Antiretroviral Therapy and Health Care Utilization: A Study of Privately Insured Men and Women with HIV Disease

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Objective. To compare the use of antiretroviral therapy and other health care resources by women and men with HIV disease who are privately insured.

Data Sources. Data were obtained from the MarketScan Commercial Claims and Encounter Database produced by the Medstat Group, Inc., of Ann Arbor, Michigan. This database includes eligibility files as well as claims data for inpatient care, outpatient care, physician services, and prescription drugs for enrollees in employer-sponsored benefit plans for 24 large employers around the nation.

Study Design. Examine utilization by 2,026 privately insured persons (1,494 men and 532 women) with HIV disease in calendar year 2000 under the age of 65.

Principal Findings. Using a simple comparison, we found that 71 percent of men (68.7 to 73.3 percent is 95 percent confidence interval) and 39 percent of women (35.1 to 43.5 percent is 95 percent confidence interval) with HIV disease received antiretroviral therapy. We also found that the average annual drug cost was \$9,037 for a man (\$8,372 to \$9,702 is 95 percent confidence interval) and \$3,893 for a woman (\$3,476 to \$4,490 is 95 percent confidence interval). Furthermore, we found that the out-of-pocket expenses comprised 10 percent of total expenses for men (\$1,617 out of \$16,405) and 4 percent for women (\$405 out of \$10,397).

Conclusion. There are major differences in the utilization and cost of health care between privately insured men and women with HIV disease.

Key Words. HIV disease, access to care, gender disparities

Ensuring access to expensive new drug therapies for persons with HIV disease is important because access to these therapies is related to morbidity and mortality (Palella et al. 1998). Over the past decade, the proportion of costs attributable to drugs has risen from 10 percent to more than 40 percent among persons with HIV disease, and the cost of drug therapy is now between \$10,000 and \$15,000 per year (Hellinger 1993a; Bozzette et al. 1998, 2001).

The importance of drug therapy is evidenced by the drop in the number of HIV deaths in the United States after the diffusion of drug therapies that include a protease inhibitor or a nonnucleoside reverse transcriptase inhibitor and at least one nucleoside reverse transcriptase inhibitor (referred hereinafter

as highly active antiretroviral therapy or HAART)(Aldridge, Davis, and Doyle 2002). In December 1995, the first protease inhibitor was approved and several other protease inhibitors were approved in early 1996 (Moore and Chaisson 1997). In June 1996, the first nonnucleoside reverse transcriptase inhibitor was approved. In 1995, there were 51,117 persons in the United States who died from AIDS, and, after the diffusion of protease inhibitors and nonnucleoside reverse transcriptase inhibitors in 1996, the number of persons who died from AIDS fell to 22,245 in 1997 (Centers for Disease Control and Prevention 2001).

Over the past several years the rate of increase in the number of women with HIV disease has exceeded that of men. And, it is likely that this phenomenon will endure because 21 percent of persons living with HIV disease in the United States were women in 2001 yet more than 32 percent of those newly infected with HIV in 2001 were women (Centers for Disease Control and Prevention 2002).

Existing studies of gender-based differences among persons with HIV disease have been conducted before the diffusion of protease inhibitors and nonnucleoside reverse transcriptase inhibitors or immediately thereafter. This study examines gender-based differences in access to new and costly drug therapies four years after the introduction of proteases inhibitors and nonnucleoside reverse transcriptase inhibitors.

To insure that patients are prescribed appropriate combinations of antiretroviral drugs it is important that patients be closely monitored and that patients receive immune panel tests to measure their level of CD4+ cells and the quantity of virus in their bloodstream (i.e., viral load). It is also important that patients have access to a variety of outpatient and inpatient services in order to mitigate the occurrence of opportunistic infections and adverse drug reactions. Consequently, this study examines variations in the utilization and cost of all health care services by women and men with HIV disease.

This study is based on administrative data, not on patient recall, and it is the first claims-based study of the privately insured population of persons with HIV disease. Problems related to patient recall are likely to be greatest among the population of patients who received many health services and among patients who have cognitive problems. And, HIV patients receive many

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health care services and are more likely than other patients to suffer cognitive impairments (Belkin et al. 1992).

BACKGROUND

Identifying Patients with HIV Disease

Explicit codes for HIV-related illness (codes 042 to 044) were put into practice in October 1986 (Green and Arno 1990). After October 1994, the International Classification of Diseases, 9th Revision, Clinical Modifications (ICD-9-CM) system included only one code (042) for HIV disease and AIDS (Fasciano et al. 1998).

