The Economic Impact of AIDS in the United States

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This analysis of several previous studies of the cost of AIDS suggests that the lifetime cost of medical care per patient will not exceed $80,000, an amount similar to the cost of treating other serious illnesses. If current projections of future AIDS cases are accurate, the cumulative lifetime costs of 270,000 cases diagnosed between 1981 and the end of 1991 will not exceed $22 billion. This amount is small compared with total U.S. medical spending. The economic impact of AIDS on San Francisco, New York, and some other cities, however, is likely to be more serious. The AIDS epidemic will also highlight the financial problems of Americans who face large medical bills without adequate insurance.

IN THIS ARTICLE WE DISCUSS THE ECONOMIC IMPACT THAT will result from the spread of AIDS in the United States. We summarize several studies on the cost of AIDS and assess their implications for two key issues: (i) How large an economic burden will AIDS place on American society? and (ii) How will this burden be shared among AIDS patients and their families, private insurance companies, employers and employees, federal, state, and local taxpayers, and public and private hospitals?

Using the Centers for Disease Control (CDC) estimate of 74,000 new AIDS cases in 1991 and 270,000 cumulative cases between 1981 and 1991 (*1*), we find that the spread of AIDS is not likely to constitute a major shock to the U.S. economy, at least into the early 1990s. However, it will create sharp increases in the demand for health care in San Francisco, New York, and some other cities. The AIDS epidemic will also highlight the financial problems of Americans who face large medical bills without adequate health insurance.

The Cost of Illness

Illness imposes a variety of pecuniary and nonpecuniary costs upon society. Pecuniary costs include both the direct costs of prevention, diagnosis, and treatment of illness, and the indirect costs associated with the lost value of market and nonmarket output due to increased morbidity or mortality resulting from illness. (*2–5*). The direct costs of AIDS include personal medical care costs as well as nonpersonal costs for educational campaigns, biomedical research, and blood screening. Indirect costs are the foregone earnings of AIDS patients and the value of any household services they would have provided. Nonpecuniary costs include the value that AIDS patients, their families and friends, and other members of society place on the suffering and death of AIDS patients and on the need to behave differently to avoid contracting or transmitting AIDS.

Several recent studies have attempted to measure the pecuniary cost of AIDS. These lower-bound estimates of total cost can be compared to estimates of the costs of other illnesses. They can also be used to judge the benefits of expenditures on AIDS research and education and as a rough measure of the national economic impact of AIDS. To the extent that the per-patient cost of medical care changes or CDC case load projections are inaccurate, these estimates of total cost will of course also be inaccurate. Nonetheless, they are useful summary measures of current cost and case load projections.

Personal medical care costs. The most natural approach to measuring the personal medical costs of AIDS would be to select a national random sample of individuals exposed to the human immunodeficiency virus (HIV) and to record all subsequent lifetime AIDS-related medical expenses. Adding expenses incurred in different years, adjusted for inflation and averaged across individuals, would yield an estimate of lifetime medical costs. Although this "cost-accounting" approach would provide accurate estimates of the medical cost of AIDS, it would be difficult to implement and would take many years to complete because of the long period between infection and death.

Because of these difficulties, most researchers have estimated the personal medical costs of AIDS by analyzing hospital records on AIDS patients. This approach may result in biased cost estimates. First, it may underestimate costs per patient for individuals who received care at more than one hospital. Second, some of these studies of lifetime costs are restricted to individuals who died by the end of the study period. Such individuals may have received more costly treatment than the average AIDS patient. However, they may also have received treatment over a shorter period. Therefore, the direction of the bias from restricting the sample is unclear.

Third, surveys limited to certain hospitals or certain cities may not be representative of all AIDS cases. Intravenous (IV) drug abusers with AIDS tend to require considerably more days of hospital care and more expensive care per day than other AIDS patients. Private hospitals treat few IV drug abusers while public hospitals treat a disproportionately high number. The mix of patients and the type of care also varies widely among cities. For example, San Francisco has reduced average hospital stays by using volunteer organizations to provide home care (*6*). Other cities have been less successful in relying on volunteers, in large part because their caseloads include higher percentages of IV drug abusers.

Finally, lifetime costs per patient may be underestimated for individuals who received medical care for AIDS-related complex (ARC) before they were firmly diagnosed as having AIDS. Little is known about the cost of ARC, but it may be substantial. A census of all public and private hospitals in New York City for the week of 18 to 24 October 1987 found a total of 876 AIDS patients and 459 ARC

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patients (*7*). Another study found an average monthly cost of $652 per patient for 243 ARC cases during January to August 1987 (*8*).

