Analysis of Michigan Medicaid Costs to Treat HIV Infection

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Synopsis

To obtain better understanding of the nature and cost of health care related to human immunodeficiency virus (HIV) infection, medical payment records were analyzed for 204 men, women, and children older than 60 months who had indications of HIV infection. The records were those of Michigan Medicaid, the General Assistance Medical Program, and the Resident County Hospitalization Program, with service dates on or after January 1, 1984, and which were processed by November 30, 1987.

Patient payment records were coded according to whether the patient's condition was considered to be pre-HIV, HIV unrelated, possibly HIV related, or HIV related. Average monthly payments were found to be $150 for pre-HIV patient payment records, $114 for those HIV unrelated, $57 for those possibly related, and $1,213 for those related to HIV infection. HIV-related monthly payments rose from about $1,500 per month in the period 3 months prior to the patient's death to more than $8,000 in the last month of life.

Men were found to have twice as many claims as women, and men's claims cost about three times as much. A higher percentage of women than men (91 percent versus 37 percent) received pre-HIV paid services, indicating a higher percentage of women were at least initially receiving Medicaid for reasons other than an HIV-related disability. Diagnostic categories that accounted for the bulk of the HIV-related health care utilization included infectious and parasitic diseases, acquired immunodeficiency syndrome, diseases of the respiratory system, and non-HIV-specific immunity disorders. Inpatient hospitalization accounted for more than 75 percent of the payments, followed by physician costs (11 percent), pharmacy costs (5 percent), and outpatient costs (3 percent). A total of 45, or about 22 percent of the recipients, received zidovudine (AZT) prescriptions at an average monthly cost of $404.

OBTAINING REASONABLE ESTIMATES of the direct and indirect costs associated with human immunodeficiency virus (HIV) infection is a critical health care issue. An estimated 400,000 persons will have received treatment in the period 1986–91 for acquired immunodeficiency syndrome (AIDS), the most serious form of HIV infection (*1*).

The few studies on the costs of treating HIV infections and the associated conditions of AIDS and AIDS-related complex (ARC) differed widely in the scope of the costs assessed, the methodology used, and the demographics of the sample upon which they were based. Although there is a clearer picture now of the costs of treating HIV infection than there was a few years ago, major gaps exist in terms of the costs for specific types of services, disease stages, demographic subpopulations, and members of different risk groups (*2*).

The Health Care Financing Administration (HCFA) estimates that nationwide about 40 percent of all persons with AIDS are at any one time served by the Medicaid program (*3*). Because intravenous drug users and their sexual partners are a growing portion of those infected with HIV, the costs of treating HIV infection under Medicaid are likely to increase. In order to make decisions on financing, comprehensive and accurate information is necessary on health services utilization and costs for HIV-infected persons.

We conducted a descriptive study that included

204 men, women, and children older than 60 months with HIV infection who were receiving public assistance through the Michigan Department of Social Services. The investigation assessed

- health care costs and utilization for four categories of illness: the patient's condition prior to the onset of infection, after onset but unrelated to the infection, possibly related to HIV, and almost certainly related to HIV
- the costs of treating HIV during the course of the infection
- demographic differences in costs and utilization, including sex, race, and age
- costs and utilization by type of health care provider
- costs and utilization by diagnostic category, according to the International Classification of Diseases (ICD-9-CM) (*4*)
- preliminary data on the cost and utilization of zidovudine (AZT)

Study Sample

Information was obtained from the Michigan Department of Social Services, Medical Services Administration, on 324 persons who were believed to have received HIV-related services through Michigan Medicaid, the General Assistance Medical Program, and the Resident County Hospitalization Program.

The sample was selected from three sources: (*a*) death certificates of those with AIDS listed as a cause of death, obtained from the Michigan Department of Public Health; (*b*) a search of the Michigan Department of Social Services payment records for a 5-week period ending September 30, 1987, for those records showing a diagnosis of immune deficiency; and (*c*) audits of Medicaid-covered services that suggested the services might be related to HIV infection.

