The HIV/AIDS Sector in THRESHOLD 21 Malawi

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I. Introduction

Most of the world's AIDS victims are in Africa, and Malawi has one of the highest HIV/AIDS prevalence rates in the continent (Reference 1). The epidemic is further complicated by poverty and culture. Measured in US dollars, Malawi's per capita GDP is less than $200, and 60% of population is living under the poverty line defined by the Malawian Government. In hospitals there, there are at present (March 1998) insufficient resources to test the blood of every patient, even when the person is seemingly dying of an AIDS related illness. Only blood donors' blood is tested. As a result there is very poor data on AIDS cases. For those who are found to be HIV positive, it is against the law to inform them of the test results. It is very rare for a death to be officially attributed to an AIDS related illness, instead the cause of death is usually simply declared as tuberculoses, diarrhea, or another such disease.

While data are limited, the impact of HIV/AIDS on educated group is very real. In June 1997, the authors ran a two week computer modeling workshop for 20 local young (Ages 20 to 35) participants. By the end of 1997, 2 of the participants were dead, probably of AIDS related illnesses.

In mid 1997, supported by UNDP/Malawi, the National Economic Council of Malawi decided to use THRESHOLD 21[*] as a tool for national and sectoral planning. It was decided that the health care sector in THRESHOLD 21 was inadequate to capture the AIDS epidemic in Malawi, and a new HIV/AIDS sector was necessary to explore the demographic, economic, and social impacts of the epidemic, and to design strategy to deal with them.

[*] The Millennium Institute's THRESHOLD 21 national sustainable development model integrates economic, social, resource, and environmental considerations. It answers questions about the future consequences of alternative policies guiding investments into alternative sectors of the economy. Versions of the model have been developed for Bangladesh, Benin, Cambodia, China, Italy, Malawi, Tunisia, and the United States. See: http://www.igc.apc.org/millennium.

II. Major assumptions of the HIV/AIDS sector

Although data was not available for actual numbers of HIV and AIDS cases in Malawi, several studies made thoughtful efforts to estimate these numbers; the most recent and the most authoritative study was chosen as the source, which is *The HIV/AIDS epidemic in Malawi: Current Status*, by the National AIDS Control Program of Malawi, published in July 1997 (Reference 2).

According to this source, new adult HIV infections were 19,000 for 1985, then gradually increased to peak in 1997 at 90,000. After 1997, annual new adult HIV infections are expected to decrease, to 70,000 in 2005, and to 50,000 in 2010. For comparison, the total population of Malawi is about 11 million.

The age and gender distributions of new HIV infections were obtained from the same source, by moving the *Age and sex distribution of 1996 AIDS cases* eight years ahead. It was estimated that it took an average of eight years to develop AIDS from initial HIV infection in Malawi. The female HIV infections cover the ages 12 to 51, with the highest infection rate appearing between ages 17 and 21. For males, the age span is from 12 to 56, with the highest rates appearing at ages 22 to 26.

According to the National AIDS Control Programme of Malawi, AIDS deaths in Malawi follow swiftly after developing AIDS. For instance, it is estimated that new adult AIDS cases for 1995 at 29,000, and AIDS deaths for the same year at 26,000. It means that about 90% of adult AIDS patients die within a year.

HIV positive babies in Malawi die even faster. Based on personal communications with an American doctor working in Malawi, about 70% die within the first year of birth.

Direct AIDS costs, including AIDS treatment and funeral costs, were estimated in *Summary Report, The Demographic and Economic Impact of HIV-AIDS in Malawi, 1987 -2022, by Bimal K. Lodh* (Reference 1) It estimated that the direct costs of testing and treatment of adult AIDS patients amounted to 15.6 million Malawian Kwachas (evaluated in 1990 prices, i.e., MK90) in 1992, while AIDS cases were estimated to be 30,000 for 1992. Converting to 1987 prices (MK87) using these numbers plus the GDP deflator for 1990, the average per

