

Health-Related Quality of Life in HIV-Infected Patients: The Role of Substance Use

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Abstract

HIV infection and substance use disorders are chronic diseases with complex contributions to health-related quality of life (HRQOL). We conducted a cross-sectional survey of 951 HIV-infected adults receiving care at 14 HIV Research Network sites in 2003 to estimate associations between HRQOL and specific substance use among HIV-infected patients. HRQOL was assessed by multi-item measures of physical and role functioning, general health, pain, energy, positive affect, anxiety, and depression. Mental and physical summary scales were developed by factor analysis. We used linear regression to estimate adjusted associations between HRQOL and current illicit use of marijuana, analgesics, heroin, amphetamines, cocaine, sedatives, inhalants, hazardous/binge alcohol, and drug use severity. Current illicit drug use was reported by 37% of subjects. Mental HRQOL was reduced for current users [adjusted β coefficient -9.66 , 95% confidence interval [(CI)] -13.4 , -5.94] but not former users compared with never users. Amphetamines and sedatives were associated with large decreases in mental (amphetamines: $\beta = -22.8$ [95% CI -33.5 , -12.0], sedatives: $\beta = -18.6$ [95% CI -26.2 , -11.0]), and physical HRQOL (amphetamines: $\beta = -11.5$ [95% CI -22.6 , -0.43], sedatives: $\beta = -13.2$ [95% CI -21.0 , -5.36]). All illicit drugs were associated with decreased mental HRQOL: marijuana ($\beta = -7.72$ [95% CI -12.0 , -3.48]), non-prescription analgesics ($\beta = -13.4$ [95% CI -20.8 , -6.07]), cocaine ($\beta = -10.5$ [95% CI -16.4 , -4.67]), and inhalants ($\beta = -14.0$ [95% CI -24.1 , -3.83]). Facilitating sobriety for patients with attention to specific illicit drugs represents an important avenue for elevating HRQOL in patients living with HIV.

Introduction

HEALTH-RELATED QUALITY OF LIFE (HRQOL) is an essential health care indicator for persons who live with chronic illnesses. Studies consistently show two major dimensions of HRQOL: physical and mental.^{1,2} HIV infection and substance use disorders are chronic diseases with overlapping morbidity and complex contributions to decreased HRQOL. Greater understanding of how substance use affects HRQOL may identify targets for improving HRQOL in persons living with HIV. Compared with general population norms, physical and mental HRQOL are lower among persons living with HIV infection.³⁻⁷ In a national probability sample of HIV-infected Americans, physical and mental HRQOL

were poorer compared to persons with other chronic diseases.⁴ Both mental and physical HRQOL decrease with more advanced stage of disease^{3,4} and lower socioeconomic status.⁷ The number of HIV-related symptoms and the presence of comorbid mood disorders have been shown to be strongly associated with lower HRQOL.^{5,8} In a cohort of HIV-infected men who have sex with men, patients who were asymptomatic with preserved cellular immunity reported mental HRQOL comparable to the general population, but lower physical scores.³ In contrast, other research shows that asymptomatic HIV-infected patients have relatively high physical functioning but lower emotional well-being, compared with the general population.⁴ HRQOL appears to diminish transiently at the time of initial diagnosis

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of HIV infection⁹ and may improve with treatment of HIV symptoms.¹⁰ Modifiable factors associated with improved HRQOL offer potential targets for intervention.

Illicit drug and alcohol use are prevalent among HIV-infected patients.^{11,12} In non-HIV-infected populations, decreased HRQOL is associated with opiate dependence,^{13–15} and alcohol dependence.^{16–19} However, previous studies of HRQOL in HIV-infected populations have considered only summary variables for drug use.^{6,7} Little is known about the relative contribution of specific illicit drugs of abuse to HRQOL in HIV-infected populations.