Recipients were excluded from the analysis if there were no services that were determined to be HIV related (50 subjects), if the recipient's age at the time of the first HIV-related service was 60 months or less (46 subjects), or if demographic information, including the date of birth, was not available (24 subjects), for a total of 120 excluded out of 324 subjects.

Children younger than 60 months were not included in the analysis because the initial selection process resulted in a high percentage of children who had immune deficiency problems that upon closer examination were believed to be non-HIV related. This caused concern that a significant number of children with non-HIV-related immune deficiency problems would remain in the sample even after careful examination of the data. We believed that there were too few children receiving services which were clearly HIV related to provide useful information.

As of mid-October 1987, 440 persons had been diagnosed with AIDS in Michigan (*5*). Because confidential public health registry data listing those in the State who had been diagnosed with AIDS were not accessible to the project, it was not possible to tell which of the 324 subjects were officially diagnosed as having AIDS. Death certificates of 86 persons who died prior to March 1987 listed AIDS as the cause of death.

The extent of Medicaid coverage as well as eligibility criteria vary from State to State. Michigan's Medicaid program has relatively liberal eligibility criteria. Andrulis and coworkers (*6*) compared the ratio of Medicaid recipients to persons living at or below the poverty level, and found the ratio in Michigan to be the fourth highest in the country. Coverage in Michigan includes hospice and home care.

Methods

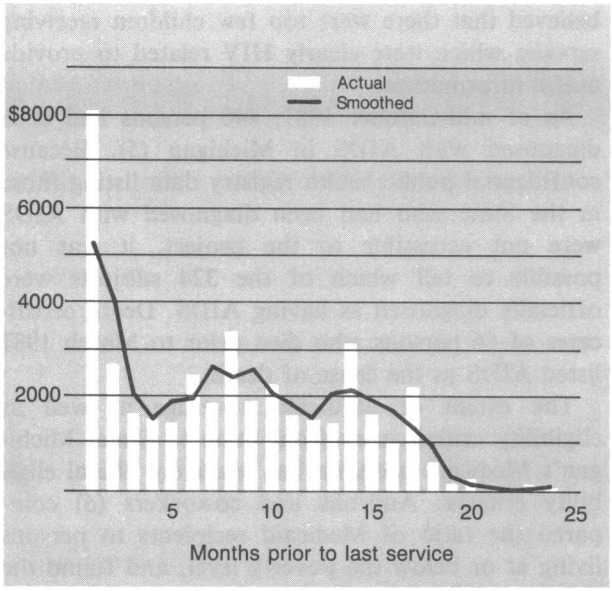
The data used in the study were contained in payment records with a service end date on or after January 1, 1984, and which were paid on or before November 30, 1987.

The payment records from the recipients were reviewed by a registered nurse under the direction of a physician with substantial experience and knowledge of HIV infection. Based on records of primary and secondary diagnoses (ICD-9-CM) and prescribed drugs and procedures, the services provided were separated into four illness categories

- pre-HIV services, those provided prior to the first service determined to be HIV related
- HIV-unrelated services, those determined to be clearly unrelated to an HIV infection but delivered after the first evidence of an HIV infection
- possibly HIV-related services, those potentially related to an HIV infection
- HIV-related services, those provided for conditions highly likely to be related to an HIV infection

Patients' payment records were reviewed chronologically in order to locate the first claim that was reasonably certain to have been HIV related, such as an AIDS diagnosis, an AZT pharmacy claim, or

Figure 1. Actual and 3-month moving averages of mean total HIV-related payments per month for 71 deceased recipients for each month prior to their last Medicaid paid service. Payments are in 1984 dollars



a diagnosis of a clinical manifestation associated with immune deficiency, such as *Pneumocystis carinii* pneumonia (PCP). Next, a check was made for claims which were dated just prior to the first reasonably certain claim and highly likely to have been HIV related, such as pneumonia unspecified (NOS) immediately before a diagnosis of PCP.

