

Effect of drug and medical treatment on wide geographic variations in repeated emergency department use by HIV-infected drug users

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ABSTRACT

Repeated (\geq two visits) emergency department (ED) visits by HIV-infected (HIV+) drug users in New York State (NYS) vary widely by region and may reflect regional inequities in receipt of needed drug treatment and medical services. The study's objective was to evaluate receipt of drug treatment and medical care by HIV+ drug users by region and its effect on ED use. For NYS Medicaid-enrolled HIV+ drug users ($N = 11,556$) in 1996 and 1997, we identified receipt of long-term (\geq six months) drug treatment, HIV care, and a usual source of medical care from claims files. Regions were classified as New York City, downstate suburban, upstate urban, and rural/small city. We examined adjusted associations of these services with \geq two ED visits in the entire cohort and separately among patients who do and do not receive these three types of services. Repeated ED visits were greatest in rural/small cities (40.7 percent) and least in New York City (24.1 percent; $p < 0.001$), and receipt of drug treatment was also poorest ($p < 0.001$) in rural/small cities, whereas receipt of HIV care and usual source of medical care varied less by region. Adjusted odds of \geq two ED visits was increased for patients in rural/small cities (1.89 [confidence interval, 1.44 to 2.50]) vs. New York City and reduced for patients with long-term drug treatment (0.76 [confidence interval, 0.69 to 0.84]). Among persons receiving long-term drug treatment, observed regional differences in ED use largely disappeared. Regional variations in receipt of long-term drug treatment by HIV+ drug users in one state appear to contribute to large differences in ED utilization.

Key words: HIV-infected drug users, emergency department visits, long-term drug treatment, regional inequities

INTRODUCTION

The National Center for Health Statistics reported that

emergency department (ED) use by Americans rose by over 20 percent in the past decade.¹ Individuals who repeatedly visit the ED stress an already overburdened medical care safety net. Because illicit drug users place significantly greater demands on the ED for care than nondrug users,² identifying healthcare services that can reduce ED use by drug users offers important benefits not only for drug users but also for all other patients needing ED care. Among Medicaid-enrolled drug users in New York State (NYS), our group reported that HIV infection was associated with substantially increased demands on the ED for care.³ In that study, we also observed a marked variation in ED use across NYS regions for HIV-infected (HIV+) and uninfected drug users.

The reasons for observed wide regional variations in ED use may relate to receipt of beneficial healthcare services that can reduce complications from drug-related or medical conditions and thereby reduce urgent care needs. We predicted that (HIV+) drug users with poorer access to drug treatment and medical care services would rely more heavily on the ED for care than would those with good access to these services. We expected that access to these services would be poorest in rural/small cities where availability of drug treatment and HIV services may be more limited and/or less convenient than in New York City and its suburbs. With its wide spectrum of urban, suburban, and rural regions, NYS represents a microcosm of the geographic variations that are likely to be observed in other regions of the country.

METHODS

We conducted a retrospective cohort study of drug users enrolled in the NYS Medicaid program from federal fiscal year 1996 through 1997. This study examined files of longitudinally linked claims for all ambulatory medical

services from physicians and clinics, as well as substance abuse services covered by the Medicaid program. This database contains information on inpatient, pharmacy, home healthcare, case management, and laboratory diagnostic services. We applied validated screens using *ICD-9-CM* codes for specific diagnoses (e.g., drug dependence, unspecified; human immunodeficiency virus [HIV] disease) and services (e.g., drug treatment, antiretroviral therapy) to this comprehensive database to identify drug users and, among these, persons with HIV infection. The operating characteristics of the drug user and HIV case-finding algorithms are very good to excellent.⁴ This process identified drug users aged 13 to 60 years old and enrolled in Medicaid at least 10 months in 1996 (n = 78,943). Of these, 59,104 patients were also enrolled in Medicaid for 10 or more months in 1997. We then excluded 861 women who were pregnant in 1997, because pregnancy would influence their healthcare use, and eight persons without demographic data. Of the remaining 58,243 nonpregnant drug users, we identified 11,556 with known HIV infection.