In the most comprehensive study of the accuracy of diagnostic coding for persons with HIV disease, it was determined that 97 percent of persons with an HIV diagnosis on their hospital discharge abstract were infected with HIV (Rosenblum et al. 1993). In that study more than 7,000 hospital records of persons in six states with diagnostic codes indicative of HIV disease were examined, and it was determined whether or not an individual was infected using AIDS surveillance data from state health departments and a review of the medical charts. The predictive accuracy of using codes for AIDS-related illnesses was poor. For example, it was determined that only 38 percent of patients with the diagnostic code for *Pneumocystis carinii* pneumonia (136.3) were infected with HIV.

Access to Antiretroviral Drugs

The first drug approved to treat HIV disease was zidovudine (also referred to as AZT and by its brand name Retrovir). It was approved in March 1987 for persons with CD4+ cell counts of less than 200 or persons with a documented case of *Pneumocystis carinii* pneumonia (PCP). In March 1990, the Food and Drug Administration expanded the recommended use of zidovudine to persons with CD4+ counts of less than 500.

The AIDS Cost and Service Utilization (ACSUS) was the first large survey of persons with HIV disease that examined the utilization of healthcare services (Fleishman, Hsia, and Hellinger 1994). ACSUS conducted surveys of almost 2,000 persons with HIV disease from 26 sites (hospitals, clinics, and physician offices) in 10 cities in 1991 and in 1992. In his study of ACSUS, Hellinger concluded that, "This study shows that, even after being diagnosed and after having accessed the medical care system, women with AIDS receive fewer services than men with AIDS" (Hellinger 1993b, p. 543). In particular,

Hellinger found that women with HIV disease were less likely to receive zidovudine than men with HIV disease.

The findings from ACSUS were buttressed by other early studies. For example, Crystal and colleagues found that women Medicaid recipients in New Jersey with AIDS or symptomatic HIV disease who participated in the home and community-based waiver program (referred to as the AIDS Community Care Alternatives Program or ACCAP) were less likely to receive zidovudine than men (Crystal, Sambamoorthi, and Merzel 1995). In particular, it was found that the proportion of women using zidovudine was 34 percent while 48 percent of the men received zidovudine.

In a study of 2,426 men and 544 women admitted for their first episode of *Pneumocystis carinii* pneumonia in New York City in 1987, Bastian and colleagues demonstrated that women were less likely to be white and to have private insurance but that women were more likely to die in the hospital (Bastian et al. 1993). In a similar study, Bastian and colleagues examined a cohort of randomly selected AIDS patients with *Pneumocystis carinii* pneumonia sampled from 82 hospitals in Chicago, New York, Los Angeles, Miami, and Raleigh-Durham (Bastian et al. 1998). They found that women were less likely to be identified with HIV during the first two days of hospitalization and that women were less likely than men to receive a bronchoscopy during this period.

These findings are corroborated by a study by Schoenbaum and colleagues who found that infected women were less likely to be identified than infected men in a cohort of patients seen in an emergency room in Bronx, New York during 1989 (Schoenbaum and Webber 1993). The authors found that HIV infection was recognized in 13.2 percent of women and 27.0 percent of men who had not progressed to AIDS at the time of their emergency room visit.

Turner and colleagues analyzed Medicaid claims data for 4,779 Medicaid beneficiaries the year before an AIDS diagnosis for continuously enrolled New York State Medicaid recipients with AIDS in 1988 through 1990 (Turner et al. 1994). They found that men were twice as likely as women to receive either zidovudine or *Pneumocystis carinii* pneumonia prophylaxis when the recipient was not a drug user. For men and women who were drug users there was no difference in access to zidovudine or *Pneumocystis carinii* pneumonia prophylaxis.

In the early to mid-1990s a number of new nucleoside analogue reverse transcriptase inhibitors were approved by the Food and Drug Administration to treat persons with HIV disease (e.g., didanosine or ddI, zalcitabine or ddC,

and stavudine or d4T). Data collected by the Department of Health in the State of New York indicate that women with AIDS in New York State were less likely than men with AIDS in New York State in late 1995 to be receiving multidrug therapies involving more than one nucleoside reverse transcriptase inhibitor (New York State Department of Health 2002).