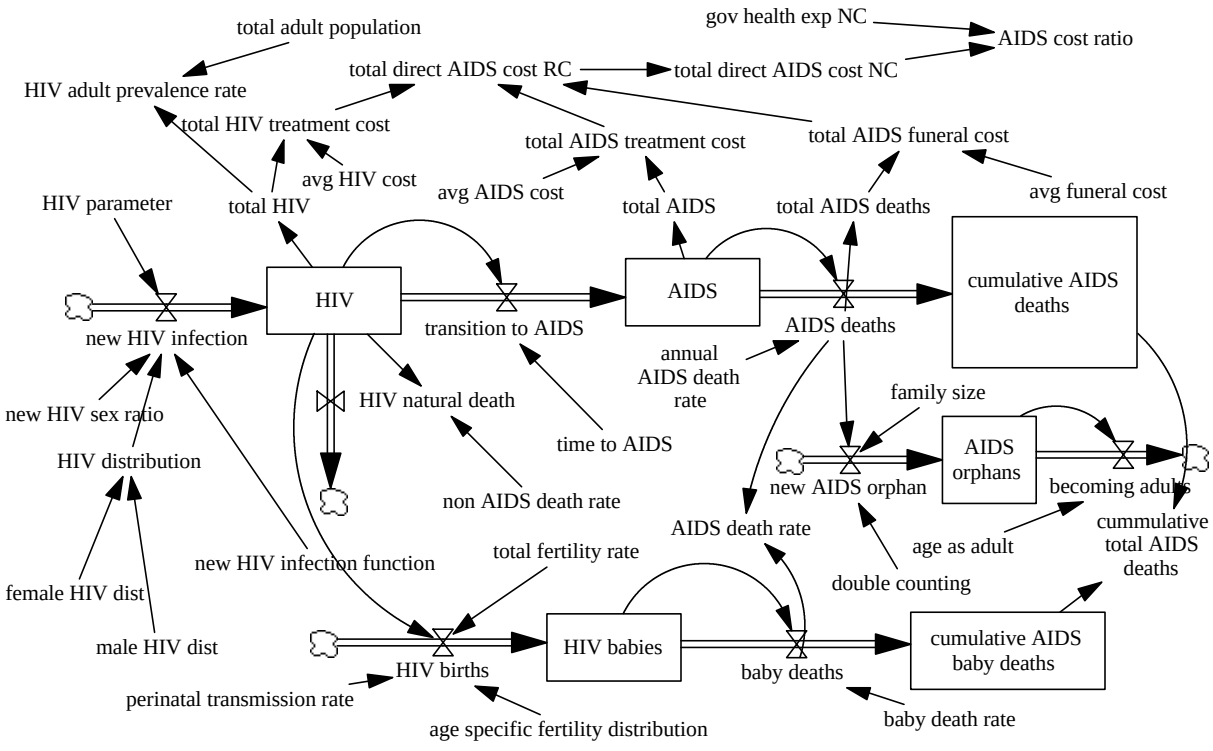
AIDS patient cost, *Avg AIDS cost,* is calculated as 300 MK87, which is equivalent to $136 in 1987 prices and for each patient this amounts to a very high proportion of the per capita GDP, which is $200. Average funeral cost for AIDS deaths is based on the assumption of Reference 1 (50% of AIDS treatment cost) to be 150 MK87 per AIDS death.

In order to develop the sector, the following assumptions were made:

- HIV positive population has the same death rates as others until progressing to AIDS
- HIV positive women have the same fertility rate as other women
- *Average HIV treatment (before developing AIDS) cost* is zero
- *Total direct AIDS cost* does not cover AIDS babies
- *AIDS orphans* is defined as the number of children 15 or less years old when the first of his/her parents dies of AIDS. There is no increase in AIDS orphans when the second poorest dies. The probability that an AIDS adult death is a second parent is assumed to be 25% (based on personal communications with an American doctor working in Malawi), which is the value of the variable *double counting*.
- Average number of children an AIDS adult has is half of that from an average adult in the population

III. Structure of the HIV/AIDS sector

The following diagram is the HIV/AIDS sector in the THRESHOLD 21 national development model:



Inputs to this sector include population age cohorts and total fertility rate.