Our dependent variable was two or more ED visits in federal fiscal year 1997. As in our prior research,⁵ we considered only repeated ED visits that occurred on different days and excluded visits that resulted in immediate hospitalization. Patient demographics were obtained from Medicaid eligibility files including age, sex, and NYS region of residence, but reliable data on ethnicity were not available. To define NYS regions, we used the county classification used by the NYS Department of Health to define local social service districts (Peter Gallagher, personal communication) that includes New York City, downstate suburban, upstate urban, small cities, and rural. Because of small sample sizes, we combined subjects in the rural and small city regions for analysis.

Identification of comorbid conditions was obtained from *ICD-9-CM* codes on inpatient (one occurrence) and outpatient (two occurrences) claims files in 1996 and included mental health disorders (e.g., depression, non-drug-related psychoses, anxiety), chronic diseases other than HIV (e.g., diabetes), and clinical AIDS. As a proxy for unmeasured health status, we calculated the total hospital days in 1996 and grouped them by quartile for analysis.

To determine whether healthcare factors resulted in sustained reductions in ED use, we defined patterns of drug treatment and medical care in 1996 and assessed demands on ED use in 1997. Long-term drug treatment was defined as treatment from a single methadone or medically supervised drug-free (Title 1035) program for at least six contiguous calendar months in 1996. To focus on the impact of medically supervised outpatient care, we excluded detoxification, residential, and nonmedically supervised ambulatory programs from this analysis. We applied a six-month minimum criterion for the duration of drug treatment based on evidence from studies of

methadone treatment.⁶ A regular source of medical care was defined as the clinic or physician visited at least twice by a study patient during 1996 and delivering more than 35 percent of all outpatient medical encounters in that year. Eligible providers were clinics, group practices, or individual physicians, but not providers who do not deliver longitudinal care, such as radiologists and ED physicians. For ties, we selected the regular medical provider according to a previously developed hierarchy of specialists.⁷ We identified HIV specialty care as at least two visits in 1996 to clinics or private physicians with an agreement with NYS to offer HIV specialty services and expertise in exchange for higher Medicaid payment rates or from a provider specializing in infectious diseases.⁸ From National Drug Codes on pharmacy claims, we identified antiretroviral drugs approved by the Food and Drug Administration. Ongoing combination antiretroviral therapy was defined from pharmacy claims based on paid prescriptions for at least two concurrent antiretroviral drugs prescribed for a minimum of two consecutive months.

Using the χ^2 test, we examined bivariate associations of region of residence with patient and healthcare variables including repeated ED use, drug treatment, usual source of medical care, and HIV specialty care. For the entire cohort, we estimated a logistic regression model predicting repeated ED use that included patient demographics, region of residence, clinical characteristics, and healthcare service utilization. We also examined unadjusted and adjusted associations of region of residence with repeated ED use separately for persons who did and did not receive each of the three types of healthcare services in order to examine whether regional variations disappeared among persons who received a particular type of service. Analyses were performed using Statistical Analysis Software 8.0 (SAS Institute, Cary, NC).

RESULTS

Of 11,556 HIV+ drug users in the study cohort, the majority resided in New York City, but in this large sample, at least 200 patients lived in each region (Table 1). Significant geographic differences in patient characteristics are apparent. In general, drug users living outside of New York City were younger, more likely to have a mental health disorder, less likely to be diagnosed with cocaine or heroin abuse or dependence, more likely to abuse alcohol, and less likely to be treated with antiretroviral therapy.

One quarter of the cohort visited the ED repeatedly in 1997, resulting in a total of 14,247 ED visits over the course of the year. Repeated visits to the ED varied widely by region, from 24 percent in New York City to 41 percent in the rural/small city region (Table 2). Overall, 40 percent of the study cohort received long-term drug treatment but, again, wide regional variations appeared.