The objective of this study was to extend the findings of previous studies by assessing the effect of individual illicit drugs and alcohol use on HRQOL in persons living with HIV/AIDS. By improving our understanding of substance-use correlates of HRQOL we hope to identify potential targets for improving quality of life for persons with coexisting HIV infection.

Methods

Sites

The HIV Research Network (HIVRN) is a consortium of 21 sites that provide primary and subspecialty care to HIV-infected adult and pediatric patients. Sites abstract specified data elements from patients' medical records; abstracted data are assembled into a uniform database.^{20,21} The participating 14 sites treating adult patients are located in the Eastern (6), Midwestern (3), Southern (2), and Western United States (3). Seven of the sites have academic affiliations; 7 are community-based.

Subject sample

During 2003, face-to-face patient interviews were conducted at 14 adult HIVRN sites. Interviews were conducted with a sample of 951 adult (18 years of age or older) HIV-infected patients who volunteered when asked to participate, as described previously.²² Initially, a random sample was drawn from deidentified patient lists at each site. Staff at each site determined the sampled patient's name and address, and mailed an invitation to participate. Resource limitations precluded more assertive recruitment efforts. We encountered a large proportion of incorrect addresses and a high rate of non-response. Of 5363 letters of invitation sent, we successfully conducted interviews with 717 patients. In all but three sites, we supplemented mail recruitment by approaching patients as they waited for treatment; this yielded interviews with another 234 patients. The low response rate implies that this should be considered a convenience sample.

Gender, race/ethnicity, and HIV transmission distributions were similar in the larger population of patients at these sites and in the interviewed sample (gender: 70% versus 68% male [$\chi^2 p = 0.153$]; race/ethnicity: 29% versus 31% white, 48% versus 52% black, 20% versus 14% Hispanic [$\chi^2 p = 0.213$ for race]; HIV transmission: 16% versus 16% injection drug use (IDU), 38% versus 34% men who have sex with men (MSM), 3% versus 3% MSM/IDU, 32% versus 30% heterosexual (HET), 6% versus 8% HET/IDU [$\chi^2 p = 0.220$ for HIV risk]). The median sample size per site was 59 patients (range, 38 to 172 patients).

Data collection

Interviews were conducted by professional interviewers trained and supervised by Battelle Corporation (Columbus, OH). The interviews assessed a wide range of HIV and substance abuse-related topics. For comparability, interview questions were taken from the interview developed for the HIV Cost and Services Utilization Study (HCSUS).^{12,23}

Health Insurance Portability and Accountability Act (HIPAA) waivers and Institutional Review Board (IRB) approval/exemption of the project, including the interview, were obtained by the data coordinating center and each site. Additionally, informed consent was obtained from each participant before the start of the interview. Participants were reimbursed \$30 for the approximately 1-hour interview.

Measures

Participants were questioned about illicit drug and alcohol use. Illicit drug use was defined as nonprescription use of sedatives, amphetamines, analgesics, marijuana, cocaine, inhalants, LSD or hallucinogens, and heroin. For each class of drugs, respondents were asked whether they had ever used it in their lifetime, and, if so, whether they had used it in the past 6 months. Current drug use was defined as using any illicit drug within 6 months of the interview. Former drug use was defined as using one or more illicit drugs greater than 6 months prior to the interview, but none currently. We excluded from analysis 14 individuals who were missing data for some drug classes or alcohol use but reported no use for the remaining classes. We derived a variable for polysubstance use that counted the number of substances patients reported they currently used; thus patients received a score of "0" if they did not currently use any substance, "1" if they currently used only one substance, "2" if they reported current use of 2 substances, etc. Because of the small number of participants currently using more than 3 substances, we categorized this score as 0, 1, 2, 3, and 4 or more substances.

