Antidepressant Treatment and Health Services Utilization Among HIV-Infected Medicaid Patients Diagnosed with Depression

Usha Sambamoorthi, PhD, James Walkup, PhD, Mark Olfson, MD, Stephen Crystal, PhD

OBJECTIVE: To characterize the prevalence and predictors of diagnosed depression among persons with HIV on Medicaid and antidepressant treatment among those diagnosed, and to compare utilization and costs between depressed HIV-infected individuals treated with and without antidepressant medications.

DESIGN: Merged Medicaid and surveillance data were used to compare health services utilized by depressed individuals who were or were not treated with antidepressant medications, controlling for other characteristics.

SETTING AND PARTICIPANTS: The study population comprised Medicaid recipients in New Jersey who were diagnosed with HIV or AIDS by March 1996 and received Medicaid services between 1991 and 1996.

MEASUREMENTS AND MAIN RESULTS: Logistic regression and ordinary least squares regressions were employed. Women were more likely and African Americans were less likely to be diagnosed with depression. Women and drug users in treatment were more likely to receive antidepressant treatment. Depressed patients treated with antidepressants were more likely to receive antiretroviral treatment than those not treated with antidepressants. Monthly total expenditures were significantly lower for individuals diagnosed with depression and receiving antidepressant therapy than for those not treated with antidepressants. After controlling for socioeconomic and clinical characteristics, treatment with antidepressant medications was associated with a 24% reduction in monthly total health care costs.

CONCLUSIONS: Depressed HIV-infected patients treated with antidepressants were more likely than untreated subjects to receive appropriate care for their HIV disease. Antidepressant therapy for treatment of depression is associated with a significantly lower monthly cost of medical care services.

KEY WORDS: depression; antidepressants; Medicaid; HIV/AIDS. *J GEN INTERN MED* 2000;15:311-320.

Depression is a major health risk for the HIV-infected^{1,2} and is associated with declines in immune function,^{3,4} acceleration of the course of disease progression,⁵ increased disability and lower quality of life,⁶ shorter survival,⁷ and

greater probability of dying.⁸ However, data on treatment of depression among HIV-infected patients paint a distinctly hopeful picture. Many efficacy studies have concluded that the symptoms of carefully selected depressed HIV-infected patients are reduced by a variety of antidepressants.⁹⁻¹⁴ Though it has been suggested that depressive symptoms and depressive disorders accompanying medical illness often lead to higher rates of health care utilization,¹⁵⁻¹⁸ recent studies have found reductions in the costs of health care due to treatment of depression.^{19,20} Prior research also suggests that antidepressant treatment failure is associated with an increase in health service expenditures,²¹ and discontinuation of use of antidepressants is associated with increased overall costs of medical care.²² However, findings of medical cost being offset by mental health care are far from universal.²³ For example, providing mental health consultation to psychologically distressed patients who are high users of medical services does not reduce utilization.²⁴

Previous studies of HIV-infected individuals, however, have not elucidated the effectiveness of antidepressant treatment in broader community practice. Findings from controlled trials may not be readily generalizable to hard-to-treat sectors of the HIV-infected population, particularly those on Medicaid who are poor, socially marginal, and have multiple medical or substance abuse comorbidities. Medicaid recipients represent a vulnerable population with restricted access to quality mental health care.²⁵ Furthermore, to date, no study has investigated the relation between antidepressant treatment and health service utilization among depressed HIV-infected patients. Such knowledge is vital to program and policy development in the era of managed care, particularly since several states are developing specialized capitated managed care programs to provide comprehensive care for special needs populations such as those with HIV.²⁶

This article builds on prior research by investigating the incidence of depression and the impact of antidepressant treatment on use of medical services among persons with HIV diagnosed with depression. We examine depression and treatment of depression among Medicaid beneficiaries with HIV/AIDS and explore the relation between antidepressant treatment and use of medical care services among those diagnosed with depression.

METHODS

Study Population

The study population comprised HIV-infected participants on Medicaid in New Jersey, identified through a file match between the New Jersey Medicaid eligibility file and

Received from the Institute for Health, Health Care Policy, and Aging Research, Rutgers University, New Brunswick, NJ (US, JW, MO, SC).

Address correspondence and reprint requests to Dr. Sambamoorthi, Institute for Health, Health Care Policy, and Aging Research, Rutgers University, 30 College Ave., New Brunswick, NJ 08901; telephone 732-932-8637; fax 732-932-6872; e-mail: sambamoo@rci.rutgers.edu.

the state's AIDS/HIV Registry through March 1996. The match was conducted under a cooperative agreement between the New Jersey Department of Health and Senior Services (DOHSS), which maintains the state's AIDS/HIV Registry,* and the state's Department of Human Services, Division of Medical Assistance and Health Services (DMAHS) which administers Medicaid.† The link between the AIDS Registry and the Medicaid file was done by DOHSS using identifying fields common to both files such as name, birth date, gender, and social security number. Once the link was established, DOHSS provided the researchers at Rutgers University with a file from which identifying information was stripped to protect confidentiality and in which unique Medicaid numbers were used to link the individual records. For these clients DMAHS provided paid Medicaid claims for medical care and prescription drugs. The claims file provided information on claim type, category of service, dates of service, actual amount paid by Medicaid, and charges billed by providers for each of the services. In addition, pharmacy claims contained national drug codes, which were used to identify antiviral drugs, and therapeutic class codes, which were used to identify antidepressants. Medicaid claims histories were run on the population identified by the match in December 1996, and subsequently provided to the research team, who cleaned and organized

these utilization data and merged them with data elements from the Registry and other administrative files such as waiver program client files. The claims histories contained all processed claims for services provided up to December 1996. To allow for time lags between receiving services, billing, payment, and appearance of paid claims in the computerized database and because vital status information was available as of March 1996, services received through March 29, 1996, were included in the analyses. In addition, we excluded all services received before 1991 because antiretroviral treatment before that date was less efficacious and less widely used.²⁷ At the final stage, our data covered services received for the period between January 1991 and March 1996.