In Table 1 we summarize seven widely cited studies of the personal medical costs of AIDS (*9*). The figures reported in each study have been adjusted for inflation by using the medical care component of the Consumer Price Index (*10*). Some studies are based on medical charge data derived from hospital accounting systems whereas others are based on alternative definitions of hospital cost. In principle, costs are preferable to charges as measures of resource utilization, despite the fact that charges do represent costs to third-party payers and patients. However, charge data are more reliable, more widely available, and, in practice, probably measure "true economic cost" more accurately than cost data. Thus, we follow the conventional practice and convert medical cost figures into medical charge figures for studies based on medical costs that provide an appropriate conversion factor. Nonetheless, the terms "charge" and "cost" are used interchangeably throughout most of the remainder of this article.

Table 1 shows data on life expectancy from initial diagnosis to death, hospital days per patient, costs per day, lifetime costs per case, and total cumulative costs of medical care to the end of 1991. Lifetime costs equal hospital days times cost per day, plus outpatient costs when available. Total costs equal lifetime costs per case times the CDC's projection of 270,000 cumulative cases by the end of 1991.

The estimates of cumulative medical costs by 1991 range from $6.3 billion (*11*) to $45.4 billion (*12*) (Table 1). The variation in estimates of inpatient costs or charges per day is much narrower. They range from $683 (*11*) to $1003 (*12*). Most of the variation in total costs is due to the variation in estimates of the lifetime number of inpatient days—from 34 to 35 days (*11, 13*) to 168 days (*12*). The three other estimates of lifetime inpatient days presented in Table 1 are 50, 63, and 67 days (*14–16*).

The three extreme estimates of lifetime inpatient days should be treated with some skepticism. The Andrulis study (*11*) may underestimate inpatient days by counting all 5393 AIDS patients receiving treatment at 169 different hospitals as separate individuals. Although there is no direct evidence on the percentage of AIDS patients who received inpatient care at more than one hospital, Scitovsky *et al.* (*13*) found that only 201 out of 445 patients admitted for AIDS to San Francisco General Hospital in 1984 received all their inpatient and outpatient care at that hospital. Of course many of the 244 other patients may have received outpatient but not inpatient care elsewhere.

The estimate of lifetime inpatient days in the study by Scitovsky *et al.* is also likely to be substantially below the national average for AIDS patients. It is based on 85 patients (out of the 201) who died during 1984. These patients died sooner after initial diagnosis than other AIDS patients in San Francisco and elsewhere (*13*). [Berger's study (*14*) has the same shortcoming.] Furthermore, San Francisco

Table 1. Personal medical care costs associated with AIDS. If independent information on life expectancy is not reported in a study, we assume a period of 13 months if needed to calculate lifetime costs [see Rothenberg *et al.* (*34*)]. "Life expectancy" refers to the period following an AIDS diagnosis, except in Kizer *et al.* (*8*); "days" refers to the average number of days hospitalized following an AIDS diagnosis, unless otherwise indicated; "charge or cost per day" is average medical charge or cost (as indicated) per inpatient day. NA, not applicable.

Study	Background information	Life expectancy	Days	Personal medical care costs (1986 dollars)		
				Charge or cost per day	Per case over lifetime	Cumulative total to end of 1991
Andrulis *et al.*, "The provision and financing of medical care for AIDS patients in U.S. public and private teaching hospitals" (*11*)	Costs from 169 metropolitan public and private teaching hospitals with 5393 AIDS patients during 1985	NA	34	683*	23,000*	6.3 billion*
Berger, "Cost of AIDS cases in Maryland" (*14*)	Hospital cost data for 26 Baltimore AIDS patients hospitalized between 1979 and February 1985 who had died by the time of the study	24 weeks	50	723*	36,000*	9.7 billion*
Hardy *et al.*, "The economic impact of the first 10,000 cases of AIDS in the U.S." (*12*)	Medical care charges for small sample of AIDS patients in New York, Philadelphia, and San Francisco in 1984	56 weeks	168	1003	168,000	45.4 billion
Kizer *et al.*, "An updated quantitative analysis of AIDS in California" (*8*)	Medi-Cal expenditures for 1103 AIDS patients from July 1983 to August 1986. Expenditures date from the onset of AIDS symptoms, which was often prior to actual AIDS diagnosis	78 weeks	NA	NA	77,000†	20.9 billion†
Scitovsky *et al.*, "Medical care costs of patients with AIDS in San Francisco" (*13*)	Medical care charges for 85 patients treated exclusively at San Francisco General Hospital who died in 1984	32 weeks	35	934	32,000	8.8 billion
Scitovsky and Rice, "Estimates of direct and indirect costs of AIDS in the United States, 1985, 1986, and 1991" (*15*)	Presents a range of charge estimates intended to be widely reflective of U.S. experience	NA	Low: 41 Medium: 63 High: 102	845† 971† 1085†	43,000†‡ 68,000†‡ 115,000†‡	11.7 billion† 18.3 billion† 31.0 billion†
Seage *et al.* "Medical care costs of AIDS in Massachusetts" (*16*)	Medical costs for 45 patients with AIDS at New England Deaconess Hospital	NA	67	775*	55,000*†	14.9 billion*†

