

The Economic Impact of AIDS on Thailand *

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Introduction

During the past several years, Thailand has experienced significant growth in two very different areas. Since 1987, the Thai economy has achieved impressive annual growth of 9 to 13 percent in its gross domestic product (GDP). However, growing unobserved alongside this economic prosperity is an AIDS epidemic. The human toll for the country in terms of death and illness will be significant. This epidemic is also likely to have a significant impact on the economy. This chapter examines the potential economic impacts of the AIDS epidemic on Thailand. The direct costs (health care and systems costs) and the indirect costs (the value of lost wages) of AIDS in Thailand are estimated based on differing future paths of the epidemic. The approach is similar to methodologies used in Africa (Over and others 1988) and in Puerto Rico (Shepard 1990).

This analysis is important to demonstrate the magnitude of the financial burden of AIDS, to rank the costs in relation to other health care issues, to justify budgets for prevention efforts, and to plan for the health care of AIDS patients. By demonstrating the potentially enormous costs of the epidemic to Thailand, the authors hope to motivate policymakers to take strong and immediate action to reduce the spread of the AIDS epidemic. As this chapter will demonstrate, the financial savings from prevention efforts that reduce the spread of AIDS will be significant.

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Characteristics of the AIDS Epidemic

AIDS is not a single, distinct disease, but a complex illness that results from an immune deficiency. The causal agent is the human immunodeficiency virus (HIV). The HIV is transmitted by sexual contact, by blood contact, and by infected mothers to their children during pregnancy or birth. AIDS is eventually fatal, but the causes of death among AIDS patients vary. Unusual types of pneumonia and cancer are among the leading causes of death in the United States and Europe. In Africa they include meningitis; tuberculosis; and the syndrome of wasting, recurrent fevers and diarrhea called "slim disease" (Myers and Henn 1988). It is too early to know what the leading causes of death of infected people in Thailand will be, but the pattern will have important consequences for health care services and costs.

A complicating feature of the epidemic is the long period of latency between the initial HIV infection and the onset of serious illness. In the United States and among middle-income and upper-income Africans, the average interval between infection (HIV-positive) and illness (AIDS cases) for adults is about ten years (Myers and Henn 1988). During this latent period infected individuals appear healthy, but they can and do infect others. The epidemic thus spreads unobserved and undetected. Some infected individuals are identified through routine blood screening and through special surveys in which blood tests for the presence of antibodies are conducted. AIDS cases are confirmed through blood tests once individuals develop illnesses that are associated with previously confirmed AIDS cases. However, those people who test positive for the HIV or who are confirmed AIDS cases represent only a small proportion of the total number of infected people. The costs of testing and the logistics of large-scale screening prevent any country from knowing with certainty the exact number of HIV-positive individuals.

AIDS epidemics typically advance in waves of infection, starting with those engaging in the highest risk behaviors, then spreading to the general population (Myers and Ashakul 1991). In the United States and Europe the epidemic began with male homosexuals and hemophiliacs, and then spread to injecting drug users (IDUs). In contrast, the epidemic in Africa and in Thailand has spread into the general population through other risk groups.

In Thailand the first and second waves were homosexuals and IDUs. The third wave infected female prostitutes via IDUs and homosexuals. The fourth wave infects the male clients of the female prostitutes. These infected men then pass the virus to their girlfriends

and wives, who make up the fifth wave. The sixth and final wave involves the children who receive the infection from their mothers. Infected mothers have a 30 percent chance of passing the virus to their children.

The Current Situation in Thailand

The AIDS epidemic is relatively new in Thailand. Experts believe that widespread transmission of the HIV began in the late 1980s. Because of the long latency period between infection and the development of AIDS symptoms, Thailand has experienced few (reported) AIDS-related illnesses or deaths. A significant number of AIDS cases and deaths will begin to develop in the mid- to late-1990s. As described above, the first wave of infected male homosexuals was followed over time by IDUs, female prostitutes, male clients of female prostitutes, partners of males infected by prostitutes, and finally the children of infected women. Each of these groups has its own AIDS epidemic with a specific start date, size of population at risk, and infection rates.

Since 1989, Thailand's Ministry of Public Health (MOPH) has conducted testing of various groups engaging in high and low risk behaviors to track the epidemic's spread. The MOPH conducts this sampling, referred to as the National Sentinel Seroprevalence Survey, every six months. Currently, all seventy-three provinces are included in the semi-annual survey. The Division of Epidemiology (1989, 1990, 1991) summarizes the results of the last five surveys (table 1). The figures provided are the national mean rate (the number tested HIV-positive divided by the total number tested), the national median rate (the midpoint rate of all the reporting provinces), the range of prevalence rates observed among the provinces, and the number of provinces reporting prevalence rates for the respective test group.

The data illustrate the individual waves and the rapidly progressing spread of the epidemic. Most notable is the high level and increasing rate of infection found during the June 1991 survey. Of the groups sampled, 24 percent of brothel prostitutes, 8 percent of men attending MOPH sexually transmitted disease (STD) clinics, and 1 percent of women attending MOPH antenatal clinics tested positive for the HIV. Between December 1990 and June 1991, a mere six months, prevalence rates increased by 30 percent for brothel prostitutes, 50 percent for men attending STD clinics, and 50 percent for women attending antenatal clinics. While there may be some sampling bias in the data, the initial results from the December 1991 survey continue to show significant increases in infection in certain groups, particularly blood donors, men attending STD clinics, and prostitutes.

Table 1. Thailand National Sentinel Seroprevalence Survey Prevalence Rates, 1989-91

Population group	June 1989	December 1989	June 1990	December 1990	June 1991
Injecting drug users					
Mean rate (%)	33.00	32.26	35.56	37.62	30.73
Median rate (%)	39.00	30.10	30.40	30.10	35.10
Number of provinces	14	26	49	53	52
Range (%)	0-51.5	0-66.6	0-70.0	0-100.0	0-69.3
Brothel prostitutes					
Mean rate (%)	6.37	9.95	13.78	16.75	24.17
Median rate (%)	3.50	6.30	9.30	12.20	15.20
Number of provinces	13	30	70	71	69
Range (%)	0-44.0	0-42.7	0-67.0	0-56.3	0-62.9
Males attending STD clinics					
Mean rate (%)	1.36	3.31	4.39	5.55	8.19
Median rate (%)	0	2.00	2.55	4.40	5.00
Number of provinces	14	30	70	71	70
Range (%)	0-10.0	0-17.8	0-24.0	0-23.0	0-30.5
Women attending antenatal clinics					
Mean rate (%)	0.15	0.41	0.21	0.67	1.00
Median rate (%)	0	0	0	0.30	0.79
Number of provinces	13	30	73	71	70
Range (%)	0-1.0	0-4.0	0-3.1	0-4.5	0-12.1
Blood donors					
Mean rate (%)	0.56	0.96	0.60	0.89	0.99
Median rate (%)	0.28	0.23	0.44	0.40	0.46
Number of provinces	13	31	72	71	67
Range (%)	0-3.7	0-7.7	0-4.7	0-7.3	0-5.9

STD = sexually transmitted diseases.