Evidence from the only national random sample of HIV patients (the HIV Cost and Services Utilization Study—HCSUS) also found that women were less likely to receive therapies involving protease inhibitors or nonnucleoside reverse transcriptase inhibitors (therapy involving these drugs is often referred to as highly active antiretroviral therapy or HAART) immediately after their diffusion (Shapiro et al. 1999). The HCSUS included 2,864 patients (about one-quarter were female) who were selected from lists from a variety of provider sites including clinics, outpatient hospital facilities, and physician practices. In particular, Shapiro and colleagues found that 22 percent of the women in the sample had not received HAART and that 13 percent of the men in the sample had not received HAART.

Cost of Care

In their study of 606 Medicaid patients (380 men and 226 women) treated at the Johns Hopkins University AIDS Service between July 1992 and June 1995, Moore and Chaisson stated that, “The higher payment that we found in men compared with women in our bivariate analyses is consistent with results from the ACSUS and the New York State Study, both of which indicated that women had lower hospital costs than men” (Moore and Chaisson 1997, p. 229). However, Moore and Chaisson did not find significantly different costs between men and women in this sample of Medicaid patients in their multivariate analyses. In an analysis of all patients treated at the Johns Hopkins HIV Clinic between July 1989 and April 1994, Chaisson and colleagues did not find any difference in disease progression or survival associated with race, gender, mode of transmission, or insurance (Chaisson, Keruly, and Moore 1995).

Hellinger found gender-based differences in the cost of care in his study of women with HIV disease in the ACSUS. Hellinger concluded that, “It is unclear why women with AIDS use fewer health services than men with AIDS after adjusting for income, race, insurance, and geographic differences” (Hellinger 1993b, p. 559). Gender-based differences were also found in a report produced by the New York State Department of Health. This report found that the average cost per Medicaid recipient with AIDS in New York

State varied by gender. In particular, this report found that the average annual cost per male adult with AIDS was \$29,668 in fiscal year 1995 while the average annual cost per adult women with AIDS was \$24,449 in fiscal year 1995 (New York State Department of Health 1998).

DATA

This study utilizes the MarketScan database for calendar year 2000 to compare the utilization and costs of the health care services received by privately insured men and women with HIV disease. The MarketScan database is produced by Medstat Group, Inc., and it is comprised of all claims paid by on behalf of numerous large national employers for all inpatient and outpatient services including pharmaceutical charges. Employers include state governments and large private corporations. Claims consist of the gross covered payments, deductibles, copayments (i.e., out-of-pocket expenses), and net payments due from the insurer to the provider. The date of service, the specific procedure and diagnosis are also included.

MarketScan data are organized into inpatient, outpatient, and pharmaceutical databases. The inpatient database is constructed by identifying all claims associated with a specific hospital admission. Inpatient claims include hospital facility, independent laboratory, surgeon, principal attending physician, and claims from all other physicians who treated the patient during the hospital admission. All claims associated with a specific hospital admission comprise the admission record. Each admission record for each hospital stay is grouped with all the payments made to hospital units and physicians, with a combined inventory of all the treatments. Claims can be linked by health care provider or by enrollee identification numbers.

The outpatient database contains all services that were provided in a physician's office, hospital outpatient clinic, emergency room, or any other outpatient facility. Claims for physician services provided in all outpatient locales, as well as psychiatric services, rehabilitation services, laboratory services, and long-term care services are incorporated in this database.

The outpatient pharmaceutical database includes information about all pharmaceuticals received by a specific enrollee. This database includes the 11-digit national drug code for each prescription, the average wholesale price for the drug entity, the administrative dispensing fee, the ingredient cost (the actual cost for the product charged by the pharmacy), and the amount of sales tax. Each pharmaceutical record also includes information on the amount

paid to the pharmacy, out-of-pocket costs (copayments and deductibles), and other savings such as coordination of benefit adjustments.

There are enrollment data (age, gender, and union membership) and some details of the plan type in the database. Health plan types include: fee-for-services, preferred provider organization (PPO), point-of-service (POS) plans, and capitated health plans.

The MarketScan database is not necessarily representative of all privately insured persons in the U.S. Enrollees in MarketScan are more concentrated in the southern United States and less concentrated in the west. The MarketScan sample also has a higher proportion of females than in the general population.

County demographic variables such as median household income and the AIDS death rate were obtained from the 2002 Area Resource File (ARF). The ARF is maintained by Quality Resource Systems, Inc., under contract with the Bureau of Health Professions, Health Resources and Services Administration, U.S. Department of Health and Human Services.

ANALYTIC METHODS

Persons with HIV disease were identified in this study using diagnostic and pharmaceutical data from claims data. If a person had a claim for a service in 2000 where the diagnostic code for HIV disease (ICD9 CM 042) was included or if a person was prescribed an antiretroviral drug used to treat HIV disease, the person was included in our sample, provided they were continuously enrolled during year 2000.