*Costs, as opposed to charges. †Includes outpatient costs or charges. ‡These figures were estimated by using the detailed prevalence and cost figures reported in (*15*).

General Hospital treats relatively few IV drug abusers and has a well-developed system of outpatient care. Lifetime hospital days for such patients are likely to be considerably lower than for AIDS patients nationally.

The Hardy estimate of lifetime inpatient days (*12*)—which is substantially higher than any other estimate in Table 1—is based on an early sample of 16 AIDS patients in New York City. As discussed above, this sample probably included a large percentage of IV drug abusers, who require more inpatient days than other AIDS patients.

The remaining three studies estimate lifetime medical costs at $55,000 (*16*), $68,000 (*15*), and $77,000 (*8*). Although some of these studies may also double-count some patients or rely on samples that are not nationally representative, they suggest that lifetime costs of inpatient and outpatient care are not likely to exceed $80,000 per AIDS patient. The lifetime cost of medical care for the 15,000 AIDS cases diagnosed in 1986 is thus likely to be at most $1.2 billion, and the 74,000 new cases projected for 1991 (*1*) should require no more than $5.9 billion in medical care. The cost of medical care for the 270,000 cumulative AIDS cases projected from 1981 to 1991 is not likely to exceed $22 billion. This estimate depends, of course, on the accuracy of case load predictions, which are still highly uncertain, and could also change with the development of new therapies.

Nonpersonal costs. In addition to personal medical costs, there are substantial nonpersonal costs associated with AIDS. In fact, the federal government spends considerably more on AIDS research and education than on the treatment of AIDS (see Table 2) (*17*). Federal spending on education and research increased from $234 million in fiscal 1986 to $494 million in fiscal 1987, and will be $931 million for fiscal 1988. State and local governments, universities, and drug companies also spend money on AIDS-related research and education, but the amount is unknown.

Some information is available on the national level of spending on blood tests for AIDS. The federal government spent $79 million on blood tests in fiscal 1986, $76 million in fiscal 1987, and plans to spend $55 million in fiscal 1988. Most of these tests were administered to military personnel and new recruits. The cost of testing the 12 million units of blood collected in the United States in 1986 was about $50 million (*18*). How much private firms and individuals spent on testing is not known.

Scitovsky and Rice (*15*) estimate that the nonpersonal direct cost of AIDS was 33% of all direct costs in 1986, and predict that it will be 21% in 1991.

Indirect costs. The indirect cost of AIDS represents the discounted value of foregone earnings due to disability and premature death caused by AIDS. The "human capital" approach measures this component of costs on the basis of the employment and earnings patterns of a synthetic cohort of otherwise "comparable" individuals (*2*). Comparability typically amounts to performing these calculations separately for males and females at different ages (that is, at future points in time), although there is in principle no reason not to account for additional earnings-related characteristics such as race, education, labor market experience, and marital status. Estimates of earnings at successive ages are appropriately discounted to their "present value" so they may be meaningfully summed. Since we are interested in the cost of AIDS to society—which values the consumption of its members—we follow standard practice in calculating indirect costs by not subtracting projected consumption expenditure from foregone earnings (*2, 19*).

The human capital method incorporates information about usual life cycle patterns of labor market activity and earnings. Most important, it directly reflects the high cost of a disease that disables and then kills individuals in the prime of their working lives. Although it does not include nonpecuniary costs, as a measure of lost output it is useful for comparisons with the direct cost of AIDS and the lost output from other diseases.

Table 2. Federal spending on AIDS (millions of current dollars). Data from Jacob (*40*).

Type of spending	Fiscal year		
	1986	1987	1988
Research and education	234	494	931
Treatment*	155	243	433
Medicaid	130	210	375
Veterans Administration	24	30	52
Federal Bureau of Prisons†	1	3	6
Blood testing	79	76	55
Defense Department	79	74	52
State and Labor departments	0	2	3
Income maintenance	0	26	48
Total	468	839	1467

*These figures do not include Medicare expenditures. †Also includes spending on random testing of new inmates and universal testing of released inmates.