Notes: National mean rates equal the number tested HIV-positive divided by the total number tested. National median rates equal the midpoint of all the reporting provinces: one-half the provinces report higher rates and one-half the provinces report lower rates.

While the national rates are alarming, regional variation may signal even higher prevalence rates in the future. For example, in the June 1991 survey, prevalence rates among brothel prostitutes in the northern provinces of Chiang Rai, Chiang Mai, and Phayao were over 40 percent. Prevalence rates for men attending STD clinics in those provinces were over 20 percent, and for women attending antenatal clinics the rates were over 3 percent (Division of Epidemiology 1991).

The data from the MOPH's sentinel survey are used to estimate the number of HIV-positive individuals (table 2). The MOPH estimated that as of December 1990, approximately 200,000 Thais were HIV-positive. The MOPH estimates the number of people in the following risk groups: IDUs, prostitutes, high risk men, partners of high risk men, and newborns. For each of these groups the regional median prevalence rate is applied to the group's population to arrive at the total estimate of 200,000 people. Preliminary analysis from the June 1991 sentinel survey indicates that an additional 50,000 to 100,000 Thais became infected in the first six months of 1991, raising the cumulative total to 250,000 to 300,000 infected (personal communications 1991).

An alternative method for estimating the number of HIV-positive individuals suggests that 240,000 people were infected as of December 1990. This method multiplies the female adult population aged fifteen to forty-nine in each province by the province-specific antenatal rate. The male adult population aged fifteen to forty-nine is multiplied by the blood donor prevalence rate. Approximately 90 percent of the blood donors in Thailand are male. Using the June 1991 antenatal and blood donor rates, this method estimates that an additional 50,000 to 100,000 people became infected in the first six months of 1991, raising the cumulative total to 300,000 to 350,000 infected (personal communications, Obremskey 1992).

The MOPH and other AIDS experts in Thailand have concurred that as of the end of 1991, between 200,000 and 400,000 people were infected with the AIDS virus. The trends in the survey prevalence rates indicate that the epidemic continues to grow at alarming rates and, with the exception of the IDU population, shows no signs of slowing. In addition, the epidemic has spread to the general population, implying that the behaviors of a large number of people need to change to reduce the spread of the epidemic.

The Future Situation in Thailand

Projecting the future spread of the HIV is difficult. Because the infection is unobservable, even estimating the current situation to determine the epidemic's starting point is problematic. Furthermore, changes in social behavior, medical breakthroughs, and other

Table 2. Thailand: Estimated Number of HIV-Positive People as of December 1990

Population group	Population size at risk for HIV	Prevalence rate (%) a	Number of HIV-infected people
Injecting drug users	49,550-99,100	22-45	16,000-32,000
Prostitutes			
Brothel	41,665-58,331	6-20	5,200-7,200
Nonbrothel	66,452-93,033	1-8	3,300-4,600
High risk men	4.6-5.0 million	1-5	92,000-184,000
Partners of high risk men	3.6-4.0 million	0.3-0.5	12,300-15,000
Newborns	3,000-6,000	30	1,000-2,000
Total			129,000-244,000

a. The prevalence rates are the regional median rates. Each region consists of a number of reporting provinces.

Source: Ministry of Public Health.

unpredictable factors could affect future growth. However, to understand the potential magnitude of the problem and its impact on the economy future scenarios must be developed. This article uses several modeling tools to develop a conservative set of HIV projections, full-blown AIDS cases, and AIDS deaths for Thailand. It examines both a high scenario and a low scenario to show a possible range of estimates.

HIV Infection

The projections for the spread of HIV infection in Thailand were constructed using the iwgAIDS model (Stanley and others 1990). This model was developed by the U.S.

Department of State's Interagency Working Group on AIDS Models and Methods. A demographic model is used as a foundation for the iwgAIDS model with AIDS-related processes integrated into it. The model projects the spread of the HIV by heterosexual sex between both casual and married partners, homosexual and bisexual sex, intravenous drug use, blood transfusions, and perinatal transmission. This is a behavior-based model that requires detailed data on demography, sexual and drug injecting behavior, epidemiology, and blood banking. In March 1990 the Thai Working Group on HIV/AIDS Projections was founded to work with the U.S. team (Thai Working Group on HIV/AIDS Projections 1991). The Thai Working Group, comprised of experts from the public, academic, and private sectors, compiled and reviewed the available data required by the iwgAIDS model. Figure 1 shows the projections for the spread of the HIV in Thailand.

Highlights from the iwgAIDS model of HIV projections for Thailand are as follows:

- The number of people infected with the HIV is projected to grow from 160,000 in 1990 to between 3.4 and 4.3 million by 2000.
- While more males are initially infected, by the year 2000 more women will be infected than men.
- People in the fifteen to thirty-four age group will be the most infected.
- Urban prevalence rates among the general population will increase from 0.9 to 11.2 percent and rural prevalence rates will increase from 0.12 to 2.50 percent between 1991 and 2000.

AIDS Cases and Deaths

The iwgAIDS model is still under development with adjustments and revisions occurring, particularly with respect to AIDS cases and AIDS deaths. For this reason a separate model, Epimodel (Chin and Lwanga 1990), was used to project AIDS cases and deaths for this analysis (figure 2). Epimodel is an extrapolation model that can be used for predicting AIDS cases and deaths once a given infection level has been determined. Epimodel duplicates the HIV infections generated by the iwgAIDS model to match the infection curve for Thailand. Epimodel assumes that the mean time from infection to AIDS illness is 9.8 years and the time from AIDS illness to death is 1.5 years. Applying these assumptions to the iwgAIDS model HIV projections, Epimodel then generates the resulting number of AIDS cases and AIDS deaths. Note that the mean conversion time of 9.8 years applies only to adults. Conversion intervals for infants and children are much shorter. Thus, the AIDS case and deaths generated by Epimodel are somewhat understated because the

HIV infections from the iwgAIDS model include both children and adults.

Direct Costs of the AIDS Epidemic

This section considers two broad categories of direct costs: overall system costs of prevention and personal health care expenditures. Overall system costs of the epidemic that have been assessed include the costs of blood testing, education and prevention programs, HIV testing by the Thai military and other groups, and training of health care workers. These costs are borne by many sectors of society due to the spread of AIDS.