On top of the diagram, there is *total direct AIDS cost RC* (RC stands for real or constant local currency, i.e., MK87), which is the sum of three variables: *total HIV treatment cost, total AIDS treatment cost*, and *total AIDS funeral cost*. Each of these costs is equal to the total number of AIDS cases times average cost. *Total direct AIDS cost RC* is converted to current (or nominal) local currency (*total direct AIDS cost NC*), and then compared with government health expenses to arrive at *AIDS cost ratio*, which is the percentage of government health expenditure to be used for AIDS testing, treatment, and funerals.

The flow variable *new HIV infection* includes total numbers of HIV new infection at different times (*new HIV infection function*), age distributions (*HIV distribution*) for female and male, and sex ratio (*new HIV sex ratio*). The stock (boxed) variable *HIV* represents HIV positive population age cohorts, which increases with the flow variable *new HIV infection*, and decreases with two flow variables: *HIV natural death* and *transition to AIDS*. The stock variable *AIDS* represents AIDS cohorts, which increases with *transition to AIDS*, and decreases with *AIDS deaths*.

AIDS orphans are generated as adults die of AIDS. As orphaned children reach the age of 16, they are no longer counted as orphans, an effect which is measured by the variable *becoming adults*.

HIV births is related to HIV positive fertile women, their fertility rate, and *perinatal transmission rate* (assumed to be 30% for Malawi). The stock variable *HIV babies* increases with *HIV births* and decreases with *baby deaths*.

IV. Uses of the HIV/AIDS sector

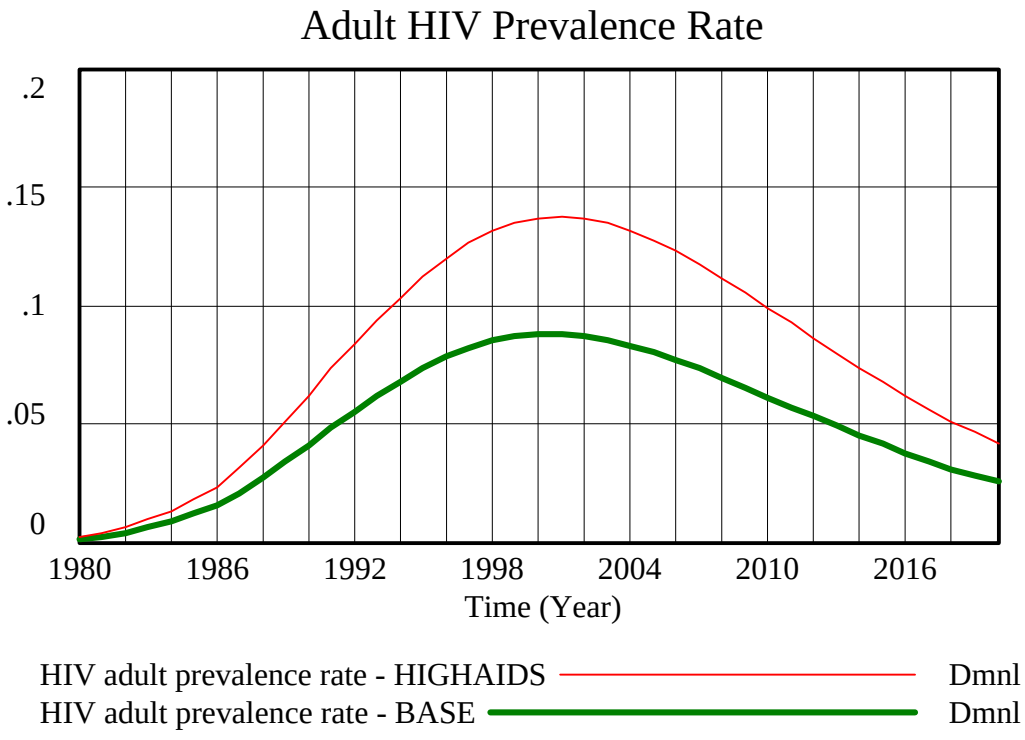
With the HIV/AIDS sector in THRESHOLD 21, we can do a variety of what-if scenario analysis. We have developed four scenarios to answer the following four questions:

1) Base scenario: What is the future like if the HIV infection estimates adopted in the model from the two references are true?
2) High AIDS scenario: What is the future like if the real new HIV infection is 50% higher than the *new HIV infection function* in the model?
3) High Cost scenario: What is the future like if the real average cost is 100% higher than the *avg AIDS cost* in the model?
4) AIDS Cost scenario (a combination of scenarios 2 and 3, above): What is the future like if real new HIV infections is 50% higher, and average AIDS cost is 100% higher?