Table 1. Demographics by New York State Region for HIV-infected drug user cohort

Characteristic ^a	Total population (N = 11,556)	New York State Region			
		New York City (N = 10,263)	Downstate suburban (N = 547)	Upstate urban (N = 510)	Rural/ small city (N = 236)
	Percent				
Total	100	88.8	4.7	4.4	2.1
Female gender	39.0	38.9	41.3	38.6	42.4
Age (years)					
< 30	7.8	7.5	8.3	11.2	14.8‡
30 to 39	42.8	42.7	40.2	45.9	46.2
40+	49.3	49.8	51.6	42.9	39.0
Comorbidity					
AIDS	15.6	15.8	15.7	12.9	11.4
Other medical condition	35.1	35.4	36.8	28.4	33.5†
Mental health disease	22.5	22.0	27.2	24.3	33.1‡
Illicit drug use					
Cocaine/heroin abuse or dependence	58.8	59.5	52.5	54.5	51.7†
Other specified drug abuse/dependence	5.4	4.8	7.1	13.9	9.8‡
Drug dependence, unspecified	15.5	15.8	10.8	14.9	14.4*
Alcohol use					
No abuse	64.4	66.0	61.8	44.5	47.5‡
Alcohol abuse/dependence	26.7	25.4	28.7	44.5	39.4
Acute alcohol complications	8.9	8.8	9.5	11.0	13.1
Combination antiretroviral therapy ≥ two months	48.0	49.1	38.2	38.4	41.1‡

^a See text for description of variables; p values for differences among the four regions from the χ^2 test: * p < 0.05; † p < 0.01; ‡ p < 0.001.

Table 2. Repeated emergency department (ED) use and pattern of healthcare by New York State Region for HIV-infected drug user cohort

Characteristic ^a	Total population (N = 11,556)	New York State Region			
		New York City (N = 10,263)	Downstate suburban (N = 547)	Upstate urban (N = 510)	Rural/ small city (N = 236)
	Percent				
Repeated ED visits	25.0	24.1	27.4	32.9	40.7
Long-term drug treatment	40.6	42.1	46.6	18.0	15.7‡
Usual source of medical care	51.8	51.3	53.9	52.8	62.7†
HIV specialty care	50.8	50.6	47.2	60.8	48.3‡
Hospital use in 1996					
Less than 7 days	53.0	53.3	52.8	48.0	51.3‡
7 to 21 days	22.9	23.1	23.4	18.2	22.0
More than 21 days	24.1	23.6	23.8	33.8	26.7

^a See text for description of variables; χ^2 test p values for differences among the four regions: † p < 0.01; ‡ p < 0.001.

Only 16 percent of drug users in the rural/small city region received long-term drug treatment compared with 42 percent in New York City and 47 percent in the downstate suburban region. Other healthcare patterns differed less markedly by region. Approximately half of the study cohort had a usual source of medical care, but two thirds of rural/small city residents received this care compared with less than 55 percent of persons in the other regions. Receipt of HIV specialty care (i.e., \geq two visits in a year) ranged from 61 percent for persons in the upstate urban region to 47 percent in the downstate suburban region. Drug users in the upstate urban region received more inpatient care than did persons in other regions.

After adjustment for patient demographics, clinical characteristics, and other health services (Table 3), persons with long-term drug treatment had nearly 25 percent lower adjusted odds of repeated ED use than those without this treatment. The protective effect of having a usual source of care on repeated ED use was weaker but still significant. HIV specialty care was not significantly associated with repeated ED use. Significant regional differences persisted in this adjusted model, with persons in the rural/small city region having nearly 90 percent greater adjusted odds of repeated ED visits than New York City residents.