Alcohol use was ascertained, as in the HIV Costs and Service Utilization Study (HCSUS),²³ from a series of questions asking (1) how many days in the past 4 weeks the respondent drank alcohol, (2) how many drinks the person consumed on a typical day when drinking, and (3) the number of days the person consumed more than 5 drinks. We defined hazardous drinking as greater than 14 drinks per week for men and greater than 7 drinks per week for women according to National Institute on Alcohol Abuse and Alcoholism (NIAAA) guidelines.²⁴ Binge drinking was defined as 5 or more drinks on at least 1 day in the past 4 weeks. We combined hazardous and binge drinkers into one category, with the reference group being non-drinkers or those who drank in moderation.

HRQOL items were the same as those used in the HCSUS baseline interview, and validated in the HCSUS cohort.⁴ Physical well-being subscales included physical functioning (9 items, $\alpha = 0.90$), role functioning (2 items, $\alpha = 0.86$), general health perceptions (3 items, $\alpha = 0.79$), no pain (2 items, $\alpha = 0.82$), and energy (2 items, $\alpha = 0.74$). Emotional well-being subscales included positive affect (2 items, $\alpha = 0.74$), no anxiety (2 items, $\alpha = 0.66$), and no depression (3 items, $\alpha = 0.87$). Five of the physical functioning items—vigorous

activity, climbing one flight of stairs; walking more than a mile, walking one block, and bathing—are identical to those in the widely used SF-36/RAND-36 Health Survey.^{25,26} Five of the six emotional well-being items correspond to the SF-36 mental health scale; the pain items correspond to the SF-36 pain scale. Two of the three general health perceptions items, and both of the energy items also come from the SF-36. Each subscale was developed by linearly transforming raw scores for component items into a 0–100 range and summing the transformed scores. Patients with incomplete raw scores were dropped from the analyses. The number of patients dropped ranged from 5 (0.5%) for the pain subscale to 18 (1.9%) for the anxiety subscale.

We conducted factor analysis of the HRQOL subscales to confirm that the items had a structure similar to that obtained in HCSUS. Results (not shown) suggested two main underlying dimensions: physical and mental health. Mental HRQOL comprised subscales of positive affect, no anxiety, and no depression. Physical HRQOL comprised subscales of physical functioning, no pain, general health, energy, and role functioning. We formed summary physical and mental HRQOL scores by adding scale scores for scales loading highly on their respective factors. In HCSUS, summary physical and mental health scores were formed based on results of factor analyses with orthogonal rotation (uncorrelated factors). In view of the controversy regarding specifying factors as uncorrelated,^{27,28} we used oblique rotation (correlated factors). However, as a check we also computed summary scores using the HCSUS algorithms; the summary HRQOL scores used in this study were highly correlated (>0.97) with the HCSUS scores, and results did not change when scores based on the algorithm used in HCSUS were used instead of the current summary scores.

We collected information regarding potential covariates, including age as of July 1, 2003 (18–39, 40–49, and 50 years or older), racial/ethnic group (non-Hispanic white, non-Hispanic black, Hispanic, and other), birth gender (male or female), highest educational level completed (less than a high school degree, a high school degree or some college, and a 4-year college degree or greater), receipt of highly active antiretroviral therapy (HAART) and self-reported CD4 nadir (<50 , 51–199, 200–499, and ≥ 500 cells/mm³).

Data analysis

We assessed sample characteristics using descriptive statistics. We calculated mean scores, and standard errors for summary mental and physical HRQOL, by whether patients were current, former, or never users. We also compared current users to nonusers, separately for each type of illicit substance, as well as for hazardous/binge drinking and drug severity score. Analyses excluded hallucinogen use, because this was reported by only two patients. We performed multivariate linear regressions, adjusting for age, race, gender, education, use of HAART, CD4 nadir and site of care. We modeled associations between current substance use and summary mental and physical HRQOL measures, as well as individual subscales of mental and physical HRQOL. In these models, users of specific drugs were compared to those who never used any illicit substances, resulting in a separate model for each substance. In addition, to adjust for the fact that some patients currently used multiple substances, we also estimated a model that simultaneously included indicators for current