In the following sections, each of the scenarios 2, 3, and 4 is compared with scenario 1, the Base scenario. The comparisons are made using sic indicators: adult HIV prevalence rate, AIDS cost ratio (percentage of AIDS cost in regular government health expenditure), AIDS orphans, cumulative total AIDS deaths, annual adult AIDS deaths, and annual baby AIDS deaths.

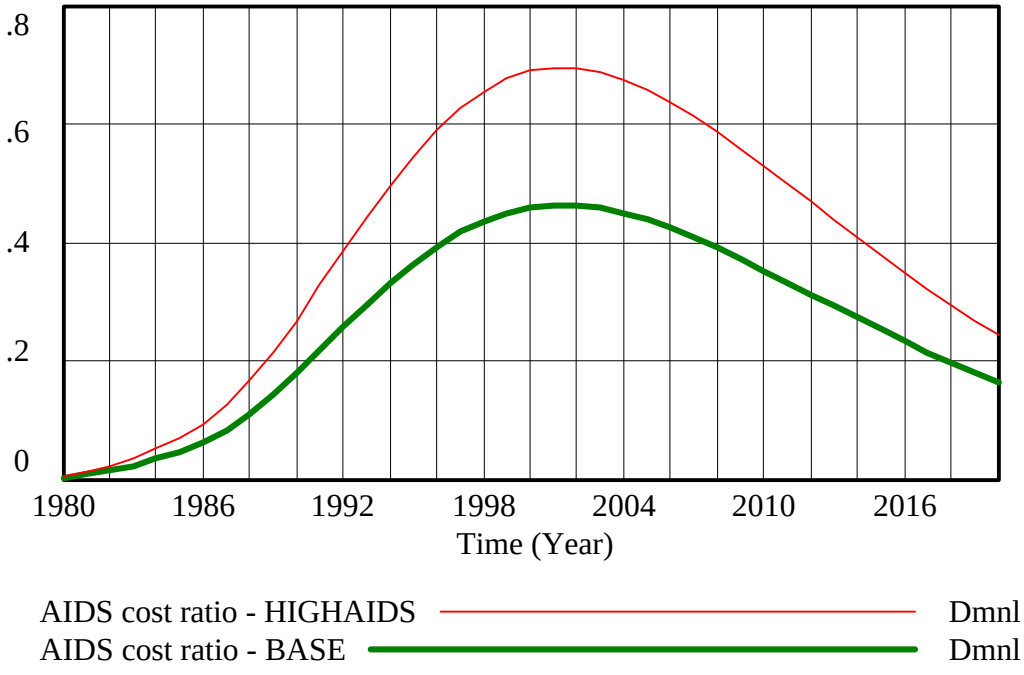
IV.1 HighAIDS compared with Base

In THRESHOLD 21, adult means the population above age 15. For HighAIDS scenario, adult HIV prevalence rate could reach 14% by the year 2001, while for Base scenario, the rate is about 8% to 9% during 1998 to 2004, as the following figure shows.