Using this methodology to identify patients with HIV disease resulted in the identification of 2,026 adults (1,494 men and 532 women) who received benefits from 24 large employers. Eighty-eight percent of these adults (1,776) were identified by the HIV diagnostic code. By gender, 89 percent of men and 85 percent of women were identified by the HIV diagnostic code. We found that for those women and men with an HIV diagnosis, the average date of the first HIV diagnosis for women was 68 days after the corresponding date for men. This does not prove that women had HIV for a shorter period of time during the year 2000 than men (it only indicates that women received their first billable service related to HIV later than men), but it does suggest that this is the case. Those in the sample not identified by the HIV diagnostic code were identified from a paid claim for an antiretroviral drug.

Only antiretroviral drugs approved by the U.S. Food and Drug Administration (FDA) for treating HIV infection were included as indicators

of HIV disease. Enrollees who were prescribed FDA-approved drugs to treat or prevent HIV-related illnesses, also called opportunistic infections, were not automatically included in our sample of persons with HIV disease because these drugs often are used to treat non-HIV-related illness. For example, azithromycin (brand name zithromax) was approved June 14, 1996, for the prevention of *Mycobacterium avium* complex in persons with advanced HIV infection. Yet, azithromycin is a macrolide antibiotic and is also used to treat many different types of bacterial infections including bronchitis, pneumonia, tonsillitis, skin infections, and ear infections.

Data on many chronic conditions were used in this study to determine if women with HIV disease were healthier (or less healthy) than men with HIV disease. In particular, we collected data on the proportion of enrollees with HIV disease who had diabetes, hypothyroidism, valvular disease, congestive heart failure, arrhythmias, pulmonary circulation disease, peripheral vascular disease, peptic ulcer disease, lymphoma, metastatic cancer, obesity, fluid and electrolyte disorders, anemia, hypertension, cancer, renal failure, liver disease, alcohol abuse, drug abuse (other than alcohol abuse), psychoses, or depression.

Data on the level of claims payments for each person in our sample were broken down into several categories. For each enrollee in our sample, payments related to an inpatient admission not including related physician payments, payments related to outpatient services not including related physician payments, payments to physicians (inpatient and outpatient), payments for HIV-related drugs, payments for protease inhibitors and nonnucleoside reverse transcriptase inhibitors, and payments for all drugs were assembled and analyzed.

RESULTS

Simple Comparisons

This study found that 71 percent of privately insured men (95 percent confidence interval: 68.7 to 73.3 percent) with HIV disease received antiretroviral drugs compared to 39 percent of privately insured women (95 percent confidence interval: 35.1 to 43.5 percent) with HIV disease. Furthermore, we found that 63 percent of privately insured men (95 percent confidence interval: 60.8 to 65.7 percent) with HIV disease received a protease inhibitor or nonnucleoside reverse transcriptase inhibitor compared to 31 percent of privately insured women (95 percent confidence interval: 26.5 to 34.4 percent) with HIV disease.

The lower utilization of antiretroviral therapy by women with HIV disease resulted in lower costs of overall care for women (see Table 1). In calendar year 2000, total expenditures for care averaged \$10,397 for women and \$16,405 for men. Almost all of this difference resulted from lower payments for drugs for women with HIV disease. The payments for drugs for women averaged \$3,983 and for men averaged \$9,037.

Copayments for all claims averaged \$1,617 for men and \$475 for women. Thus, the ratio of copayments to total expenditures for men (.10) is significantly larger than the corresponding ratio for women (.04). This is probably the result of the comparatively high copayment levels for pharmaceuticals relative to the copayment levels for other covered services such as hospital care (i.e., this occurs because enrollees are responsible for a larger proportion of payments for pharmaceuticals than they are for other services such as hospital care).

This study also found that 89 percent of men who took antiretroviral drugs received a protease inhibitor or a nonnucleoside reverse transcriptase inhibitor while 77 percent of the women who took HIV drugs received a protease inhibitor or a nonnucleoside reverse transcriptase inhibitor (this gender difference is statistically significant at the 99 percent level). Thus, even after taking into account the fact that women were less likely to receive HIV drugs, those women who did receive HIV drugs were less likely to receive the newest and most expensive medications.