Payments prior to the first HIV-related claim were coded as pre-HIV. Payments after that date were coded as HIV unrelated if they were clearly unrelated to HIV, such as treatment for trauma, or pharmacy claims for antihistamines. Common acute infections, such as urinary track infections, were coded as possibly HIV related. Clearly HIV-related payments and payments for common manifestations of HIV, such as pneumonia NOS, or thrush, were coded as HIV related.

In some instances the decisions were made based on the context of the diagnoses of adjacent payments. For example, a diagnosis of chest pain was considered HIV related when payments for services made on the same day had a diagnosis of pleurisy. A diagnosis of chest pain was coded as unrelated when payments for services on the same day showed a diagnosis of myocardial infarction. A complete description of the coding procedure may be obtained from the principal author ("Coding Manual for Michigan Medicaid Payment Records of Potentially HIV Infected Individuals").

Service related payment analyses in this report were based on actual Medicaid payments made to the providers. Payments have been adjusted, based on the medical portion of the consumer's price index, in 1984 dollars. For each case, two periods were established, the time from the first payment date of service to the first payment date of service that was determined to be HIV related, and the time from the first payment date of service determined to be HIV related to the last payment date of service in the file for that person.

To control for the natural history of the HIV infection of each person, average monthly cost and utilization amounts are presented, as opposed to total amounts per person. To form these averages, pre-HIV cost and utilization were divided by the number of months between the first claim and the first HIV-related claim, while the HIV-related, possibly-HIV related, and HIV-unrelated total costs and utilization were divided by the number of months between the first HIV-related claim and the last claim.

Both payment amounts and numbers of claims were analyzed. Claims were the person's claims made to and reimbursed by Medicaid. In the hospitalizations, there was a single claim per hospitalization. In general, each claim was for a single service provided to the person.

Results

Service categories. Previous studies of the costs of HIV infection have not attempted to differentiate between HIV-related and HIV-unrelated health care. For some persons with HIV infection, such as hemophiliacs, health care unrelated to HIV may comprise the major portion of their total health care expenses.

We found that the average monthly Medicaid payments prior to the first HIV-related records to be $149.78. Subsequently, the payments were $114.15 for HIV-unrelated services, $56.53 for possibly HIV-related services, and $1,213.46 for HIV-related services. Of the health care costs after the first HIV-related claim, the HIV-unrelated services accounted for an average of 8.2 percent of the payments. Possibly HIV-related services were 4.1 percent, and HIV-related services averaged 87.7 percent of the payments.

Costs of treating HIV over the course of the infection. There is little information available on the cost of treating HIV infection over the course of the disease. Cross-sectional data collected by Scitovsky (*7*) suggests that the cost of treating AIDS is

bimodal, peaking about the time the disease is diagnosed and again around the time of death.

To assess the change in the cost of treating HIV infection over the course of the disease, we computed the HIV-related expenditures for each month, from the last month a recipient received services to the first HIV-related service. Death certificates for Medicaid recipients with AIDS listed as a cause of death were available for the 86 who died prior to March 1987. Of these, 71 perceived services that were determined to be clearly HIV related.

Figure 1 shows the mean total HIV-related payments per month for the 71 recipients who died, for each month prior to the last Medicaid-paid service they received. Three-month moving averages were calculated in order to smooth the trend line. Recipients were included in the calculation if they used services during a particular month. Figure 2 shows the percentage of the 71 recipients receiving HIV-related services during each month prior to their last Medicaid service.