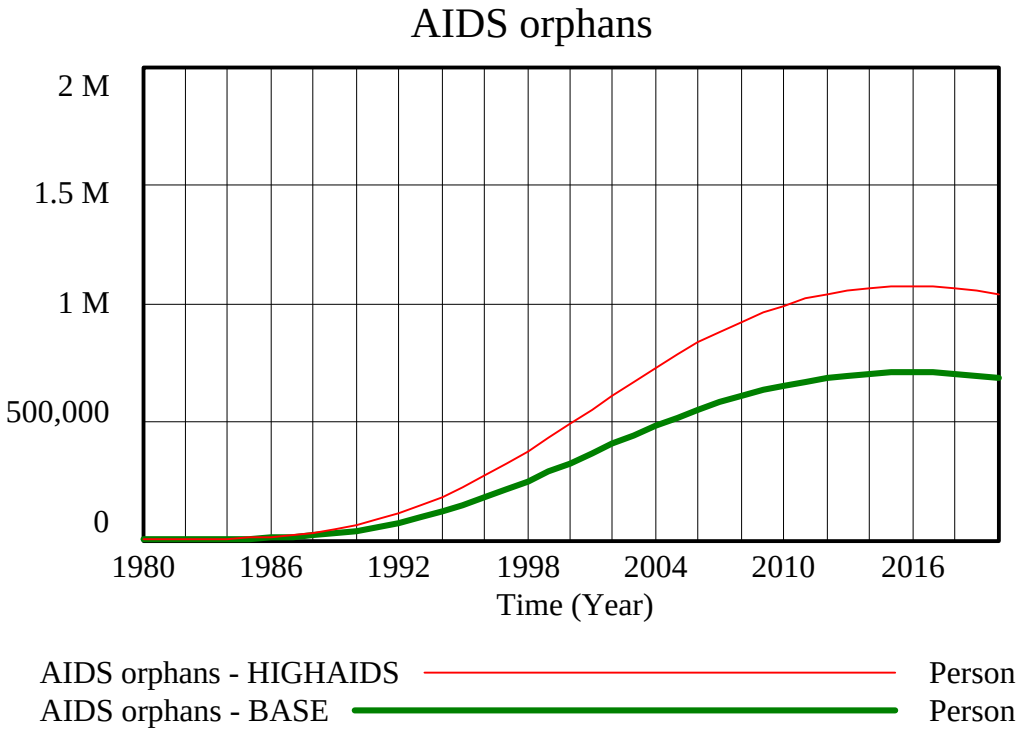


Direct AIDS cost could reach almost 70% of regular government expenditure on health care for HighAIDS scenario, which will crowd out government health work in other areas, such as child nutrition. Even for Base scenario, it will be close to 50% by the year 2000 to 2002.

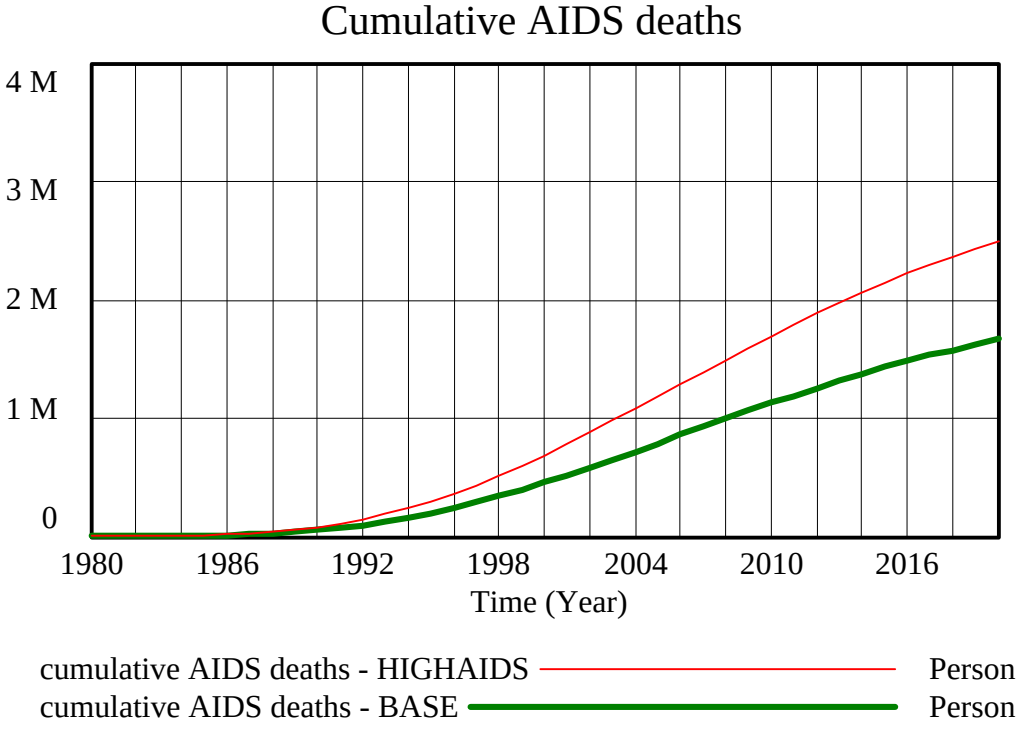
Percentage of AIDS cost in goverment health expenditure