TABLE 1. DEMOGRAPHIC CHARACTERISTICS ($n = 951$)

	n (%)
Age in years	
18–39	240 (25)
40–49	437 (46)
≥ 50	267 (28)
Race/ethnicity	
White	294 (31)
Black	491 (51)
Hispanic	130 (14)
Other	36 (4)
Male gender	648 (68)
Education	
<High school degree	244 (26)
High school grad/junior college	569 (61)
College/postcollege	127 (13)
On HAART	659 (69)
CD4 nadir (cells/mm ³)	
0–49	247 (26)
50–199	279 (29)
200–499	277 (29)
500 or more	101 (11)
Unknown/missing	47 (5)

HAART, highly active antiretroviral therapy.

use of each substance. These latter analyses were conducted on 554 participants who currently used one or more substances or had never used any substances. All analyses were performed using STATA 9.0 (College Station, TX).

Results

Table 1 describes sample characteristics. The sample of 951 respondents was predominantly male (68%) and of minority race/ethnicity (51% black, 14% Hispanic). The median age was 45 (range 20 to 85) years. Twenty-six percent had less than a high school degree. Fifty-five percent reported a nadir CD4 count less than 200 cells/mm³. Sixty-nine percent of participants were receiving HAART at the time of the study.

Illicit drug use was common, with 344 (37%) participants reporting current illicit drug use, 330 (35%) reporting former drug use but none in the past 6 months, and 265 (28%) re-

TABLE 2. PATTERNS OF CURRENT SUBSTANCE USE ($n = 951$)

	n (%)
Nonmedical marijuana	241 (26)
Hazardous/binge drinking	93 (10)
Cocaine	90 (10)
Nonprescription analgesics	54 (6)
Sedatives	48 (5)
Heroin	28 (3)
Inhalants	27 (3)
Amphetamines	23 (2)
Hallucinogens	2 (0.2)
Number of substances used currently	
0	554 (59)
1	239 (26)
2	95 (10)
3	31 (3)
≥ 4	18 (2)

TABLE 3. MEAN SCORES FOR MENTAL AND PHYSICAL HEALTH-RELATED QUALITY OF LIFE AND MULTIVARIATE ASSOCIATIONS WITH CURRENT, FORMER, OR NO ILLICIT DRUG USE^a

	<i>Mental HRQOL</i> (n = 905)		<i>Physical HRQOL</i> (n = 899)	
	<i>Mean score</i> (SE)	<i>Adjusted β</i> <i>coefficient (95% CI)^a</i>	<i>Mean score</i> (SE)	<i>Adjusted β</i> <i>coefficient (95% CI)^a</i>
Illicit Drug Use				
Never	69.2 (1.21)	Ref	65.4 (1.51)	Ref
Former	66.8 (1.19)	-2.40 (-6.08, 1.28)	60.6 (1.36)	-4.18 (-8.13, -0.23)
Current	60.9 (1.21)	-9.66 (-13.4, -5.94)	61.4 (1.24)	-4.32 (-8.30, -0.34)

^aAdjusted for age, race, gender, education, use of highly active antiretroviral therapy, CD4 nadir and site. Mean scores are unadjusted. SE, standard error; CI, confidence interval.

porting never having used illicit drugs. Table 2 presents the proportion of the sample currently using each specific substance and the polysubstance count distribution among current users. Among current users, marijuana was the most common drug of abuse (26%) followed by hazardous/binge drinking (10%), cocaine (10%), and nonprescription analgesics (6%). Fifteen percent of the study population reported polysubstance use.