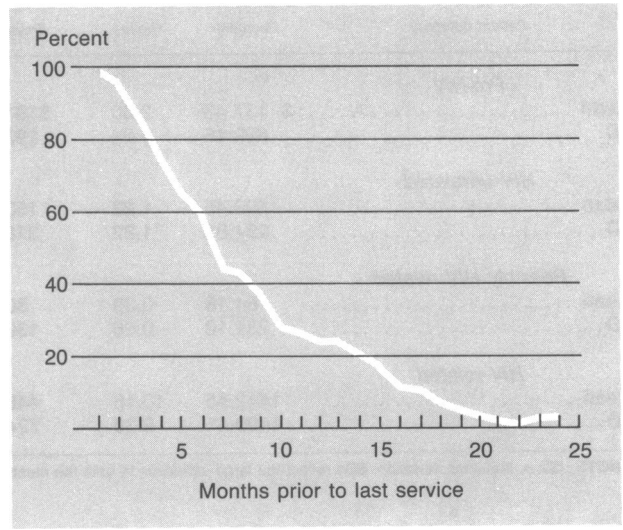
The data are consistent with Scitovsky's finding of a sharp rise in the cost of treating HIV just prior to death (*7*). Service use seemed to be cyclical, with a rise in costs beginning about 8 months prior to the last service, and again at about 14 months prior to the last service. Persons with HIV infection seem to have episodes of active use of health care followed by periods of relatively low use. Although episodes appear sporadic on an individual basis, they may be cyclical on average among numbers of persons; however, there is a steady increase moving toward the last service.

Demographic differences in costs. A multivariate analysis of covariance was used to test for differences in cost or service utilization in terms of sex, race, and age. Race was categorized as white or other. Age was included as a covariate in the design. The dependent variables were payments and number of claims for each HIV category (pre-HIV, HIV unrelated, possibly HIV related, and HIV related).

No significant sex by race interaction in the HIV categories for claims or payments was seen ($P < 0.05$). No relationship was found between age and number of claims or monthly payments ($P < 0.05$). There were, however, statistically significant race ($P < 0.02$) and sex ($P < 0.001$) differences. (Details of the multivariate analysis are available from the principal author.)

Table 1 contains summary statistics for the monthly payments and claims in the HIV services

Figure 2. Percentages of the 71 deceased recipients receiving HIV-related services during each month prior to their last Medicaid paid service



categories by sex and race. There was a great deal of variability in both the number of claims and size of payments. This reflects the wide range in Medicaid paid services used among the recipients. For example, while many recipients had no pre-HIV service utilization, a few hemophiliacs had extremely large pre-HIV payments for clotting factors. This factor resulted in average monthly payments for pre-HIV services ranging from zero to $4,880. A breakdown by age was not included because of the lack of any statistically significant differences in the payments or claims in terms of age. Only marginal summary statistics were included in table 1 because there was no sex by race interaction.

Although the multivariate test was statistically significant for race, the differences between whites and other races were relatively small for both payments and number of claims. Only the univariate significance tests for pre-HIV and possibly HIV-related claims were statistically significant ($P < 0.05$). As can be seen in table 2, the magnitude of the differences was relatively small. In the case of pre-HIV and possibly HIV-related services, other races used slightly more health care per month than whites.

The differences were substantial between men and women in terms of both HIV-related payments and claims. Men had nearly twice as many claims as women, costing almost three times as much. A detailed analysis of these differences failed to locate a definitive reason why HIV-related expenses for women were so much lower than for men

Table 1. Monthly Medicaid payments in dollars and numbers of claims within patient condition category, by sex and race

Patient category	Men (N = 157)		Women (N = 47)		White (N = 106)		Other (N = 98)	
	Payment	Claims	Payment	Claims	Payment	Claims	Payment	Claims
Pre-HIV								
Mean	$ 137.43	2.00	$191.57	5.41	$ 166.60	2.25	$ 131.10	3.37
SD	639.15	4.32	293.66	6.86	756.06	4.63	282.07	5.73
HIV unrelated								
Mean	102.45	1.22	153.23	2.02	86.11	1.28	144.48	1.54
SD	294.82	1.82	318.95	2.66	229.76	2.03	360.64	2.11
Possibly HIV related								
Mean	64.18	0.39	30.95	0.59	34.06	0.28	80.83	0.60
SD	231.18	0.66	136.96	0.97	130.53	0.54	275.07	0.90
HIV related								
Mean	1442.58	13.18	448.12	7.23	1188.69	12.64	1240.26	10.92
SD	1409.41	9.36	724.84	5.33	1482.20	10.65	1197.13	6.58

NOTE: SD = standard deviation. SDs reflect the large variations in both the number of claims and payment size.