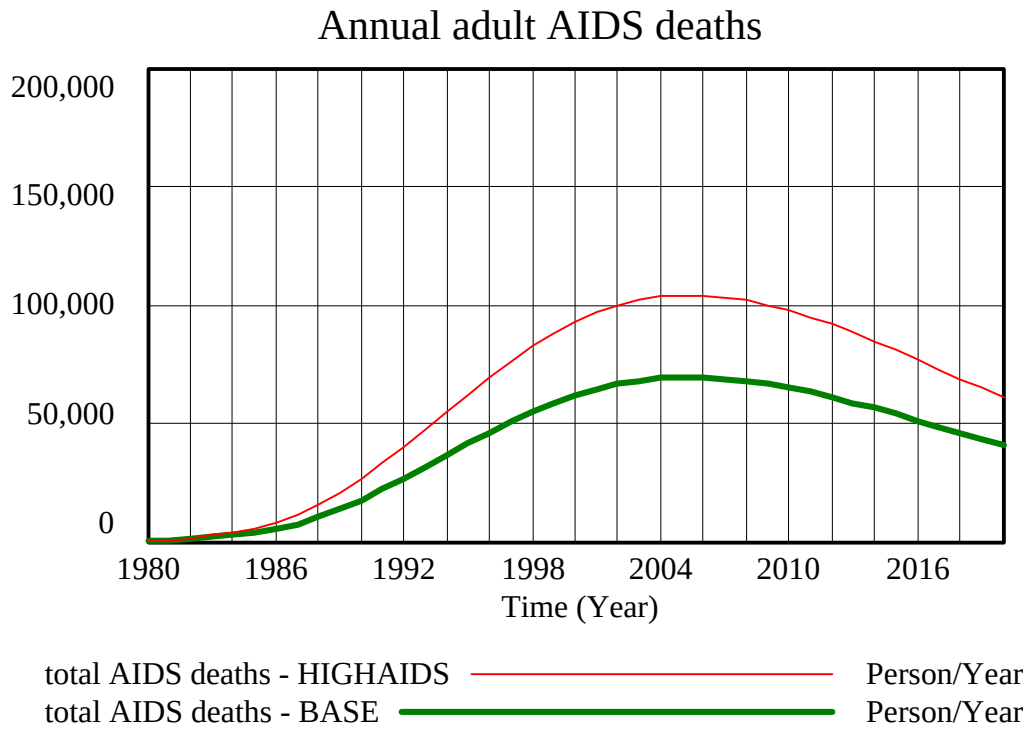
AIDS orphans will exceed 1 million (% of the total current population) for the High AIDS scenario, and about 700,000 for the Base scenario. In either scenario, this could bring a huge social problem to the country.