Estimates of foregone earnings by Hardy *et al.* (*12*) and by Scitovsky and Rice (*15*) assume that AIDS patients resemble a cross section of American society in terms of their employment and earnings behavior. However, from 1981 to the end of 1987, 70% of AIDS cases among adult males were homosexual or bisexual men, 15% were IV drug abusers, and 8% were individuals reporting both homosexuality and IV drug use as risk factors (*20*). AIDS patients are thus unlikely to have the same average pattern of earnings, employment, and work life as other individuals of similar age and sex. Indeed, if IV drug abuse and criminal behavior are correlated, the foregone earnings of drug abusers who die from AIDS may in fact be far below average. Homosexual and bisexual males, however, may have above average earnings (*21*). These errors may effectively offset each other in the calculation of foregone earnings.

Hardy *et al.* (*12*) estimate total foregone earnings resulting from the first 10,000 AIDS cases. Scitovsky and Rice (*15*) estimate the total foregone earnings of AIDS cases and fatalities in 1985, 1986, and 1991. We converted these aggregate estimates into estimates of foregone earnings per case in 1986 dollars. The average AIDS patient in the study of Hardy *et al.* (*12*) had foregone earnings of $623,000, of which 96% was due to losses associated with premature death. Scitovsky and Rice (*15*) estimate foregone earnings at $541,000 per case, of which roughly 93% is due to losses associated with premature death. Both sets of calculations are based on a 4% discount rate (*22*).

These estimates of foregone earnings are about six to eight times as large as the $80,000 in medical costs discussed above. For the 270,000 AIDS cases projected to arise between 1981 and the end of 1991, they imply a loss of $168 billion (*12*) and $146 billion (*15*). Thus most of the economic impact of AIDS will occur via the loss of future output and only to a lesser extent via the diversion of scarce resources to medical care for AIDS patients.

Some Comparative Measures

To place the cost of AIDS in perspective, we show statistics in Table 3 on national health expenditures and the estimated costs of other illnesses in the United States. Scitovsky and Rice's medium estimate (*15*) of the total direct cost of AIDS is $1.7 billion in 1986 and $8.0 billion in 1991. These estimates include nonpersonal costs as well as personal medical costs incurred by all AIDS patients during 1986 and 1991. They are not strictly comparable to the

lifetime medical costs of patients diagnosed in 1986 and 1991, which may be spread out over several years (and which do not include nonpersonal costs).

Table 3 indicates that the direct cost of AIDS in 1986 was 24% of the direct costs of all infectious diseases as recently as 1980, before the increase in AIDS. The total pecuniary cost of AIDS, which includes a large foregone earnings component, represents 57% of the total cost of infectious diseases.

The direct costs of AIDS in 1986 were less than 0.5% of the direct costs of all illnesses in the United States in 1980, and the total pecuniary costs of AIDS were only 1.3% of the total pecuniary costs of all illness. The direct cost of AIDS in 1986 was only 0.4% of total health expenditures in the United States in 1986, 0.04% of gross national product, and a small, though not trivial, fraction of the average increase in national health expenditures from 1970 to 1986.

Although total pecuniary costs of AIDS were small in 1986 in relation to other reasonable standards of comparison, these costs will increase significantly by 1991. The estimated direct costs of $8.0 billion in 1991 will exceed the direct costs of all infectious diseases in 1980 and will be over 2% of the direct costs of all illnesses in the United States in 1980. If national health expenditures grow at the same rate (adjusted for inflation) between 1986 and 1991 as they grew between 1970 and 1986, the direct costs of AIDS will represent 1.5% of total national health care expenditures in 1991, over four times higher than the ratio in 1986. The indirect costs of AIDS will also increase significantly from 1986 to 1991, when they will represent one-eighth of foregone earnings due to all illnesses in 1980. AIDS will thus constitute a much larger fraction of foregone earnings than of direct costs. This reflects the fact that foregone earnings are small relative to medical costs for other illnesses, while the reverse is true for AIDS.