Table 2. Percentage of pre-HIV claims among Medicaid-funded health care study recipients, by race and sex

Sex	All		White		Other	
	Number	Percent with claims	Number	Percent with claims	Number	Percent with claims
Men	141	37	78	31	63	44
Women	44	91	18	94	26	88
Total	185	50	96	43	89	57

NOTE: Numbers are the total number of persons in each category; percents are the percentage of persons with pre-HIV claims, as for example, 78 white males, 31 percent of whom (or 24) had pre-HIV claims.

(Hogan, A. J., Solomon, D. J., Bouknight, R., and Solomon, C. T.: Under-utilization of Health Services by HIV-Infected Women? Unpublished manuscript, 1988, available from the authors).

Pre-HIV Medicaid usage. There is evidence that a much higher percentage of men than women have become eligible for Medicaid because of their HIV infection. Table 2 shows the percentage of persons who received pre-HIV Medicaid funded health care. Those whose first Medicaid paid services were HIV related were likely to have become eligible for Medicaid because of HIV-related disabilities. Those who received pre-HIV services required Medicaid at least partly for reasons unrelated to their HIV infection. Subjects were only included in this analysis if the date of service of their first claim in the data set was after April 1, 1984, 3 months after the beginning of data collection. This should have excluded most who were receiving HIV-related services at the time data collection began, and for whom it was impossible to tell if they had used any pre-HIV services.

Slightly more than one-third of the men had pre-HIV claims, suggesting that most became eligible for Medicaid after they became disabled as a result of HIV-related complications. About 90 percent of the women in the sample had received pre-HIV Medicaid services, indicating that they were eligible for Medicaid for reasons other than an HIV-related disability.

A log-linear analysis was used to determine what effects were statistically significant. No significant lack of fit was found when race by sex ($P = 0.238$) and race effects ($P = 0.194$) were sequentially dropped from the model. There was, however, significant lack of fit ($P < 0.00001$) after the sex effect was dropped from the model. The large discrepancy in the percentage of men and women with pre-HIV, Medicaid-paid health care utilization suggests that there were distinct differences in the socioeconomic background of men and women in this sample.

Cost by provider type. Most prior studies of the costs of treating HIV infection have not included ambulatory physician costs and ancillary services. Using provider type codes on the individual payment records, it was possible to separate the costs of different types of medical services. Table 3 contains a summary of the payment and number of claims for physicians, pharmacy, home health care, inpatient, outpatient, and the aggregate of all other health care providers.

Inpatient hospitalizations accounted for about 75 percent of the HIV-related costs, although the

Table 3. Monthly Medicaid payments in dollars and numbers of claims, by type of care provider

Provider	Pre-HIV		HIV unrelated		Possibly related		HIV related	
	Payment	Claims	Payment	Claims	Payment	Claims	Payment	Claims
Physician								
Mean	$ 16.46	0.81	$ 15.09	0.52	$ 4.89	0.22	$ 137.88	5.06
SD	55.22	1.97	36.14	0.90	11.51	0.00	251.04	6.88
Pharmacy								
Mean	18.28	0.86	9.81	0.38	0.32	0.04	63.48	2.17
SD	119.50	1.99	70.92	1.27	1.44	0.18	104.78	2.20
Home health care								
Mean	0.00	0.00	1.17	0.01	0.38	0.00	16.35	0.07
SD	0.00	0.00	13.53	0.05	4.11	0.01	75.75	0.26
Inpatient hospital								
Mean	93.67	0.02	77.10	0.03	49.23	0.01	915.57	0.20
SD	523.60	0.11	254.68	0.12	205.50	0.03	1,156.89	0.25
Outpatient hospital								
Mean	6.49	0.50	3.77	0.22	1.46	0.13	36.12	2.98
SD	16.97	1.69	11.76	0.52	4.03	0.33	44.18	3.44
Other[1]								
Mean	14.87	0.60	7.20	0.25	0.24	0.04	43.81	1.32
SD	68.02	1.59	31.58	0.89	0.90	0.15	160.33	2.99