Table 3 reports unadjusted mean scores and adjusted associations between summary physical and mental HRQOL

and current, former, or never having used illicit drugs. In multivariate analysis, current illicit drug use was strongly associated with decreased mental HRQOL (adjusted β coefficient = -9.66, 95% CI -13.4, -5.94] compared to never having used, after adjusting for age, race, gender, education, use of HAART, CD4 nadir, and site. Former illicit drug use was not associated with mental HRQOL (β = -2.40 [95% CI -6.08, 1.28]). In contrast, both current (β = -4.32 [95% CI -8.30, -0.34]) and former (β = -4.18 [95% CI -8.13, -0.23]) drug use were associ-

TABLE 4. MEAN SCORES FOR MENTAL AND PHYSICAL HEALTH-RELATED QUALITY OF LIFE AND MULTIVARIATE ASSOCIATIONS WITH CURRENT SUBSTANCE USE^a

<i>Substance (n)</i>	<i>Mental HRQOL</i>		<i>Physical HRQOL</i>	
	<i>Mean score</i> (SE)	<i>Adjusted β</i> <i>coefficient (95% CI)</i>	<i>Mean score</i> (SE)	<i>Adjusted β</i> <i>coefficient (95% CI)</i>
Marijuana (506)				
Never	69.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	63.2 (1.35)	-7.72 (-12.0, -3.48)	63.5 (1.44)	-2.78 (-7.29, 1.72)
Analgesics (319)				
Never	66.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	56.6 (3.25)	-13.4 (-20.8, -6.07)	56.8 (3.47)	-7.94 (-15.7, -0.23)
Heroin (293)				
Never	69.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	55.4 (4.75)	-11.9 (-21.7, -1.98)	56.7 (4.29)	-8.00 (-18.0, 1.96)
Amphetamines (288)				
Never	69.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	46.8 (4.75)	-22.8 (-33.5, -12.0)	50.7 (4.75)	-11.5 (-22.6, -0.43)
Cocaine (355)				
Never	69.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	60.1 (2.32)	-10.5 (-16.4, -4.67)	61.8 (2.30)	-4.41 (-10.4, 1.55)
Sedatives (313)				
Never	69.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	51.5 (3.44)	-18.6 (-26.2, -11.0)	54.9 (3.55)	-13.2 (-21.0, -5.36)
Inhalants (292)				
Never	69.2 (1.42)	Ref	65.4 (1.51)	Ref
Current	54.7 (4.95)	-14.0 (-24.1, -3.83)	66.6 (5.27)	-0.02 (-10.5, 10.5)
Haz/Binge Drinking (949)				
No	65.4 (0.78)	Ref	61.8 (0.83)	Ref
Yes	63.6 (2.22)	-1.06 (-5.95, 3.83)	65.8 (2.29)	4.07 (-1.11, 9.25)
Polysubstance Use (937)				
0	67.8 (0.95)	Ref	62.4 (1.05)	Ref
1	63.5 (1.43)	-5.71 (-9.20, -2.21)	62.4 (1.49)	-2.20 (-3.96, 3.56)
2	61.4 (2.17)	-6.01 (-10.9, -1.08)	62.3 (2.39)	0.07 (-5.25, 5.38)
3	53.9 (4.64)	-14.0 (-22.0, -5.89)	59.6 (4.83)	-2.31 (-10.8, 6.22)
≥ 4	52.3 (5.10)	-17.1 (-27.4, -6.82)	58.8 (4.67)	-4.61 (-15.6, 6.42)

^aEach row represents a separate multivariate model, adjusted for age, race, gender, education, use of highly active antiretroviral therapy, CD4 nadir, and site. Mean scores are unadjusted. SE, standard error; CI, confidence interval.

TABLE 5. THE RELATIVE CONTRIBUTION OF INDIVIDUAL SUBSTANCES TO MENTAL AND PHYSICAL HRQoL ($n = 554$)

