most profitable activity for an unskilled person in Uganda.[41] Compared to the wages offered as a casual or permanent agricultural

[39] World Bank, *ibid.*

[40] Alison Evans, *A Review of the Rural Labor Market in Uganda,* School of African and Asian Studies, University of Sussex, May 1992.

[41] World Bank, *ibid*, p. 97.

worker or even unskilled labor in urban formal sector or government service, the average returns to family labor are significantly higher. This implies that casual labor is supplied by poorer peasant households with below average returns to labor or those who would face sharply diminishing returns if that labor were kept on the family farm.

To summarize, the bulk of the Ugandan labor force—including a large contribution from women—is employed in agricultural production, which in turn accounts for a large share of national output. While the rural sector forms the pool of labor for the economy, there are, however, relative shortages of labor in the agricultural sector, implying high average opportunity costs to seek employment as unskilled wage laborers in off-farm, rural or urban activities.

Socioeconomic Status and Risk of HIV Infection

Given the structure of the Ugandan labor force, the next questions to ask are: Who and how many are infected? What do they do? Where do they live? As AIDS began to spread through African capitals, it did not discriminate among higher socioeconomic groups. In fact, many early studies showed that AIDS disproportionately affected the urban elite.[42] Characteristics such as urban residence and higher education and income levels pointed to higher relative risks of HIV infection.

Early evidence: National Serosurvey (1987–88). The 1987–88 national serosurvey tested blood samples for over 3,400 adults in three regions of Uganda, with clusters drawn from urban and rural locations. A questionnaire was also administered, which, among other things, asked about occupation. Occupational categories included: professional, worker/driver, housewife, farmer/fisherman, student, and unemployed. Table 4.3 shows the proportion infected by occupational status, residency, and gender. Among urban dwellers, 23 percent were found to be HIV-positive, whereas 9 percent of rural residents were infected. As noted in chapter 2, a higher proportion of women were infected than men. The proportion of those infected was also higher among the professional and worker/driver categories and less for farmers and fishermen. Further analysis of the data can provide clues as to whether residency, occupation, or gender, or some combination of these factors were significant determinants of HIV status.

[42] See, for example, Berkley and others 1989b; Ndilu, M. and others, 1988. "Medical, Social and Economic Impact of AIDS in a Large African Factory." IV[th] International Conference on AIDS, Abstract. Stockholm.

Table 4.3: Uganda National Serosurvey by Occupation, Residency and Gender, 1987–88
(number in sample and percent HIV-positive)

CATEGORY	Tested	Positive (%)
Occupation		
Professional	497	24.6
Worker/Driver	296	21.3
Unemployed	477	14.3
Unknown	40	15.0
Housewife	1056	13.2
Student	316	11.7
Farmer/Fisher	744	8.3
Residency		
Urban	1399	22.9
Rural	2,027	8.7
Sex		
Male	1,314	12.3
Female	2,112	15.9

Source: Uganda National Serosurvey 1988.

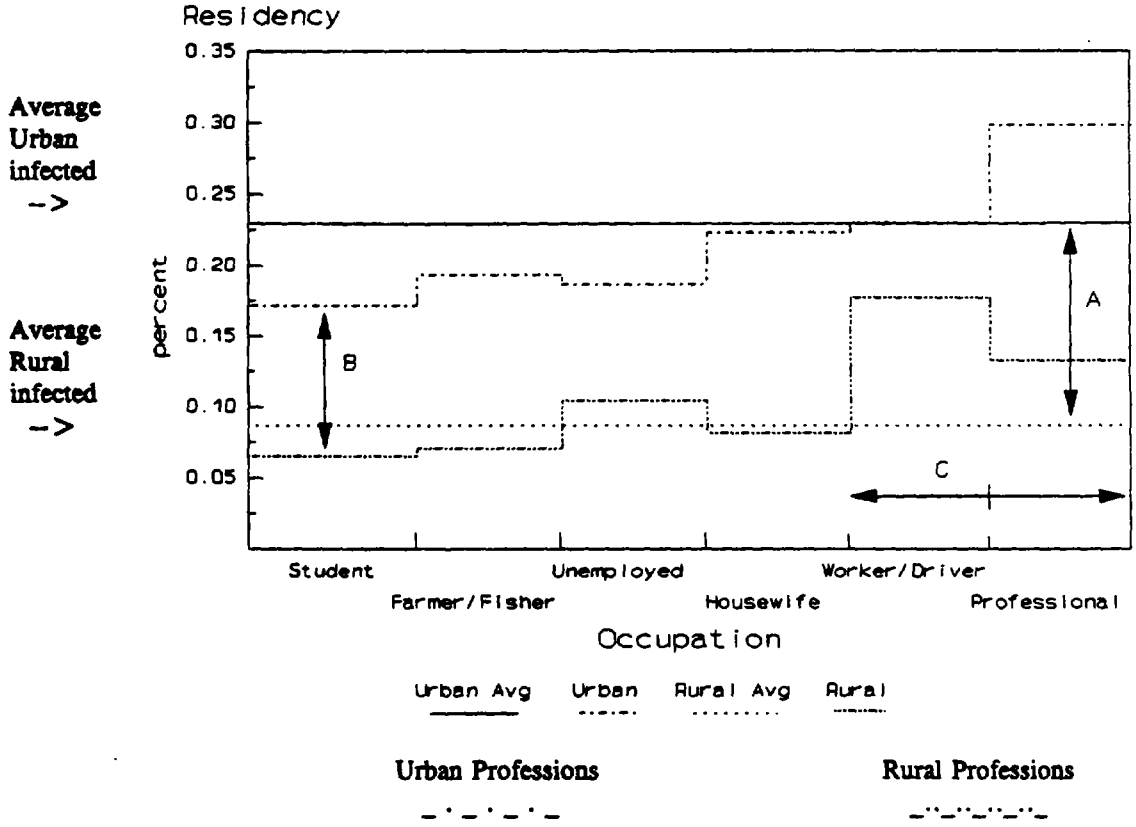
Occupation/residency. Figure 4.1 shows graphically the differences in proportions infected by residence and occupation. Statistical tests indicate that the difference between urban and rural infection rates for the entire sample (arrow A) are significant at the 5 percent level.[43] By examining the composition of urban/rural samples by occupational status (arrow B), significant differences were also detected between urban versus rural residents despite their occupation. In other words, *the probability of infection—regardless of occupation—is higher if one lives in an urban area.*

Differences across occupational categories *within* residency categories were also tested (arrow C). The calculations for both urban and rural subgroups used the farmer/fisherman category as the reference occupation. Overall in the urban group, not much difference among occupations was observed. There is some evidence that the professional category had a higher probability of infection than (urban) farmers (significant at 10 percent level). Among the rural classification, the professional and driver/worker occupations had a significantly greater probability of infection than other rural professions (significant at 5 percent). This is hardly surprising, as these two jobs are likely to entail travel to and from urban areas. There was weaker evidence (significant at 10 percent) that proportions of infected among the rural unemployed were greater than the reference occupation. This, too, might be explained if the unemployed travel to urban areas seeking work.

[43] Differences between proportions were tested allowing for sampling error employing standard testing procedures. The test statistic is asymptotically normal. Two-tailed tests were carried out at various significance levels.

Occupation/gender. Testing for differences between infection of males and females confirms earlier observations that women are more likely to be infected than men (1 percent level) in a ratio of 1.3 to 1. This difference is positive across occupational categories; the difference is significant for workers/drivers (1 percent level) and still suggestive for students (10 percent level). The likelihood that female students are more likely to be infected than men is disturbing; young women may seek paid sex to support educational expenses.[44] Comparing occupational categories for men and women separately, the professional and worker/driver categories were significantly higher than farmer/fisherman (10 percent level). For unemployed women, the sample suggested that a higher proportion were infected, perhaps because it included women involved in commercial sex.

Figure 4.1: HIV Infection by Occupational Status and Residency



Source: World Bank Staff Estimates based on Uganda National Serosurvey 1987-88.

Dynamics. The serological survey that was conducted in 1987–88 provided a weighted estimate of adult HIV infection of about 9 percent. In addition, it indicated that the probability of infection was higher if one lived in or traveled to urban areas. As detailed in chapter 2, HIV infection has continued to spread such that current infection levels among adults are estimated to range between 15 to 20 percent. Moreover, there are signs that the epidemic has spread beyond an initial concentration in urban areas and higher occupational groups and that it is spreading rapidly in rural areas.

[44] This has been known to happen in Uganda to fourteen-year-old girls and reported in a Ugandan weekly paper; see "Selling Sex for School Fees," *Weekly Topic*, December 14, 1990.

One crucial factor explaining the narrowing of differentials between urban and rural prevalence rates is the movement of people between urban and rural areas and the mixing with groups that have higher risk factors for HIV infection.[45] A 1989–90 study in the predominantly rural district of Rakai district sought to understand the dynamics of the spreading of the epidemic to and within rural areas.[46] It found adult HIV prevalence levels of over 38 percent in trading centers located on the main road carrying traffic from Tanzania, Rwanda, and Kenya; 25 percent in trading villages located on secondary dirt roads; and 9 percent in the most isolated agrarian villages. Their conclusion was that the main trading centers, characterized by the presence of hotels and bars, were an obvious reservoir of HIV outside of urban areas. The sexual interaction of long-distance truck drivers with local women served as a conduit for spreading infection to intermediate trading villages and remote agricultural villages. Not unsurprisingly, seroprevalence was higher among women than men, especially in the main trading centers. Elsewhere in Uganda, this same mechanism may be working to spread HIV facilitated by the massive road repair works undertaken following the years of civil war. The movement of military forces (themselves a high risk group), particularly to the north, also contribute to the interaction of urban and rural populations.

Box 4.1: AIDS and Poverty

There is evidence from one district that HIV is spreading among lower income groups. A 1992 study of fifteen villages in Masaka district looked at the linkages between socioeconomic status and poverty. It found that both women and men of low socioeconomic status were at greater risk of HIV infection than those of higher status. It argued that an individual's lack of access to resources leads to risk-prone, income-generating activities, especially for poor women. The study found that:

> "vulnerability to infection . . . would occur when a woman adopt[ed] . . . an income-generating strategy, such as brewing or selling alcohol, coupled with the provision of sexual services to provide cash income . . . qualitative analysis suggested that alcohol manufacture is one means by which the poor seek to increase their income, and alcohol consumption may keep some men and women in poverty and at increased risk of 'careless' sex."*

Thus, in addition to lower levels of per capita income, the AIDS epidemic might also mean that the distribution of income could be adversely affected if low socioeconomic status (especially poor women in rural areas) increases vulnerability to HIV infection.

* *Source:* Janet Seely and others 1992. *Socioeconomic Status, Gender, and Risk of HIV-1 Infection in a Rural Community in South West Uganda*, Medical Research Council (UK) Programme on AIDS in Uganda.

Another factor narrowing the gap between urban and rural prevalence rates is that as the epidemic progresses, prevention efforts aimed at reducing further transmission are likely to first have an impact on the urban elite. Higher socioeconomic groups are more literate and exposed to written

[45] Migratory workers in copper mines in southern Africa and truck drivers travelling inland from coastal ports are known to have substantially higher risk ratios.

[46] Wawer, M. J. and others, 1991, *op. cit.*

media messages of education and information campaigns. In addition, this group might also be more apt to know where to obtain condoms and how to use them effectively, and be able to afford them. Similarly, access to and ability to pay for treatment of other sexually transmitted diseases is liable initially to reduce spread of AIDS among higher economic classes.

A final factor that may obscure the growing enormity of the problem in rural areas and among lower social strata arises because of poor surveillance and reporting. AIDS cases are reported to Ministry of Health officials only if they are seen by health workers in the formal health care system. Health personnel working in rural areas of Masaka and Rakai districts confidently estimate that they come into contact with less than 20 percent of AIDS cases. Many people suffering from full-blown AIDS either know they cannot afford modern treatment or find it inaccessible. Many seem to accept that any treatment will not be curative, while others prefer to seek medication ("cures") from traditional healers.

The Impact of AIDS on Capital Formation

Economic activity also depends on capital, both physical capital (such as equipment and infrastructure) and human capital. Investments in these forms of capital are made by businesses, governments, and households. For example, firms purchase physical capital (machinery) to produce output. Similarly, investments by governments and households in human capital (such as education and health care) are also expected to yield increased outputs—albeit on a more long-term horizon—through positive effects on the productivity of labor. These investments, however, must be financed out of public or private savings, or both. The AIDS epidemic will affect the stock of savings and hence the ability of governments, firms, and households to make capital investments.

As illustrated in the previous chapter, the fiscal implications in terms of increased public expenditures for health care because of AIDS is likely to mean reduced government savings or at least investments diverted away from other kinds of expenditures (perhaps education). In addition, Uganda must also contend with the cost of some support for its 784,000 orphans, identified in the 1991 census as those under 15 with at least one missing parent. Many, although not all, of these children were orphaned by a parent dying of AIDS.