Personal health care expenditures are the costs of health care for people with AIDS. At this point, the analysis does not cover asymptomatic HIV-positive individuals. The

Figure 1. Thailand: Projections of Annual New Infections and those Currently Infected: 1990-2000

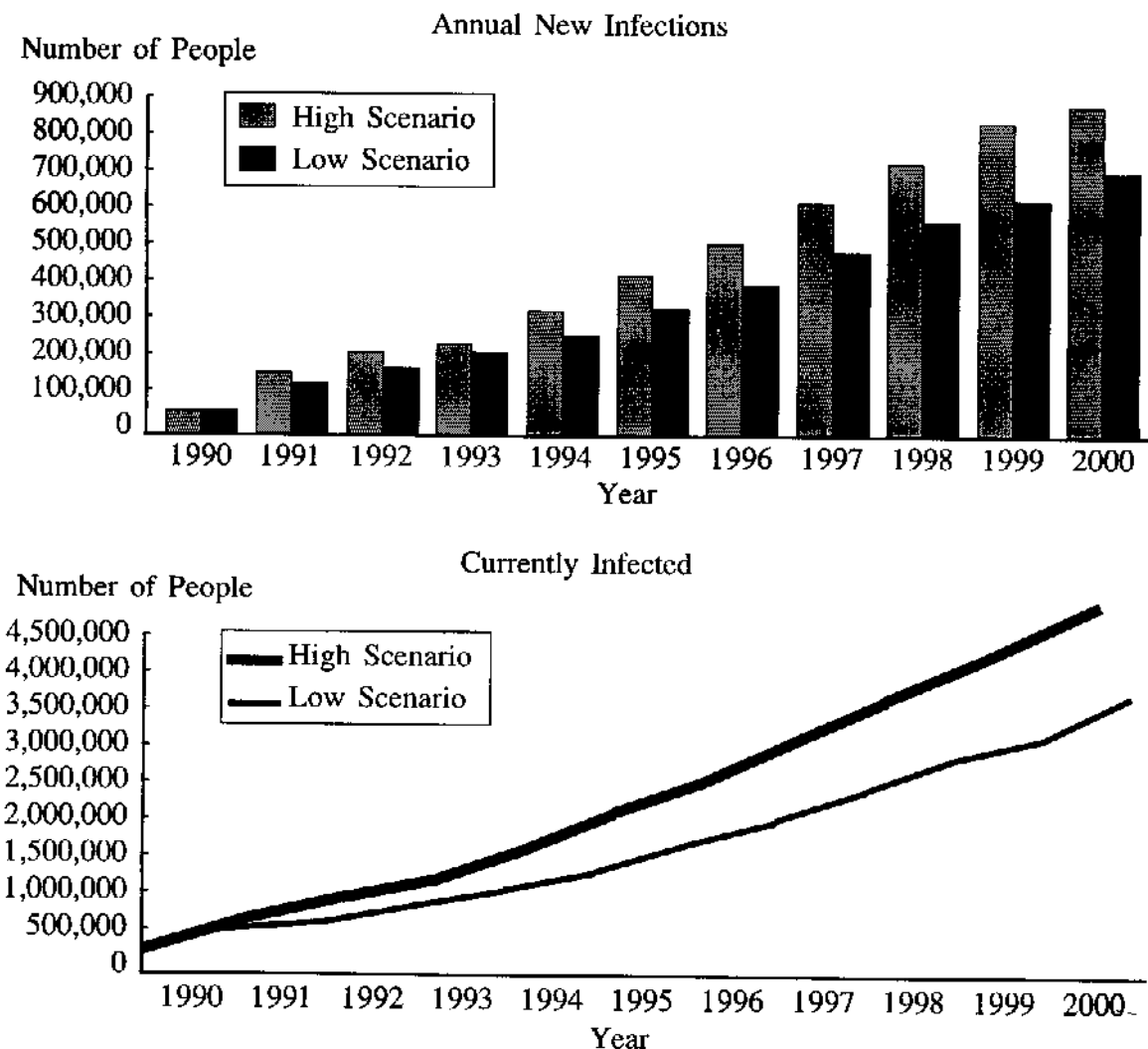
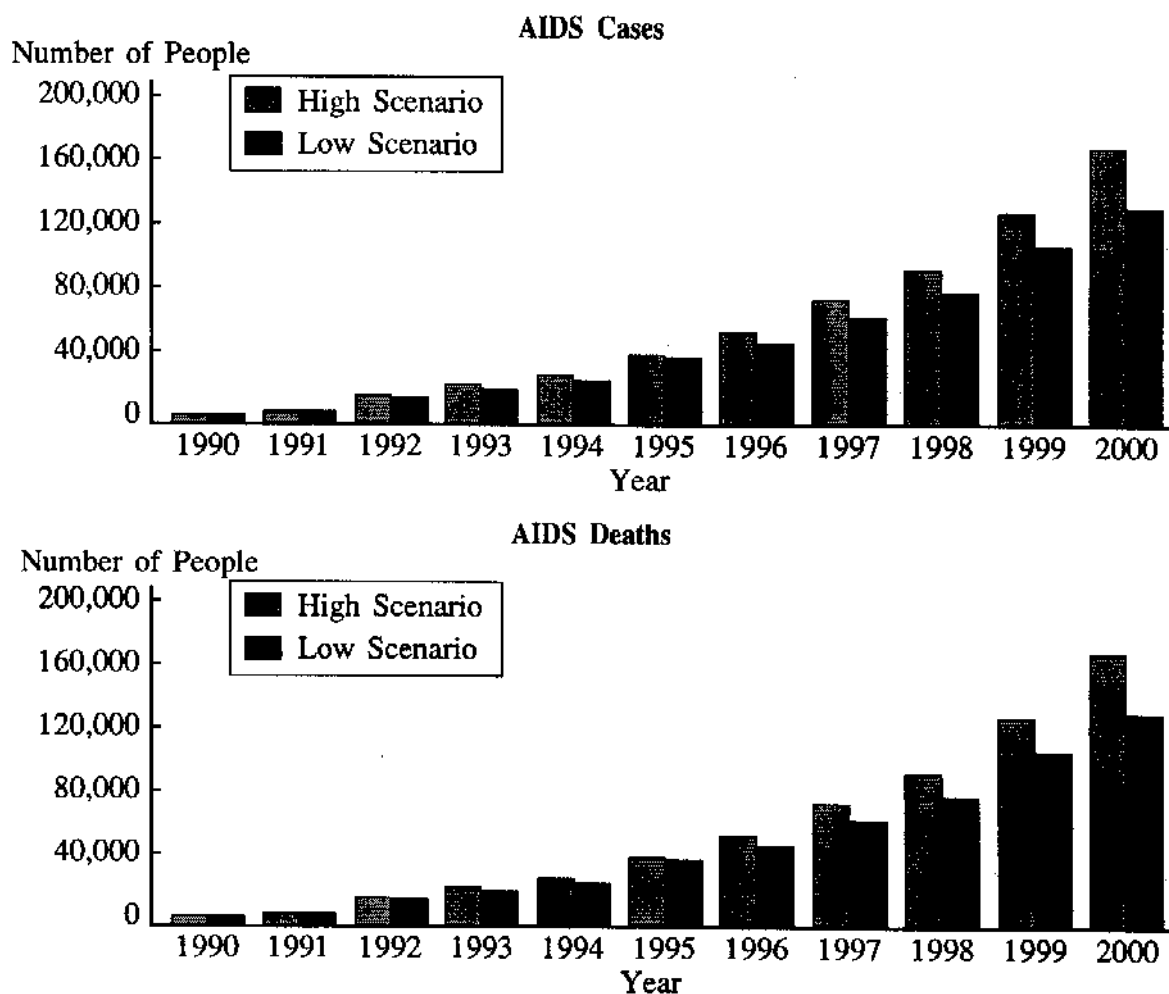


Figure 2. Thailand: Projections of AIDS Cases and Deaths, 1991-2000



assumption is that these individuals consume very few health care resources. Furthermore, given the overwhelming needs of AIDS patients, it is unlikely that current drug therapies, namely, the anti-viral AZT, would be given prophylactically to HIV-positive individuals in Thailand.