These comparisons suggest that the impact of AIDS on the national health care sector and on the economy will increase sharply during the next few years but will nonetheless be small in 1991. However, the impact on the health care sector in San Francisco, New York, and some other cities will be more serious. AIDS patients occupied 2.7% of all medical and surgical beds in hospitals in San Francisco in 1986, 3.0% in New York, and 0.4% nationally. By 1991 these figures are projected to rise to 12.4%, 8.1%, and 1.9%, respectively (*23*). Because AIDS patients are more expensive to treat than most other patients, their percentage of total hospital inpatient costs in 1991 will be even larger: 16.2%, 8.4%, and 3.0%, respectively, in San Francisco, New York, and nationally. Many parts of the country now have unused hospital beds, so the added cost of treating AIDS patients involves primarily the cost of medical supplies and personnel. If the increase in case loads requires building additional hospital capacity, the economic impact of AIDS will be somewhat greater.

By the early 1990s patients with AIDS will constitute a dramatically higher but nonetheless small fraction of total deaths in the United States. The number of recorded deaths from AIDS was 5,774 in 1985, 8,932 in 1986, and is projected to be 54,000 in 1991 (*1, 24*). By comparison, there were 2.1 million deaths from all causes in the United States in 1986 (*25*). The number of AIDS deaths is also small in relation to deaths from cardiovascular diseases (968,000) and from cancer (472,000). Of course, patients with heart disease and cancer tend to be much older than patients with AIDS, but other causes of death strike the young as well as the old. For example, there were 49,000 deaths from motor vehicle accidents in 1986, 47,000 deaths in other types of accidents, 31,000 suicides, and 21,000 homicides. Nonetheless, by 1991 the list of cities in which AIDS is the leading cause of death among prime-age men will be much longer.

The average lifetime medical cost per AIDS patient is similar to costs for other serious illnesses. For males aged 35 to 44, lifetime per-patient medical costs (in 1986 dollars) are $67,000 for heart attack, $47,500 for cancer of the digestive system, and $28,600 for leukemia. Lifetime costs are $68,700 for individuals of all ages with paraplegia as a result of motor vehicle accidents (*21, 26*). Health insurance claims for the last years of care for nonelderly terminal cancer patients are $34,600 (*27*). Another study calculates annualized per capita medical costs for end-stage renal disease patients who received dialysis in 1979. Among patients who received kidney dialysis through the entire year, average Medicare reimbursement was $35,340, while Medicare reimbursement per dialysis patient who died during the year was $51,000 (1986 dollars) (*28*). These figures refer to 1 year of treatment and therefore are lower-bound estimates of lifetime medical care costs of patients with terminal cancer and end-stage renal disease.

Table 3. Costs of AIDS in perspective (billions of 1986 dollars).

Category	Year	Billions of 1986 dollars
Direct cost of AIDS*	1986	1.7
	1991	8.0
Total pecuniary cost of AIDS*	1986	8.5
	1991	48.8
Direct cost of all infectious disease†	1980	7.0
Direct cost of all illnesses†	1980	344.2
Total pecuniary cost of all infectious diseases†	1980	14.9
Total pecuniary cost of all illnesses†	1980	668.3
National health expenditures‡	1986	458.2
U.S. gross national product§	1986	4236.8
Average yearly increase in national health expenditures	1970–86	11.8

*Source: Medium estimates reported in Scitovsky and Rice (*15*, table 9), with different inflation adjustments applied to direct and indirect costs. All discounting was done at a rate of 4%. †From Rice *et al.* (*41*), with different inflation adjustments applied to direct and indirect costs. All discounting was done at a rate of 4%. ‡Source: National Center for Health Statistics (*29*). §Source: *Economic Report of the President* (*10*).

To summarize, these comparative measures indicate that the total cost of AIDS has been small relative to total national health expenditures and to the costs of all illnesses. This is true despite the fact that the per-patient cost of AIDS is similar to the cost of other serious illnesses that are expensive to treat. The national economy will not face a major shock, at least into the near future, because the prevalence of AIDS will continue to be small relative to the prevalence of other serious illnesses.

Who Bears the Direct Costs of AIDS?

Although the total cost of AIDS is still small on a national scale, the high medical cost per AIDS case raises important issues concerning the U.S. system for financing health care. The need to address these issues is intensified by the regional concentration of AIDS and by the high prevalence of AIDS among individuals who are already most likely to fall through cracks in the system—the young, minorities, the poor, and the jobless (*29*).

On the surface, the direct costs of AIDS appear to be borne by a wide range of payers: AIDS patients and their families, employers of individuals with AIDS and their insurance companies, public and private hospitals, and the federal, state, and local governments. However, some of these payers may try to shift the financial burden of AIDS onto others. This shifting may be unimportant until the prevalence of AIDS increases. But as the number of AIDS cases

increases, the burden of the direct costs of AIDS may ultimately be highly concentrated among individuals who have AIDS or are perceived as having a high risk of developing AIDS, other users of the health care system, and federal, state, and local taxpayers.