Table 1: Average Annual Costs of All Claims per Enrollee with HIV in 2000^a

<i>Service Type</i>	<i>Men</i>	<i>Women</i>	<i>P-Value</i>
Outpatient	\$4,473 (11,245)	\$3,955 (8,765)	0.34
Inpatient	2,580 (28,970)	2,007 (14,060)	0.66
Drugs	9,037 (13,102)	3,983 (5,948)	0.001
Others	315 (1,551)	452 (2,027)	0.11
Total	16,405 (34,887)	10,397 (20,489)	0.001
<i>Number of Observations</i>	1,494	532	

^aThe *P*-value is for the test of whether the difference between the genders is statistically different than zero. Standard deviations are in parentheses.

The difference in the utilization rates between men and women with HIV disease in our sample is not a result of age differences. The average age of the women in our sample was 41 years and the average age of the men was 43 years (see Table 2). Neither does the difference in utilization appear to be related to the likelihood of an enrollee possessing a chronic condition. Indeed, women in our sample were more likely to have hypothyroidism and rheumatoid arthritis and to be obese.

The geographic dispersion of men and women throughout the nation also was similar. Thus, it is unlikely that geographic differences contributed to the variation in utilization rates between men and women with HIV disease, and the proportion of women with a diagnosis of drug (alcohol or other drugs) abuse or mental health problems was not statistically different from that of men.

Multivariate Logit Analyses

In order to account for the impact of multiple factors on the use of new and expensive HIV-related drug therapies we use logistic multivariate analysis. The logistic model is often used to scrutinize an association where the dependent variable is binary (e.g., did, or did not, use an antiretroviral drug) and where the explanatory variables are categorical. Odds ratios in the logistic model are calculated using maximum likelihood methods and are built on the postulation that the dependent variable equals one (i.e., the event occurred) only when a fundamental response variable defined $Y^* = a_0 + a_1x_1 + a_2x_2 + \dots + a_nx_n + u$ is greater than zero where u has a logistic distribution (Maddala 1977).

The odds ratio of .296 for women in Table 3 means that women with HIV disease are 70.4 percent less likely than men with HIV disease (the reference category for the gender variable) to have received an antiretroviral drug during the study period after taking into account the impact of all of the other explanatory variables in the model (e.g., age, geographic region, union membership, type of health plan, county characteristics, and distinct variables representing the existence of a large number of conditions including ulcers, obesity, diabetes, alcohol use, drug use, and mental health problems). The odds ratio for the gender variable is statistically significant at the 99 percent level.

The odds ratio of .424 in Table 4 for women means that women with HIV disease receiving antiretroviral medications are 57.6 percent less likely than men with HIV disease receiving antiretroviral medications to have

Table 2: Descriptive Statistics for the HIV Sample^a

<i>Variables</i>	<i>All People with HIV</i>		<i>People Using HIV Drugs</i>	
	<i>Men</i>	<i>Women</i>	<i>Men</i>	<i>Women</i>
HIV drug use	0.710	0.393***	1.0	1.0
Protease inhibitor	0.458	0.199***	0.644	0.502***
Nonnucleoside reverse transcriptase inhibitor	0.327	0.156***	0.460	0.397*
Protease inhibitor or nonnucleoside reverse transcriptase inhibitor	0.633	0.305***	0.890	0.770***
Newborn delivery	0	0.073***	0	0.072***
Age	43.307 (9.677)	40.919*** (11.185)	43.522 (8.702)	40.890*** (10.082)
Union member	0.114	0.137	0.097	0.110
Disability insurance	0.007	0.004	0.009	0.010
FFS plan	0.230	0.235	0.238	0.182*
PPO plan	0.235	0.284**	0.191	0.244*
POS plan	0.174	0.173	0.190	0.191
Capitated plan	0.361	0.308**	0.381	0.383
North East	0.222	0.286***	0.220	0.278*
North Central	0.183	0.216*	0.154	0.115
South	0.477	0.442	0.507	0.550
West	0.118	0.056***	0.121	0.057***
County median household income	\$42,013 (8,222)	\$42,058 (9,908)	\$41,960 (7,697)	\$40,338*** (8,155)
County AIDS death rate per 100,000	8.784 (10.325)	6.891*** (8.670)	9.282 (10.421)	8.931 (10.097)
<i>Patient Chronic Conditions</i>				
Cytomegalovirus	0.016	0.004**	0.019	0.010
Mycobacterium	0.003	0.000	0.003	0.000
Toxoplasmosis	0.003	0.002	0.004	0.000
Pneumocystis carinii	0.021	0.021	0.025	0.043
Congestive heart failure	0.007	0.008	0.007	0.010
Arrhythmias	0.012	0.030***	0.009	0.033***
Valvular disease	0.010	0.019	0.008	0.019
Pulmonary circulation disease	0.001	0.001	0.000	0.000
Peripheral vascular disease	0.006	0.006	0.005	0.005
Hypertension	0.088	0.105	0.071	0.091
Paralysis	0.005	0.008	0.004	0.000
Other neurological disorders	0.013	0.013	0.010	0.014
Chronic pulmonary disease	0.037	0.045	0.034	0.043
Diabetes	0.045	0.045	0.046	0.057
Diabetes w/chronic complications	0.010	0.009	0.007	0.019*
Hypothyroidism	0.009	0.034***	0.008	0.014
Renal failure	0.013	0.015	0.008	0.010
Liver disease	0.029	0.013**	0.034	0.029
Peptic ulcer disease × bleeding	0.005	0.006	0.006	0.005
Lymphoma	0.009	0.004	0.010	0.010