Other criteria for inclusion in our study population were diagnosis with AIDS or HIV by December 1995; age between 18 and 64 years at the time of diagnosis; presence on the Medicaid eligibility file by March 1996; and actual receipt of Medicaid services for at least 90 days during some part of the period from January 1991 through March 1996 and not participating in managed care or Medicare programs. We identified 5,559 patients who met these criteria for inclusion.

Measures

Depression Diagnosis. Depressed patients were identified on the basis of primary and secondary diagnostic codes conforming to *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* for medical care episodes contained in administrative Medicaid claims data. We included only diagnoses assigned by hospitals, physicians, medical clinics, or mental health care providers and disregarded claims indicating depression diagnosis from other medical care providers such as emergency department physicians, case managers, and home-health agencies. Types of depressive illness included major depressive disorder, single episode (ICD-9-CM code 296.2); major depressive disorder, recurrent (296.3); depressive-type psychosis (298.0); neurotic depression (300.4); brief depressive reaction (309.0); prolonged depressive reaction (309.1); and depressive disorder not elsewhere classified (311). Major depressive disorder (single and recurrent) was classified as "major depressive disorder" and other types of depressive illness were grouped into "other depression." In multivariate analysis, other depression was used as the reference group.

Antidepressant Use. Antidepressants were identified from therapeutic class codes recorded in pharmacy claims. The list of therapeutic class codes was provided by DMAHS. Individuals having at least 1 claim with the therapeutic class codes H2H, H2J, H2K, and H2N indicating antidepressant use were considered antidepressant users.

Use of Antidepressant Treatment Among Those with Depression Diagnosis. This measure was defined only

*In New Jersey, the Department of Health maintains the AIDS/HIV Registry. New Jersey has had named reporting of HIV since 1992. HIV/AIDS surveillance methods include reporting of diagnosed HIV and AIDS cases, and reporting of deaths among persons with HIV or AIDS. Since HIV/AIDS surveillance data are generally based on reports from health care providers, few false positives are produced. The Department of Health also uses retrospective review to reclassify patients whenever there are changes in case definition of HIV infection. For example, the time frame of our study crosses 1993, when there was a change in definition of AIDS by the Centers for Disease Control. Using retrospective review New Jersey Department of Health reclassified patients to meet the revised definition of AIDS.

†In New Jersey, beneficiaries qualify for Medicaid through Aid to Families with Dependent Children, by establishing disability and low income (typically through establishing eligibility for Supplemental Security Income), or through New Jersey's HIV-specific waiver program for home and community-based care. Eligible for the latter are those who have medical and social needs that would otherwise require care in a skilled nursing facility. The waiver program is available to individuals with income levels above the regular Medicaid income threshold, up to the income level at which they would become financially eligible if institutionalized. New Jersey Medicaid covers inpatient and outpatient treatment encompassing 27 service categories including pharmacy, physician, inpatient hospital, outpatient hospital, independent clinic, home-health agency, medical supplies and equipment, transportation, laboratory, optical appliance, durable medical equipment, psychology, podiatry, chiropractor, and others.

among patients who had at least 1 claim with a primary or secondary diagnosis of depression. Patients without a depression diagnosis were excluded even if they had claims for antidepressants. To ensure that the use of antidepressants was likely to be related to the diagnosis of depression, we classified subjects as receiving antidepressants if their antidepressants were prescribed within 60 days preceding or following their diagnosis of depression. A period of 60 days was chosen to ensure that each patient was being treated for depression and to allow for time lag between diagnosis and filling of prescriptions, an issue especially for patients diagnosed during inpatient admissions. HIV-infected patients diagnosed with depression who had no linked prescriptions according to the above-mentioned criteria were classified as "depression diagnosis with no antidepressant use." For multivariate analyses, an indicator variable was constructed for each of the 2 groups and "depression diagnosis with no antidepressant use" was used as the reference category. Multiple episodes of depression were identified for those with a gap of 365 days between claims with depression diagnosis. For those with multiple spells of depression, the first treated (or untreated) spell of depression was included.

Methadone Treatment. An outpatient encounter with a HCFA Common Procedure Coding System (HCPCS) code of Z2006 was used to identify methadone maintenance treatment (MMT) visits. Service dates in MMT claims, ranging from a single day to a month of methadone use, were used to determine total number of days on MMT. For each individual, we divided the total number of days represented in the MMT service claim dates by duration of observation (the number of days enrolled in Medicaid after AIDS diagnosis) to determine the proportion of time on MMT. Beneficiaries with MMT claims representing more than 50% of the enrollment time were included in the consistent MMT group.

Drug Abuse. Current drug abuse was identified through claims-based diagnosis codes conforming to the ICD-9-CM, including drug dependence (304), nondependent drug abuse (305), drug withdrawal syndrome (292), dirty needle (hepatitis) (573.3), and poisoning by opiates and related derivatives (565). (A similar approach has been used to identify drug users in New York State Medicaid claims data.)²⁸ Our procedure classified 61% of Registry-classified injection drug users (IDUs) as having indications of current drug abuse or methadone treatment. This procedure is probably not highly sensitive. Subgroups of patients whose abuse is less severe may fail to be classified as current drug abusers. Nevertheless, it can be considered highly specific in that there are likely to be relatively few false positives. The procedure serves to classify our patient population into groups differing in current drug involvement and to provide a basis for examining statistical differences between these groups.

Using the MMT and drug abuse variables described above, each IDU with HIV/AIDS was classified into 1 of 4 mutually exclusive categories: (1) consistent MMT; (2) inconsistent MMT; (3) no MMT and no indication of current drug abuse; and (4) no MMT with indications of current drug abuse.