Several other direct costs are caused by the AIDS epidemic that are not covered in this analysis, namely, the costs of death, such as funeral expenses and mourning rituals. These are expected to be significant as AIDS deaths increase. Likewise, the cost of caring for orphaned children in the event of both parents' death or illness has not been considered. A million and a half women are projected to be infected by the year 2000. If these women have two children each, three million children will be born to infected women. One million, or one-third, can be expected to die from AIDS themselves, leaving the remaining two million to be orphaned when their parents eventually die from AIDS. Providing for these children will be an additional burden for society.

The information for determining the system costs of the epidemic came from interviews with individuals at the Thai Red Cross, the Ministry of Public Health, the Prime Minister's Office, and the World Health Organization.

As the AIDS epidemic is relatively new in Thailand, very little clinical data exist on AIDS patients' care and costs. Therefore, a variety of secondary sources were used to estimate personal health care expenditures. The first step was to determine the unit cost of care for non-AIDS patients in Thailand. The Ministry of Public Health and others have undertaken several of these cost studies. The most recent study, completed by the MOPH in July 1991, evaluates unit costs for eighty-nine provincial hospitals from 1988-90 (Health Planning Division 1991). This report provides information on material and labor costs for out-patient costs per visit and in-patient costs per day. The information is categorized by size and type of provincial hospital.

The next step was to determine the AIDS-specific cost variables, such as patient days per episode, drug costs per episode, episodes per year, and so on. These AIDS-specific data were estimated based on a study of AIDS patients at Bamrasnaradura Hospital (Cameron and Schopper 1990a,b). The sample of patients was relatively small. A report on the costs of AIDS in Puerto Rico (Shepard 1990) supplemented the Bamrasnaradura data.

Health care services are delivered in a variety of settings in Thailand, including private hospitals, Ministry of Public Health hospitals, and other ministry hospitals such as Military, Police, and the Interior. Each hospital setting has its own cost structure. The cost of care considered here pertains to hospitals run by the MOPH, whose facilities currently make up more than 60 percent of the total number of hospital beds in the country.

This analysis represents an initial attempt to collect and organize the information required to assess the cost of care for AIDS patients. Many of the key assumptions need more empirical research to verify and refine the estimates.

System Costs

In the past five years, Thailand has implemented a number of initiatives to try to contain the AIDS epidemic. System costs, excluding personal health care costs, are those expenses incurred by governments, businesses, and individuals to reduce the spread of the disease. Table 3 summarizes the major expenditures indentified to date, which in 1991 came to approximately US\$107 million or baht 2.7 billion.

The private sector spent the largest amount of money by providing an estimated US\$48 million or baht 1.2 billion in free commercial air time for AIDS messages. Businesses are

estimated to contribute another US\$32 million or baht 800 million for AIDS education programs for their employees. The Thai government will spend an estimated US\$20 million or baht 489 million on its AIDS program, of which 60 percent is allocated to the Ministry of Public Health to cover medical and social care, health education, program management, training, coordination, and laboratory support. The remaining 40 percent of the funds are distributed to other government ministries to support AIDS education programs. An estimated US\$6 million or baht 145 million is expected to be provided by international donor agencies to the MOPH, nongovernmental organizations, and other private organizations for implementing AIDS programs. Testing for HIV currently costs approximately US\$2 million or baht 50 million. The Thai Red Cross, which supplies and tests blood products, and the Thai military, which tests new recruits, are currently the two largest users of HIV tests.

This is clearly only a partial list of expenditures for AIDS prevention activities. As the epidemic continues to grow, additional resources will be required to fight the disease.

Personal Health Care Expenditures

Personal health care expenditures are costs that an individual will incur as a result of seeking treatment for full-blown AIDS. These costs are paid by the individual, third party payer, or the government. In the case of Thailand, which has very little health insurance coverage, individuals or the government will bear most of the costs. The annual cost of AIDS treatment is estimated to be approximately US\$1,000 or baht 25,000 per case. This figure represents over 50 percent of the average annual household income, implying that the government will most likely carry the burden of the cost of AIDS care after households' assets are gone. With current per capita annual health expenditures at US\$20, AIDS treatment costs will severely strain the MOPH's budget.

IN-PATIENT COSTS. The most significant health care costs for AIDS patients are currently those incurred during hospitalization. These costs are referred to as in-patient costs. Annual in-patient costs are driven by the type of treatment received (drugs, laboratory procedures, surgery, and so on), the length of hospitalization, and the number of episodes of hospitalization required in a year. Tables 4, 5, and 6 set out the assumptions and the results of the health care cost analysis for personal expenditures. As limited data exist for many of the key assumptions, a low and a high scenario are developed.

In this analysis, an average cost per in-patient day of US\$22 is used for the high scenario and US\$18 for the low scenario. This cost includes all materials as well as direct and indirect labor. This estimate is based on a review of several cost studies for non-AIDS

Table 3. Thailand: Systems Costs of the AIDS Epidemic, Estimates for 1991-92

Category	Item	Cost (US\$)	Cost (baht)
Blood supply			
	Annual units tested	800,000	
	ELISA test cost	US\$1	
	Percentage tested, ELISA ^b	110%	
	Western blot test cost	US\$25	
	Percentage tested, Western blot	5%	
	Subtotal	1,880,000	47,000,000
Military recruits testing			
	Annual number of recruits tested	40,000	
	ELISA test cost	US\$1	
	Subtotal	40,000	1,000,000
Thai government AIDS program^c			
	Ministry of Public Health	9,560,000	239,000,000
	Other ministries	10,000,000	250,000,000
International donor AIDS program^d			
	To Ministry of Public Health	1,500,000	37,500,000
	To nongovernmental organizations	2,750,000	68,750,000
	To private organizations	1,500,000	37,500,000
Private sector^e			
	AIDS education in businesses	32,000,000	800,000,000
	Media air time for AIDS education	48,000,000	1,200,000,000
	Total	107,230,000	2,680,750,000

a. Conversion rate US\$1 = B 25.

b. Units of blood that test positive for HIV are tested again using the ELISA test for confirmation.

c. Based on projections of the Thai government's budget for fiscal year 1992.

d. Estimates from the World Health Organization.

e. Estimates from the Prime Minister's Office.

patients. The MOPH recently completed a cost study using 1988-90 data from eighty-nine provincial hospitals. The average cost per in-patient day in 1990 for hospitals of all sizes was US\$19.50. This cost has increased by 11.5 percent per year during the past three years. This historical growth rate was applied to the 1990 cost per in-patient day to generate the 1991 estimate of US\$22.