[1] Includes providers of ambulance, laboratory, medical supply, inpatient mental health, and community mental health services.

NOTE: SD = standard deviation.

number of claims (hospitalizations) was small. The percentage was substantially less than the 90 percent accounted for by hospital costs found by Kizer and coworkers among persons with AIDS receiving Medi-Cal (*8*). Physician services were the second major health care expense, requiring more than 11 percent of the HIV-related costs, nearly double the 6 percent found by Kizer. Note that physician charges for inpatient services where in some cases billed separately in this data set.

Forty-six, or 22.5 percent, of the recipients had HIV-related, or possibly HIV-related, home health care claims, compared with 141, or 69 percent, of the recipients having at least one HIV-related, or possibly HIV-related, inpatient hospital claim. As can be construed from table 3, the combined HIV related and possibly HIV-related payments for home health care totaled $16.73 per month per recipient, compared with $964.80 for inpatient hospitalization. Note that Michigan Medicaid was covering home health care during the total period for which data were collected.

Costs by diagnostic category. Table 4 shows the average monthly Medicaid payments and the average number of claims per month by diagnosis category. Payment records were included in a category if either the primary or secondary diagnosis was within the category. Inpatient hospital payment records showed only a primary diagnosis.

The diagnostic categories that accounted for the bulk of the HIV-related health care use included infectious and parasitic diseases, AIDS, diseases of the respiratory system, and non-HIV specific immune disorders. AIDS diagnoses and infectious and parasitic diseases accounted for the majority of the costs, while non-HIV specific immunity disorders included the largest number of claims.

AZT use and costs. AZT was approved in March 1987 by the Food and Drug Administration (FDA) as a treatment for HIV infection. Based on the Medicaid payment records analyzed in this study, the first prescription for AZT paid by Michigan Medicaid was purchased in April 1987. Between that time and October 1987, Medicaid paid for at least one AZT prescription for 45 recipients. Recognizing that a claim may take months to be processed, the costs and number of AZT claims in the later months of this data set are likely to be incomplete.

The average cost of providing AZT to a recipient was $1,351.94, or $404.03 per month during the period he or she received AZT. This results in an expected cost of $4,848.36 per year, well below the projected cost of about $8,000 per year for the

Table 4. Monthly Medicaid payments in dollars and numbers of claims, by diagnostic category [1]