Within each region, we conducted bivariate comparisons of repeated ED use for persons who did and did not use each of the services of interest (i.e., long-term drug

treatment, usual source of medical care, and HIV specialty care) (Tables 4 to 6). We also conducted bivariate and multivariate analyses of the association of region with ED use among persons with and without each of these types of services. These analyses allow us to examine whether receipt of these services reduces the regional variation in ED use. With the exception of the downstate suburban region, intraregional comparisons showed that the proportion of persons who used the ED repeatedly was significantly greater for those without long-term drug treatment than for those with this care (Table 4). In the upstate urban region, for example, 36 percent of the subjects without long-term drug treatment used the ED repeatedly versus only 20 percent of persons with this care. Both before and after adjustment for demographic, clinical, and other healthcare characteristics, ED use varied significantly by region only among drug users *without* long-term drug treatment. In this group of drug users who lacked long-term drug treatment, the adjusted odds of multiple ED visits for persons in the rural/small city region was increased two-fold compared to those in New York City. Among persons *with* long-term drug treatment, much smaller differences in the adjusted odds of repeated ED use appeared and are significant only for persons in the downstate suburban region vs. those in New York City.

Intraregional bivariate comparisons of ED use for drug users with and without a usual source of medical care revealed no significant differences (Table 5). However,

Table 3. Adjusted associations with repeated emergency department visits

Variable	Adjusted odds [95 percent CI] ^a
Long-term drug treatment	0.76 [0.69, 0.84]‡
Usual source of medical care	0.87 [0.80, 0.95]†
HIV specialty care	0.97 [0.88, 1.06]
Region	
Rural/small city	1.89 [1.44, 2.50]‡
Upstate urban	1.35 [1.11, 1.65]†
Downstate suburban	1.18 [0.97, 1.45]

^a Reference groups: no long-term drug treatment, no usual source of medical care, no HIV specialty care, New York City; also adjusted for: age, gender, comorbidity, drug abuse, alcohol use, hospitalized days in 1996, combination antiretroviral therapy; † p < 0.01; ‡ p < 0.001.

significant interregional differences appear both before and after adjustment in separate analyses in drug users *without* a usual source of care as well as in drug users with a usual source of care. Both models show that persons in the rural/small city and upstate urban regions had significantly increased adjusted odds of ED use vs. New York City residents.

Similarly, analyses dividing the cohort into those with and without HIV specialty care (Table 6) fail to reveal any intraregional differences. Separate analyses among those with and without HIV specialty care also show significant variations in ED use across regions. Among persons with HIV specialty care, persons in rural/small cities and in upstate urban regions have significantly higher adjusted odds of repeatedly using the ED vs. those in New York City. Among persons without HIV specialty care, a two-fold increase in the adjusted odds of repeated ED visits appeared for those in the rural/small cities region, but residents of the other two regions had no significant differences in ED use compared with New York City residents.

DISCUSSION

Drug abuse,⁹ HIV infection,¹⁰ and Medicaid enrollment¹¹ are all recognized correlates of increased demand for ED services. Because our study cohort has all three characteristics, these patients are likely to be among the heaviest users of ED services in NYS. Our cohort's 11,556 HIV+ drug users made over 14,000 separate ED visits in one year, and one quarter of the patient sample visited the ED two or more times. This frequency of visits translates into roughly 125 visits per 100 persons in comparison

with an estimated national rate of 28 ED visits per 100 persons.¹² Therefore, our data offer further evidence regarding drug users' heavy reliance on ED care.

Yet this demand for ED services was far from uniform across NYS regions. Of HIV+ drug users in the 38 counties classified as rural or having only small cities, approximately 40 percent visited the ED repeatedly compared with only 24 percent of those in New York City. However, regional differences in ED use were virtually eliminated for HIV+ drug users who received long-term drug treatment. Only approximately 20 percent or less of persons with long-term drug treatment used the ED repeatedly compared with 28 to 45 percent (depending on region) of persons without long-term drug treatment. These data provide compelling evidence that receipt of long-term drug treatment is associated with a significant reduction in ED use by HIV+ drug users in NYS and can largely eliminate regional variations in repeated ED visits.