Private insurance typically covers a large share of medical costs that occur with the onset of AIDS-related symptoms, and virtually all the costs of hospitalization, for AIDS patients who are insured. AIDS patients without private insurance coverage must pay for the cost of treatment themselves. After they have spent nearly all their assets and are medically indigent, they become eligible for Medicaid coverage in most but not all states. Income and asset limits for Medicaid vary both across and within states. The federal government pays 50 to 77% of Medicaid costs, depending on per capita state income, with the state governments and in some instances local governments paying the remainder (*30*). A small fraction of the medical costs of treating AIDS patients who are veterans, who have long-term disabilities, or who are elderly or prisoners is borne by the U.S. Veterans Administration, the Medicare program (financed entirely by the federal government), and federal and state prison systems. Hospitals also absorb a significant share of the cost of treating AIDS. This occurs because Medicaid reimbursement rates are generally lower than hospital costs of treating AIDS patients (*31*) and because patients without private health insurance or Medicaid coverage may be unable or unwilling to pay their hospital bills.

Far less information is available on the sources of financing for AIDS medical bills than on the size of those bills. Evidence from a national survey of hospitals conducted in 1985 indicates that 54% of AIDS patients were covered by Medicaid, 2% by Medicare, and 17% by private insurance, while 27% were not covered by any insurance (*11*). However, these figures may underestimate the extent of private insurance coverage for several reasons. First, public hospitals, especially in the Northeast, are overrepresented in this sample. As a result, 47% of the AIDS patients treated in this survey were homosexuals and bisexuals who were not IV drug abusers, while 37% were IV drug abusers. By comparison, the CDC reports the overall national statistics for these two categories of AIDS cases to be 66% and 28%, respectively (*20*). Since patients in public hospitals in general, and IV drug abusers in particular, are less likely to have private insurance coverage than other AIDS patients, this survey probably overestimates Medicaid coverage and underestimates private insurance coverage. Another national survey of 204 discharges of AIDS patients in 1984 and 1985 found 55% covered by private insurance and 21% covered by Medicaid (*32*). Most of the remaining 24% presumably had no insurance coverage.

Second, beginning in 1986, employees covered by private health insurance policies with 20 or more participants have had the right to continue their coverage for 18 months after leaving work, at a premium not to exceed 102 percent of the employer's cost (*21*). Although many AIDS victims are not eligible for this coverage and others will have difficulty paying the premiums, this change in federal law will tend to shift the cost of treating AIDS from other payers to private insurance.

Another recent development is use of the drug azidothymidine (AZT), which increases the life expectancy of AIDS patients without curing them. AZT costs approximately $8000 per patient per year (*33*), and has side effects that may require patients to have frequent blood transfusions. AZT usage may or may not decrease the total lifetime cost of medical care. If AZT increases the life expectancy of AIDS patients for more than 18 months after they become unable to work, costs could shift from private insurance to individuals, and then to Medicaid (*34*).

In this discussion of who pays the cost of AIDS we have thus far focused only on who writes the checks. However, some payers may be able to shift part of their initial cost burden onto others. As hospitals, private insurance companies, employees, and others adjust to the growing medical cost of the AIDS epidemic, the ultimate burden of these costs is likely to be somewhat different than their initial distribution.

Costs borne by private hospitals that are not reimbursed by other payers initially come from profits or operating surpluses. Eventually, however, these costs will be passed on to other hospital users and their insurance companies. Private hospitals cannot operate indefinitely with ever larger losses from AIDS cases without going out of business. As their AIDS case loads increase, at some point they must either find other sources of revenue to cover those losses or refuse admission to AIDS patients. The traditional response of hospitals has been to increase the charges of patients covered by insurance to help cover the charges of patients who are not covered. Many hospitals can no longer afford this solution because of increased competition and stricter cost containment in the hospital industry.

In the case of public hospitals, most of the AIDS treatment costs that are not covered by AIDS patients, their insurance, or other payers will be borne by state and local taxpayers. Tax increases to cover the cost of AIDS treatment will tend to make some localities less desirable places to live and to depress property values (*35*).

Almost half of all AIDS cases have occurred in New York and California, and a disproportionate share of uninsured patients has been treated in public hospitals in New York City and San Francisco. Much of the burden of financing AIDS patients who do not qualify for Medicaid, and the portion of costs not reimbursed by Medicaid, fall on taxpayers in those states and cities. A sharp increase in the number of AIDS cases will put intense strains on health care facilities in those cities, and may create pressures for financial help similar to the federal disaster relief received by communities hit by hurricanes, floods, and tornadoes. Some relief could be provided by increasing the range of health services covered by Medicaid, for example, expanded home or hospice care that is less expensive and often more medically appropriate than traditional inpatient care.