Demographic Characteristics. Demographic characteristics (gender, ethnicity, age at diagnosis), exposure category, date of AIDS/HIV diagnosis, vital status, and date of death for decedents were derived from the state's AIDS/HIV Registry. Exposure category was based on drug use history as reported in the AIDS/HIV Registry, and patients were classified as IDUs and non-IDUs. Missing values for exposure category were imputed using hotdeck procedures, in which an observation with missing data for a particular characteristic was assigned the value of the characteristic from a randomly selected observation with valid data in the same gender, ethnicity, waiver status, and geographic location. Mortality status was ascertained as of March 1996, and beneficiaries were categorized as dead, alive, or unknown. The small number of cases ($n = 49$ or 0.9%) with unknown vital status were grouped with those alive to form the nondecedent category. Age at diagnosis was grouped into 4 categories: 18–29; 30–39; 40–49, and 50 years or older.

Geographical areas of New Jersey vary widely in HIV/AIDS prevalence and therefore in the extent to which the health care system has been affected by the demands of AIDS care. The highest-prevalence area of the state for HIV/AIDS is the 5-county area nearest to New York City, comprising Essex, Hudson, Passaic, Bergen, and Union Counties. This is an area with a high prevalence of poverty and HIV. It includes such inner-city localities as Newark, Jersey City, and Paterson, and represents an area in which the health care system has had to respond to a substantial and growing volume of HIV/AIDS care needs. In our analyses, we included region as a covariate and contrasted utilization patterns in this high-prevalence region to those in the remainder of the state.

Waiver Status. Some of the New Jersey Medicaid population is enrolled in an HIV-specific Medicaid waiver program for home and community-based care, the AIDS Community Care Alternatives Program (ACCAP), which offers case management and private duty nursing among other services.²⁸ Because the case management services offered by the waiver program may affect health care use, we used waiver status as a covariate in all our analyses.

Year of Depression Diagnosis. To control for changes in practice patterns in prescription of antidepressant therapy and HIV care, we also included year of depression diagnosis as an independent variable. We created 3 dummy variables (1991–1992, 1993–1994, and 1995–1996), indicating year of depression diagnosis. In multivariate analyses diagnosis, year 1991–1992 was used as the reference category.

Antiretroviral Treatment. Intergroup differences in use of antiretroviral (ARV) drugs were evaluated using pharmacy claims. Because our study precedes the era of highly active antiretroviral therapy (HAART) in treating HIV infection, we included the 5 nucleoside analogue reverse transcriptase inhibitors (NRTIs)—ddI, ddC, 3TC, d4T, and zidovudine (ZDV or AZT)—that were available during the period of observation (January 1991 to March 1996). National drug codes were used to identify the above-mentioned ARV drugs to classify respondents as users of ARV treatment. We used receipt of at least 1 prescription for an ARV drug. In examining ARV drug use in relation to depression diagnosis, we included only ARV treatment received during the year after diagnosis of depression. Among users of ARV treatment, an overwhelming majority (81%) received at least one ZDV prescription during the follow-up period, followed by ddC (21%), d4T (16%), 3TC (15%), and ddI (12%).

Costs of Care. Expenditure data were based on the actual amount reimbursed by the New Jersey Medicaid program and were reported in 1996 dollars based on the national Consumer Price Index for medical care. The claims data on expenditure were aggregated by type of service to compute cumulative costs per beneficiary during the 12 months after diagnosis of depression. Because the observation period varied among subjects, we used average monthly expenditures per person, calculated by dividing the total expenditures (during the year after diagnosis of depression) for each type of service per patient by the number of months of follow-up.

Data Analysis

We used bivariate statistical methods and multivariate models to address our research questions. We tested for subgroup differences in depression diagnosis, antidepressant use, and use of ARV drugs with χ^2 statistics. The statistical significance of bivariate subgroup differences in average monthly cost of care was evaluated with t tests. We employed simple logistic regression to predict the probability of diagnosis of depression, antidepressant treatment, or antiviral use. Parameter estimates from logistic regressions were transformed into odds ratios associated with each independent variable, which represent the relative risk ratios for a 1-unit change in the variable in question. Odds ratios that exceed 1 indicate an increased likelihood of depression diagnosis or depression treatment with antidepressants or antiviral treatment relative to the comparison group, whereas odds ratios less than 1 indicate a decreased probability of depression diagnosis or depression treatment with antidepressants or ARV treatment. To isolate the effects of untreated depression on costs and utilization while controlling for other important characteristics such as gender, ethnicity, and other socioeconomic characteristics, we employed linear regression techniques. Monthly total expenditures were

transformed to a logarithmic scale to reduce skewness. Effect estimates for continuous independent variables on the log of monthly expenditures can be interpreted as percentage change for each unit of change in the independent variable. The effect of dummy variables in terms of percentage of expenditures can be estimated by exponentiating the regression coefficients of dummy variables and subtracting 1 (i.e., Percent Change = $e^b - 1$).²⁹

RESULTS

Table 1 describes the study population and compares sociodemographic characteristics for individuals with no depression diagnosis and individuals with depression diagnosis. The study population was 54% male and 46% female, 63% African American, 19% white, and 17% Latino. Sixty-nine percent of the population lived in the area of the state with high HIV prevalence, near New York City. A majority of the population (80%) was alive as of March 1996. Sixty-seven percent of the study population was diagnosed with AIDS, and the rest with other HIV disease. Of the 5,559 patients in our study population, 1,011 (18%) were diagnosed with depression. Of those diagnosed, 58% were treated with antidepressants.

Characteristics of Patients with Depression

Table 1 also reports crude and adjusted ratios of depression diagnosis in our study population. Adjusted ratios are derived from parameter estimates from logistic regression transformed into odds ratios (column 4). Confidence intervals (95%) for the odds ratio [OR] (column 5) associated with each independent variable are also presented in Table 1. We found significant differences in gender, ethnicity, age at diagnosis, drug abuse and treatment, primary diagnosis, and vital status by diagnosis of depression. All of these differences were statistically significant at the 5% level by χ^2 tests. A significantly higher percentage of women (21.6%) than men (15.3%) were diagnosed with depression. Significantly lower percentages of African Americans, older adults aged 50 years and over, non-IDUs, IDUs with no current drug abuse claims, AIDS patients, and decedents were diagnosed with depression. However, in multivariate analysis on the predictors of diagnosed depression, no differences by age at diagnosis, primary diagnosis, and vital status were noted. Controlling for other characteristics, women were more likely to receive a diagnosis of depression (OR, 1.37). African Americans were less likely (OR, 0.61) to be diagnosed with depression than whites. Similarly, IDUs with no indications of current drug abuse (OR, 0.28) and non-IDUs (OR, 0.48) were less likely to be diagnosed with depression than IDUs with drug abuse claims.