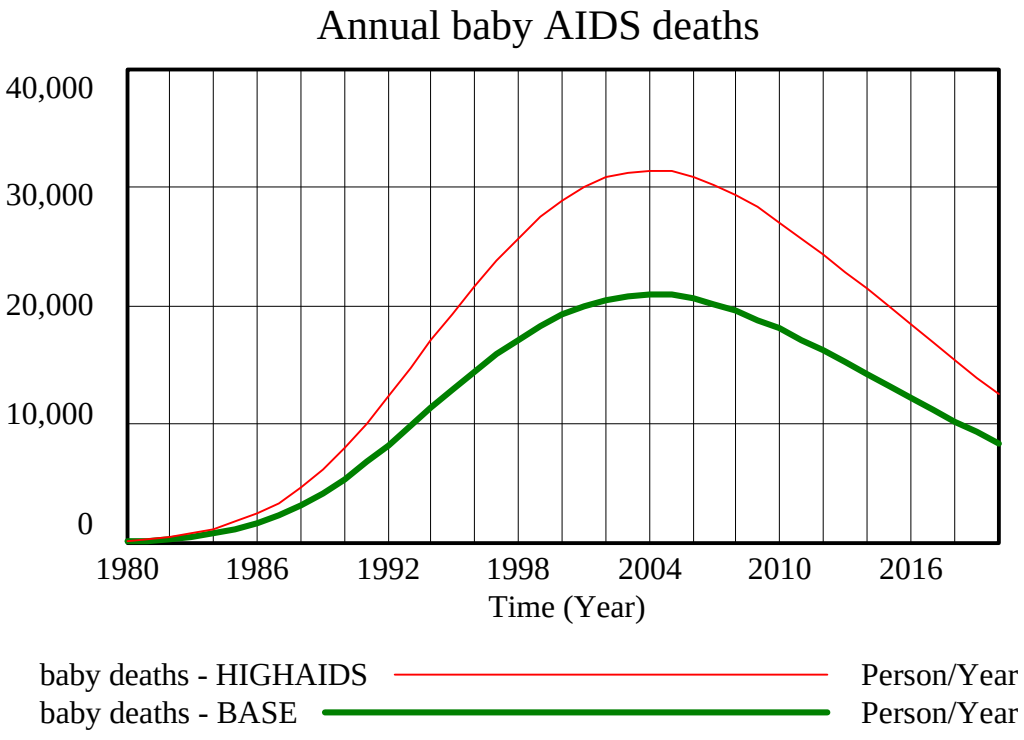
Cumulative AIDS deaths will be 2.4 million for the HighAIDS scenario and about 1.7 million for the Base scenario. The total Malawi population will be about 22 million for HighAIDS, and about 24 million for Base scenario.



Annual adult AIDS deaths will exceed 100,000 for HighAIDS and reach 70,000 for the Base case around the year 2002 to 2008. Without AIDS, annual deaths would be about 215,000 per year, so AIDS will add about 30%.



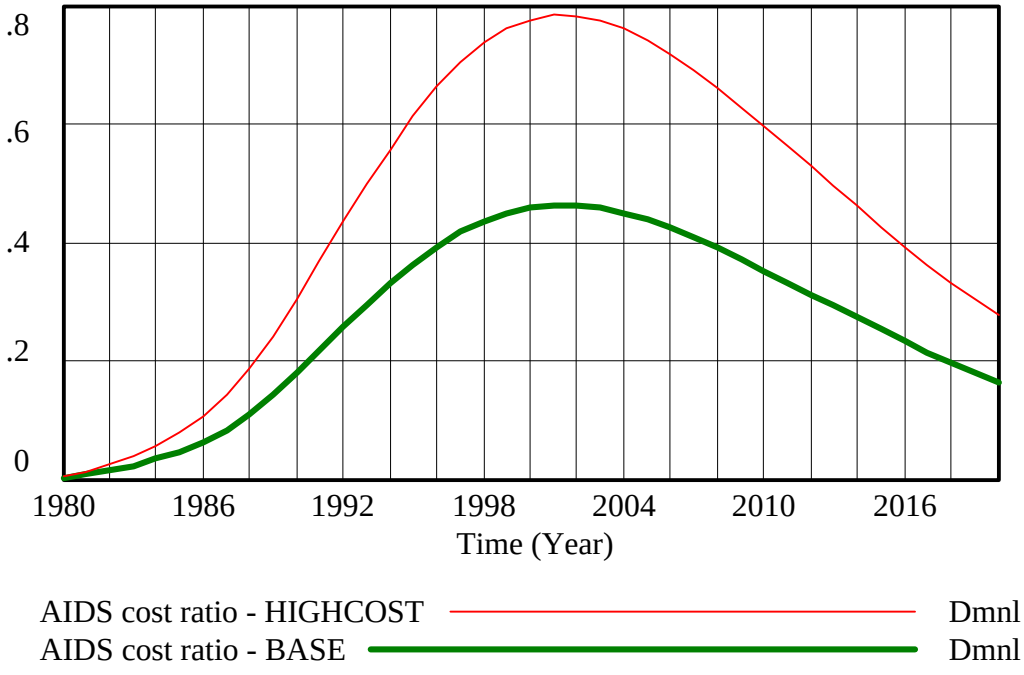
Annual HIV/AIDS baby deaths will be over 30,000 for HighAIDS and over 20,000 for the Base scenario around 2001 to 2007.