Unfortunately, we found that receipt of long-term drug treatment was very poor outside of the New York City region, with less than 20 percent of study residents of the upstate urban and rural/small city regions receiving this care vs. over 40 percent of study residents in the New York City region. This low rate likely reflects known gaps between need for substance abuse treatment and availability of these facilities.¹³ Although 24 percent of methadone programs are located outside of the New York City area, the average capacity of these programs is much smaller (average 240 vs. 359 in New York City, respectively) (source: New York State Office of Alcoholism and Substance Abuse Services). A larger proportion of medically supervised drug-free programs are outside

Table 4. Adjusted associations with repeated emergency department use from separate logistic regression models for HIV-infected drug users with and without long-term drug treatment

Region of residence	No long-term drug treatment			Long-term drug treatment		
	N	Repeated ED use (percent)	Adjusted odds ^d (95 percent CI)	N	Repeated ED use (percent)	Adjusted odds ^d (95 percent CI)
Total	6,861	29.2 ^{‡a,b}		4,695	18.9 ^{a,c}	
Rural	199	44.7 [†]	2.05 [1.52, 2.76] [‡]	37	18.9	0.91 [0.39, 2.13]
Upstate urban	418	35.9 [†]	1.38 [1.12, 1.72] [†]	92	19.6	1.05 [0.61, 1.80]
Downstate suburban	292	30.5	1.04 [0.80, 1.35]	255	23.9	1.38 [1.02, 1.88]*
New York City	5,952	28.1 [‡]	1.0	4,311	18.6	1.0

^a p value from χ^2 test for intraregional comparisons of ED use by persons without and with long-term drug treatment; [†] p < 0.01, [‡] p < 0.001; ^b p value (not shown) from χ^2 test < 0.001 for interregional comparison of ED use; ^c p value (not shown) > 0.05 for interregional comparison of ED use; ^d Adjusted for gender, age, AIDS, other chronic medical condition, mental health disease, type of illicit drug abuse, alcohol abuse or complications, combination antiretroviral treatment, usual source of medical care, HIV specialty care, hospitalized days in 1996; * p value < 0.05.

Table 5. Adjusted associations with repeated emergency department use from separate logistic regression models for HIV-infected drug users with and without a usual source of medical care

Region of residence	No usual source of medical care			Usual source of medical care		
	N	Repeated ED use (percent)	Adjusted odds ^d (95 percent CI)	N	Repeated ED use (percent)	Adjusted odds ^d (95 percent CI)
Total	5,576	25.6 ^{a,b}		5,980	24.5 ^{a,c}	
Rural	88	47.7	2.14 [1.37, 3.34] [‡]	148	36.5	1.75 [1.22, 2.49]
Upstate urban	241	33.6	1.34 [1.01, 1.80]*	269	32.3	1.37 [1.04, 1.81]
Downstate suburban	252	29.0	1.19 [0.89, 1.60]	295	26.1	1.15 [0.87, 1.52]
New York City	4,995	24.6	1.0	5,268	23.6	1.0

^a p value from χ^2 test p > 0.05 for all four intraregional comparisons of ED use by persons with and without a usual source of medical care; ^b p value from χ^2 test < 0.001 for interregional comparison of ED use; ^c p value from χ^2 test < 0.001 for interregional comparison of ED use; ^d Adjusted for gender, age, AIDS, other chronic medical condition, mental health disease, type of illicit drug abuse, alcohol abuse or complications, combination antiretroviral treatment, long-term drug treatment, HIV specialty care, and hospitalized days in 1996; p value * < 0.05; [‡] p < 0.001.

Table 6. Adjusted associations with repeated emergency department use from separate logistic regression models for HIV-infected drug users with and without HIV specialty care

Region of residence	No HIV specialty care			HIV specialty care		
	N	Repeated ED use (percent)	Adjusted odds ^d (95 percent CI)	N	Repeated ED use (percent)	Adjusted odds ^d (95 percent CI)
Total	5,683	25.6 ^{a,b}		5,873	24.4 ^{a,c}	
Rural	122	45.1	2.02 [1.38, 2.96]‡	114	36.0	1.66 [1.10, 2.50]*
Upstate urban	200	33.0	1.27 [0.93, 1.75]	310	32.9	1.35 [1.04, 1.75]*
Downstate suburban	289	28.0	1.21 [0.92, 1.60]	258	26.7	1.14 [0.85, 1.53]
New York City	5,072	24.7	1.0	5,191	23.5	1.0