Treatment of Depression with Antidepressants

Results from the bivariate comparisons and multivariate regression on predictors of depression treatment

Table 1. Crude Rates and Adjusted Odds Ratios of Depression Diagnosis in an Adult HIV-Infected Medicaid Population by Selected Patient Characteristics*

Characteristic	Sample Size	% Sample	% with Depression Diagnosis [†]	Logistic Regression on Depression Diagnosis Odds Ratio (95% CI) [‡]	
N		5,559	1,011		
All		100.0	18.2		—
Gender					
Male	3,013	54.2	15.3 [†]	—	—
Female	2,546	45.8	21.6	1.37 [‡]	(1.18 to 1.59)
Ethnicity					
White	1,065	19.2	22.5 [†]	—	—
African American	3,482	62.6	16.2	0.61 [‡]	(0.51 to 0.74)
Hispanic	980	17.6	20.3	0.87	(0.69 to 1.10)
Age at diagnosis, y					
18–29	1,129	20.3	18.6 [†]	—	—
30–39	2,769	49.8	19.6	1.13	(0.93 to 1.37)
40–49	1,349	24.3	16.1	0.98	(0.78 to 1.24)
50 and over	312	5.6	12.8	0.90	(0.60 to 1.31)
Drug abuse and treatment [§]					
Non-IDU	1,672	30.3	14.4 [†]	0.48 [‡]	(0.40 to 0.60)
IDU, consistent MMT	403	7.3	30.5	0.99	(0.76 to 1.28)
IDU, inconsistent MMT	739	13.4	28.7	0.95	(0.77 to 1.18)
IDU, no current drug abuse	1,566	28.3	8.0	0.28 [‡]	(0.22 to 0.35)
IDU, current drug abuse	1,147	20.8	26.2	—	—
County of residence					
Near NYC	3,809	68.5	18.8	1.13	(0.96 to 1.33)
Elsewhere	1,750	31.5	16.9	—	—
Primary diagnosis					
AIDS	3,726	67.0	17.4 [†]	1.01	(0.86 to 1.20)
HIV	1,833	33.0	19.7	—	—
Waiver status					
Non-ACCAP	4,956	89.2	18.4	—	—
ACCAP	603	10.8	16.6	0.99	(0.76 to 1.27)
Vital status as of March 26, 1996					
Nondecedents	4,441	79.9	18.8 [†]	—	—
Decedents	1,118	20.1	15.6	0.93	(0.76 to 1.13)
Months of follow-up				1.03	(1.02 to 1.03)

*The study population is based on adult Medicaid participants with AIDS/HIV, aged 18 years or older, whose utilization and costs were observed for at least 90 days between January 1, 1991, and March 29, 1996.

[†]Denotes that group differences in depression diagnosis were significant at the 5% level. Odds ratios are estimated from logistic regressions on depression diagnosis. The regressions also include an intercept term.

[‡]Indicate the statistical significance of estimated effects, relative to the omitted reference category ($P \leq .05$).

[§]IDU denotes injection drug user; MMT, methadone maintenance treatment.

^{||}ACCAP denotes AIDS Community Care Alternative Program.

with antidepressant drugs among depressed patients are reported in Table 2. In the bivariate comparisons, we found that a significantly higher percentage of women than men, IDUs in MMT than IDUs with current drug use, nondecedents than decedents, and individuals with major depressive disorder than individuals with other types of depressive illness were treated for depression with antidepressants. The multivariate analysis confirmed the bivariate findings. The odds of receiving antidepressant drugs were 1.26 ($P = .09$) for women relative to men. Injection drug users with regular MMT were twice as likely to receive antidepressants as IDUs with current drug abuse

claims. Patients with major depressive disorder were more likely to be treated with antidepressants than patients with other types of depressive illness. Patients diagnosed with depression in 1995–1996 were almost 3 times more likely to receive antidepressants than patients diagnosed with depression in 1991–1992. None of the other variables were significant.

Depression and Antiretroviral Use

Table 3 reports the bivariate and multivariate analysis of ARV use and multivariate analysis of monthly total

Table 2. Predictors of Depression Treatment with Antidepressants Among Patients with Depression Diagnosis*

Predictor	Sample Size	% with Antidepressant Use [†]	Logistic Regression on Antidepressant Use Odds Ratio (95% CI) [‡]	
N	1,011	57.8	—	—
Gender				
Male	462	54.1 [†]	—	—
Female	549	60.8	1.26	(0.96 to 1.64)
Ethnicity				
White	240	58.3	—	—
African American	563	57.5	0.95	(0.68 to 1.33)
Hispanic	199	59.8	1.10	(0.73 to 1.66)
Age at diagnosis				
18–29	210	53.8	—	—
30–39	544	57.9	1.11	(0.79 to 1.56)
40–49	217	62.4	1.29	(0.86 to 1.95)
50 and over	40	50.0	0.92	(0.45 to 1.89)
Drug abuse and treatment [§]				
Non-IDU	240	49.2 [†]	0.70 [‡]	(0.49 to 0.99)
IDU, consistent MMT	123	70.7	1.82 [‡]	(1.15 to 2.94)
IDU, inconsistent MMT	212	68.9	1.68 [‡]	(1.15 to 2.47)
IDU, no current drug abuse	126	46.0	0.62 [‡]	(0.40 to 0.96)
IDU, current drug abuse	301	57.8	—	—
County of residence				
Near NYC	715	58.9	1.05	(0.78 to 1.41)
Elsewhere	296	55.1	—	—
Primary diagnosis				
AIDS	650	56.9	1.00	(0.75 to 1.34)
HIV	361	59.3	—	—
Waiver status				
Non-ACCAP	911	58.5	—	—
ACCAP	100	51.0	0.93	(0.59 to 1.48)
Vital status as of March 29, 1996				
Nondecedents	837	59.5 [†]	—	—
Decedents	174	49.4	0.98	(0.63 to 1.55)
Year of depression diagnosis				
1991–1992	111	57.7	—	—
1993–1994	455	55.4	1.66	(0.87 to 3.20)
1995–1996	445	60.2	2.74 [‡]	(1.06 to 7.13)
Type of depression				
Major depressive disorder	364	62.1	1.45 [‡]	(1.10 to 1.91)
Other depression	647	55.3 [†]	—	—
Months of follow-up after depression diagnosis			1.02	(0.99 to 1.04)