Diagnosis	Pre-HIV		HIV unrelated		Possibly HIV		HIV related	
	Payment	Claims	Payment	Claims	Payment	Claims	Payment	Claims
AIDS (279.19, 042–044)								
Mean	0.00	0.00	0.00	0.00	0.00	0.00	$351.97	1.27
SD	0.00	0.00	0.00	0.00	0.00	0.00	709.06	2.05
Non-AIDS specific immunity disorders (279, except 279.19)								
Mean	0.00	0.00	0.00	0.00	$ 0.14	0.02	84.50	2.38
SD	0.00	0.00	0.00	0.00	1.30	0.15	247.36	3.62
Infectious and parasitic diseases (001–139, except 042–044)								
Mean	$ 20.51	0.31	$ 5.44	0.17	0.62	0.07	374.52	1.46
SD	117.56	0.86	24.65	0.75	1.88	0.21	776.21	1.90
Neoplasms (140–239)								
Mean	0.21	0.01	11.60	0.01	4.25	0.00	21.02	0.36
SD	0.90	0.06	138.64	0.09	60.63	0.01	103.17	1.07
Diseases of the blood and blood forming organs (280–289)								
Mean	1.47	0.09	0.89	0.08	0.32	0.01	26.95	0.51
SD	11.84	0.33	6.06	0.62	3.55	0.10	134.66	1.39
Mental disorders (290–319)								
Mean	4.41	0.10	12.95	0.05	0.03	0.00	8.18	0.22
SD	28.87	0.49	116.83	0.28	0.26	0.03	41.14	0.54
Diseases of the nervous system (320–389)								
Mean	54.08	0.13	4.24	0.05	0.69	0.01	38.55	0.36
SD	512.18	0.79	45.11	0.19	7.09	0.06	230.00	1.26
Diseases of the circulatory system (390–459)								
Mean	7.01	0.17	15.59	0.09	3.34	0.03	11.51	0.21
SD	80.82	1.17	109.31	0.27	40.85	0.30	69.16	0.60
Diseases of the respiratory system (460–519)								
Mean	3.75	0.19	0.28	0.02	0.76	0.07	118.79	1.48
SD	20.36	0.98	1.73	0.15	3.49	0.34	329.06	2.84
Diseases of the digestive system (520–579)								
Mean	9.20	0.15	7.14	0.06	24.85	0.06	44.70	0.32
SD	55.51	0.67	54.85	0.19	154.71	0.20	166.32	0.61
Diseases of the skin (680–709)								
Mean	5.74	0.09	5.05	0.02	13.42	0.06	10.98	0.15
SD	37.59	0.29	49.60	0.14	93.21	0.22	69.70	0.38
Ill-defined conditions (780–799)								
Mean	2.46	0.16	0.85	0.05	0.23	0.02	52.99	1.67
SD	9.39	0.58	2.62	0.20	1.49	0.10	140.17	3.08
Other								
Mean	25.51	0.73	41.96	0.46	8.09	0.13	23.83	0.54
SD	95.65	1.79	159.86	0.98	67.45	0.45	88.55	1.60

[1] Payment records were categorized by primary or secondary diagnosis, or both. Diagnoses are by ICD-9-CM codes (reference 4). Pharmaceutical payment records were without diagnoses and were not included.

recommended dosage (*9*). The difference may result from the fact that a high percentage of patients cannot tolerate the full dosage and these patients were given a reduced amount.

Discussion

Assessing the economic impact of HIV infection is complex and difficult. Even the limited goal of determining the direct costs of providing health care for those with HIV infection has only begun to be addressed. It is apparent that no single study or approach will provide a complete picture of such costs. Shadish has suggested that multiple methods and strategies from different disciplines need to be applied to control the biases inherent in any single approach to addressing a problem (*10*). This appears to hold true for assessing the economic impact of HIV on the health care system.

The total payments for HIV-related health care found in this study are considerably less than in other studies (*11*), even those focusing exclusively on Medicaid-paid costs as did, for example, Kizer and coworkers (*8*). Factors probably contributing to the cost of treatment being relatively low are (*a*) the data set is both left- and right-censored because it includes payment records from a fixed time period; (*b*) a majority of the subjects were still alive at the time the data collection ended; our findings, as well as those of Scitovsky (*7*), indicate the cost of treatment rises dramatically in the period just prior to the patient's death; and (*c*) the cost of treatment varies substantially across the country; hospitalization costs in California, where Kizer's data were collected, are substantially higher than those in Michigan.

Previous studies of the cost of HIV infection have not addressed the issue that a portion of the health care received by those with HIV infection is for unrelated care. Disentangling the HIV-related and HIV-unrelated health care costs based on paid claims records is difficult and sometimes impossible. Being able to separate costs, even on a crude basis, will provide better estimates of the actual health care costs of HIV infection. We estimated the HIV-unrelated health care costs to be about 8 percent of the total Michigan Medicaid-paid health care costs of recipients with HIV infection. Another 4 percent of the costs were questionable. The same percentages reasonably may be applied to adjust other estimates of the cost of treating HIV related illnesses for unrelated health care.