The CDC (*1*) projects that New York City will have 8700 new cases of AIDS in 1991. At $80,000 per case, the lifetime cost of treating these patients will be approximately $100 for each New York City resident (*36*). The CDC also projects that San Francisco will have 5900 new AIDS cases in 1991. At $40,000 per case, the lifetime cost of treating these patients will be about $350 per resident. Of course, private insurance companies, the federal government, and the patients themselves will share the costs of medical treatment with local taxpayers. Boufford (*37*) estimates that local tax revenues paid 27% of the total costs of AIDS care in New York City in fiscal 1987.

In the short run, costs that fall on private insurance companies will reduce the profits of those companies and, as premiums are increased, on the employers they insure. In the long run, if employers pay premiums that are based on their experience, an increase in the cost of fringe benefits, that is, medical insurance, will fall on employees in the form of lower wages, especially on those employees thought to be at high risk of developing AIDS. Usually, employers do not test prospective employees for other diseases that are expensive to treat, and personal or legal considerations may discourage them from discriminating against suspected HIV carriers. However, employers in cities with large numbers of AIDS cases do have economic incentives to discriminate against such people by offering lower wages or by refusing to hire them.

As the AIDS epidemic grows, it may become increasingly difficult for individuals to buy health insurance, and some firms may even be refused group coverage for their employees. Almost all insurance companies currently refuse to sell insurance to individuals with

AIDS, and 91% refuse to sell to people with HIV antibody–positive blood tests (*38*). In the near future, insurance companies may insist on testing prospective customers for HIV, just as they often test for high blood pressure today. People who test positive could conceivably be offered coverage at premiums that equaled the expected value of the cost of treatment, but in practice they would be considered uninsurable. Testing would effectively prevent seropositive individuals from obtaining individual insurance, but insurance companies would continue to offer coverage to other people in high-risk cities.

If testing for AIDS is prohibited for insurance purposes, private insurance companies may begin to refuse to sell health insurance to all individuals in cities with many AIDS patients or to write policies that limit benefits for AIDS. They may choose this alternative instead of raising premiums to cover their increased costs because of the problem of adverse selection. As insurance companies tried to raise their premiums, low-risk individuals would begin to stop buying insurance. However, individuals with a high risk of developing AIDS would continue to want full coverage, and the percentage of AIDS patients among those insured would rise. Insurance companies would then raise their premiums further, and additional low-risk individuals would discontinue their coverage. Finally, only those individuals with the highest risk of developing AIDS would want to buy insurance at the very high rates that the insurance companies would require.

The problem of adverse selection is more serious for life insurance than for health insurance. The potential cost to health insurance companies is limited to the cost of medical care, or about $80,000 per customer. However, there is no natural limit to the amount of life insurance that a person who knows he is infected by HIV might want to buy.

This spiral of adverse selection could also affect small employers, especially in industries with a high percentage of suspected HIV carriers. If insurance companies see such a pattern developing, they may refuse to sell group insurance in certain cities and industries as well as refusing to sell individual insurance. The AIDS epidemic could thus result in increasing numbers of people without private health insurance.

The lack of insurance coverage among AIDS patients, and the requirement that they impoverish themselves before gaining eligibility for Medicaid, has led to proposals for more generous federal coverage for AIDS patients (*37, 39*) and to calls for a broader system of government health insurance. Lack of private insurance coverage is not unique for people at high risk of contracting AIDS. Nearly one-fourth of the adult population under age 65 is not covered by private health insurance (*29*), and federal health insurance is only available to the poor, the elderly, or the long-term disabled. Even at the prevalence levels projected for 1991, AIDS patients will constitute only a small fraction of all patients not covered by health insurance. The considerations for and against broader national health insurance will be only slightly changed by the spread of AIDS.

Conclusion

Our review of the cost of AIDS suggests that the lifetime cost of medical care per patient is not likely to exceed $80,000. This is similar to the cost of treating other serious illnesses. The lifetime cost of treating the 15,000 AIDS cases newly diagnosed in 1986 will thus be at most $1.2 billion. If CDC projections of future AIDS cases are accurate, the cost of medical care for 74,000 new cases in 1991 will be no more than $5.9 billion, and the cumulative cost of 270,000 cases diagnosed between 1981 and 1991 will not exceed $22 billion. The cost in terms of lost output due to the morbidity and mortality of AIDS patients will be far higher—from $541,000 to $623,000 per patient.