Researchers at Thammasat University are in the process of completing a unit cost analysis of hospital services in Thailand (Thammasat 1990). Preliminary results from this

Table 4. Thailand: Personal Health Care Expenditure Assumptions

Health care assumptions	High Scenario	Low Scenario
In-patient costs		
Material and labor cost per patient day (US\$) ^a	22.00	18.00
Capital costs per patient day (US\$)	1.84	1.40
Total costs per patient day (US\$)	23.84	19.40
Patient days per episode	25	20
Annual percentage reduction of in-patient days per episode ^b (%)	10	10
Drug costs per episode (US\$)	60.00	40.00
Episodes per year	1.5	1.5
Percentage of AIDS cases receiving treatment (%)	30-70	20-60
Out-patient costs		
Total costs per visit (US\$)	6.40	5.20
Number of visits per year	5	3
Annual percentage increase in out-patient visits ^b (%)	10	10
Percentage of AIDS cases receiving treatment (%)	40-70	30-60
Discount rate (%)	5	5

a. Material costs exclude drug costs.

b. Over time strategies will likely be adopted to reduce the length of in-patient care as physicians gain experience treating AIDS cases and as alternative, outpatient treatment options become available. Thus, in-patient days per episode are projected to decrease annually, while out-patient visits are projected to increase.

Table 5. Thailand: Estimated and Projected Personal Health Care Expenditures, High Scenario, 1991-2000

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
In-patient costs										
Total cost per in-patient day (US\$)	23.84	21.84	23.84	23.84	23.84	23.84	23.84	23.84	23.84	23.8
Patient days per episode	25	23	20	18	16	15	13	12	11	10
Cost per episode (US\$)	596.00	536.40	482.76	434.48	391.04	351.93	316.74	285.06	256.56	230.9
Drug cost per episode (US\$)	60	60	60	60	60	60	60	60	60	60
Total cost per episode (US\$)	656.00	596.40	542.76	494.48	451.04	411.93	376.74	345.06	316.56	290.9
Episodes per year	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Total cost per year (US\$)	984.00	894.60	814.14	741.73	676.55	617.90	656.11	517.60	474.84	436.3
AIDS cases per year	5,691	9,286	14,827	24,288	37,199	54,409	76,438	104,455	139,310	181,062
Percentage receiving treatment	30	30	40	40	50	50	60	60	70	70
AIDS cases treated per year	1,707	2,786	5,931	9,715	18,600	27,205	45,863	62,673	97,517	126,743
Total in-patient costs (US\$)	1,679,983	2,492,177	4,828,502	7,206,016	12,583,555	16,809,608	25,439,384	32,439,384	46,304,747	55,304,975
Out-patient costs										
Total cost per visit (US\$)	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40
Visits per year	5	6	6	7	7	8	9	10	11	12
Total cost per year (US\$)	32.00	35.20	38.72	42.59	46.85	51.54	56.69	62.36	68.59	75.40
AIDS cases per year	5,691	9,286	14,827	24,288	37,199	54,409	76,438	104,455	139,310	181,062
Percentage receiving treatment	40	40	50	50	60	60	70	70	70	70
AIDS cases treated per year	2,276	3,714	7,414	12,144	22,319	32,645	53,507	73,119	97,517	126,743
Total out-patient costs (US\$)	72,845	130,747	287,051	517,237	1,045,691	1,682,424	3,033,287	4,559,593	6,689,163	9,563,336
Total costs										
Total costs (US\$)	1,752,828	2,622,924	5,115,552	7,723,254	13,629,246	18,492,032	28,950,733	36,998,976	52,993,910	64,868,317
Discounted costs (US\$) ^a	1,752,828	2,498,022	4,639,957	6,671,637	11,212,814	14,488,991	21,603,483	26,294,482	35,868,364	41,814,695
Total discounted costs (US\$)	166,845,273									
In-patient costs as a percentage of total costs	95.8	95.0	94.4	93.3	92.3	90.9	89.5	87.7	87.4	85.3
Out-patient costs as a percentage of total costs	4.2	5.0	5.6	6.7	7.7	9.1	10.5	12.3	12.6	14.7

^a Costs discounted at real discount rate of 5 percent

Source: Described in the text.

Table 6. Thailand: Estimated and Projected Personal Health Care Expenditures, Low Scenario, 1991-2000

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
In-patient costs										
Total cost per in-patient day (US\$)	19.40	19.40	19.40	19.40	19.40	19.40	19.40	19.40	19.40	19.40
Patient days per episode	20	18	16	15	13	12	11	10	5	5
Cost per episode (US\$)	388.00	349.20	314.28	282.85	254.57	229.11	206.20	185.58	97.00	97.00
Drug cost per episode (US\$)	40	40	40	40	40	40	40	40	40	40
Total cost per episode (US\$)	428.00	389.20	345.28	322.85	294.57	269.11	246.20	225.58	137.00	137.00
Episodes per year	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Total cost per year (US\$)	642.00	583.80	531.42	484.28	441.85	403.67	369.30	338.37	205.50	205.50
AIDS cases per year	5,691	9,217	14,324	22,507	33,338	47,563	64,832	86,614	113,364	145,342
Percentage receiving treatment	20	20	30	30	40	40	50	50	60	60
AIDS cases treated per year	1,138	1,843	4,297	6,752	13,335	19,025	32,416	43,307	68,018	87,205
Total in-patient costs (US\$)	730,724	1,076,177	2,283,618	3,269,893	5,892,161	7,679,811	11,971,185	14,653,737	13,977,781	17,920,669
Out-patient costs										
Total cost per visit (US\$)	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20
Visits per year	3	3	4	4	4	5	5	6	6	7
Total cost per year (US\$)	15.60	17.16	18.88	20.76	22.84	25.12	27.64	30.40	33.44	36.78
AIDS cases per year	5,691	9,217	14,324	22,507	33,338	47,563	64,832	86,614	113,364	145,342
Percentage receiving treatment	30	30	40	40	50	50	60	60	60	60
AIDS cases treated per year	1,707	2,765	5,730	9,003	16,669	23,782	38,899	51,968	68,018	87,205
Total out-patient costs (US\$)	26,634	47,449	108,152	186,931	380,719	597,485	1,075,032	1,579,839	2,274,534	3,207,755
Total costs										
Total costs (US\$)	757,358	1,123,626	2,391,770	3,456,824	6,272,880	8,277,296	13,046,217	16,233,576	16,252,316	21,128,423
Discounted costs (US\$) ^a	757,358	1,070,120	2,169,406	2,986,135	5,160,714	6,485,478	9,735,288	11,536,899	11,000,207	13,619,570
Total discounted costs (US\$)	64,521,175									
In-patient costs as a percentage of total costs	96.5	95.8	95.5	94.6	93.9	92.8	91.8	90.3	86.0	84.8
Out-patient costs as a percentage of total costs	3.5	4.2	4.5	5.4	6.1	7.2	8.2	9.7	14.0	15.2

a. Costs discounted at real discount rate of 5 percent

Source: Described in the text.

three-year study of two district and two provincial hospitals yield a range for costs per in-patient and out-patient day similar to the MOPH's survey.