IV.2 HighCost compared with Base

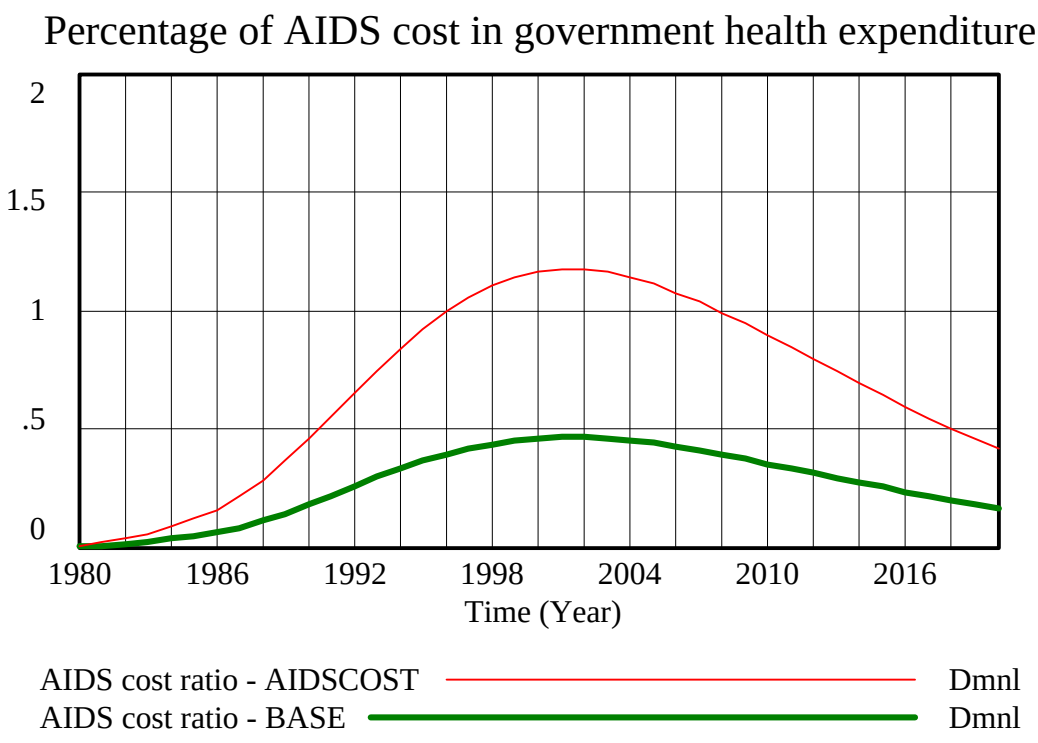
The only difference the HighCost scenario generates is cost, while the numbers of adult HIV prevalence rate, AIDS orphans, and AIDS deaths for adults and children, are the same as the Base scenario. In the following figure. At the peak around 2000, the annual cost of AIDS treatment is expressed a percentage of total government expenditure on health care, currently about 800 million Malawian Kwacha. Almost 80% of government health expenditure will be consumed by AIDS cost for the HighCost scenario.

Percentage of AIDS cost in government health expenditure



IV.3 AIDSCost compared with Base

The AIDSCost scenario generates the same values as the HighAIDS scenario for the following indicators: adult HIV prevalence rate, AIDS orphans, and AIDS deaths for adults and children. But now there are not only more AIDS patients to treat, but each patient is more costly. The following figure shows that total direct AIDS cost will exceed regular government health expenditure during the years 1996 to 2008.



V. References:

1. *Summary Report of the Demographic and Economic Impact of HIV-AIDS in Malawi, 1987 - 2022*, Bimal K. Lodh, November 1995.

2. *The HIV/AIDS Epidemic in Malawi: Current Status*, by the National AIDS Control Programme of Malawi, 1997.