Substance	Mental HRQoL	Physical HRQoL
	Adjusted β coefficient (95% CI)	Adjusted β coefficient (95% CI)
Marijuana		
Noncurrent	Ref	Ref
Current	-0.95 (-5.05, 3.16)	0.70 (-3.60, 5.01)
Analgesics		
Noncurrent	Ref	Ref
Current	-4.12 (-11.4, 3.18)	-3.68 (-11.3, 3.97)
Heroin		
Noncurrent	Ref	Ref
Current	-3.39 (-13.2, 6.42)	-3.72 (-14.0, 6.57)
Amphetamines		
Noncurrent	Ref	Ref
Current	-16.4 (-26.6, -6.07)	-11.6 (-22.3, -0.78)
Cocaine		
Noncurrent	Ref	Ref
Current	-4.47 (-10.1, 1.20)	-0.48 (-6.43, 5.46)
Sedatives		
Noncurrent	Ref	Ref
Current	-11.1 (-18.5, -3.62)	-9.49 (-17.3, -1.67)
Inhalants		
Noncurrent	Ref	Ref
Current	-3.33 (-12.8, 6.09)	9.50 (-0.38, 19.4)
Haz/binge drinking		
No	Ref	Ref
Yes	-0.69 (-6.02, 4.65)	2.45 (-3.15, 8.04)

Note: Mental HRQOL is single regression model containing all drugs shown and adjusted for age, race, gender, education, and site. Physical HRQOL is single regression model containing all drugs shown and adjusted for age, race, gender, education, use of highly active antiretroviral therapy, CD4 nadir and site.
CI, confidence interval.

ated with decreased physical HRQOL compared with never having used drugs.

Table 4 reports unadjusted mean scores and adjusted associations between specific substances and summary physical and mental HRQOL scores, excluding 330 respondents who reported former illicit drug use but none in the past 6 months. All illicit drugs were associated with lower mean mental HRQOL scores compared with never having used drugs. In adjusted models, current amphetamine and sedative use were associated with the largest decreases in both mental HRQOL (amphetamines: $\beta = -22.8$ [95% CI -33.5, -12.0], sedatives: $\beta = -18.6$ [95% CI -26.2, -11.0]), and physical HRQOL (amphetamines: $\beta = -11.5$ [95% CI -22.6, -0.43], sedatives: $\beta = -13.2$ [95% CI -21.0, -5.36]). Mental HRQOL was lower for other substances, as well: marijuana ($\beta = -7.72$ [95% CI -12.0, -3.48]), nonprescription analgesics ($\beta = -13.4$ [95% CI -20.8, -6.07]), cocaine ($\beta = -10.5$ [95% CI -16.4, -4.67]), and inhalants ($\beta = -14.0$ [95% CI -24.1, -3.83]). Associations between illicit drug use and physical HRQOL were mixed. In addition to amphetamine and sedative use, decreased physical HRQOL was associated with non-prescription analgesic use ($\beta = -7.94$ [95% CI -15.7, -0.23]). In contrast to mental HRQOL, decreased physical HRQOL was not associated with marijuana, heroin, cocaine, or inhalant use. Alcohol use was not associated with mental or physical HRQOL. Polysubstance use showed a

strong monotonic association with decreased mental HRQOL but not physical HRQOL.

Table 5 reports the results of adjusted models that include all substances in a single regression model to assess the relative contributions of each substance to mental and physical HRQOL. Only current amphetamine and sedative use remained associated with decreased mental and physical HRQOL.

Table 6 shows adjusted associations between current illicit drug use and subscales of mental and physical HRQOL. Associations between individual substances and the three-component dimensions of mental HRQOL were similar to that of the overall mental HRQOL measure. The negative association between marijuana use and mental HRQOL appeared to predominantly reflect decreased absence of anxiety ($\beta = -10.3$, [95% CI -15.4, -5.23]) and decreased absence of depression ($\beta = -7.21$, [95% CI -12.2, -2.22]). In contrast, associations between illicit drug use and the five-component dimensions of physical HRQOL were mixed. Nonprescription sedative use adversely impacted most subscales of physical HRQOL (energy, pain, general health, and role). Nonprescription analgesics and amphetamines were associated with decreased absence of pain, while heroin and cocaine use were associated with decreased general health. As with overall physical HRQOL, marijuana was not associated with subscales of physical HRQOL.