Supachutikul, a Thai researcher, estimated the cost per in-patient day (material and labor) for non-AIDS patients at Bamrasnaradura Hospital to be US\$21.25. This analysis was undertaken in connection with a visit by Cameron and Schopper of the School of Public Health, Harvard University, who were in Thailand to develop the first estimates of the cost of treatment of AIDS patients at Bamrasnaradura Hospital. Their analysis (Cameron and Schopper 1990a,b), while incomplete, is valuable in that it provides the only treatment data on AIDS patients to date. Based on their preliminary findings, which included only the charges for drugs and procedures, the average cost per in-patient day was US\$7.25. One issue with this estimate is that the direct costs were estimated using charges, not actual costs. Charges, which have not changed for ten years, are defined as the price charged to patients and are probably significantly less than actual costs.

Clearly, more information on costs per in-patient day for AIDS patients needs to be collected and analyzed to improve the estimates. Furthermore, some estimates of capital costs need to be included. For this analysis, capital costs per bed are estimated at US\$16,000 with an average life of thirty years. Table 7 illustrates the assumptions and calculations used to arrive at a capital cost per in-patient day of US\$1.84. Total cost per in-patient day, including capital, labor, and materials, is estimated at US\$23.84 for the high scenario and US\$19.40 for the low scenario.

The number of patient days per episode is estimated to be twenty-five days in 1991 in the high scenario and twenty days in the low scenario (Cameron and Schopper 1990a,b). Over time strategies will likely be adopted to reduce the length of in-patient care as physicians gain experience in treating AIDS cases. This has been well-documented in Puerto Rico. In San Juan, the mean length of stay of AIDS in-patients had been reduced from 22.3 days in 1987 to 11.3 days by 1998 by implementing an aggressive patient management program, including offering alternative treatment options, such as home care, out-patient clinics, and hospices. However, in the case of Thailand, many of these alternative treatment options do not currently exist, but the analysis assumes that they will be developed in the future. Thus, the analysis assumes an annual 10 percent reduction in patient days per episode, both as a result of physician experience and of alternative care options. The result is that from 1991 to 2000 patient days per episode fall from twenty-five to ten days in the high scenario and from twenty to five days in the low scenario.

Drug costs per episode are calculated separately from in-patient costs per day. The assumption is that AIDS patients will require more medication on average than non-AIDS

patients. Handling this cost separately also allows us to look at the effect of the use of AZT or other therapies on the overall costs of treatment. As an initial estimate, drug cost per episode is set at US\$60 in the high scenario and US\$40 in the low scenario. This estimate is consistent with Cameron and Schopper's (1990a,b) average drug costs per episode for AIDS patients at Bamrasnaradura.

Again, this is an area where more research is required to understand the specific diseases people are presenting with as well as the likely drug treatments and duration of therapy. These initial drug cost estimates do not include the use of AZT, which would increase the cost substantially.

Episodes per year are estimated at 1.5, which is again consistent with Cameron and Schopper's (1990a,b) results. Data from Shepard's (1990) study in Puerto Rico of direct health care costs show 1.67 episodes per patient per year. This 1.5 days estimate is held constant over time for both the scenarios.

OUT-PATIENT COSTS. The estimate for total cost per out-patient visit is US\$6.40 in the high scenario and US\$5.20 in the low scenario based on sources and studies described in the cost per in-patient day section. Again, the primary data source is the Ministry of Public Health's study of eighty-nine provincial hospitals. The average cost per out-patient visit in 1990 for all the hospitals was US\$5.48. This cost has grown by 15 percent during the last three years.

The analysis assumes that AIDS patients frequent out-patient facilities five times per year to receive treatment in the high scenario and three times in the low scenario. Thailand has limited data on out-patient care. Experience in Puerto Rico (Shepard 1990) indicates that out-patient visits per year range from 4.4 to 16.0. This number increases by 10 percent per year as patient care is shifted from an in-patient to an out-patient setting.

AIDS CASES PER YEAR. Projections of the annual number of AIDS cases were discussed earlier (see figure 2). The figures are adjusted on the assumption that not all those afflicted will receive treatment. The high scenario assumes that for in-patient care, 30 percent of AIDS cases are treated in 1991, growing to 70 percent by 2000. The range of patients treated under the low scenario is 20 to 60 percent. For out-patient care, 40 percent are treated in 1991, increasing to 70 percent by 2000 in the high scenario, and 30 percent increasing to 60 percent for the low scenario.

INFRASTRUCTURE AND CAPACITY ANALYSIS. Table 7 illustrates the impact the epidemic is likely to have on the current health care infrastructure. Assuming that the country has 75,000 general hospital beds, government and private, available over the ten-year time horizon 1991-2000, AIDS patients will consume 1 percent of the bed-days in 1991,

increasing to 12 percent of the bed-days by 2000 in the high scenario. If, however, hospital beds need to be added when the system reaches a certain level of capacity, the MOPH will have to build additional hospitals to care for AIDS patients. Assuming capital costs are a conservative US\$16,000 per bed (Cameron and Schopper 1990a,b), the MOPH would have to make significant outlays during the next ten years to add capacity for AIDS patients. Assuming that the number of beds will grow with the population at 2.5 percent per year in any case, if additional beds are added when AIDS patients consume 5 percent of the bed-days available, then the discounted costs of the total capital investment required would be US\$311 million. If capacity is not required until AIDS patients use 10 percent of bed-days, then the cumulative, discounted capital costs amount to US\$176 million. As hospital construction requires a three- to five-year lead time, advance planning is critical to avoid a shortage of available hospital beds.

SUMMARY: PERSONAL HEALTH CARE EXPENDITURES. Annual health care costs for AIDS patients amount to US\$1,016 (in-patient annual cost of US\$984 plus out-patient annual cost of US\$32) per patient in the high scenario and US\$658 (in-patient annual cost of US\$642 plus out-patient annual cost of US\$16) in the low scenario. These amounts represent 50 and 30 percent, respectively, of the annual household income of an average Thai family. The cost of AIDS treatment is ten times the amount of money families currently spend on health care per year. Given the high costs of care relative to family resources, most families will not be able to afford treatment. Assuming that patients live for one and a half years on average from the onset of AIDS, the lifetime cost per patient would be US\$1,524 in the high scenario and US\$987 in the low scenario. Figure 3 summarizes these personal health care expenditures.

The MOPH's current annual per capita health expenditure is US\$20. The cost of treatment for AIDS patients far exceeds this amount. In the high scenario, aggregate health care costs grow from US\$1.7 million in 1991 to US\$65.0 million by 2000. In the low scenario, costs increase from US\$709,000 to US\$20 million.