Firms, too, will have fewer profits to potentially reinvest because of lower productivity and output and increased medical expenses due to AIDS. Rising health costs provided under employee benefit schemes will boost expenditures. Full sick leave entitlements are frequently and easily exhausted by those with AIDS. The costs of prolonged illnesses have a triple bite for employers—not only is output lost, but many workers continue to draw full (or graduated) pay while incurring medical expenses. Moreover, if these workers are essential, employers must pay for replacements. At death, many employers also meet funeral expenses. Finally, there is also a growing concern that the severity of the AIDS epidemic in Uganda will make it difficult to attract foreign investment to supplement national savings, in part because of the increased labor cost implications.

At the family level, savings will be drawn down because of increased health expenditures and costly funerals. Assets such as land or livestock might be sold to cover these expenses. The additional loss of the expected lifetime earning stream of income or output of the deceased further reduces family resources that might otherwise be invested in children. There is ample anecdotal evidence that outlays on health care (including preventive) for other household members are foregone. And, fewer resources

are also at hand to pay for school fees in an education system that currently places a heavy financial burden on families at the primary level.[47]

Discussion

Although the Ugandan economy has not been empirically modeled here, the presence of three key characteristics of the Ugandan economy and labor market strongly suggests that AIDS will have a negative impact on Uganda's economy and per capita income. First, the bulk of economic activity and production takes place in rural areas. Second, agricultural production is labor intensive. Third, despite rapid population growth, labor is a relatively scarce factor of production. At an aggregate level, the AIDS epidemic will bring about a significant reduction in the labor force—12 percent by the year 2010—striking adults in their prime productive years; however, as argued, the spread of HIV infection is still increasing rapidly in rural areas, where most of Uganda's population resides and where the bulk of economic activity takes place. Moreover, even though prevalence levels are currently lower in rural areas, the fact that over 80 percent of the population lives there means that in terms of absolute numbers, there will be many more people infected in rural areas. These effects combined with the intensity and relative scarcity of labor in agricultural production suggests that the AIDS epidemic is likely to have a negative impact on both overall production and per capita income (assuming that—at best—the capital stock and technology remain constant). Finally, future productivity and growth prospects are also influenced by society's ability to invest in their children today; the possibility that AIDS will also affect capital formation is very real.

Finally, to provide a quantifiable estimate of the impact of AIDS on the economy, macroeconomic modeling should be undertaken. In particular, it should explicitly incorporate the kinds of likely effects that AIDS will undoubtedly have on both labor and capital parameters.

[47] Enrollment rates in Uganda are currently between 60–70 percent.

CHAPTER 5.

SECTORAL IMPACTS

This chapter looks at the potential effects of AIDS on selected sectors, namely agriculture and the formal sector, including such firms as transportation companies, banks, hotels, construction companies, and so on.

AGRICULTURE

Agriculture is the engine of growth for the Ugandan economy, with the livelihood of over 80 percent of the population depending on it. The sector produced 51 percent of GDP in 1991 and nearly all of Uganda's exports. Food crops accounted for 71 percent of agricultural production (average 1989–91). Of this, only one-third ever reached market, implying that over 60 percent of food crops were grown for the producer's own consumption. Livestock products generated another 17 percent of agricultural GDP, export crops only 5 percent, fishing 4 percent, and forestry products 3 percent.[48] The bulk of production is concentrated almost exclusively on smallholder farms and tends to be very labor intensive. This includes coffee, which accounts for over 95 percent of the value of exports. Large-scale commercial production has tended to be limited to sugar and tea estates, although smallholders also cultivate about 40 percent of the area under tea. The consequences of AIDS for agricultural production will be driven largely by the effects on labor availability. Given the predominance of smallholder farms, this chapter first takes a qualitative look at the impact of AIDS at the family level, then examines sectoral implications.

Agricultural Production: Effects at the Household Level

Several studies[49] have suggested that AIDS will have a detrimental impact on rural households' productive capacity. The effects of HIV/AIDS will be felt on two key farm production parameters. First, household labor quality and quantity will be reduced, initially in terms of productivity when the HIV-infected person is ill and later the supply of household labor will fall with the death of that person. Moreover, the probability that more than one adult per family is infected is high, given the heterosexual nature of HIV transmission. A compounding factor is that infection rates are higher among women, who account for 70 percent of the agricultural labor force and 80 percent of food production (see table 4.2). In addition, other household members will devote productive time to caring for the sick person.

The second factor of household agricultural production that AIDS will affect is the availability of disposable cash income. During episodes of illness, household financial resources may be diverted to pay for medical treatment and eventually to meet funeral costs. Such resources could otherwise be used

[48] World Bank, 1993 (a), *Uganda: Agricultural Sector Memorandum*, Eastern Africa Department.

[49] Evans, Alison (1992) *A Review of the Rural Labour Market in Uganda*, University of Sussex; Barnett, T. and P. Blaikie (1992) AIDS in Africa: Its Present and Future Impact. Bellhaven Press; and Gillespie, S. (1989) *Potential Impact of AIDS on Farming Systems: a case study from Rwanda*, Land Use Policy, Vol 6, pp. 301–12.

to purchase agricultural inputs, such as occasional extra labor or other complementary inputs (for example, new seeds or plants, fertilizer, pesticides, or oxen power). Family assets, for example, livestock, might also be sold off.

What is the likely response strategy of a smallholder farm family in the circumstance of a death or deaths to AIDS? Established patterns of most smallholder farmers show that they will first produce enough to cover household subsistence and only then will they grow small and varying amounts of marketable surplus. Such behavior of peasant farmers has been termed a "survival algorithm;"[50] hence, if a household becomes unable to either supply such labor internally or hire temporary workers, the composition of crops may be gradually altered, shifting back toward subsistence crops. The key constraint will be during periods of peak labor demand, usually in planting and harvesting seasons, but, given the nature of the rural labor market, these are also times when wages or opportunity costs are most high. Another response to labor shortages would be to reduce the area under cultivation. And, it is likely that husbandry levels would also be less intense with some nonessential activities, such as weeding and pruning, curtailed.

Although coping mechanisms involving labor allocation decisions are not well understood, it is probable that they are based on returns to labor at the unit of the family.[51] Even the contribution of children's labor may be increased (with children withdrawn from school) as the family struggles to maintain current cropping patterns. But, as a family becomes more impoverished, it may have little choice but to produce for its own consumption needs. Even then, family nutrition levels could be gradually compromised (box 5.1). It is not uncommon in districts already especially affected by AIDS to observe entire families of children, with elderly grandparents as their only form of support. Figure 5.1 depicts how AIDS can affect an agricultural household, showing the variety of coping responses and the ripple effects triggered by the deaths of one or more adults. It also highlights the possible spillover effects from urban areas. Rural households who have family members infected in urban areas may suffer the additional loss of valuable cash remittances.

Assessing the Vulnerability of Farming Systems

The actual magnitude of the response mechanisms described above at the family level will, of course, also be affected by prevailing local labor market conditions, including factors that influence the demand for labor, such as the productivity of land and the availability of rainfall. For example, a single short rainy season limits flexibility in phasing peak cropping seasons to minimize bunching of labor demands compared with a bimodal cropping cycle with longer effective rains.[52] The impact of AIDS will be felt more in farming systems where labor is a relatively scarce factor of production.

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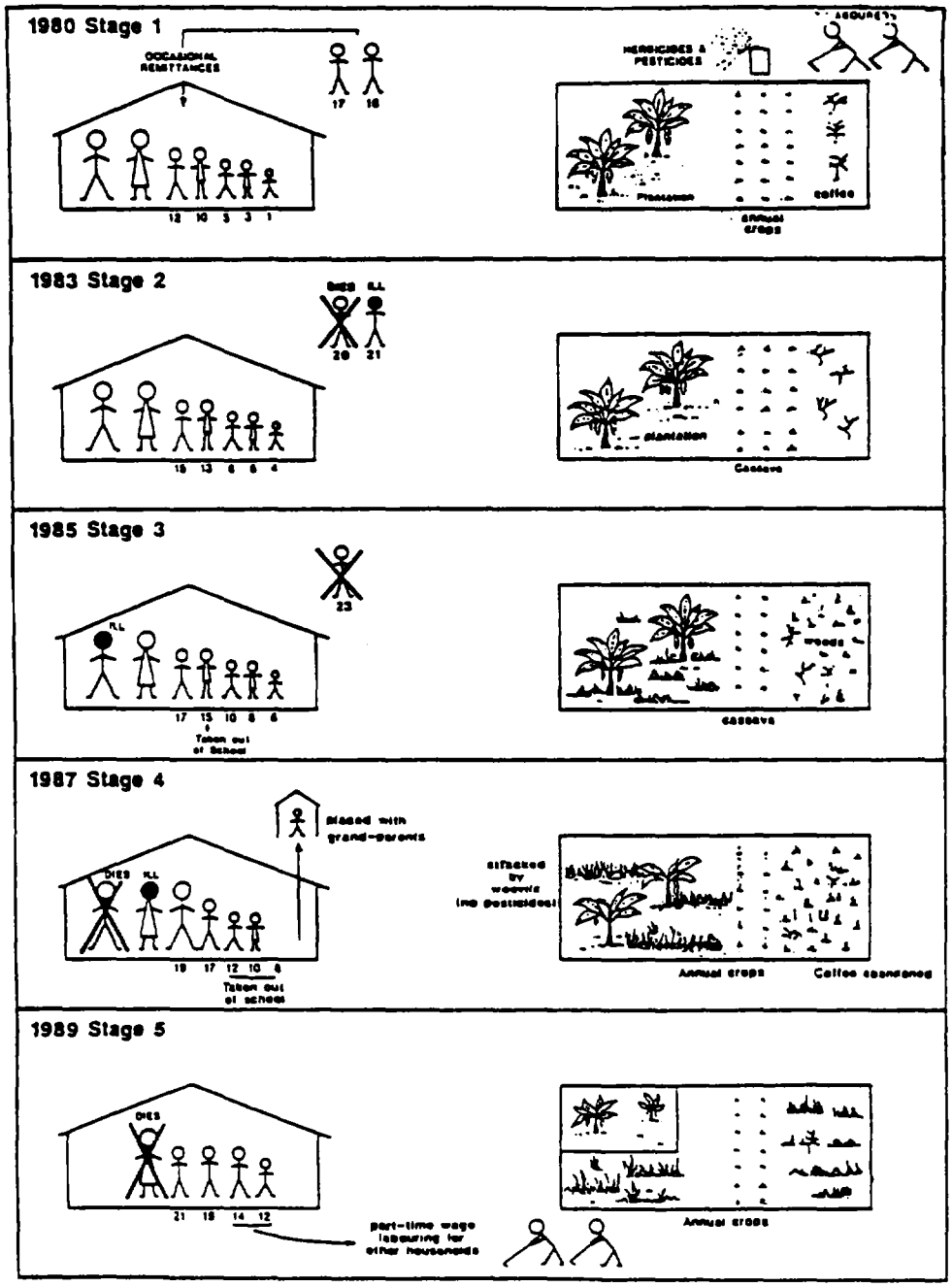
[50] Peasants are defined here as "farm households, with access to their means of livelihood in land, using mainly family labor in farm production, always located in a larger economic system, but basically characterized by partial engagement in markets that tend to function with a high degree of imperfection. They are cautiously risk-averse and are often said to practice a 'survival algorithm'" [Johnson and Sskeitoleko 1989, p. 5]

[51] The World Bank is conducting an ongoing study in neighboring Kagera district in Tanzania, which investigates household coping mechanisms in the event of adult mortality, such as AIDS.

[52] Evans, *op. cit.*

Figure 5.1 AIDS and the Rural Household



Source: Barnett, T. and P.M. Blaikie 1991.

Box 5.1: The Linkages between AIDS, Nutrition, and Food Security

The linkages between AIDS, nutrition, and household food security are complex. At the individual level, there are *direct effects* evidenced by visible extreme weight loss of those with full-blown AIDS. Such wasting might be recorded as acute malnutrition, but it is more a reflection of the difficulty of food intake because of HIV-related illnesses. For example, oral thrush makes swallowing extremely painful, thus limiting both food and water intake. Lack of water further exacerbates diarrheal conditions and the ability of the body to retain nutrients. Distinguishing between AIDS and acute malnutrition in young children is very difficult without performing blood tests, since signs of both conditions are extreme wasting. In general, though, Uganda has low (2 percent) levels of *acute* malnutrition in children and even though some areas had higher rates (4 percent in West Nile), the situation is not alarming. *Chronic* malnutrition in children (or stunted growth) was found to be generally high. And while overestimating actual chronic malnutrition—when it really is AIDS—is possible, it is unlikely to be significant. Chronic malnutrition or stunted growth will only show up in children over time. Unfortunately, pediatric AIDS cases do not live long enough to show serious signs of stunting.