continued

Table 2: *Continued*

<i>Variables</i>	<i>All People with HIV</i>		<i>People Using HIV Drugs</i>	
	<i>Men</i>	<i>Women</i>	<i>Men</i>	<i>Women</i>
Metastatic cancer	0.004	0.002	0.005	0.005
Solid tumor w/out metastasis	0.015	0.026*	0.017	0.024
Rheumatoid arthritis coolagen vas	0.002	0.021***	0.001	0.019***
Coagulopathy	0.015	0.015	0.017	0.024
Obesity	0.007	0.017**	0.003	0.005
Weight loss	0.031	0.023	0.037	0.033
Fluid and electrolyte disorders	0.027	0.030	0.025	0.033
Chronic blood loss anemia	0.003	0.006	0.004	0.010
Deficiency anemias	0.056	0.062	0.057	0.090*
Alcohol abuse	0.007	0.009	0.006	0.010
Drug abuse	0.008	0.004	0.008	0.000
Psychoses	0.019	0.023	0.017	0.010
Depression	0.033	0.032	0.036	0.038
Sample size	1,494	532	1,061	209

^aStandard deviations for continuous variables are in parentheses.

*** (**) (*) Women are significantly different than men at the 99% (95%) (90%) level.

received a protease inhibitor or a nonnucleoside reverse transcriptase inhibitor after taking into account all of the other explanatory variables in the model. This gender variable also is statistically significant at the 99 percent level.

The odds ratio of 1.96 in Table 3 for the second age variable indicates that patients with HIV disease between the ages of 35 to 39 are 96 percent more likely to receive antiretroviral medications than patients with HIV disease between the ages of 18 and 34 (the reference category). Similarly, the odds ratio of 2.40 for the variable *Pneumocystis carinii* pneumonia in Table 3 implies that patient who have *Pneumocystis carinii* pneumonia are more than twice as likely to receive antiretroviral medications as patients with HIV disease who have not had *Pneumocystis carinii* pneumonia.

It is unclear why the odds of receiving an antiretroviral drug varied across types of health plans. We found that men and women were similarly distributed across types of health plans—23 percent of men and 24 percent of women were in a fee-for-service plan; 24 percent of men and 28 percent of women were in a PPO; 17 percent of men and 17 percent of women were in a POS; and 36 percent of men and 31 percent of women were in a capitated plan.

Table 3: Estimated Odds Ratio of Using an Antiretroviral Drug^a

<i>Independent Variables</i>	<i>Odds Ratio</i>	<i>P-Value</i>	<i>Confidence Interval</i>	
Female	0.296	0.000	0.236	0.373
Newborn delivery	1.244	0.563	0.594	2.602
Age 18–34	–	–	–	
Age 35–39	1.958	0.000	1.414	2.711
Age 40–44	1.995	0.000	1.433	2.778
Age 45–51	2.145	0.000	1.565	2.941
Age 52+	1.479	0.016	1.075	2.034
Disability insurance	2.972	0.249	0.466	18.939
Union member	0.871	0.442	0.613	1.238
FFS plan	–	–	–	
PPO plan	0.609	0.001	0.453	0.819
POS plan	1.435	0.033	1.030	1.998
Capitated plan	1.387	0.031	1.031	1.868
North East	–	–	–	
North Central	0.792	0.170	0.569	1.105
South	1.519	0.003	1.148	2.010
West	1.224	0.295	0.839	1.786
County median household income	1.180	0.547	0.688	2.023
County AIDS death rate per 100,000	1.015	0.022	1.002	1.027
<i>Significant Chronic Conditions</i>				
Pneumocystis carinii	2.401	0.089	0.876	6.583
Hypertension	0.543	0.001	0.376	0.785
Diabetes	1.698	0.050	1.001	2.881
Hypothyroidism	0.436	0.020	0.216	0.8478
Renal failure	0.208	0.001	0.082	0.531
Liver disease	2.586	0.030	1.098	6.092
Coagulopathy	2.651	0.087	0.869	8.083
Obesity	0.180	0.007	0.057	0.628
Weight loss	2.158	0.039	1.041	4.473
Chronic blood loss anemia	5.343	0.100	0.726	39.330
<i>C-statistic</i>	0.742			
<i>Hosmer-Lemshow</i>	1.07			
<i>Number of Observations</i>	2,026			