*The study population is based on adult Medicaid participants with AIDS/HIV, aged 18 years or older, whose utilization and costs were observed for at least 90 days between January 1, 1991, and March 29, 1996.

[†]Denotes group differences in depression treatment with antidepressants that were significant at the 5% significance level.

[‡]Odds ratios are estimated from logistic regressions on depression treatment and was restricted to individuals receiving a depression diagnosis. The regressions also include an intercept term. Double daggers indicate the statistical significance of estimated effects, relative to the omitted reference category ($P \leq .05$).

[§]IDU denotes injection drug user; MMT, methadone maintenance treatment.

^{||}ACCAP denotes AIDS Community Care Alternative Program.

cost of care during the year after diagnosis of depression among patients treated and not treated with antidepressants for depression. Bivariate analysis of ARV use (column 1) and estimated odds ratios from the logistic regression of receiving at least 1 prescription for ARV drugs (column 2) are presented in Table 3. Also presented are the 95% confidence intervals for the odds ratios (column

3). Overall, a majority of our study population (59%) used ARV drugs, defined as receiving at least 1 prescription for ARV drugs during the follow-up period (year) after diagnosis of depression. A significantly higher proportion of depressed patients with antidepressant prescription received ARV therapy (65%) than patients without antidepressant therapy (50%).

Table 3. Antiretroviral Use, Total Cost of Care (in 1996), and Treatment of Depression (N = 1,011)*

Characteristic	% with ARV Use [†]	Logistic Regression on ARV Use [‡]		OLS Regression on Log of Monthly Total Cost of Care, β
		Odds Ratio	(95% CI)	
Depression and treatment				
Treated	64.9 [†]	1.93 [‡]	(1.46 to 2.56)	-0.28 [‡]
Not treated	50.4	—	—	—
Gender				
Male	64.5 [†]	—	—	—
Female	53.9	0.72 [‡]	(0.54 to 0.96)	0.13
Ethnicity				
White	62.5	—	—	—
African American	57.5	0.78	(0.55 to 1.11)	0.32 [‡]
Hispanic	57.8	0.82	(0.54 to 1.26)	0.04
Age at diagnosis, y				
18–29	45.7 [†]	—	—	—
30–39	60.3	1.43 [‡]	(1.01 to 2.03)	0.02
40–49	67.3	1.90 [‡]	(1.24 to 2.92)	0.12
50 and over	60.3	1.64	(0.77 to 3.55)	0.19
Drug abuse and treatment [§]				
Non-IDU	55.0	0.90	(0.62 to 1.32)	-0.17
IDU, consistent MMT	67.0	1.17	(0.72 to 1.90)	-0.16
IDU, inconsistent MMT	59.0	0.92	(0.62 to 1.37)	-0.13
IDU, no current drug abuse	55.6	0.83	(0.53 to 1.32)	-0.68 [‡]
IDU, current drug abuse	59.8	—	—	—
County of residence				
Near NYC	59.2	1.12	(0.82 to 1.52)	0.33 [‡]
Elsewhere	57.8	—	—	—
Primary diagnosis				
AIDS	68.2 [†]	3.19 [‡]	(2.38 to 4.29)	0.52 [‡]
HIV	41.8	—	—	—
Waiver status				
Non-ACCAP	57.7 [†]	—	—	—
ACCAP	68.0	1.33	(0.82 to 2.20)	0.72 [‡]
Vital status [¶]				
Nondecedents	60.2 [†]	—	—	—
Decedents	44.0	0.42 [‡]	(0.24 to 0.74)	1.39 [‡]
Year of depression diagnosis				
1991–1992	57.7	—	—	—
1993–1994	59.3	1.17	(0.74 to 1.86)	0.01
1995–1996	58.4	1.37	(0.80 to 2.35)	0.44 [‡]
Months of follow up		1.07 [‡]	(1.01 to 1.12)	—
All	58.8			

*The study population is based on adult Medicaid participants with AIDS/HIV, aged 18 or older, diagnosed with depression and whose utilization and costs were observed for 12 months after diagnosis of depression between January 1, 1991 and March 29, 1996.

[†]Denotes significant group differences in antiretroviral treatment were significant at the 5% significance level.

[‡]Odds ratios were estimated from the logistic regression of antiretroviral treatment and restricted to individuals receiving a depression diagnosis. β values were estimated from OLS regressions on log monthly total cost of care. The regressions also include an intercept term. Double daggers indicate the statistical significance of estimated effects, years relative to the omitted reference category ($P \leq .05$). Percentage change in expenditures can be estimated by exponentiating the regression coefficients of dummy variables and subtracting 1 (i.e., percent change = $e^b - 1$).

[¶]Months of follow-up and vital status observed during the follow-up period after diagnosis of depression.

[§]IDU denotes injection drug users; MMT, methadone maintenance treatment.

^{||}ACCAP denotes AIDS Community Care Alternative Program.

Controlling for socioeconomic characteristics and months of follow-up, depressed patients treated with antidepressants were almost twice as likely to be on ARV therapy as depressed individuals who did not receive antidepressants. For depressed patients with antidepressant

therapy, the OR was 1.93. Other significant predictors were gender, age at diagnosis, primary diagnosis, vital status, and months of follow-up. No differences in receipt of antiviral therapy by ethnicity, geographic location, or waiver status were noted.