More disturbing, however, are the *indirect effects* of AIDS within a household that threaten food security and the nutritional status of surviving family members. The disruption of the family as an economic unit because of AIDS in turn influences household food security through:

Reduced productive capacity:

- loss of adult/child labor
- increased time spent caring for the sick

Reduced purchasing power:

- reduced income
- increased medical expenditures
- loss of entitlement (for example, land)
- reduction in remittances and food transfers
- asset depletion

Reduced food availability per household member:

- increased number of dependents (foster families)

The extent to which malnutrition rates will rise when households are affected by AIDS will depend on: coping mechanisms due to the loss of an adult, particularly the mother who is the principal food preparer and caretaker of the young; vulnerability of the household to changes in economic status; and the ability of survivors to withstand the associated social and emotional stress of AIDS deaths. The nature and degree of malnourishment will take different forms. If food intake is severely compromised, a rise in *acute* malnutrition can be expected. Such wasting in very young children can occur rapidly; infants whose mothers are infected with AIDS will have reduced breast milk during illness and after her death. Other households may gradually reduce food intake resulting over time in increased *chronic* malnutrition. Alterations in crop and diet composition can compromise the quality of the diet, even though the quantity of food produced may remain stable. Switching from a cereal-based diet to a tuber/banana diet and reduced consumption of vegetable and animal proteins can lead to child malnutrition and an increase in specific nutrient deficiency diseases. In areas with high levels of HIV infection (for example, Rakai) there have been noted dietary changes, in particular a reduction in bean, milk, and cereal consumption and an increased reliance on bananas.

What does the AIDS epidemic mean for food security and nutrition in Uganda? If family disruption is a key precursor for food insecurity, one can expect a sharp increase in the indirect effects of AIDS-related malnutrition as adult mortality increases.

Source: Sylvester K. 1991.

As part of this study, geographical information system (GIS) technology was used to develop a georeferenced mapping of farming systems in Uganda. The classification of farming systems was drawn from two studies. The first from the Ministry of Agriculture[53] classified forty-nine farming systems in Uganda based on climate, soil fertility, and livestock/crop composition. The study employed linear programming to determine feasible crop activities, constrained by maximum monthly supply of labor and land and by meeting minimum energy/protein needs.

The Johnson and Ssekitoleko study found that seasonal labor demand, not land, was the binding constraint to increasing output in many farming systems. Barnett and Blaikie (1990) extended this classification by developing an algorithm to determine the vulnerability of these systems to labor loss given current cropping patterns and the feasibility of switching to less labor-intensive staple crops. They defined farming systems vulnerable to labor loss if labor supply was less than 80 percent of labor demand during peak seasons. In addition, systems that were energy or protein deficient were identified. Figure 5.2 is a map that classifies systems according to four main groups, each at risk to the AIDS epidemic in slightly different ways. The first are those that are vulnerable to labor shortages *and* also deficient in generating minimum intake levels of energy and/or protein. A second group comprises systems that are only susceptible to labor shortages during peak seasons. A handful of areas are deficient only on the protein/energy criteria. The final group of farming systems were not constrained by labor availability nor in meeting basic protein or energy requirements.

The most vulnerable areas in terms of the criteria of labor and energy/protein deficiency are: Moroto; Apac; Nebbi; the area surrounding the common boundaries of Mubende, Hoima, Masindi, and Luwero; and part of Kabarole. Farming systems facing only labor shortages include vast parts of the North, Soroti, Hoima, Kumi, Mbale, Kabale, and part of Masaka. Those areas likely to be in energy or protein deficiency are Kamuli and Bushyeni.[54]

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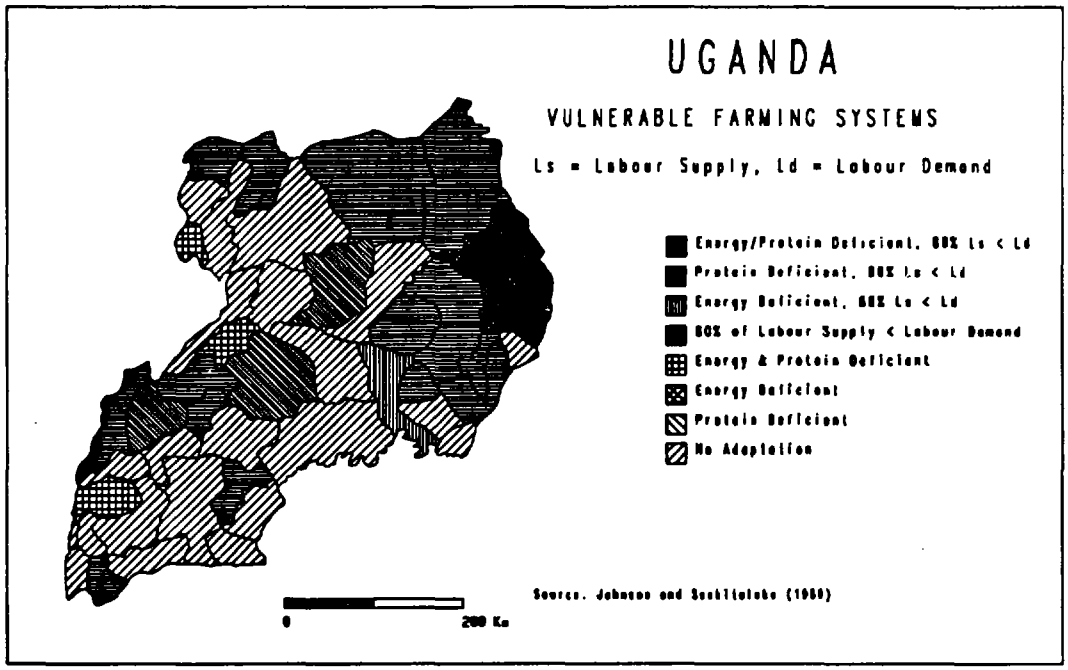
[53] Johnson and Sskeitoeko, 1989.

[54] Given that all four authors (Johnson/Ssekitoleko and Barnett/Blaikie) warn about the accuracy of the existing agricultural data on which they base their taxonomy, the above analysis (and its extension to consider the impact AIDS, which follows) should be interpreted as a potential methodology to consider the impact of AIDS at the farming system level. Further rapid rural appraisals need to be carried out to verify/modify basic data. In particular, calculations of labor equivalents (female and youth) need further review. The boundaries of districts and farming systems in most cases do not coincide.

Figure 5.2: Ugandan Farming Systems



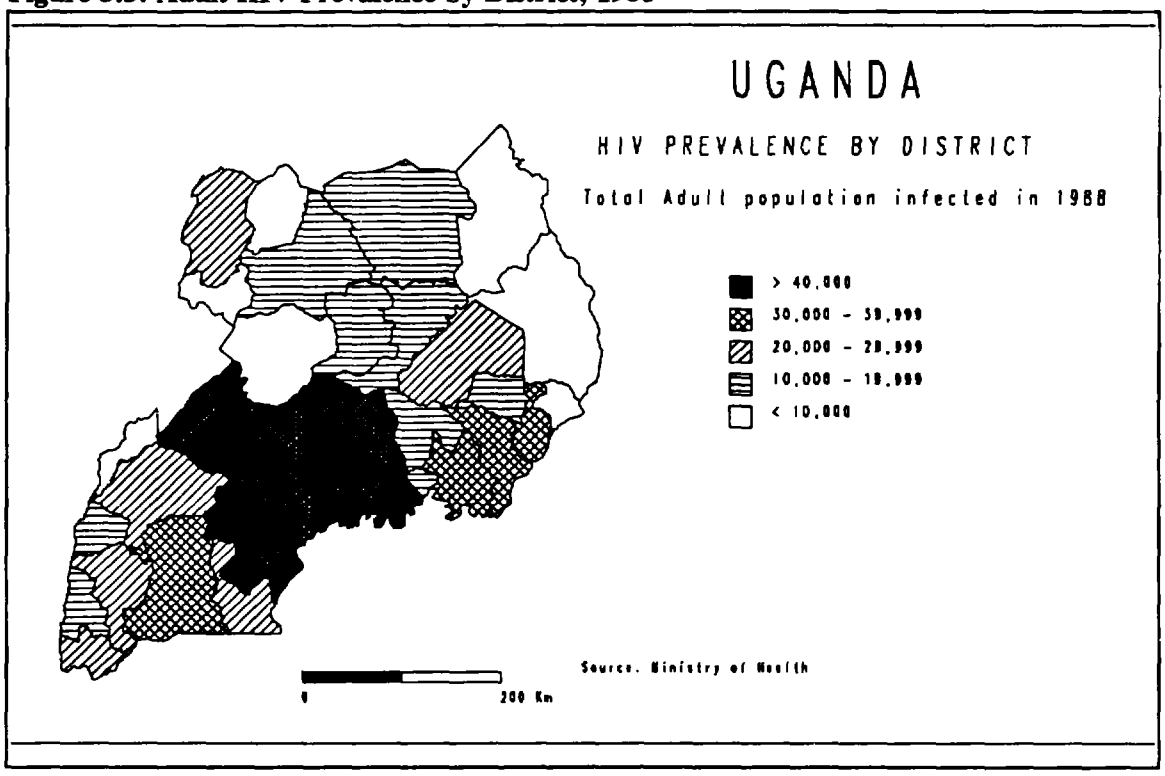
The implications of the HIV/AIDS epidemic for each category are fairly straightforward. For those systems already experiencing difficulty in meeting peak labor requirements (categories I and II), the impact of AIDS will only exacerbate the situation. And, because the effect of an adult AIDS death on the household—especially mothers—has been seen to compromise food security, households in categories I and III will be especially susceptible to increased malnutrition (see box 5.1). Category IV is sufficient in both labor supply and meeting protein/energy requirements; however, the Ministry of Agriculture classification was done before the rapid spread of AIDS and, therefore, even systems in categories I and IV that marginally enjoyed a labor surplus may now be affected.

To highlight areas where AIDS is likely to have the highest impact, regional estimates of HIV prevalence were overlaid on the preceding farming system classification. Prevalence data were taken from the 1988-89 national serosurvey and applied to district population sizes, disaggregated by urban and rural subgroups.[55] Figure 5.3 shows that the area most severely affected by AIDS is a central swath spreading north and west from Kampala. The southeast and parts of Masaka and Rakai also show high seroprevalence levels. As argued in chapter 2, since 1988 HIV prevalence levels have risen significantly, especially in rural areas; hence figure 5.3 is a conservative representation.

[55] The mapping exercise utilized population data projected from the 1980 census and not the most recent 1991 census. Discretion should be used when interpreting this data for two reasons. First, increased mortality during civil strife has resulted not only in a reduction of population in certain regions but probably caused substantial migration. A second limitation of the data concerns the estimates of HIV which reflect 1988/89 levels and, as explained in chapter 2, have increased substantially since then; however, the GIS technique can be used to update farming system information, and demographic and HIV prevalence data.

Figure 5.4 combines the previous two maps, showing those farming systems most at risk to labor loss and food insecurity as a function of levels of HIV infection. The impact of excessive adult deaths due to AIDS will be highest in zones where the labor balance (between supply and demand) is lowest. Based on the criteria above, it appears that the area surrounding the common boundaries of Mubende, Hoima, Masindi, and Luwero is potentially the most vulnerable to effects of HIV infection. These tracts are susceptible to both labor shortages as well as energy/protein deficiency. The environs of Mt. Elgon also look to be at risk, although more from shortages of labor. Kabarole and Soroti, too, will be exposed to additional demands on labor supply. The already marginal Karamojong lands will face further strains on both labor and protein/energy criteria, although the

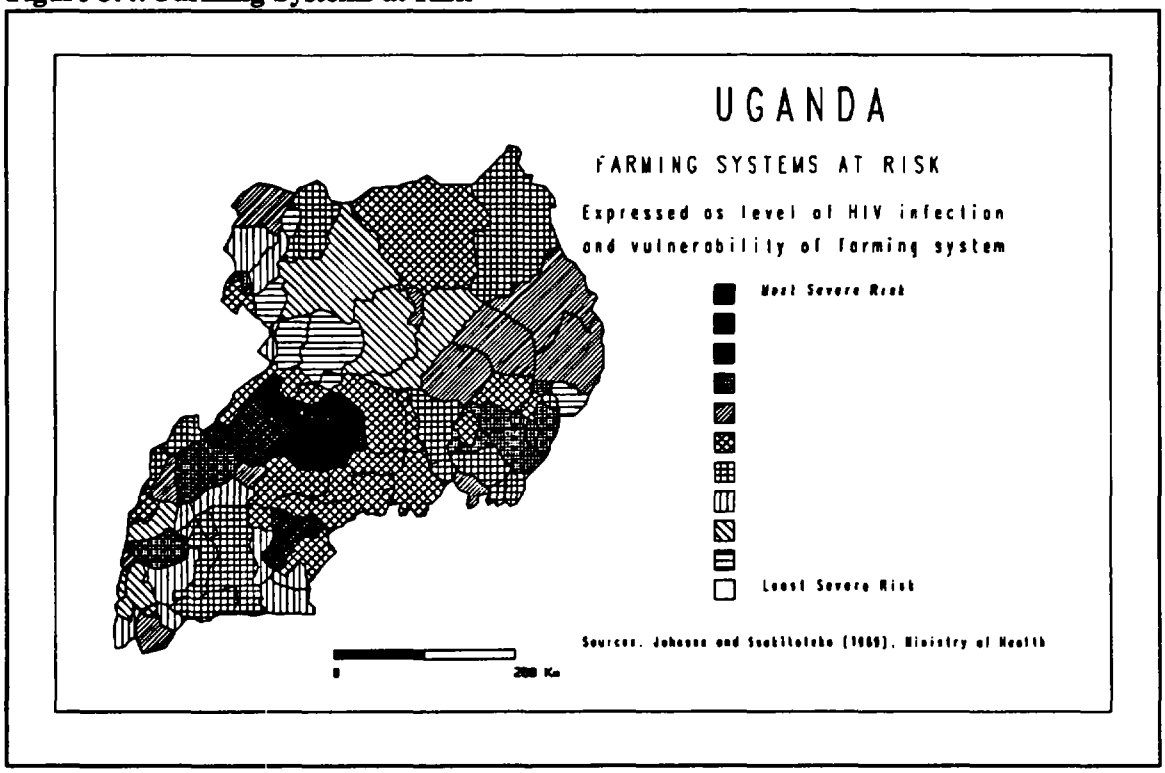
Figure 5.3: Adult HIV Prevalence by District, 1988



apparent level of HIV has not reached serious proportions. Inaccessibility to this area has prevented much epidemiological inquiry. But precisely because of insecurity and possible spillover of refugees from neighboring countries, rapid spread of the virus may be facilitated. And, in Rakai, although AIDS prevalence is high, labor demand was observed to be fairly constant throughout the year, with a wide variety of potential crops grown.[56] Barnett and Blaikie found that while farmers incrementally switched to less labor intensive crops, widespread food shortages were not noticeable, although the nutritional value of the crops may have been compromised (see box 5.1).