^aDependent variable is HIV drug use indicator. Robust standard errors are used. All independent variables from Table 2 are used, but only the chronic condition variables that are significant at the 10% level are reported above. Rows with hyphens (–) indicate the reference group.

We estimated several logit equations in order to determine which, if any, variables contributed to gender differences. In particular, we estimated a logit equation explaining the use of antiretroviral drugs with only gender (the odds ratio for female was .26 and statistically significant), with gender and age group (the odds ratio for female was .27 and statistically significant), with gender and type of health plan (the odds ratio for female was .27 and statistically

Table 4: Estimated Odds Ratio of Using a Protease Inhibitor or Nonnucleoside Reverse Transcriptase Inhibitor Conditional on Use of an Antiretroviral Drug^a

<i>Independent Variables</i>	<i>Odds Ratio</i>	<i>P-Value</i>	<i>Confidence Interval</i>	
Female	0.424	0.000	0.277	0.649
Newborn Delivery	0.444	0.154	0.145	1.357
Age 18–34	—	—	—	—
Age 35–39	1.823	0.062	0.971	3.423
Age 40–44	0.848	0.585	0.469	1.532
Age 45–51	1.030	0.920	0.578	1.835
Age 52+	0.972	0.928	0.526	1.796
Disability insurance	2.535	0.243	0.532	12.070
Union member	1.331	0.435	0.649	2.725
FFS plan	—	—	—	—
PPO plan	0.581	0.052	0.336	1.003
POS plan	0.507	0.240	0.761	2.985
Capitated plan	1.595	0.048	0.356	0.996
North East	—	—	—	—
North Central	1.321	0.387	0.703	2.484
South	0.824	0.418	0.515	1.317
West	1.152	0.682	0.586	2.265
County median household income	1.360	0.553	0.492	3.754
County AIDS death rate per 100,000	1.023	0.023	1.003	1.043
<i>Significant Chronic Conditions</i>				
Renal failure	0.209	0.087	0.035	1.255
Liver disease	0.174	0.000	0.080	0.378
Weight loss	4.078	0.058	0.954	17.424
<i>C-statistic</i>	0.707			
<i>Hosmer-Lemshow</i>	1.01			
<i>Number of Observations</i>	1,270			

^aDependent variable is indicator of whether a protease inhibitor or nonnucleoside reverse transcriptase inhibitor is used. Robust, standard errors are used. All independent variables from Table 2 are used, but only the chronic condition variables that are significant at the 10% level are reported above. Rows with hyphens (—) indicate the reference group.

significant), and an equation with gender and each chronic condition (the odds ratio for female was .27 and statistically significant).

In the regressions of Tables 3 and 4, we included the following demographic variables from the 2002 Area Resource File: the county's death rate from AIDS per 100,000 residents from 1997 through 1999, and the natural logarithm of the 1998 county median household income. The odds ratio for the AIDS death rate was slightly greater than one and statistically significant.

We also estimated our equations including only those 1,776 patients (88 percent of our cohort) who had an HIV diagnosis (i.e., we excluded the 12 percent of our cohort that was identified only because they used an HIV drug). The odds ratio for female remained less than one and statistically significant. It was .296 in the equation estimating the odds of using an antiretroviral drug using all persons in our sample (see Table 3) compared to .249 when estimating the equations using only those persons with an HIV diagnosis (i.e., when excluding persons that were identified solely for the reason that they received an HIV drug). That is, the gender disparity became more pronounced when we restricted the sample to those identified using an HIV diagnosis: women were 75 percent less likely (rather than 70 percent less likely) to use HIV drugs than men.

In Table 2, the variable "delivery" represents the women in the sample who had a newborn delivery between June 1999 and October 2001. Only 39 (7 percent) of the 532 women in our sample were admitted for childbirth. Only 3 of the 39 women who were hospitalized for childbirth had outpatient drug prescriptions for Zidovudine. However, we do not have data on drugs given during hospitalization, and only two of these women were identified with HIV disease during their hospitalization for childbirth. Overall, in the regressions of Tables 3 and 4 we see that newborn delivery had no impact on antiretroviral drug use among women throughout the entire year.