Depression and Monthly Cost of Care

Mean total monthly expenditure for all members of our study population during the year after diagnosis of depression was \$2,747 (data not shown). Sixty-one percent of the total expenditure was for inpatient services (\$1,680). On average, patients in our study spent about \$605 per month on noninpatient services without pharmacy costs and \$461 on prescription drugs. Patients treated with antidepressants averaged lower monthly inpatient expenditures (\$1,531) than patients not treated with antidepressants (\$1,884). Relative to patients diagnosed with depression but not in treatment with antidepressant drugs, patients with antidepressant therapy spent on average 19% (or about \$4,300 per year) less on inpatient costs. However, this difference was not statistically significant.

Table 3 also presents the results of multivariate analyses on log of monthly total cost of care, showing statistically significant coefficients. Controlling for gender, ethnicity, age at diagnosis, drug abuse and treatment, geographic location, stage of illness, vital status, waiver status, and year of depression diagnosis, depression treatment with antidepressant drugs was strongly associated with the log of monthly cost of health care services. In terms of monthly total cost of care, depressed patients not treated with antidepressants incurred substantially higher total expenditures than persons in other depression groups did. For example, depressed patients receiving antidepressant therapy incurred 24% ($\beta = -0.28$) less total health care expenditures than was the case for those not receiving antidepressants.

DISCUSSION

The prevalence of diagnosed depression we found was in the range found by others studying depression and HIV.¹ As in virtually all studies of depression, women predominated.³⁰ Nor is it surprising that non-IDUs and IDUs with no indication of current drug abuse were less likely to be diagnosed with depression, since depression is a common complication of drug abuse.³¹ We also found that minorities were underrepresented among those diagnosed with depression, consistent with accumulating evidence that the incidence of depression is greater in whites than African Americans. This pattern has also been found in substance-dependent treatment-seeking groups, in which whites have been found to have higher rates of lifetime major depression.³² Because we relied on diagnoses associated with care episodes, a difference in diagnosed depression between whites and African Americans could also be influenced by differences in care seeking, access, or quality of care; studies report that African Americans are referred for evaluation of depression and diagnosed with depression less often³³ and are less likely than whites to receive mental health care.^{34–36}

In this community sample of poor patients with HIV,

we found that nearly 40% of patients diagnosed with “depression” did not receive antidepressant prescriptions. Our finding is consistent with studies of primary care in which 40% of primary care visits with a diagnosis of depression did not include prescription of an antidepressant.³⁷ It is difficult to know from the inspection of claims data what is impeding the prescription of antidepressant medications. When treating HIV-infected patients, some clinicians may view pathologically depressed mood in these patients as “normal” or “reactive.” In some cases, they may fail to target the diagnosed depression because they too quickly attribute fatigue, sleep problems, or difficulty concentrating to HIV or medication side effects, thus failing to appreciate the full impact of depression on functioning. Some clinicians may be disposed to prescribe, but find that patients with HIV/AIDS are reluctant to add antidepressants to what is often a complex medication regimen, or tolerate side effects that may further diminish functioning.

Our findings on the relation of ARV with depression treatment and the cost-effectiveness of treating depression underscore the need for clinicians to devise ways to promote treatment for depression in this group. Although concern exists about older tricyclic antidepressants,¹⁴ several effective options are available that are better tolerated, including selective serotonin reuptake inhibitors, “alternative” antidepressant therapies (e.g., dextroamphetamine or testosterone replacement therapy),^{38,39} and interpersonal psychotherapy.^{40,41} Care should be taken in selection of a treatment that is easily tolerated and produces rapid clinical response, because one study has found that, compared with a matched seronegative group with depression, the seropositive group was slower to improve with antidepressant improvement.⁴² The medical comorbidities associated with the late stages of HIV illness need not rule out treatment, since there are data suggesting that, even for these patients, comorbid depression may be influencing somatic symptoms thought to result from HIV, so that a 6-week trial of antidepressants produced improvement in somatic symptoms.⁴³

We found that in this population treatments tend to cluster (with one type associated with higher probability of receiving another). For example, among patients diagnosed with depression, patients receiving treatment for depression were more likely than patients not treated for depression to receive a prescription for ARV drugs. Similarly, patients in drug treatment were more likely than patients with current drug abuse and no treatment claims to receive an antidepressant. This pattern could reflect either a patient group’s level of involvement with the service delivery system, or the treated group’s elevated capacity to seek out health care resources (possibly as a result of treatment), or both. Regular drug treatment may provide more opportunities for mental health care, or patients in drug treatment may take better care of their health. A more nuanced understanding of these processes may reveal opportunities for clinicians to engage socially marginal patients in a network of care.

Our finding that 59% of patients with AIDS received ARV therapy during a 1-year follow-up should be viewed in the context of prevailing clinical practices during the period covered by the study. This figure is lower than with the rate (74%) reported by Smith and Kirking using data from the AIDS Cost and Service Utilization Study.⁴⁴ However, lack of precise information on the illness severity of the patients in our population (e.g., CD4 counts) makes it difficult to compare treatment rates in our HIV group with those found in other studies. The absence of an ethnicity effect in the treatment of depression and ARV therapy is notable, since whites have been reported to have some access advantages in general⁴⁵ and in among AIDS populations.⁴⁶ This absence may reflect special characteristics of the depression subgroup, or it may reflect the documented reduction in ethnicity differences that has occurred in the course of the epidemic.²⁷

Our study found that antidepressant treatment is associated with lower total health care costs, consistent with earlier research mentioned in the introduction. Given the high levels of disability generally found with depression, an estimation of indirect costs associated with untreated depression (e.g., the hours of labor required of friends and loved ones who provide instrumental support) might further strengthen the economic warrant for treatment.