[56] Barnett and Blaikie, *op. cit.*

Figure 5.4: Farming Systems at Risk



Overall, how will this impact be manifested? Although it is hard to predict precisely without more quantitative sectoral analyses, labor costs can be expected to increase reflected by both market wage rates and the shadow wage rate implicit in family farm operations. This, in turn, could lead to a reversal in migration from urban areas or increased migration from other regions with surplus labor. The composition of crop production might also change as farm households respond to labor shortages by altering cropping patterns, most likely in favor of less labor-intensive staple crops. Land under cultivation might also be affected if labor shortages prevent clearing or preparation of underutilized areas.

The Sectoral Impact

Although more empirical work should be done to quantify the effects of significant AIDS mortality on agricultural prospects, this section looks first at the sectoral context and government strategies for increasing agricultural growth. It then asks how the AIDS epidemic as translated through household production decisions might affect that strategy.

The emergence and predominance of food crops as an attractive and profitable cash crop alternative to traditional cash crops (such as coffee and tea) came about during the recovery period (1986–91) following the civil war in response to a growing demand from the domestic, especially urban, market. At the same time, the traditional cash crops became less profitable, in part due to low international prices. During this period, growth in the agricultural sector was led by growth in food

crops, particularly bananas. This growth was attributable mainly to expanding areas under cultivation and less to improvements in efficiency.[57]

The government's current agricultural strategy for fostering additional growth is dual. First, it hopes to encourage a shift away from food production for domestic markets (given eventual absorption capacity of the internal market) toward production of raw materials for processing or direct export or both. Second, production of more traditional export crops (such as coffee and cotton) should be increased, while at the same time diversifying into nontraditional, low investment-intensive, agricultural exports. Measures to achieve this focus largely on supply-side incentives, including the liberalization of marketing and pricing and increasing the efficiency of both factor and product markets through improved infrastructure and extension services.[58]

The effects of AIDS, however, will restrict the capacity of smallholder producers to respond to changed macroeconomic and microeconomic incentives. In fact at one extreme, some AIDS-fragmented families may virtually withdraw into subsistence food production. The extent to which this happens could affect overall levels of nonmarketed food crops. If significant, such a shift could reduce marketed food crops and push up urban food prices.

For AIDS' other survivors, especially female-headed households, the extent to which they are able to respond to market signals may be constrained (see table 5.1). Specifically, access to rural credit for women is limited. Only 6 percent of women are members of cooperatives, even though 32 percent of women sell their output to them. Agricultural extension services and training are predominantly male-oriented and not tailored to female farmers. Women's limited access to agricultural inputs also reduces their ability to support their family after the husband's death. And, it is not uncommon for AIDS widows and orphans to lose property rights, posing a threat for even attaining food security from subsistence crops.

Table 5.1: Survey of Ugandan Women Constraints to Agricultural Production

Problems	Percent Stating	Suggested Solutions	Percent Stating
Lack of Labor	32	Tractor Services/Money for Labor	26
Lack of Tools	25	Credit/Subsidies	12
Lack of Land	17	More Land/Move to Fertile Land	16
Poor Soil/Bad Weather	16	Apply Fertilizer	12
Pest/Vermin	4	Pesticides	14

Source: From Jarawan (1991) derived from AFCODE, *Survey on Women's Problems and Needs*, 1989, 33.1(e)

Government strategy has focused efforts on restoring the capacity of at least two traditional export crops, coffee and cotton; however, each have particular characteristics that might make the success of the strategy somewhat vulnerable to the AIDS epidemic. Approximately, 5 percent of land under cultivation is in *coffee*, and most is grown in the Fertile Crescent around Lake Victoria. Figure

[57] World Bank 1993 (a), *op.cit.*

[58] *Ibid.*

5.3 shows that this area has a relatively high HIV prevalence. Coffee, a perennial, is grown exclusively by smallholders and is very labor intensive. Current indicators of coffee production show that output has remained roughly level since the mid-1970s. Many attribute deflated real producer prices plus labor constraints as reasons for stagnating output. The quality of coffee, for example, can be negatively affected by harvesting while it is underripe, although it requires less labor. In addition to timely picking, pruning is necessary for the plants to be most productive. Although coffee can still be harvested with less labor, neglect of weeding and pruning practices weakens trees and over time lowers their yield. Furthermore, about 40 percent of the coffee trees are estimated to be between fifty and sixty years old and should be replanted. Hence, increased coffee production requires both significant labor inputs and production finance to plant new trees and maintain viable ones. Unfortunately, large-scale adult AIDS deaths in rural areas could severely limit this objective.

Cotton. This crop is also grown mostly on smallholder plots and an annual crop that must be replanted each year, implying higher marginal costs of production. As such and unlike coffee, it competes with food crops in decisions concerning annual planting at the family farm level. In fact, the timing of the first two weedings for cotton coincides with the harvest of early planted crops, most likely requiring the hiring of additional labor.[59] Key to competitiveness and profitability, cotton must reach certain yield levels that require quality seeds and insecticides. Such inputs can be quite costly for a small farmer and drain cash balances in periods between planting and harvesting. Households with AIDS patients or suffering from the lost income of those individuals will be even less able to afford these expensive inputs, especially if household income is diverted for medical expenses.

Although estates' production is small compared with the smallholder sector, they produce and process both tea and sugarcane. *Tea* is grown in western districts, including Kabarole, Hoima, and Masindi, and along the lakeshore between Kampala and Jinja. *Sugar* is also grown in the area around Jinja. These estates have faced increasing competition for labor from the domestic food-producing sector. Although both types of estates offer nonwage benefits to workers (accommodations, food rations, medical, and, for permanent workers, education), the value of the wage component stagnated during the 1970s due to declining revenues and falling productivity. Since the early 1980s, these estates have faced chronic labor shortages and have been unable to compete for labor. The advent of AIDS will make it even more difficult to attract labor. Because of AIDS, estates are likely to face paying both higher wage rates and increased medical costs (see discussion below on formal sector).

Discussion

It is still too early to determine the magnitude of the impact that AIDS will have on farming systems and aggregate output. Much will depend on the movement of variables such as migration and wage levels as well as coping mechanisms adopted by individual production units—the smallholder household. The policy implications, though, of the likely effects of AIDS for the agricultural labor force need to be more explicitly considered. This can be done through strategic planning exercises at both a microeconomic production level as well as from a macroeconomic perspective. In addition, the effects of AIDS on the rural labor market need to be monitored and take into account issues, such as migration and division of labor along gender lines.

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[59] *Ibid.*

For some farming systems, AIDS is very likely to have significant consequences for agricultural production. In view of the potential effects of labor availability, the agricultural research agenda should be responsive to this issue, for example, through labor-saving devices and techniques. Improvements in appropriate labor-saving technology (for example, ox plows) might be explored. And, although many high-yielding hybrid varieties require higher levels of cash inputs and husbandry than nonhybrids, the research agenda might explore hybrid maize varieties that do not need fertilizer or pesticides. Disseminating such research (as well as existing knowledge) through extension services should be broadened to include women. Extending credit to smallholder farmers, in particular to women and other vulnerable households, should also be on the agenda.

Severely affected households will need special targeted assistance to help ensure food security. Orphan households, for example, with limited or no extended family support are a prime group. Such assistance should not be limited to emergency relief, but could also provide technical training, basic implements and advice on such issues as crop management, nutrition, and even marketing. Because the magnitude of the AIDS epidemic is only revealed gradually, there is a need to develop an early warning system. This system could be useful to monitor the situation on two levels: first, to prevent most vulnerable households being thrown more deeply into poverty and, second, for long-term planning purposes (including urban food security, real wage movements, and nutrient content of changing crop composition).

Most Ugandans earn their livelihoods through agriculture. The preceding analysis has been based largely on information at the farming system and district levels. It is essential, however, to have a better understanding of the coping mechanisms induced at the household level in the event of AIDS. Such analysis would also help to determine criteria to assist the most vulnerable households. Limited operational research could be undertaken to shed light on effects of AIDS and AIDS-related mortality at the household level.[60]

FORMAL SECTOR

As part of this study, interviews were conducted with selected firms in the formal sector to ascertain whether AIDS was having noticeable effects on productivity and output. The visits were arranged through the Federation of Ugandan Employers, which has an established "AIDS in the Workplace Program." On the whole, managers were more than eager to discuss the impact of AIDS. Fifteen firms were visited including transportation companies, banks, a hotel, a construction firm, a brewery, a milling company, and sugar plantations. Persons met with usually included the company's general manager, secretary, personnel officer, and/or medical officer. The number of employees ranged between 400 and 6,500. Questions were asked about numbers of employees who have died over the past year and whether AIDS was thought to have been the cause. Inquiries were also made about their occupational category (managerial, skilled, semiskilled, unskilled) and salary levels. The implications of both illness and the eventual loss of these employees were discussed, particularly regarding productivity, health expenditures, death benefits, and recruitment.

AIDS mortality. The overall impression is that mortality is clearly above normal levels for most firms and that it has been increasing since the mid-1980s. Although records were often patchy, it was generally known from personal recall whether a given employee had died from AIDS. Assuming that, for Sub-Saharan Africa, adult mortality rates are approximately 5/1000 per year in the absence of

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[60] See footnote 4.

AIDS, death rates for selected firms were crudely calculated. In a recent year, one firm in the transportation sector with 600 employees lost 21 workers. One would expect, using the above rule of thumb, that the number would be on the order of three to four per year. Another firm located in Kampala with 3,000 workers lost 57 staff during 1989—more than triple the expected number. Those reportedly dying from AIDS were not from the higher management echelons. More detailed information is needed to weight such numbers by the composition of employees by skill level. Transportation industry officials noted that loss was high among drivers and a construction firm had lost several senior engineers.

Productivity. The general impression was that productivity was being compromised due to the increasing numbers of AIDS cases. No employer, though, had established any monitoring system. Transport companies noted that medically unfit drivers posed a risk to passenger or cargo safety and were usually taken off the road during episodes of illness. The same companies also noticed more rapid depreciation of vehicles, which are usually maintained by drivers. One bank noted reduced productivity of workers who continued to report for work but were ill, while other clerks felt the burden of increased workloads.

Health Costs. Most firms provide health care for their employees, either through company clinics or reimbursable expenses from private health care providers. All enterprises noted escalating outlays for medical expenses well beyond budgeted amounts. A transport company estimated that health benefits had doubled in three years, largely attributable to increases in drugs used to treat HIV-related illnesses. Estimated entitlements per employee were regularly exceeded with most employers meeting them on an ad hoc basis. None of the employers had established formal monitoring of cost overruns nor incorporated these trends into forward planning and budgeting, although many expressed the need to do so. Entitlements in 1990 were about USh 15,000–30,000[61] per month compared to an average hospitalization of USh 100,000. In addition, many companies also provided social benefits (health and sometimes housing and education) for dependents. Several employers noted with concern that surviving children were in particularly difficult positions, as they often return to home villages without any means of support.

Salary/Termination Entitlements. Most employers still continued to pay salaries even though an employee was unable to work. The norm was three months at full pay with graduated pay thereafter. Again, several employers noted they had shown leniency toward this regulation for humanitarian reasons with the knowledge that the worker was unlikely to recover. At termination or death, established workers usually received some fixed proportion of their salary, taking into account years of service. Termination on learning of HIV-positive status was not generally practiced; however, given escalating medical expenditures, some firms noted that they might need to take this into consideration in the future. Several food processing industries, expressed apprehension that there might be negative publicity concerning employees with AIDS.

Burial Costs. Most employers paid for the purchase of a coffin and the transportation of the body plus a dozen mourners to home villages for burial. Such costs were usually very high and depended largely on distance. One sugar company estimated that this could cost up to USh 500,000 per individual compared with an average monthly salary of USh 4,500.

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[61] Ugandan shillings.