Compared to total spending on medical care, or deaths from all illnesses, the national economic impact of AIDS in the early 1990s will be small. Its impact on San Francisco, New York, and some other large cities, however, will be quite serious. Residents of those cities will pay higher taxes and health insurance premiums to finance a portion of the medical costs of local AIDS patients and may have increasing difficulty buying health insurance for themselves. There may also be increased job discrimination against people suspected of being infected with HIV.

Although AIDS will not inflict a major impact on the economy through the early 1990s, this does not mean that it will not do so in the more distant future. The disease would pose a much greater economic threat if it began to spread rapidly through the general heterosexual population. Current information suggests that this has not yet occurred. Even if case loads do not grow rapidly after 1991, AIDS will continue to be a serious concern, and for AIDS patients and their families it will continue to be both a personal and financial tragedy.

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Epidemiology of HIV Infection and AIDS in the United States

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By the end of 1987, nearly 50,000 cases of acquired immunodeficiency syndrome (AIDS) had been reported since 1981, 20,745 in the past year alone. Black and Hispanic adults and children have reported rates 3 to 12 times as high as whites. This can be largely attributed to higher reported rates in black and Hispanic intravenous (IV) drug abusers, their sex partners, and infants. In 1986, reported AIDS deaths increased adult male and female mortality in the United States by an estimated 0.7 and 0.07%, respectively, with much greater increases in selected age groups or areas of the country. The greatest variation in infection with the human immunodeficiency virus (HIV) (0 to 70%) has been found in surveys of IV drug abusers, while surveys of homosexual men reveal infection rates of 20 to 50%. Infection with HIV ranged from 0 to 2.6% in limited sexually transmitted disease clinic surveys of heterosexual men and women without a history of IV drug abuse or known sexual contact with persons at increased risk. The modes of HIV transmission are now well understood, but a large amount of biologic variability in efficiency of transmission remains to be explained. The period between initial infection with HIV and the development of AIDS is variable, but the risk for disease progression increases with duration of infection.

SINCE 1981, MORE THAN 70,000 CASES OF ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS) have been reported from more than 127 countries (*1*). Of these, well over half have been reported from the United States, reflecting the relatively high incidence of the syndrome here and a well-established national active surveillance system. By the end of 1987, 49,793 cases of AIDS in adults and children had been reported to the Centers for Disease Control (CDC); 27,909 (56%) were reported to have died, including over 80% of those diagnosed before 1985. During the past 12 months, 20,745 reports were received, a 57% increase over the preceding year. Since 1981, most adults in the United States with AIDS have been homosexual or bisexual men without a history of intravenous (IV) drug abuse (65%); 8% have been homosexual or bisexual IV drug abusers.

More than 60% of the 13,492 cases reported in heterosexual men and women were among those with a history of IV drug abuse, representing 17% of total cases. One percent of adults with AIDS (484) had hemophilia and 2% (1124) of the cases were associated with transfusions, almost always received before 1985. Of the 4% of cases of discare attributed to heterosexual transmission, 1107 (243 men and 864 women) had a history of heterosexual contact with a person with documented infection with human immunodeficiency virus (HIV) or in one of the main transmission categories, whereas 857 were born in countries (such as Haiti or central Africa) where heterosexual contact has been shown to be the major route of HIV transmission. The proportion of reported cases associated with heterosexual contact increased from 1.1% in 1982 to 2.3% in 1986. Approximately 70% of the index partners for these cases were IV drug abusers; 18% of the index partners for female cases were bisexual men. The male to female ratio of heterosexual contact cases in the United States is 1:3. In part, the predominance of women in the heterosexual contact category is probably due to a larger pool of infected men, but the relative efficiencies of male-to-female versus female-to-male transmission might also be relevant.

The presumed means of acquiring HIV infection was undetermined in only 3% of adults with AIDS; in most of these instances, risk information was incomplete. Within this group, no risk was identified for 211 heterosexual men who were interviewed or for whom other follow-up information was obtained. However, of those men responding to a standardized questionnaire, 51 (42%) of 122 gave a history of a sexually transmitted disease (STD) and 33 (34%) of 96 gave a history of prostitute contact.

Of the 737 cases of AIDS in children under 13 years old, 317 were reported in the past 12 months, a 64% increase over the previous year. Seventy-seven percent of pediatric AIDS cases were acquired perinatally, 13% were associated with transfusions, and 5% occurred in children with hemophilia. Over 70% of the perinatally

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