^a p value from χ^2 test $p > 0.05$ for all four intraregional comparisons of ED use by persons with and without a usual source of medical care; ^b p value from χ^2 test $p < 0.001$ for interregional comparison of ED use; ^c p value from χ^2 test < 0.001 for inter-regional comparison of ED use; ^d Adjusted for gender, age, AIDS, other chronic medical condition, acute infection, mental health disease, type of illicit drug abuse, alcohol abuse or complications, combination antiretroviral therapy, long-term drug treatment, usual source of medical care, and hospitalized days in 1996; p value * < 0.05 ; ‡ < 0.001 .

of New York City (38 percent), but again programs are smaller (average 86 vs. 106 clients in New York City programs). Thus, limited treatment slots may contribute to observed variations in receipt of long-term drug treatment across regions.

Even if adequate treatment slots were available, factors such as limited transportation, large distances, and the stigma of drug treatment may disproportionately affect persons living outside of New York City. Poor transportation and large distances were both cited as reasons for a dismal 10 percent of substance abusers in nonmetropolitan and rural areas with mental health problems receiving care for these conditions, based on data from the National Household Survey on Drug Abuse.¹⁴ Problems with transportation are even more daunting for clients of methadone treatment programs who need to come to the facility almost on a daily basis. The stigma of drug abuse presents a major obstacle to expansion of drug treatment facilities.^{15,16} To avoid this stigma, drug users try to “pass as normal.”¹⁷ Maintaining anonymity is easier in large metropolitan areas. Our data suggest that communities may suffer indirect consequences related to these barriers to drug treatment such as dysfunctionally high demand for ED care by drug users.

Of all the regions, access to a usual source of medical care was greatest for these residents of the rural/small cities. Unfortunately, even among persons receiving this care, we still observed significantly increased adjusted odds of ED use compared to New York City residents after adjustment for long-term drug treatment, HIV care,

and other patient characteristics. Residents of New York City suburbs were significantly more likely to receive HIV specialty services than those of the other regions, but this care did not protect against higher ED use. In prior research conducted by our group, HIV+ persons whose usual source of care was a generalist were less likely to use the ED than were those with an HIV specialist in this role.¹⁸ Generalists may be better equipped to handle emergencies than HIV specialty clinics. But a large proportion of urgent care needs of HIV+ drug users relate to drug abuse. We previously reported that roughly one third of hospitalizations for HIV+ drug users were for drug abuse-related problems.⁴ Options to involve medical care providers in treating drug abuse have expanded in recent years. Buprenorphine has been approved by the Food and Drug Administration for the treatment of narcotic dependence.¹⁹ Creative solutions such as this are necessary to improve access to treatment for addiction but need to be accompanied by adequate support for medical providers because few are taking advantage of this opportunity.²⁰

We should acknowledge that NYS is a region of the United States where gaps between need for drug treatment for HIV+ persons and availability are smallest.²¹ In other states, regional variations in receipt of drug treatment and, consequently, in repeated ED use may be much smaller because statewide access to drug treatment programs is universally poor. In addition, we lacked information on other predictors of ED use such as unstable housing²² or frequency of drug use.¹⁰ We did not evaluate

availability of case management for drug users, which was reported to produce greater stability of health status and reduced ED use in a small intervention study in Canada.²³

This study has important implications not only for the care of drug users with HIV infection but also for the public in general. Failure to address drug treatment needs can lead to significant urgent care needs of these patients that, in turn, result in the ED being used to manage these conditions. Solutions can include expanding availability and accessibility of drug treatment programs and involving other types of providers such as generalists and HIV specialists in the management of substance abuse. All these solutions require resources, and the general public needs to recognize that they also benefit from these initiatives.

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