Recruitment/Replacement. Many workers received on-the-job training with experience accumulated over many years. A senior driver, for example, usually had ten years of experience. The transportation firms and the construction firm all noted that recruiting skilled senior mechanics/technicians was becoming increasingly difficult. Asking salary levels were noticeably higher with many potential employees already holding a job with a competitor. For senior managers and administrators who were trained from within, time is the key constraint for their replacement.

Discussion

As for other sectors, dealing with the AIDS epidemic in the formal employment sector requires two types of action. First, measures need to be taken at the level of the firm to confront the consequences of those already infected. The costs of caring for sick employees and the negative impact they have on output must at least be monitored and appropriately planned for in terms of projected employee benefits and output. For larger firms, an explicit company policy on HIV/AIDS will assist employers in making such projections. Company policy can also help to reduce discrimination especially before employees develop full-blown AIDS. Many still have important contributions to make and can benefit from a supportive work environment. The second and equally important aspect of addressing the AIDS epidemic is preventing its further spread. As part of the multisectoral approach to AIDS in Uganda, there are efforts under way to disseminate educational materials through the workplace. As mentioned, the Federation of Ugandan Employers has developed peer education campaigns for the workplace. Health messages and often condoms are disseminated by trained colleagues. Such efforts should be encouraged and broadened.

The larger implications of AIDS for the development of the formal sector should be addressed through planning efforts. These should explicitly attempt to incorporate the potential impact of the epidemic for projections of manpower needs (for example, teachers, health professionals, and engineers) and educational requirements to meet that demand. Even capacity building, as it refers to the pool of high calibre manpower, may be undermined if key individuals in government ministries are lost. To undertake such an exercise may require rapid assessments to determine impact on selected occupations. From there a critical look must be taken at the composition of output of key educational and training institutions.

CHAPTER 6.

SUMMARY AND RECOMMENDATIONS

This chapter briefly outlines Uganda's response to the epidemic to date and recommends measures that would enhance prevention and mitigate the consequences of the epidemic as well as areas that need more in-depth investigation.

The Uganda Response

Among the countries of Sub-Saharan Africa, Uganda has been one of the most forthright in admitting the seriousness of its AIDS problem. It has also been one of the first to take concrete steps to confront the issue. In 1986 Uganda established the AIDS Control Programme (ACP) in the Ministry of Health. With assistance from WHO, it developed and adopted a Medium-Term Plan. Early efforts concentrated on developing and disseminating health education messages, screening blood supplies, and establishing a system to track the disease's spread. The growing realization that the AIDS epidemic was a multisectoral issue prompted the government in April 1991 to establish the National AIDS Commission to raise the fight against AIDS to a national level involving all sectors. The commission has been charged with the coordination of the overall AIDS program across government ministries and the nongovernmental sector and to mobilize resources. A National Multisectoral Strategy has been adopted with the objectives of preventing the further spread of HIV and coping with the existing epidemic. Five goals have been articulated:

- Prevent HIV transmission attributable to sexual behavior and blood transfusion and passed from mother to child
- Mitigate the adverse health and socioeconomic impact
- Strengthen the national capacity to respond to the epidemic
- Establish a national information base on HIV/AIDS
- Strengthen national capacity to undertake research relevant to HIV/AIDS

In July 1993 the UAC issued an Operational Plan for achieving these goals.[62] The plan was the result of a consensus-building process and national workshop involving many government ministries and agencies, nongovernmental organizations, and donor agencies. Included in the plan are priority activities that will be carried out during the period 1994–98. AIDS Control Programs, similar to the one established in the Ministry of Health, have been set up in other key ministries (such as Local Government).

[62] Uganda AIDS Commission, 1993.

Recommendations

Although this study has only begun to scratch the surface of the complex interrelationship between AIDS and economic activity, it has illustrated the channels by which AIDS will have serious implications for Uganda's growth and development prospects. Emerging from the study's findings are a set of recommendations that are consistent with the objectives of the National Multisectoral Strategy.

For reducing the spread of AIDS, the simulation model in chapter 2 illustrated the significant synergistic effects of a prevention program that induced behavior change—including not only a reduction in the number of sexual partners but also increased condom use—coupled with an effective STD treatment and control program. The *effective* integration of AIDS control efforts with those for reducing other sexually transmitted diseases, a widely accepted approach, is important at the program level. Changing behavior is challenging. As the results from the study in rural agricultural villages in Rakai show, knowledge of how AIDS is spread has not been sufficient to reduce new infections significantly. Shifting from mass education campaigns for awareness raising to more intensive peer education is likely to have a greater impact on behavior change. Activities to promote behavior change must also address the issue of how women can better protect themselves.

In the coming years, AIDS could absorb significant portions of the public health care budget, even if only pharmaceuticals are considered. Because average drug costs for AIDS are sensitive to the choice of treatment regimen, treatment protocols for the various individual opportunistic infections should be reviewed to select those that are most cost-effective. Once selected, pharmaceuticals must be efficiently and effectively utilized; therefore, revised treatment guidelines should be widely distributed to health personnel and a public education campaign mounted for the rational prescription and use of these drugs.

The agricultural sector holds the key to Uganda's immediate growth and development prospects. The policy implications, though, of the potential effects of AIDS for agriculture have not been, but need to be, sufficiently taken into account at either the microeconomic production level or from a macroeconomic perspective.

For farming systems in which AIDS will have significant negative consequences because of labor scarcity, agricultural research should explore labor-saving technology and hybrid varieties that require less fertilizer or pesticide. Disseminating such research (as well as existing knowledge) through extension services should be broadened to include women. Extending credit to smallholder farmers, in particular to women and other vulnerable households, should also be considered.

It is likely that the effect of AIDS at the family level will throw more households into poverty. Severely affected households will need special targeted assistance to ensure food security. The challenge of the orphan population will be enormous. Orphan households, for example, with limited or no extended family support could benefit from not only emergency relief but from technical training and basic implements.

In the formal sector, profits will be negatively affected due to reduced productivity of infected workers and to rising costs associated with health care benefits and other AIDS-related expenditures. As a first response, firms should begin to monitor the trends in these costs and consider what company

policy should be regarding HIV/AIDS. The formal workplace should also serve as an important venue to help prevent the further spread of HIV through peer education activities.

Finally, in light of the far-reaching multisectoral implications of AIDS, it is also recommended that international aid agencies and bilateral donors acknowledge these potential ramifications when considering development strategies and project design. Already, donors have been actively involved in the development and articulation of the National Multisectoral Strategy; coordinating donor responses will be important for eliminating possible duplication of efforts.

Areas for Further Research

Several information gaps also emerged from the study. More in-depth investigation is recommended in particular areas to have a more accurate understanding of the epidemic's impact and to better inform policy decisions. The UAC has already indicated that two key activities are to build a data base on HIV/AIDS and to carry out operational research concerning the epidemic. The following list suggests areas for inclusion:

To more accurately predict the potential demographic and economic impact and to further refine appropriate programs and policies, more certainty about the epidemiological parameters (and their interactions) used to model the spread of the epidemic is needed. More detailed information concerning the current status of the epidemic, especially in rural and remote areas, as well as the rate of spread, among the types of data needed.

While the impact of HIV/AIDS on the health sector extends beyond drugs (for example, health personnel, hospital beds, and laboratory facilities), there are major information gaps about the magnitude. Such data can help to better anticipate and plan for the care of AIDS patients in the health care sector, while protecting other health programs. Families and communities also face increased challenges in caring for AIDS patients. More information is needed about the costs, benefits, and trade-offs of alternative strategies for caring for AIDS patients, ranging from home- to community- to facility-based care. While caring for patients at home may reduce the burden on hospital beds, it increases it on families.

It has been argued that the AIDS epidemic in Uganda will have negative consequences for economic growth prospects; however, the impact has yet to be quantified. Macroeconomic modeling, including in particular the adjustment of labor and capital parameters, can provide an order of magnitude for the impact on output and per capita income.

In agriculture, the magnitude of the impact that AIDS will have on farming systems and aggregate agricultural output will depend on variables such as migration and wage levels as well as coping mechanisms adopted by individual production units. More information is needed on the effects of AIDS on the rural labor market (which should be monitored especially for the effects of migration and the division of labor along gender lines) and on microeconomic-level production decisions.

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ANNEX I

Inputs for AIDS Simulations/Projections

Uganda - no interventions ---- AYP I N P U T ---- 3 Sep 93, 14:57:12

INITIAL PARAMETERS

Output file prefix	uga	Homosexuals (incl bisexuals)	.000	Anal sex (insertive) effect	1.000
Subgroups per risk group	4	Bisexuals (prop of homosexl)	.000	Anal sex (receptive) effect	1.000
No. of genetic groups	1	Fertility adjustment	1.000	Condom use effect	.200
Intervals within year	1	Annual change, transmission	.000	Genital ulcers effect	50.000
First year	1975	Annual change, perinatal tr	.000	Dummy cofactor effect	1.000
Projection-start year	1990	Year of change, transmission	2025	Random prop for cofactor grp	.100
End year	2020	Year of change, perinatal tr	2025	Condom-genital ulcers assoc	.750

Print input? (0=yes)	0
Print details? (1-9=yes)	0
Graph files? (1-4=yes)	3
Repetitions for attr matrix	0
Tolerance for attr matrix	.010
Starting seroprevalence	.00001
Starting prev % nonsexual	.100

INFECTIVITY (PY,PZ)

Phase	Relative length	Per cent
1	.25	.025
2	.25	.025
3	5.50	.550
4	2.50	.250
5	1.00	.100
6	.50	.050

TRANSMISSION (T)

Phase	Perinatal	Injection	Transfusion	Male to female	Female to male	Male to male
1	.4000	.0010	.9500	.0060	.0030	.0001
2	.3500	.0010	.9500	.0045	.0023	.0001
3	.2500	.0010	.9500	.0030	.0015	.0001
4	.3500	.0010	.9500	.0035	.0018	.0001
5	.4000	.0010	.9500	.0045	.0023	.0001
6	.9500	.0010	.9500	.0060	.0030	.0001
AIDS	.9500					

GENETIC GROUPS (EG,G)

Group number	1
Proportion of pop in group	1.000
Susceptibility	1.000

SUBGROUP BEHAVIOR AND COFACTORS

		Injection	Transfusion	Female	Male heterosexual	Male homosexual	Male bisex w/wom	Male bisex w/men
Random prop for subgroup	RN	.500	.500	.050	.050	.010	.000	
Year new-contac rate changes	FY	2025	2025	2020	2020	2020	2020	2020
Contact behavior	JS,BS,SF	.100	.050	.000	.000	.000	.000	.000
Annual change in contacts	J/B/SC	.000	.040	.000	.000	.000	.000	.000
Year contacts change	J/B/SY	1990	1985	2020	2020	2020	2020	2020
Annual change in anal sex	AC			.000	.000	.000	.000	.000
Year anal sex changes	AY			2020	2020	2020	2020	2020
Year condom use changes	CY			2020	2020	2020	2020	
Annual change genital ulcers	GUC			.200	.200	.200	.200	
Year genital ulcers change	GY			2020	2020	2020	2020	
Annual change dummy cofactor	DUC			.000	.000	.000	.000	
Year dummy cofactor changes	DY			2020	2020	2020	2020	

Uganda - no interventions ---- AYP I N P U T ----

MEMBERSHIP IN RISK-GROUP SUBGROUP (E)

Sub group	Injection	Transfusion	Female	Male hetero sexual	Male homo sexual	Male bi sexual
1	.70000	.98000	.400	.364	.250	.250
2	.10000	.01500	.300	.273	.250	.250
3	.10000	.00490	.280	.273	.250	.250
4	.10000	.00010	.020	.091	.250	.250

NEW-CONTACT FREQUENCY (F)

Sub group	Injection	Transfusion	Female	Male hetero sexual	Male homo sexual	Male bisex w/wom	Male bisex w/men
1	.10	.00	.10	.10	5.00	5.00	5.00
2	1.00	.10	2.00	2.00	5.00	5.00	5.00
3	3.00	1.00	5.00	10.00	5.00	5.00	5.00
4	10.00	5.00	100.00	20.00	5.00	5.00	5.00

CHANGE IN NEW-CONTACT FREQUENCY (FC)

Sub group	Injection	Transfusion	Female	Male hetero sexual	Male homo sexual	Male bisex w/wom	Male bisex w/men
1	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.00	.00	.00

ANAL SEX PROBABILITY (AM)

Sub group	Female	Male hetero sexual	Male homo sexual	Male bisex w/wom	Male bisex w/men
1	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.00

BLOOD DONATION PROPENSITY (BD)

Sub group	Female	Male hetero sexual	Male homo sexual	Male bi sexual
1	1.00	1.00	1.00	1.00
2	1.00	1.00	1.00	1.00
3	1.00	1.00	1.00	1.00
4	1.00	1.00	1.00	1.00

PROPORTION USING CONDOMS (CU)

Sub group	Female	Male hetero sexual	Male homo sexual	Male bi sexual
1	.05	.05	.05	.05
2	.05	.05	.05	.05
3	.05	.05	.05	.05
4	.05	.05	.05	.05

CHANGE IN CONDOM USE (CUC)

Sub group	Female	Male hetero sexual	Male homo sexual	bi sexual
1	.00	.00	.00	.00
2	.00	.00	.00	.00
3	.00	.00	.00	.00
4	.00	.00	.00	.00