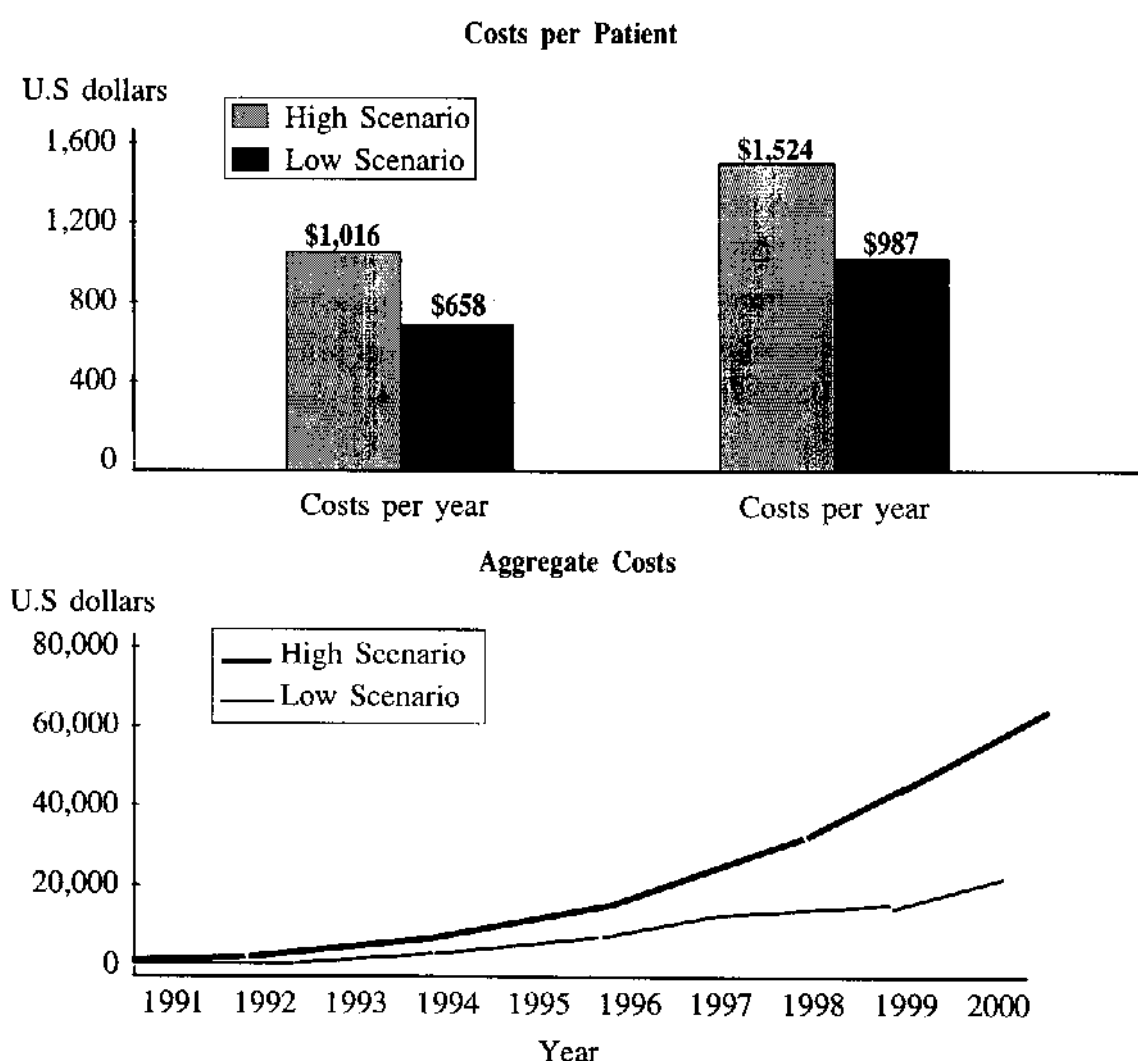
Indirect Costs of the AIDS Epidemic

The indirect costs of the AIDS epidemic are a measure of the burden on society of an increase and redistribution of mortality due to AIDS. In other words, the prospective economic costs of the illness and death of adults of working age include not only the cost of medical care, but also the foregone contribution these individuals would have made to

the economy and to society. Deaths from AIDS will increase among women in their twenties and thirties, men in their thirties and forties, and infants and young children of HIV-positive mothers.

In the next decade, most AIDS deaths in Thailand will be of adults in their prime working years. Because the epidemic is now mainly urban as suggested by the National Sentinel Seroprevalence Surveys, most of these deaths will be of adults in cities, whose marginal product is higher than that of their rural counterparts. To estimate the present value of the indirect cost of AIDS in the high and low scenarios, an average loss per AIDS death of twenty-five years is assumed, and the 1991 urban marginal product of labor (marketed and nonmarketed) is estimated at US\$1,500. National average GDP per capita

Figure 3. Thailand: Estimated Health Care Costs for AIDS per Patient and Aggregate, 1991-2000



in 1991 was approximately US\$1,250. The methodology used is to discount prime adult years lost (Over, Bertozzi, and Chin 1989). A social discount rate of 5 percent is used. Table 8 shows the results of this analysis.

The present value of cumulative indirect costs is US\$8.5 billion in the high scenario and US\$7.3 billion in the low scenario. The loss per death of US\$22,000 is equivalent to 17.6 times per capita income in 1991.

Table 8. Thailand: Indirect Cost Analysis, 1991-2000

Year	Annual deaths	Discounted years	Annual loss (US\$)	Cumulative loss (US\$)	Loss per death (US\$)
High scenario					
1991	4,457	14.45	96,605,475	96,605,475	21,675
1992	7,489	13.73	154,235,955	250,841,430	20,595
1993	12,056	13.04	235,815,360	486,656,790	19,560
1994	19,557	12.63	370,507,365	857,164,155	18,945
1995	30,743	11.77	542,767,665	1,399,931,820	17,655
1996	45,804	11.18	768,133,080	2,168,064,900	16,770
1997	65,423	10.63	1,043,169,735	3,211,234,635	15,945
1998	90,446	10.09	1,368,900,210	4,580,134,845	15,135
1999	121,882	9.59	1,753,272,570	6,333,407,415	14,385
2000	160,186	9.11	2,188,941,690	8,522,349,105	13,665
Low scenario					
1991	4,457	14.45	96,605,475	96,605,475	21,675
1992	7,454	13.73	153,515,130	250,120,605	20,595
1993	11,770	13.04	230,221,200	480,341,805	19,560
1994	18,415	12.63	348,872,175	829,213,980	19,945
1995	27,923	11.77	492,980,565	1,322,194,545	17,655
1996	40,451	11.18	678,363,270	2,000,557,815	16,770
1997	56,198	10.63	896,077,110	2,896,634,925	15,945
1998	75,723	10.09	1,146,067,605	4,402,702,530	15,135
1999	99,989	9.59	1,483,341,765	5,481,044,295	14,385
2000	129,353	9.11	1,767,608,745	7,248,653,040	13,665

Aggregate Costs: Direct and Indirect

As shown in figure 4, total annual health care costs plus the value of lost income are projected to grow from US\$100 million in 1991 to US\$2.2 billion by 2000 in the high scenario, and from US\$97 million to US\$1.8 billion in the low scenario. Over the ten-year period, US\$8.7 billion will be lost due to AIDS in the high case and US\$7.3 billion in the low case. These annual costs, both direct and indirect, are equivalent to some sixteen to eighteen times the per capita GDP.