There are limitations to the inferences that can be drawn from studies such as ours that rely on health care claims data to model outcomes. In studies that compare administrative data files on utilization with information from clinical charts on diagnoses and procedures,⁴⁷ good agreement is usually reported, including excellent agreement for major psychiatric disorders^{29,48} and associated secondary diagnoses.⁴⁹ Reliability of clinical diagnoses has been a problem, however, for more transient or less well-specified conditions, such as depressive disorder, not otherwise classified.²⁹ Diagnoses (or misdiagnoses) of depression might occur for several reasons such as reimbursement issues, mistaking the symptoms of one disorder for another, or concern regarding stigma.⁵⁰ Although we had some measures of disease stage and physical health status such as primary diagnosis and vital status, this study lacked good independent measures of illness severity such as CD4 counts that would have been helpful in interpreting some of our findings.

Our study is based on a single payer (Medicaid) and excludes patients seeking health care outside the Medicaid system, and episodes of care that might occur in a setting not reimbursed by Medicaid (e.g., privately financed or uncompensated care, or services provided in a Veterans Administration hospital). The pattern of depression diagnoses and treatment we report may not be generalizable to the full population with HIV/AIDS, and our cost calculations do not capture expenses incurred outside the Medicaid system. However, HIV-infected individuals tend to be high-cost patients, most have their care financed by Medicaid, and these costs can be expected to grow as improved treatment increases survival rates.

Thus, despite the limitations of these naturalistic data, our findings suggest that substantial cost savings may be associated with treatment of depression and point to the need for well-designed intervention studies that control for selection effects and capture medical expenditures, regardless of payment source.

Finally, although our study precedes the era of HAART therapy in treating HIV infection, the results are important because the antiviral drugs included in our study continue to be important components of current HAART regimens. A key policy concern is how to encourage and enable persons to comply with the complex and costly regimens involving protease inhibitors. Given the evidence that patients with a history of depression have significant delays in protease inhibitor initiation,⁵¹ the association between antidepressant treatment and ARV therapy identified in our study supports the value of recognition and treatment of depression for this population.

This research was supported by a grant from the National Institute on Drug Abuse, R01-DA11362-01. The findings and opinions reported here are those of the authors and do not necessarily represent the views of any other individuals or organizations.

REFERENCES

1. Rabkin JG, Ferrando S, Jacobsberg L, Fishman B. Prevalence of axis I disorders in an AIDS cohort: a cross-sectional, controlled study. *Compr Psychiatry*. 1997;38:146-54.
2. Stober D, Schwartz J, McDaniel J, Abrams R. Depression and HIV disease: prevalence, correlates, and treatment. *Psychiatr Ann*. 1997;27:372-7.
3. Lesserman J, Petitto J, Perkin D, et al. Severe stress, depressive symptoms, and changes in lymphocyte subsets in human immunodeficiency virus-infected men. *Arch Gen Psychiatry*. 1997;54:279-85.
4. Zorilla E, McKay J, Luborsky L, Schmidt K. Relation of stressors and depressive symptoms to clinical progression of viral illness. *Am J Psychiatry*. 1996;153:626-35.
5. Leserman J, Jackson ED, Petitto JM, et al. Progression to AIDS: the effects of stress, depressive symptoms and social support. *Psychosom Med*. 1999;61:397-406.
6. Holmes W, Bix B, Meritz M, Turner J, Hutelmeyer C. Human immunodeficiency virus (HIV) infection and quality of life: the potential impact of axis I psychiatric disorders in a sample of 95 HIV seropositive men. *Psychosom Med*. 1997;59:187-92.
7. Patterson T, Shaw W, Semple S, et al. Relationship of psychosocial factors to HIV disease progression. *Ann Behav Med*. 1996;18:30-9.
8. Mayne T, Vittinghoff E, Chesney M, et al. Depressive affect and survival among gay and bisexual men infected with HIV. *Arch Intern Med*. 1996;156:2233-8.
9. Markowitz J, Rabkin J, Perry SW. Treating depression in HIV-positive patients. *AIDS*. 1994;8:403-12.
10. Rabkin J, Wagner G, Rabkin R. Effects of sertraline on mood and immune status in patients with major depression and HIV illness: an open trial. *J Clin Psychiatry*. 1994;55:433-9.
11. Rabkin J, Rabkin R, Wagner G. Effects of fluoxetine on mood and immune status in depressed patients with HIV illness. *J Clin Psychiatry*. 1994;55:92-7.
12. Hintz S, Kuck J, Peterkin J, Volk D, Zisook S. Depression in the context of human immunodeficiency virus infection: implications for treatment. *J Clin Psychiatry*. 1990;51:497-501.
13. Fernandez F, Levy J. Psychopharmacotherapy of psychiatric syn-