PROPORTION WITH GENITAL ULCERS (GU)

Sub group	Female	Male hetero sexual	Male homo sexual	Male bi sexual
1	.00	.00	.00	.00
2	.01	.01	.01	.01
3	.05	.05	.05	.05
4	.40	.30	.30	.30

PROPORTION WITH DUMMY COFACTOR (DU)

Sub group	Female	Male hetero sexual	Male homo sexual	bi sexual
1	.00	.00	.00	.00
2	.00	.00	.00	.00
3	.00	.00	.00	.00
4	.00	.00	.00	.00

SEXUAL BEHAVIOR BY SUBGROUP (SG)

Sub group	Female	Male hetero sexual	Male homo sexual	Male bisex w/wom	Male bisex w/men
1	120.00	120.00	.00	.00	.00
2	30.00	30.00	.00	.00	.00
3	15.00	15.00	.00	.00	.00
4	1.00	1.00	.00	.00	.00

STARTING SEROPREVALENCE (OS)

Sub group	Female	Male hetero sexual	Male homo sexual	Male bi sexual
1	.00	.00	.00	.00
2	.00	.00	.00	.00
3	.00	.00	.00	.00
4	.00	.00	.00	.00

Uganda - no interventions ---- AYP I N P U T ----

FERTILITY AND POPULATION (FE,MA,MF,UR)

Year	Fertility rate	Adult males	Adult females	15-year olds	Urban proportion
1975	.2320	2943.000	3030.000	238.000	.000
1976	.2320	2988.000	3093.000	246.000	.000
1977	.2320	3037.000	3160.000	255.000	.000
1978	.2320	3091.000	3231.000	266.000	.000
1979	.2320	3150.000	3308.000	278.000	.000
1980	.2330	3214.000	3389.000	290.000	.000
1981	.2330	3257.000	3463.000	308.000	.000
1982	.2330	3304.000	3538.000	320.000	.000
1983	.2330	3357.000	3615.000	331.000	.000
1984	.2330	3415.000	3696.000	351.000	.000
1985	.2330	3481.000	3782.000	366.000	.000
1986	.2330	3586.000	3902.000	376.000	.000
1987	.2330	3693.000	4020.000	383.000	.000
1988	.2330	3803.000	4137.000	389.000	.000
1989	.2330	3914.000	4253.000	389.000	.000
1990	.2330	4019.000	4364.000	396.000	.000
1991	.2330	.000	.000	.000	.000

AGE DIST OF SEROPOSITIVES (MD)

Age group	Male	Female
1	.600	.600
2	2.400	2.400
3	.100	.100
4	.140	.280
5	.800	4.700
6	6.400	13.300
7	12.400	12.700
8	10.500	8.000
9	6.400	4.400
10	4.390	2.350
11	2.200	1.370
12	1.100	.590
13	.550	.300
14	.280	.230
15	.140	.120
16	.100	.060
17	.000	.000

MORTALITY (Q)

Age group	Period 1		Period 2		Period 3		Period 4		Period 5		Period 6		Period 7	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	124.59	105.92	124.59	105.92	124.59	105.92	124.59	105.92	118.57	100.60	108.31	91.54	96.06	80.78
2	90.03	85.71	90.03	85.71	90.03	85.71	90.03	85.71	83.73	79.38	73.34	69.00	61.69	57.51
3	38.56	36.99	38.56	36.99	38.56	36.99	38.56	36.99	36.13	34.27	32.10	29.88	27.44	24.97
4	19.79	21.42	19.79	21.42	19.79	21.42	19.79	21.42	19.02	20.48	17.88	19.06	16.45	17.31
5	23.28	24.12	23.28	24.12	23.28	24.12	23.28	24.12	22.94	23.61	22.60	22.94	22.00	21.97
6	32.10	29.16	32.10	29.16	32.10	29.16	32.10	29.16	32.13	28.99	32.68	29.08	32.92	28.82
7	33.62	33.72	33.62	33.72	33.62	33.72	33.62	33.72	33.66	33.53	34.23	33.62	34.51	33.32
8	35.87	38.99	35.87	38.99	35.87	38.99	35.87	38.99	35.90	38.76	36.50	38.87	36.78	38.52
9	40.47	44.57	40.47	44.57	40.47	44.57	40.47	44.57	40.50	44.31	41.18	44.45	41.51	44.02
10	48.62	49.67	48.62	49.67	48.62	49.67	48.62	49.67	48.67	49.42	49.46	49.55	49.82	49.13
11	58.96	54.50	58.96	54.50	58.96	54.50	58.96	54.50	58.99	54.23	59.89	54.36	60.30	53.92
12	76.91	68.34	76.91	68.34	76.91	68.34	76.91	68.34	76.99	68.04	77.95	68.18	78.38	67.70
13	99.67	91.35	99.67	91.35	99.67	91.35	99.67	91.35	99.72	90.95	100.89	91.16	101.42	90.49
14	140.38	132.07	140.38	132.07	140.38	132.07	140.38	132.07	140.46	131.53	141.88	131.77	142.51	130.91
15	201.49	196.14	201.49	196.14	201.49	196.14	201.49	196.14	201.59	195.43	203.32	195.81	204.12	194.62
16	295.45	290.18	295.45	290.18	295.45	290.18	295.45	290.18	295.58	289.27	297.91	289.74	298.92	288.25
17	419.65	409.91	419.65	409.91	419.65	409.91	419.65	409.91	419.79	408.85	422.45	409.34	423.60	407.69

HAZARD PARAMETERS (H-)

Parm	Adults		Children	
	AIDS	Death	AIDS	Death
K	.950	1.000	1.000	1.000
A	3.500	.850	4.000	2.000
B	.400	1.000	4.000	2.000
Chg-A	.000	.000	.000	.000
Yr-chg	1990	1990	1990	1990

CUMULATIVE PROGRESSION (HL)

Year	Adults		Children	
	AIDS	Death	AIDS	Death
0	.0000	.0000	.0000	.0000
1	.0410	.5374	.4999	.4999
2	.0598	.7594	.9819	.8807
3	.0866	.8956	.9996	.9819
4	.1236	.9588	.9999	.9974
5	.1733	.9844	.9999	.9996
6	.2373	.9941	.9999	.9999
7	.3152	.9978	.9999	.9999
8	.4043	.9991	.9999	.9999
9	.4987	.9996	.9999	.9999
10	.5913	.9998	.9999	.9999
11	.6754	.9999	.9999	.9999
12	.7465	.9999	.9999	.9999
13	.8033	.9999	.9999	.9999
14	.8464	.9999	.9999	.9999
15	.8779	.9999	.9999	.9999

ANNUAL HAZARD (H)

Year	Adults		Children	
	AIDS	Death	AIDS	Death
0	.0410	.5374	.4999	.4999
1	.0197	.4800	.9638	.7614
2	.0284	.5659	.9759	.8484
3	.0405	.6056	.7562	.8578
4	.0567	.6208	.0567	.8308
5	.0774	.6245	.0012	.6659
6	.1022	.6200	.0000	.2701
7	.1301	.6033	.0000	.0500
8	.1585	.5605	.0000	.0071
9	.1847	.4693	.0000	.0012
10	.2057	.3257	.0000	.0000
11	.2192	.1775	.0000	.0000
12	.2238	.0792	.0000	.0000
13	.2191	.0317	.0000	.0000
14	.2055	.0123	.0000	.0000
15	.1845	.0047	.0000	.0000

INFECTIVE PHASES, TIMED FROM INFECTION, BY YEARS TO AIDS (PZ)

Years to AIDS	Lower and upper boundaries for phase -1-	-2-	-3-	-4-	-5-	-6-
4	.00	.10	.20	2.40	3.40	3.80	4.00
5	.00	.13	.25	3.00	4.25	4.75	5.00
6	.00	.15	.30	3.60	5.10	5.70	6.00
7	.00	.17	.35	4.20	5.95	6.65	7.00
8	.00	.20	.40	4.80	6.80	7.60	8.00
9	.00	.23	.45	5.40	7.65	8.55	9.00
10	.00	.25	.50	6.00	8.50	9.50	10.00
11	.00	.28	.55	6.60	9.35	10.45	11.00
12	.00	.30	.60	7.20	10.20	11.40	12.00
13	.00	.33	.65	7.80	11.05	12.35	13.00
14	.00	.35	.70	8.40	11.90	13.30	14.00
15	.00	.38	.75	9.00	12.75	14.25	15.00
16	.00	.40	.80	9.60	13.60	15.20	16.00
17	.00	.43	.85	10.20	14.45	16.15	17.00
18	.00	.45	.90	10.80	15.30	17.10	18.00
19	.00	.47	.95	11.40	16.15	18.05	19.00
20	.00	.50	1.00	12.00	17.00	19.00	20.00

COFACTOR COMBINATIONS, RESULTING RISK, AND PROPORTION OF SUBGROUPS AFFECTED (VE,VZ)

Combination	Condom use	Genitl ulcers	Dummy cofac	Risk	FEMALE subgroup 1	2	3	4
1	-	-	-	1.000	.949	.940	.901	.555
2	-	-	+	1.000	.000	.000	.000	.000
3	-	+	-	50.000	.001	.010	.049	.395
4	-	+	+	50.000	.000	.000	.000	.000
5	+	-	-	.200	.050	.050	.049	.045
6	+	-	+	.200	.000	.000	.000	.000
7	+	+	-	10.000	.000	.000	.001	.005
8	+	+	+	10.000	.000	.000	.000	.000

Combination	Condom use	Genitl ulcers	Dummy cofac	Risk	MALE HETERO subgroup 1	2	3	4
1	-	-	-	1.000	.949	.940	.901	.654
2	-	-	+	1.000	.000	.000	.000	.000
3	-	+	-	50.000	.001	.010	.049	.296
4	-	+	+	50.000	.000	.000	.000	.000
5	+	-	-	.200	.050	.050	.049	.046
6	+	-	+	.200	.000	.000	.000	.000
7	+	+	-	10.000	.000	.000	.001	.004
8	+	+	+	10.000	.000	.000	.000	.000

Combination	Condom use	Genitl ulcers	Dummy cofac	Risk	MALE HOMO subgroup 1	2	3	4
1	-	-	-	1.000	.949	.940	.901	.654
2	-	-	+	1.000	.000	.000	.000	.000
3	-	+	-	50.000	.001	.010	.049	.296
4	-	+	+	50.000	.000	.000	.000	.000
5	+	-	-	.200	.050	.050	.049	.046
6	+	-	+	.200	.000	.000	.000	.000
7	+	+	-	10.000	.000	.000	.001	.004
8	+	+	+	10.000	.000	.000	.000	.000

Combination	Condom use	Genitl ulcers	Dummy cofac	Risk	MALE BISEX subgroup 1	2	3	4
1	-	-	-	1.000	.949	.940	.901	.654
2	-	-	+	1.000	.000	.000	.000	.000
3	-	+	-	50.000	.001	.010	.049	.296
4	-	+	+	50.000	.000	.000	.000	.000
5	+	-	-	.200	.050	.050	.049	.046
6	+	-	+	.200	.000	.000	.000	.000
7	+	+	-	10.000	.000	.000	.001	.004
8	+	+	+	10.000	.000	.000	.000	.000

PROJECTION ASSUMING NO AIDS MORTALITY

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	19554	23526	28042	32894	38263	44138
MALES							
0-4	1530	2082	2510	2834	3052	3339	3716
5-9	1219	1419	1950	2375	2694	2916	3225
10-14	1109	1188	1386	1910	2331	2649	2871
15-19	852	1086	1164	1360	1876	2293	2610
20-24	693	829	1056	1132	1326	1833	2245
25-29	587	670	801	1020	1097	1288	1785
30-34	450	567	646	772	987	1064	1252
35-39	330	433	545	621	744	954	1031
40-44	256	315	413	520	595	715	919
45-49	222	242	298	391	493	566	683
50-54	206	207	226	278	365	462	533
55-59	137	188	189	206	254	335	426
60-64	133	121	166	166	182	225	298
65-69	88	111	100	137	138	152	189
70-74	78	67	84	76	104	106	117
75+	117	100	85	90	88	106	116
TOTAL	8006	9624	11619	13889	16326	19023	22016
FEMALES							
0-4	1554	2065	2486	2800	3013	3313	3634
5-9	1235	1448	1943	2364	2675	2892	3180
10-14	1072	1204	1416	1905	2321	2632	2845
15-19	924	1049	1179	1388	1871	2284	2589
20-24	799	900	1021	1149	1356	1832	2236
25-29	652	774	872	990	1116	1321	1784
30-34	468	629	746	841	957	1083	1281
35-39	347	449	603	716	809	924	1045
40-44	276	331	428	575	685	777	888
45-49	230	262	314	406	547	654	742
50-54	218	216	246	295	383	518	619
55-59	127	201	199	227	273	356	481
60-64	148	113	179	177	203	246	320
65-69	85	124	95	150	150	173	210
70-74	83	65	95	73	116	117	135
75+	106	100	86	99	92	119	132
TOTAL	8325	9930	11906	14153	16567	19240	22122
BIRTH RATE		53.7	53.1	49.1	44.4	41.5	39.3
DEATH RATE		17.7	16.1	14.1	12.5	11.3	10.7
RATE OF NAT. INC.		3.60	3.69	3.51	3.19	3.02	2.86
NET MIGRATION RATE		.0	.0	.0	.0	.0	.0
GROWTH RATE		3.60	3.70	3.51	3.19	3.02	2.86
TOTAL FERTILITY		7.300	7.300	7.000	6.400	5.800	5.200
NRR		2.586	2.665	2.639	2.466	2.283	2.049
e(0) - BOTH SEXES		49.14	50.38	51.96	53.43	54.95	55.70
e(10) - BOTH SEXES		51.75	51.72	51.85	52.75	53.68	54.11
IMR - BOTH SEXES		109.7	100.0	88.5	82.9	77.2	74.2
q(5) - BOTH SEXES		.1823	.1641	.1429	.1327	.1225	.1171
DEP. RATIO	102.7	104.1	108.4	112.8	104.1	93.9	85.7