TABLE 6. SUBSCALES OF HRQOL, BY SUBSTANCE USE (ADJUSTED β COEFFICIENT)

Substance (n)	Mental HRQoL			Physical HRQoL				
	Positive affect	No anxiety	No Depression	Energy	Physical function	No pain	General health	Role
Marijuana (506)	-4.82 ^a	-10.3 ^b	-7.21 ^c	-4.66	0.62	-3.96	-2.87	-2.41
Analgesics (319)	-10.5 ^a	-11.8 ^c	-15.7 ^b	-8.18	-3.88	-12.0 ^{**}	-8.36	-7.77
Heroin (293)	-8.51	-12.0 ^a	-14.2 ^a	-4.55	-8.72	-6.85	-14.9 ^a	-4.27
Amphetamines (288)	-17.8 ^c	-28.9 ^b	-20.4 ^c	-17.9 [*]	-1.77	-13.4 ^a	-11.3	-11.7
Cocaine (355)	-7.57 ^c	-13.0 ^b	-10.3 ^c	-4.93	-2.49	-2.27	-9.31 ^a	-1.25
Sedatives (313)	-17.3 ^b	-19.3 ^b	-17.8 ^b	-14.6 ^c	-5.68	-16.8 ^b	-15.4 ^a	-12.9 ^a
Inhalants (292)	-13.8 ^a	-15.6 ^c	-12.4 ^a	-1.21	2.66	-3.55	0.83	0.88
Haz/binge drinking (949)	1.06	-4.41	-1.05	-0.15	3.48	4.28	3.85	8.49 ^a
Drug use severity (939)								
0	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
1-3	-3.83	-7.87 ^c	-4.13	-5.76 ^a	-1.49	-4.36	-2.35	-2.11
4-7	-5.53 ^a	-7.83 ^c	-5.46 ^a	-4.85	-2.28	-4.46	-4.00	-4.37
≥ 8	-7.70 ^c	-5.08	-3.94	-6.50 ^a	-2.43	-10.4 ^b	-6.56 ^a	-4.32

^a*p* < 0.05.^b*p* < 0.01^c*p* < 0.001

Each row represents a separate multivariate model, adjusted for age, race, gender, education, use of highly active antiretroviral therapy, CD4 nadir, and site. Coefficients compare current users of the drug in each row with never users.

Discussion

In this study, current illicit drug use was strongly associated with decreased mental and physical HRQOL among persons living with HIV/AIDS. Overall, mental HRQOL appeared to be more severely impacted by illicit drug use than physical HRQOL. Though all illicit drugs were associated with decreased mental HRQOL, the largest reductions were observed for amphetamines and sedatives and these associations persisted even after controlling for use of other substances.

Methamphetamines and sedatives also were associated with reductions in physical HRQOL, compared with those who had never used drugs. Our study is among the first to document deficits in HRQOL associated with illicit methamphetamine and sedative use among patients with HIV infection.

While patients with current illicit drug use reported reductions in both mental and physical HRQOL, mental HRQOL among those with former drug use (but none in the last 6 months) was comparable to that of patients who had never used illicit drugs. Major depression and other mental health disorders are common among HIV-infected patients with substance use disorders,^{11,29} and may mediate measured deficits in mental HRQOL.⁶ Our study's finding of decreased mental HRQOL in current, but not former substance users suggests that observed deficits may be reversible for illicit drug users who achieve sustained sobriety. Prior studies report similar findings. Morgan et al.³⁰ reported greater improvement in mental than physical HRQOL among 252 patients with dependence for a range of substances who completed outpatient substance use counseling programs. Vorma et al.³¹ reported that benzodiazepine-dependent patients who achieved sustained reductions in benzodiazepine use of more than 50% during follow-up of 4-17 months experienced significant improvements in mental HRQOL compared to those whose benzodiazepine use was unchanged.

Sustained sobriety is a potential target for improving mental HRQOL among patients with a history of illicit drug use.