- dromes in asymptomatic and symptomatic HIV infection. *Psychiatr Med*. 1991;9:377-94.
14. Elliott A, Uldall K, Bergam K, Russo J, Claypoole K, Roy-Byrne P. Randomized, placebo-controlled trial of paroxetine versus imipramine in depressed HIV-positive outpatients. *Am J Psychiatry*. 1998;155:367-72.
15. Vali F, Walkup J. Combined medical and psychological symptoms: impact on disability and health care utilization of patients with arthritis. *Med Care*. 1998;36:1073-84.
16. Unutzer J, Patrick D, Simon G, et al. Depressive symptoms and the cost of health services in HMO patients aged 65 years and older. *JAMA*. 1997;277(20):1618-23.
17. Manning W Jr, Wells K. The effects of psychological distress and psychological well-being on use of medical services. *Med Care*. 1992;30:541-53.
18. Von Korff M, Ormel J, Katon W, Lin E. Disability and depression among high utilizers of health care: a longitudinal analysis. *Arch Gen Psychiatry*. 1992;49:91-100.
19. Frank RG, Busch SH, Berndt ER. Measuring prices and quantities of treatment for depression. *Am Econ Rev*. 1998;88:106-11.
20. Katzelnick D, Kobak K, Greist J, Jefferson J, Henk H. Effect of primary care treatment of depression on service use by patients with high medical expenditures. *Psychiatr Serv*. 1997;48:59-64.
21. McCombs JS, Nichol MB, Stimmel GL, Sclar DA, Beasley CM, Gross LS. The cost of antidepressant drug therapy failure: a study of antidepressant drug use in a Medicaid population. *J Clin Psychiatry*. 1990;51 (suppl 6):60-9.
22. Thompson D, Buesching D, Gregor KJ, Oster G. Patterns of antidepressant use and their relation to costs of care. *Am J Manag Care*. 1996;2:1239-46.
23. Olsson M, Sing M, Schlesinger H. Mental health/medical care cost offsets: opportunities for managed care. *Health Aff*. 1999;18:79-90.
24. Katon W, von Korff M, Lin E, et al. A randomized trial of psychiatric consultation with distressed high utilizers. *Gen Hosp Psychiatry*. 1992;14:86-98.
25. Melfi CA, Croghan TW, Hanna MP. Access to treatment for depression in a Medicaid population. *J Health Care Poor Underserved*. 1999;10:201-15.
26. Conviser R, Gamliel S, Honberg L. Health-based payment for HIV/AIDS in Medicaid managed care programs. *Health Care Financ Rev*. 1998;19:63-82.
27. Crystal S, Sambamoorthi U, Merzel C. The diffusion of innovation in AIDS treatment: zidovudine use in two New Jersey cohorts. *Health Serv Res*. 1995;30:593-614.
28. Markson LE, McKee L, Mauskopf J, Houchens R, Fanning TR, Turner BJ. Patterns of Medicaid expenditures after AIDS diagnosis. *Health Care Financ Rev*. 1994;15:43-59.
29. Halvorsen R, Palmquist R. The interpretation of dummy variables in semilogarithmic equations. *Am Econ Rev*. 1980;70:474-5.
30. Kessler R, McGonagle K, Swartz M, Blazer D, Nelson C. Sex and depression in the National Comorbidity Survey, I: lifetime prevalence, chronicity and recurrence. *J Affect Disord*. 1993;29:85-96.
31. Miller N, Klamen D, Hoffmann N, Flaherty J. Prevalence of depression and alcohol and other drug dependence in addictions treatment populations. *J Psychoactive Drugs*. 1996;28:111-24.
32. Ziedonis D, Rayford B, Bryant K, Rounsaville B. Psychiatric comorbidity in white and African-American cocaine addicts seeking substance abuse treatment. *Hosp Community Psychiatry*. 1994;45:43-9.
33. Leo R, Sherry C, Jones A. Referral patterns and recognition of depression among African American and Caucasian patients. *Gen Hosp Psychiatry*. 1998;20:175-82.
34. Sussman L, Robins L, Earls F. Treatment seeking for depression by black and white Americans. *Soc Sci Med*. 1987;24:187-96.
35. Gallo JJ, Marino S, Ford D, Anthony J. Filters on the pathway to mental health care, II: sociodemographic factors. *Psychol Med*. 1995;25:1149-60.
36. Padgett DK, Patrick C, Burns B, Schlesinger H. Ethnicity and the use of outpatient mental health services in a national insured population. *Am J Public Health*. 1994;84:222-6.
37. Pincus HA, Tanielian TL, Marcus SC, et al. Prescribing trends in psychotropic medications: primary care, psychiatry, and other medical specialties. *JAMA*. 1998;279:526-31.
38. Wagner GJ, Rabkin JG, Rabkin R. A comparative analysis of standard and alternative antidepressants in the treatment of human immunodeficiency virus patients. *Comp Psychiatry*. 1996;37:402-8.
39. Wagner GJ, Rabkin JG, Rabkin R. Dextroamphetamine as a treatment for depression and low energy in AIDS patients: a pilot study. *J Psychosom Res*. 1997;42:407-11.
40. Markowitz JC, Klerman GL, Clougherty KF, et al. Individual psychotherapies for depressed HIV-positive patients. *Am J Psychiatry*. 1995;152:1504-9.
41. Markowitz JC, Kocsis JH, Fishman B, et al. Treatment of depressive symptoms in human immunodeficiency virus-positive patients. *Arch Gen Psychiatry*. 1998;55:452-7.
42. Cazzullo CL, Bessone E, Bertrando P, et al. Treatment of depression in HIV-infected patients. *J Psychiatry Neurosci*. 1998;23:293-7.
43. Ferrando SJ, Goldman JD, Charness WE. Selective serotonin reuptake inhibitor treatment of depression in symptomatic HIV infection and AIDS: improvements in affective and somatic symptoms. *Gen Hosp Psychiatry*. 1997;19:89-97.
44. Smith SR, Kirking DM. Access and use of medications in HIV disease. *Health Serv Res*. 1999;34:123-44.
45. Sirey JA, Meyers BS, Bruce ML, et al. Predictors of antidepressant prescription and early use among depressed outpatients. *Am J Psychiatry*. 1999;156:690-6.
46. Stein M, Piette J, Mor V, et al. Differences in access to zidovudine (AZT) among symptomatic HIV-infected persons. *J Gen Intern Med*. 1991;6:35-40.
47. Rawson N, Malcolm E, D'Arcy C. Reliability of the recording of schizophrenia and depressive disorder in the Saskatchewan health care datafiles. *Soc Psychiatry Psychiatr Epidemiol*. 1997;32:191-9.
48. Kashner T. Agreement between administrative files and written medical records: a case of the Department of Veterans Affairs. *Med Care*. 1998;36:1324-36.
49. Walkup J, Boyer C, Kellerman S. Using Medicaid claims for research, clinical decision making, and policy: how reliable can they be? *Admin Mental Health*. 2000;27:129-39.
50. Rost K, Smith R, Matthews DB, Guise B. The deliberate misdiagnosis of major depression in primary care. *Arch Fam Med*. 1994;3:333-7.
51. Fairfield KM, Libman H, Davis RB, et al. Delays in protease inhibitor use in clinical practice. *J Gen Intern Med*. 1999;14:395-401.