The analysis of HIV-related costs for the months prior to last service supports other researchers' findings that the costs of HIV-related health care rise dramatically in the end stages of the disease. Service use also seemed to be cyclical. The trend may be an anomaly because of the relatively small number of subjects on which the estimates were based and the fact that the number of recipients of HIV-related services dropped steadily, counting back from the last service.

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The decrease may be because of recipients beginning to receive Medicaid as they exhaust their own funds or lose their private health insurance; because many are likely to have died within 24 months of receiving their first HIV-related service; or because, early in the course of the disease, there may be months in which patients are in relatively good health and no health care services are used.

Substantial differences between men and women were found in utilization of the HIV-related Michigan Medicaid-paid health care during the period of data collection. An analysis of the data set did not provide a clear indication of the cause of the discrepancy, which could be because of demographic differences between the men and women who had HIV infection and were receiving publicly financed health care during the period. The hypothesis that there are demographic differences between men and women in the study is supported by the fact that a much higher percentage of women were in the medical system prior to requiring HIV-related health care.

There is evidence that a higher proportion of women than men with HIV infection are intravenous drug users (*12*). The discrepancy in cost may be attributable to differences between users and nonusers, rather than between men and women. This is an issue which we plan to address in a future study.

The consensus is that, in many situations, home health services can provide the care required to treat persons with HIV infection more comfortably and much less expensively than hospitalization (*6*).

As noted, an average of $16.73 per recipient per month was spent for HIV-related or possibly HIV-related home health care, compared with $964.80 for inpatient hospital care. Home health services are being provided to Michigan Medicaid recipients for HIV-related services, but not on a large scale. While it is difficult to tell to what extent additional home health care could replace hospitalization, it seems likely that, to some degree, additional home health care could be used to reduce costs, as well as improve the quality of life of Medicaid recipients with HIV infection. The living situation or personal circumstances of many of the recipients, however, may not be conducive to using home health care.

There are few publications on health care utilization and costs associated with the specific clinical manifestations of HIV. Scitovsky found PCP and other infectious diseases to be more expensive to treat than Kaposi's sarcoma and other conditions, at least in terms of hospital care in San Francisco (*13*).

Thomas and Fox (*14*) found that PCP and other infectious diseases were the primary diagnosis for 58 percent of the hospital admissions at four hospitals located in New York City in 1985. The findings in our study are consistent with those of Scitovsky as well as Thomas and Fox. Infectious and parasitic diseases was the most expensive diagnostic category. Neoplasms and diseases of the skin together accounted for less than a third of the cost, and half as many claims per month, as infectious diseases.

The use of AZT as a treatment for HIV infection is likely to have an impact on the cost of treating the infection, although it is not clear what that effect will be (*1,9*). By the fall of 1987, about 22 percent of Michigan Medicaid recipients with HIV infection were receiving AZT. The cost of providing AZT to Michigan Medicaid recipients was estimated to be about 60 percent of the projected cost of the recommended dose of AZT. There is some indication that many people cannot tolerate the recommended dose and receive a reduced dosage, which might explain the reduced cost (*9*). Alternatively, the reduced cost may result from a discrepancy between what Medicaid will pay and what is generally charged for AZT.

Fox and Thomas, as well as Hellinger, note that there are additional costs associated with the side effects of AZT (*15,9*). There is some evidence that treating its side effects may be greater than the cost of the AZT (*9*).

Unfortunately, there was not enough information available to assess the ancillary costs. Further research on Medicaid payment data after 1987 is planned and could provide information both on the ancillary costs of administering AZT, as well as the savings from reducing health care utilization by administering AZT.

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