Researchers have performed similar analyses in other developing countries to assess the direct and indirect costs of AIDS. In Zaire, total costs range from fifteen to fifty-four times the per capita GDP and in Tanzania the costs range from twenty-four to fifty-two times per capita GDP. The Puerto Rico (Shepard 1990) analysis produced figures more in line with those for Thailand, with the costs equaling nineteen times per capita GDP. In Puerto Rico, health care costs are substantially higher; however, the epidemic has primarily affected injecting drug users and homosexuals. The indirect costs were adjusted to allow for the fact that these two groups are generally unemployed or have below average incomes. Even with this adjustment, the indirect costs still significantly outweigh the direct costs.

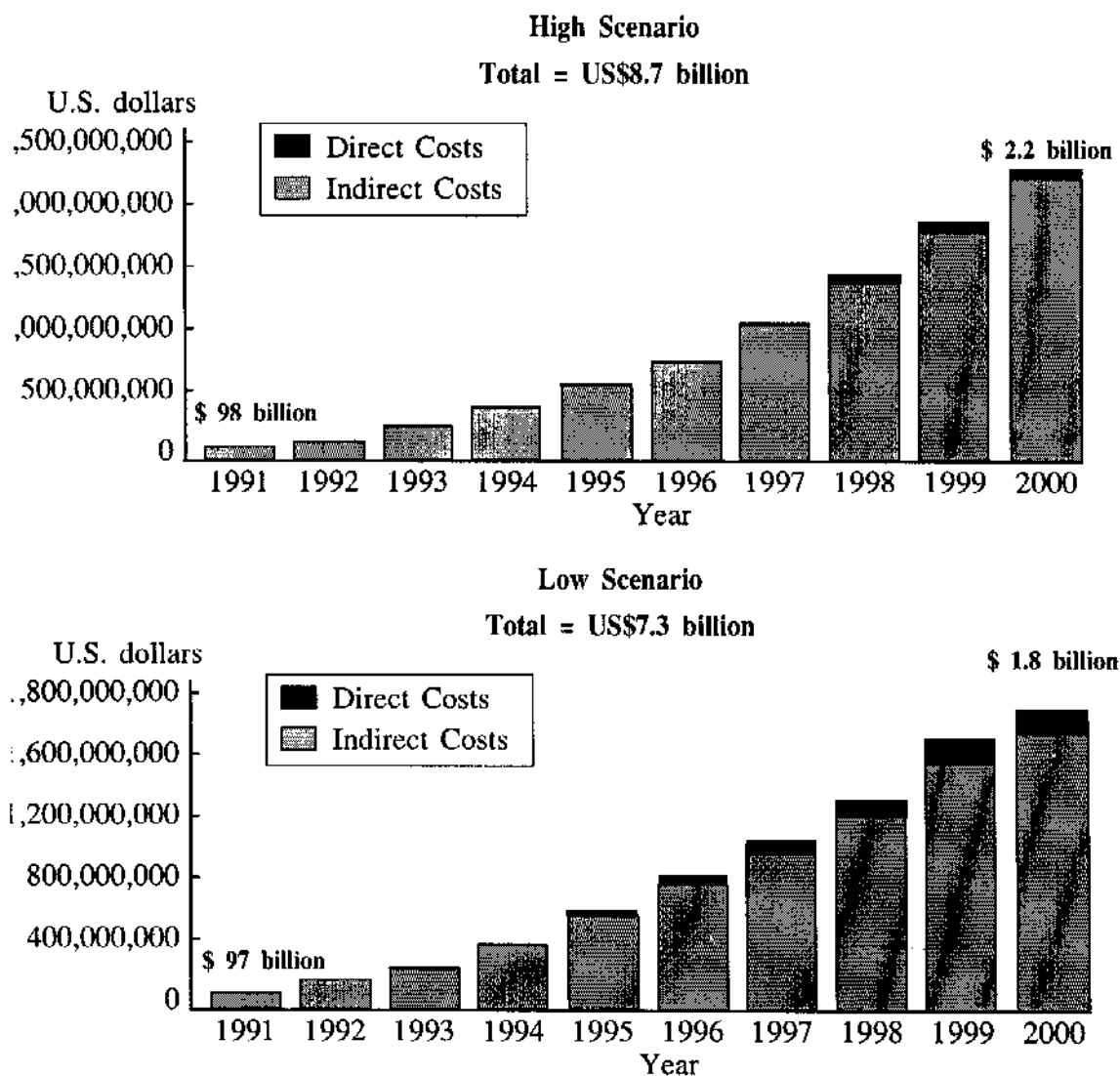
Other Macroeconomic Impacts

Unless significant behavior changes occur, the AIDS epidemic is likely to alter the performance of the Thai economy. The health care costs and lost income outlined above are not the only prospective costs of the epidemic. Domestically, a shortage of labor, both in quantity and quality, may occur with an increase in AIDS. High rates of absenteeism brought on by illness will certainly be disruptive to companies. Finding and retraining workers to replace those that have died will be difficult and costly, especially if the unemployment rate remains at the current low of 3 to 4 percent.

Various business surveys researching foreign investment criteria cite a large supply of inexpensive labor as a key factor in selecting Thailand. For the past two years foreign direct investment has surpassed US\$2 billion annually. A reduction in the supply and health of labor could increase both wage rates and production costs, making Thailand a less attractive place to invest in.

In 1991, approximately 70,000 Thai laborers travelled abroad to find employment. These workers remitted nearly US\$1 billion in wages to their families. Already countries

Figure 4. Thailand: Aggregate Costs of the AIDS Epidemic, 1991-2000



are testing prospective foreign workers for the HIV before permitting them to enter. If Thai workers are no longer able to work abroad, a valuable source of income will be lost.

The nation's savings rate may also decline as spending on medical care rises relative to income. The country's aggregate investment may be further eroded as the government is required to devote more resources on social and health service, rather than investing in infrastructure and other productive projects.

Thailand's US\$5 billion per year tourism industry may already be feeling the effects of AIDS. Tourist arrivals are down for a variety of reasons, with the fear of AIDS certain to be a significant factor in the future.

Investment in Prevention

The iwgAIDS model used to generate the high and low scenarios can measure various interventions on the spread of the epidemic. The following behavioral changes were made to the assumptions in the high scenario to generate an alternative scenario:

- . Sexual contacts with different partners are reduced by one-half,
- . Condom use doubles from about 25 to 50 percent,
- . Sexually transmitted diseases are treated quickly and effectively.

If this level of extensive behavior change occurs in the very near future, it results in dramatic savings of lives and costs: by the year 2000, 3.5 million fewer people would become infected and US\$5.1 billion would be saved. Even if the AIDS prevention budget triples in the next several years, the cost of prevention yields a seventeenfold return on that investment in human life.

The challenge is for all sectors of society, government and private, to devote adequate resources, people and money, to reduce the spread of the epidemic. Immediate action is needed for both financial and humanitarian reasons.

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