We found that 32 percent of the men and 23 percent of the women in our sample received trimethoprim-sulfamethoxazole (TMP-SMZ, brand names Bactrim and Septra). It is likely that this variable is correlated with CD4 cell count levels and that use of this drug was related to efforts to prevent *Pneumocystis carinii* pneumonia. Nonetheless, adding this variable to our equation explaining the use of antiretroviral drugs had little impact on the odds ratio for female.

FINAL REMARKS

This study compares women and men with HIV disease who are privately insured. In the only probability-based national random sample of persons with HIV disease almost one-third of those sampled in 1996 were found to be privately insured (Bozzette et al. 1998). The proportion of privately insured patients has likely increased because drug therapies that diffused in 1996 have enhanced patient survival and increased the period of time between infection and serious illness. The increased survival time and the enhanced span of time

between infection and serious illness permit persons with HIV disease to participate in the work force for a longer period of time.

This study finds significant differences in the utilization of costly, new drug therapies between privately insured men with HIV disease and privately insured women with HIV disease in calendar year 2000. In particular, a simple comparison revealed that 71 percent of men (95 percent confidence interval: 68.7 to 73.3 percent) and 39 percent of women (95 percent confidence interval: 35.1 to 43.5 percent) received an antiretroviral drug, and that 63 percent of men (95 percent confidence interval: 60.8 to 65.7 percent) and 31 percent of women (95 percent confidence interval: 26.5 to 34.4 percent) received a protease inhibitor or a nonnucleoside reverse transcriptase inhibitor.

In multivariate analyses that took into account the impact of other factors such as age, health status, union membership, type of health plan, county characteristics, and geographic region, the impact of gender was even more pronounced. The results of multivariate logit analyses reveal that the probability that a woman received an antiretroviral drug was less than one-third that of a man (see Table 3), and that the probability a woman received a protease inhibitor or a nonnucleoside reverse transcriptase inhibitor conditional on receipt of an antiretroviral drug was less than one-half that of a man (see Table 4).

These findings are important because access to costly drug therapies is linked to increased survival and a higher quality of life for persons with HIV disease. However, the reasons behind the disparity in access to costly, new drug therapies are not completely clear even though previous studies indicate that HIV is less likely to be identified in women, that women are less likely to receive PCP prophylaxis, and that concerns about pregnancy may affect access to drug therapy (Schoenbaum and Webber 1993; Bastian et al. 1993; Chaisson, Keruly, and Moore 1995). Moreover, women generally have more childcare and other family-related responsibilities even when they are employed outside of their household, and women may be healthier than men even after accounting for the presence of a large number of disease conditions and for the fact that all persons in our study are privately employed.

Finally, differential access to some extent may result from bias on the part of medical providers. Indeed, previous research has shown that women are less likely to receive certain heart procedures. In particular, Tobin and colleagues found that men were 10 times more likely than women to be given cardiac catheterization after a positive nuclear exercise test (Tobin et al. 1987), and a prospective intervention trial (the SAVE trial) established that women

were less likely to be given cardiac catheterization and undergo coronary artery bypass surgery following a myocardial infarction in spite of the fact that women had more severe comorbidities (Steingart et al. 1991).

Out-of-pocket costs for men and women in our sample who receive the same drug regimens may be expected to be comparable because every drug plan in our sample provides excellent coverage for prescription drugs. However, it is possible that the cost of drugs affects plan and provider decisions regarding drug choice.

Sociodemographic variables such as education and race may contribute to the disparity. However, all of those in the MarketScan database are gainfully employed and obtain health benefits through the employee benefit health plan sponsored by their employer. In addition, the MarketScan data contains information on age, geographic region, type of health plan, and union membership, and these variables are included in the multivariate logit analyses reported in this study. Union membership, in particular, may be related to education and race, and to the extent that these variables are related, union membership will reflect their influence.

The absence of clinical information is a major limitation of this study, and though this study includes information about substance abuse and mental health diagnoses, it is possible that these diagnoses were omitted in the records. Nonetheless, findings from this study demonstrate the need for further study of gender-based disparities in access to health care services for persons with HIV disease. The magnitude of gender-based disparities and the uncertainty about the underlying reasons for these disparities highlight the need for more research. Furthermore, future research should examine the extent of such disparities among publicly insured persons with HIV disease as well as among those without health insurance.

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