PROJECTION ASSUMING NO INTERVENTIONS TO REDUCE AIDS MORTALITY

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	19025	21967	25061	28274	31732	35501
MALES							
0-4	1530	1981	2301	2522	2674	2858	3080
5-9	1219	1383	1784	2085	2313	2468	2658
10-14	1109	1186	1347	1743	2043	2269	2426
15-19	852	1085	1161	1320	1709	2007	2233
20-24	693	828	1055	1129	1284	1666	1960
25-29	587	669	799	1017	1088	1241	1614
30-34	450	556	627	746	950	1022	1168
35-39	330	405	484	539	639	824	898
40-44	256	284	327	382	423	506	668
45-49	222	220	226	250	291	325	394
50-54	206	193	179	175	190	222	250
55-59	137	178	160	142	134	144	170
60-64	133	116	148	130	112	104	111
65-69	88	108	93	117	102	87	79
70-74	78	66	80	67	85	74	62
75+	117	99	83	84	77	85	82
TOTAL	8006	9357	10854	12449	14113	15901	17852
FEMALES							
0-4	1554	1968	2283	2499	2643	2822	3038
5-9	1235	1411	1781	2079	2302	2450	2636
10-14	1072	1202	1375	1740	2038	2260	2411
15-19	924	1048	1175	1347	1706	2002	2224
20-24	799	900	1020	1145	1313	1667	1959
25-29	652	768	859	970	1088	1251	1594
30-34	468	603	690	757	850	958	1108
35-39	347	415	504	558	604	681	773
40-44	276	305	338	395	433	470	533
45-49	230	246	256	272	315	348	378
50-54	218	208	214	215	224	261	290
55-59	127	195	182	183	181	189	221
60-64	148	111	168	155	154	152	159
65-69	85	123	91	137	126	126	125
70-74	83	64	92	67	102	95	95
75+	106	99	83	94	83	101	106
TOTAL	8325	9667	11113	12612	14161	15831	17649

BIRTH RATE	53.9	54.1	51.0	46.7	43.9	41.7
DEATH RATE	23.4	25.3	24.6	22.6	20.8	19.2
RATE OF NAT. INC.	3.05	2.88	2.64	2.41	2.31	2.24
NET MIGRATION RATE	.0	.0	.0	.0	.0	.0
GROWTH RATE	3.05	2.88	2.64	2.41	2.31	2.24
TOTAL FERTILITY	7.300	7.300	7.000	6.400	5.800	5.200
NRR	2.313	2.254	2.172	2.046	1.904	1.765
e(0) - BOTH SEXES	40.55	37.32	36.56	37.30	38.35	39.72
e(10) - BOTH SEXES	44.20	40.00	38.02	37.50	38.02	38.78
IMR - BOTH SEXES	128.4	125.3	116.3	103.8	97.7	90.6
q(5) - BOTH SEXES	.2325	.2370	.2248	.2029	.1905	.1755
DEP. RATIO 102.7	103.8	107.8	111.9	106.6	97.9	89.8

PROJECTION ASSUMING INCREASED USE OF CONDOMS

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	19025	21971	25108	28488	32348	36830
MALES							
0-4	1530	1981	2301	2530	2700	2922	3193
5-9	1219	1383	1784	2089	2330	2515	2753
10-14	1109	1186	1347	1743	2046	2286	2472
15-19	852	1085	1161	1320	1710	2010	2249
20-24	693	828	1055	1129	1284	1666	1964
25-29	587	669	799	1017	1089	1242	1616
30-34	450	556	627	746	956	1031	1185
35-39	330	405	484	542	649	853	947
40-44	256	284	327	384	436	545	751
45-49	222	220	226	253	302	358	470
50-54	206	193	179	176	197	246	305
55-59	137	178	160	143	138	158	207
60-64	133	116	148	131	115	111	131
65-69	88	108	93	117	103	90	89
70-74	78	66	80	68	85	76	67
75+	117	99	83	85	77	86	85
TOTAL	8006	9357	10856	12471	14215	16195	18484
FEMALES							
0-4	1554	1968	2284	2506	2670	2885	3150
5-9	1235	1411	1781	2082	2319	2497	2730
10-14	1072	1202	1375	1740	2041	2277	2457
15-19	924	1048	1175	1347	1706	2005	2240
20-24	799	900	1020	1145	1313	1667	1963
25-29	652	768	859	971	1090	1257	1607
30-34	468	603	690	760	861	985	1161
35-39	347	415	504	561	620	726	866
40-44	276	305	339	398	448	513	629
45-49	230	246	256	274	325	378	450
50-54	218	208	214	215	230	280	336
55-59	127	195	182	183	184	199	248
60-64	148	111	168	155	155	157	173
65-69	85	123	91	137	127	128	131
70-74	83	64	92	68	102	96	98
75+	106	99	83	94	83	102	108
TOTAL	8325	9667	11115	12636	14273	16153	18347
BIRTH RATE		53.9	54.1	51.0	46.7	43.7	41.3
DEATH RATE		23.4	25.3	24.3	21.4	18.3	15.3
RATE OF NAT. INC.		3.05	2.88	2.67	2.53	2.54	2.60
NET MIGRATION RATE		.0	.0	.0	.0	.0	.0
GROWTH RATE		3.05	2.88	2.67	2.53	2.54	2.60
TOTAL FERTILITY		7.300	7.300	7.000	6.400	5.800	5.200
NRR		2.313	2.256	2.186	2.090	1.991	1.890
e(0) - BOTH SEXES		40.55	37.36	36.93	38.70	41.70	45.71
e(10) - BOTH SEXES		44.20	40.03	38.36	38.78	41.21	44.59
IMR - BOTH SEXES		128.4	125.1	115.3	101.1	92.6	83.8
q(5) - BOTH SEXES		.2325	.2368	.2221	.1943	.1732	.1503
DEP. RATIO	102.7	103.8	107.8	111.9	106.4	97.4	88.9

PROJECTION ASSUMING FEWER NEW PARTNERS

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	19025	21971	25135	28600	32603	37246
MALES							
0-4	1530	1981	2302	2534	2715	2947	3226
5-9	1219	1383	1784	2091	2340	2536	2785
10-14	1109	1186	1347	1743	2048	2296	2493
15-19	852	1085	1161	1320	1710	2012	2259
20-24	693	828	1055	1129	1284	1667	1966
25-29	587	669	799	1017	1089	1242	1617
30-34	430	556	628	747	955	1033	1187
35-39	330	405	484	543	653	861	956
40-44	256	284	327	386	442	556	768
45-49	222	220	226	254	307	369	487
50-54	206	193	179	177	200	254	319
55-59	137	178	160	143	140	163	216
60-64	133	116	148	131	115	114	137
65-69	88	108	93	117	103	92	92
70-74	78	66	80	68	85	76	68
75+	117	99	83	85	77	87	86
TOTAL	8006	9357	10856	12483	14264	16305	18660
FEMALES							
0-4	1554	1968	2284	2511	2684	2910	3182
5-9	1235	1411	1781	2084	2329	2518	2762
10-14	1072	1202	1375	1740	2043	2287	2478
15-19	924	1048	1175	1347	1706	2007	2250
20-24	799	900	1020	1145	1313	1667	1965
25-29	652	768	859	971	1092	1260	1610
30-34	468	603	690	761	866	996	1174
35-39	347	415	504	563	629	746	893
40-44	276	305	339	400	456	533	662
45-49	230	246	256	275	330	393	477
50-54	218	208	214	216	233	288	354
55-59	127	195	182	183	185	203	258
60-64	148	111	168	155	156	160	178
65-69	85	123	91	137	127	129	134
70-74	83	64	92	68	102	97	100
75+	106	99	83	94	83	103	109
TOTAL	8325	9667	11115	12651	14335	16297	18585
BIRTH RATE		53.9	54.1	51.0	46.6	43.7	41.2
DEATH RATE		23.4	25.3	24.1	20.8	17.5	14.5
RATE OF NAT. INC.		3.05	2.88	2.69	2.58	2.62	2.66
NET MIGRATION RATE		.0	.0	.0	.0	.0	.0
GROWTH RATE		3.05	2.88	2.69	2.58	2.62	2.66
TOTAL FERTILITY		7.300	7.300	7.000	6.400	5.800	5.200
NRR		2.313	2.256	2.194	2.114	2.025	1.921
e(0) - BOTH SEXES		40.55	37.37	37.16	39.42	42.98	47.16
e(10) - BOTH SEXES		44.20	40.04	38.54	39.44	42.42	45.98
IMR - BOTH SEXES		128.4	125.1	114.7	99.8	91.0	82.4
q(5) - BOTH SEXES		.2325	.2367	.2203	.1897	.1671	.1447
DEP. RATIO	102.7	103.8	107.8	111.9	106.3	97.3	88.8

PROJECTION ASSUMING INCREASED CONDOM USE, FEWER NEW SEX PARTNERS AND REDUCED PREVALENCE OF GENITAL ULCERS

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	19025	21976	25185	28804	33101	38129
MALES							
0-4	1530	1981	2302	2542	2739	2993	3290
5-9	1219	1383	1784	2095	2356	2573	2845
10-14	1109	1186	1347	1743	2052	2312	2530
15-19	852	1085	1161	1320	1710	2016	2274
20-24	693	828	1055	1129	1284	1667	1969
25-29	587	669	799	1017	1089	1243	1618
30-34	450	556	628	768	959	1040	1197
35-39	330	405	484	545	664	885	986
40-44	256	284	327	389	456	590	824
45-49	222	220	226	256	319	399	542
50-54	206	193	179	178	208	276	362
55-59	137	178	160	144	144	177	245
60-64	133	116	148	131	118	121	153
65-69	88	108	93	117	105	95	100
70-74	78	66	80	68	86	78	72
75+	117	99	83	85	78	88	88
TOTAL	8006	9357	10858	12508	14365	16552	19096
FEMALES							
0-4	1554	1968	2285	2519	2707	2955	3245
5-9	1235	1411	1781	2088	2345	2556	2821
10-14	1072	1202	1375	1741	2047	2303	2514
15-19	924	1048	1175	1347	1707	2010	2266
20-24	799	900	1020	1145	1313	1667	1968
25-29	652	768	859	972	1094	1264	1617
30-34	468	603	691	764	876	1016	1203
35-39	347	415	504	567	644	781	947
40-44	276	305	339	403	470	568	722
45-49	230	246	256	277	339	418	526
50-54	218	208	214	217	238	304	387
55-59	127	195	182	184	188	211	277
60-64	148	111	168	155	158	164	188
65-69	85	123	91	137	128	131	139
70-74	83	64	92	68	103	98	102
75+	106	99	83	94	83	104	111
TOTAL	8325	9667	11117	12677	14439	16549	19033
BIRTH RATE		53.9	54.1	51.0	46.6	43.5	40.9
DEATH RATE		23.4	25.2	23.7	19.7	15.7	12.6
RATE OF NAT. INC.		3.05	2.88	2.73	2.69	2.78	2.83
NET MIGRATION RATE		.0	.0	.0	.0	.0	.0
GROWTH RATE		3.05	2.88	2.73	2.69	2.78	2.83
TOTAL FERTILITY		7.300	7.300	7.000	6.400	5.800	5.200
NRR		2.313	2.258	2.208	2.153	2.088	1.986
e(0) - BOTH SEXES		40.55	37.42	37.57	40.86	45.93	51.11
e(10) - BOTH SEXES		44.20	40.09	38.93	40.81	45.32	49.89
IMR - BOTH SEXES		128.4	124.9	113.7	97.6	88.1	79.4
q(5) - BOTH SEXES		.2325	.2364	.2175	.1823	.1557	.1329
DEP. RATIO	102.7	103.8	107.8	111.8	106.1	96.9	88.1

PROJECTION ASSUMING MEDICAL INTERVENTION AFTER 2000

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	19025	21967	25101	28681	33109	38349
MALES							
0-4	1530	1981	2301	2529	2733	3006	3316
5-9	1219	1383	1784	2087	2344	2576	2866
10-14	1109	1186	1347	1743	2045	2300	2532
15-19	852	1085	1161	1320	1709	2009	2263
20-24	693	828	1055	1129	1284	1666	1962
25-29	587	669	799	1017	1089	1243	1618
30-34	450	556	627	746	958	1043	1202
35-39	330	405	484	561	659	891	1001
40-44	256	284	327	384	448	594	846
45-49	222	220	226	252	311	398	558
50-54	206	193	179	176	202	273	369
55-59	137	178	160	142	141	174	247
60-64	133	116	148	131	116	120	153
65-69	88	108	93	117	104	94	100
70-74	78	66	80	68	86	78	72
75+	117	99	83	85	77	88	88
TOTAL	8006	9357	10854	12468	14306	16551	19193
FEMALES							
0-4	1554	1968	2283	2506	2701	2968	3271
5-9	1235	1411	1781	2081	2333	2558	2842
10-14	1072	1202	1373	1740	2040	2291	2517
15-19	924	1048	1175	1347	1706	2004	2254
20-24	799	900	1020	1145	1313	1667	1961
25-29	652	768	859	971	1093	1267	1621
30-34	468	603	690	760	872	1024	1220
35-39	347	415	504	561	636	789	976
40-44	276	305	338	398	460	570	748
45-49	230	246	256	273	332	415	538
50-54	218	208	214	215	234	300	390
55-59	127	195	182	183	186	209	277
60-64	148	111	168	155	156	163	188
65-69	85	123	91	137	127	131	139
70-74	83	64	92	68	103	97	102
75+	106	99	83	94	83	104	112
TOTAL	8325	9667	11113	12633	14375	16557	19156
BIRTH RATE		53.9	54.1	51.0	46.6	43.6	40.9
DEATH RATE		23.4	25.3	24.3	20.0	14.9	11.5
RATE OF NAT. INC.		3.05	2.88	2.67	2.67	2.87	2.94
NET MIGRATION RATE		.0	.0	.0	.0	.0	.0
GROWTH RATE		3.05	2.88	2.67	2.67	2.87	2.94
TOTAL FERTILITY		7.300	7.300	7.000	6.400	5.800	5.200
NRR		2.313	2.254	2.185	2.146	2.121	2.025
e(0) - BOTH SEXES		40.55	37.32	36.91	40.44	47.33	53.46
e(10) - BOTH SEXES		44.20	40.00	38.34	40.26	46.59	52.22
IMR - BOTH SEXES		128.4	125.3	115.0	97.0	86.1	77.9
q(5) - BOTH SEXES		.2325	.2370	.2224	.1820	.1492	.1264
DEP. RATIO	102.7	103.8	107.8	111.9	106.3	96.9	88.1

PROJECTION ASSUMING HIGH HIV INFECTION LEVEL IN 1993 AND NO INTERVENTIONS TO REDUCE AIDS MORTALITY

AGE GROUP	1990	1995	2000	2005	2010	2015	2020
TOTAL M+F	16331	18809	21450	24237	27169	30361	33858
MALES							
0-4	1530	1943	2242	2452	2596	2767	2970
5-9	1219	1369	1732	2014	2234	2385	2565
10-14	1109	1186	1334	1692	1972	2192	2345
15-19	852	1085	1161	1307	1659	1938	2157
20-24	693	828	1055	1129	1271	1618	1893
25-29	587	669	798	1017	1088	1228	1567
30-34	450	551	621	739	943	1018	1152
35-39	330	394	464	518	618	805	883
40-44	256	271	297	342	385	470	634
45-49	222	210	200	209	241	276	348
50-54	206	187	162	144	144	167	196
55-59	137	174	150	122	101	98	115
60-64	133	115	142	119	93	74	69
65-69	88	107	90	110	91	70	53
70-74	78	65	78	65	79	65	49
75+	117	99	82	83	74	79	74
TOTAL	8006	9253	10609	12060	13591	15251	17069
FEMALES							
0-4	1534	1932	2225	2430	2567	2733	2930
5-9	1235	1398	1730	2008	2223	2368	2543
10-14	1072	1202	1362	1690	1968	2183	2330
15-19	924	1048	1175	1334	1657	1933	2148
20-24	799	900	1020	1145	1300	1619	1892
25-29	652	765	855	966	1084	1236	1545
30-34	468	591	670	735	830	941	1083
35-39	347	399	467	512	560	642	740
40-44	276	292	304	339	371	411	480
45-49	230	239	233	228	251	279	313
50-54	218	204	200	187	178	197	221
55-59	127	193	175	167	153	144	160
60-64	148	110	164	147	139	126	118
65-69	85	122	89	132	119	112	102
70-74	83	64	91	66	97	89	84
75+	106	99	83	93	80	97	100
TOTAL	8325	9556	10842	12177	13579	15110	16789
BIRTH RATE		54.0	54.4	51.6	47.4	44.6	-2.3
DEATH RATE		25.7	28.1	27.1	24.6	22.4	20.5
RATE OF NAT. INC.		2.83	2.63	2.44	2.28	2.22	2.18
NET MIGRATION RATE		.0	.0	.0	.0	.0	.0
GROWTH RATE		2.83	2.63	2.44	2.28	2.22	2.18
TOTAL FERTILITY		7.300	7.300	7.000	6.400	5.800	5.200
NRR		2.213	2.148	2.083	1.980	1.858	1.732
e(0) - BOTH SEXES		37.65	34.31	33.83	34.85	36.12	37.67
e(10) - BOTH SEXES		41.41	36.97	35.22	34.94	35.66	36.61
IMR - BOTH SEXES		133.8	130.1	119.4	106.5	99.7	92.2
q(5) - BOTH SEXES		.2500	.2550	.2398	.2142	.1990	.1822
DEP. RATIO	102.7	103.9	108.0	112.5	107.9	99..	91..

ANNEX II

Estimation of Drug Costs for AIDS-Related Conditions

AIDS is not a single disease, but a complex of AIDS-related conditions that occur over time with considerable variability, severity, and permutation; symptomatic individuals usually have two or more AIDS-related conditions simultaneously and in any order.

There are no longitudinal study data on cohorts of AIDS cases in Uganda that allow definition of an "average" AIDS case or to calculate drug costs to treat it. Although there are no accepted standard treatment and management guidelines, health care workers are limited by the range of available essential drugs and there is very little flexibility.

Representative average treatment regimens for treatment of AIDS-related conditions based on essential drugs are used to estimate costs for additional drug needs. These treatment regimens are reduced to substantially minimum possible costs and realistically illustrate current prescribing practices in Uganda.

Essential Drugs and AIDS Treatment

A limited range of essential drugs is available for treating HIV-related conditions in the different types of health units (annex II table 1). How these drugs are actually prescribed and dispensed is not documented, although WHO consultants on quantification of essential drug requirements have recommended that rational prescription and use of drugs be made priorities for training and monitoring.

The drugs used in routine clinical management of HIV/AIDS in the Uganda health care system are the least expensive essential drugs on the national essential drugs list; for example, both nystatin and ketoconazole are on the list but only small quantities of ketoconazole are bought because of its greater cost. "AIDS Care" lists a modest number of priority drugs used in palliative care of AIDS patients (annex II, table 2) as well as alternatives because even priority drugs are not always available due to shortages or stockouts.

Although an AIDS Care manual on treatment strategies has been prepared, there is little information on how widely it is available or followed. Based on treatment and prescription practices currently used in Uganda—including the AIDS Care manual protocols—and on the essential drugs routinely provided in the health care system, a list of representative average treatment regimens for each AIDS-related condition in adults is shown in annex II, table 3. It should be noted that the average treatment courses shown are *indicative*; there will be variations according to which drugs are currently available and on clinical judgment concerning dosage and treatment time.

Cost Per Average Course of Drug Treatment

A Treatment Episode (TE) is a patient contact for which a course of treatment is required. One patient contact can give rise to more than one TE if he/she requires a course of treatment for more than one condition. This is typically the circumstance when an AIDS case seeks treatment.

Using the WHO methodology, drug costs are calculated according to amounts used for a treatment episode. Total numbers of treatment episodes and total amounts of drugs used are summed to

give the total costs of drugs used by the health care system. The methodology is best applied when standard treatment regimens are used in the health care system or when prescribing practices are well-known. The cost of drugs for a Treatment Episode of an AIDS-related condition is given by: Unit price of drug(s) x Amount of drug(s)/TE = Cost/TE. Cost/TE of the representative Uganda treatment regimens are shown in annex II, table 4.

Annex II, Table 1: Essential Drugs Used in AIDS Treatment in Uganda
(in 1990 US$)

Drug	Strength/Form	Unit Price	Source
Calamine lotion	15% 500 ml bottle	$3.59	UNICEF
Cotrimoxazole (sulfamethoxazole and trimethoprim)	400 mg and 80 mg tablet	$0.014	UNICEF
Chlorphenamine	4 mg tablet	$0.001	UNICEF
Gentian violet	1% solution, 500 ml	$0.019	UNICEF
Loperamide	2 mg capsule	$0.004	UNICEF
Metronidazole	250 mg tablet	$0.006	UNICEF
Nystatin	500,000 IU tablet	$0.043	UNICEF
ORS	sachet/liter	$0.064	UNICEF
Paracetamol	500 mg tablet	$0.007	UNICEF
Phenoxymethyl penicillin	250 mg tab	$0.012	UNICEF
Saline, normal	1 liter parenteral	$1.09	IDA
Streptomycin	1 g injection	$0.09	IDA
Thiacetazone/ isoniazid	50 + 100 mg tab	$0.005	UNICEF
Vincristine	1 g injection	$6.61	IDA

Source: World Bank Staff Mission Estimates 1990.

Annex II, Table 2: Priority Drugs for Palliation in AIDS Patients*

Drug	Indication	Alternatives
ketoconazole	Candidiasis Tinea	nystatin, gentian violet, griseofulvin
cotrimoxazole	Diarrhea (Isospora) Shigellosis, skin sepsis, Salmonella infections, bacterial pneumonia	tetracycline, ampicillin, erythromycin, chloramphenicol, other antibiotics
metronidazole	Diarrhea (Giardia) amoebic colitis	
chlorpromazine	nausea and vomiting, itching, sleeplessness, psychosis	promethazine (Phenergan), metachlorpropamide, chlorphenimine, diazepam
chloroquine	malaria	fansidar, quinine
aspirin/paracetamol	pain, fever	
codeine	severe pain, diarrhea	Immodium (loperamide), Lomotil (diphenoxylate)
multivitamins +/- iron	anemia, deficiencies	
calamine lotion	many skin problems	
petroleum jelly	dry skin	
hydrocortisone cream	atopic skin disease	

* Drugs for TB are an essential part of AIDS care.

Source: Elly Katabiri and Richard Goodgame. 1989. *Diagnostic and Treatment Strategies for Health Workers*. AIDS Care.

Annex II, Table 3: Representative Average AIDS Treatment Regimens in Uganda

Indication	Drug/strength	Dose	Times per day	Number of days	Amount per course
Chronic Diarrhea[a/]	cotrimox 400 + 80 mg metronid 250 mg ORS 1 liter loperam 2 mg	2 tabs 1 tab 2 sachet 2 cap	2 3 1 max:16 mg	5 7 5 5	20 tab 21 tab 10 sachet 40 cap
Chronic Cough	phenoxymeth. penicill. 250mg	2 tabs	3	10	60 tabs
Body Rash[b/]	calamine lotion 500 ml chlorphen 4 mg	paint area 1 tab	as needed 3	— 3	250 ml 9 tab
Oro-phar Candidia	nystatin 500,000 IU[c/]	1 tab	4	7	28 tab
TB[d/]	streptomycin 1 g thiacet/isoniaz 50/100 mg	1 g inj 1 tab	1 1	60 308	60 g 308 tab
Herpes Zoster[e/]	calamine lotion 500 ml paracetamol 500 mg	paint affected area 1 tab	2 4	3 3	250 ml 12 tab
Herpes Simplex, aggressive	gentian violet 1% paracet 500 mg	paint area 1 tab	3 4	as needed 3	500 ml 12 tab
Dissem. Kaposi's	vincristine 1 mg	1 mg amp	2	2–3 wk interval	2 mg[f/]

Source: World Bank Mission Estimates 1990.

[a/] Management of chronic diarrhea is difficult; the causative agent (bacteria, amoeba, virus) is rarely identified. Repeat/continued treatment is often required. A proportion of cases—around 20 percent—will require intravenous rehydration in hospital or home care (around 4 liters rehydration fluid, for example, normal saline).

[b/] If the rash is dry skin, petroleum jelly is used as required. Focal infections may require treatment with an anti-infective such as cotrimoxazole or tetracycline.

[c/] Unlikely to be effective in severe candidiasis; if available, ketoconazole 200mg x 2 tab x 7 (total: 14 tab) should be used.

[d/] A proportion of TB in AIDS will have sensitivity to one or another drug. Around 1–5 percent will have a potentially fatal sensitivity to thiacetazone and will need to be switched to a regimen using ethambutol or rifampicin; the course is shorter but the drugs are more expensive than standard course drugs. Retreatment cases may also be placed on a regimen using ethambutol.

[e/] Narcotics will be needed at times for pain control. When it is available the opioid analgesic, codeine, can be used (30 milligram tabs, as required).

[f/] Vincristine and other chemotherapeutic agents used in Kaposi's sarcoma are immunosuppressive. The dose (2 milligrams) is given at two to three weekly intervals; the total amount used in an AIDS case will depend on patient evaluation.

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