Physical HRQOL was lower for both current and former users, compared with those who had never used illicit drugs. Physical HRQOL may be less responsive to prolonged abstinence from illicit drug use in HIV-infected patients due to the high prevalence of chronic comorbid physical conditions that also decrease physical HRQOL, such as chronic hepatitis C.³²

Not all drug use impacted HRQOL equally. The association between amphetamine use and mental and physical HRQOL was particularly striking, with point estimates exceeding those for cocaine, heroin, and analgesics. This association persisted after controlling for concurrent use of other substances. Recreational methamphetamine use is expanding among populations at risk for HIV,³³ increases the risk of HIV seroconversion³⁴ and may lead to short-term and long-term mental and physical complications.³³ In a community sample of injection drug users in North Carolina, methamphetamine use had the strongest associations with reduced HRQOL.³⁵ Our study suggests methamphetamine use is an important contributor to decreased HRQOL in HIV-infected populations, as well.

Like methamphetamines, illicit sedative use was also associated with marked reductions in both mental and physical HRQOL, that persisted after controlling for concurrent use of other substances. Use of sedatives was associated with decreased mental HRQOL among opiate users enrolling in a methadone maintenance program.¹⁵ Overall, however, little has been published about effects of sedative abuse in HIV-infected populations, and this topic deserves further research.

Marijuana has achieved popular acceptance among persons living with HIV/AIDS for alleviating HIV-related pain, nausea, and wasting.³⁶⁻³⁸ In a national probability sample of patients receiving care for HIV infection, HRQOL did not differ between those who used marijuana alone (without

other drugs), compared to those who reported no drug use.⁶ Our data, however, suggest worse mental HRQOL among persons with current illicit marijuana use compared with those who have never used illicit drugs. This effect was explained predominantly by increased anxiety & depression among marijuana users. Similarly, a recent randomized clinical trial of marijuana for chronic neuropathic pain demonstrated improved pain control, but increased anxiety with marijuana use.³⁷ Marijuana use has also been correlated with a modest increased risk of depression³⁹ as well as suicidal ideations⁴⁰ in HIV-infected persons.

Inhalant use was associated with decreased mental HRQOL. This is consistent with findings from a nationally representative sample of Americans that reported increased prevalence of psychiatric disorders among users of inhalants.⁴¹ In contrast to other substances, hazardous or binge alcohol drinking had little impact on HRQOL in this study. This finding differs from previously reported associations between decreased mental and physical HRQOL, and heavy alcohol use.^{16–19,42,43} The majority of these studies, however, were conducted in non-HIV-infected populations and reported associations in persons with more severe medical and addiction issues than those in our sample. In a national probability sample of Americans receiving care for HIV-infection, Sherbourne et al.⁶ also found no association between mental or physical HRQOL and heavy drinking.

Polysubstance use was strongly negatively associated with decreased mental HRQOL, though not with physical HRQOL. This is consistent with previous studies which have documented increased depressive symptoms, memory deficits, and psychosocial dysfunction in persons with polysubstance use.^{44–46}

Subscales of mental HRQOL were uniformly affected by illicit drug use. For physical HRQOL, however, energy and pain appear to contribute more to decreases in physical HRQOL than other dimensions—particularly for amphetamine and sedative use. Clinical interventions that improve mood, energy level, and pain control may represent important adjuncts in treating HIV-infected patients for illicit amphetamine and sedative use.

Results of this study should be interpreted in light of several limitations. First, the HIVRN is not a national probability sample. Though its sample is similar to that of a 1996 nationally representative sample of persons in care for HIV infection,^{47,48} we are cautious about generalizing our findings to the entire U.S. HIV-infected population. Second, the low response rate increases the possibility of selection bias. The sample did, however, reflect the demographics of the larger HIVRN population. Third, we were limited by self-reported measures of substance use in this analysis. Though this may introduce misclassification bias, reliance on self-reported data greatly increases the feasibility of such studies. Finally, we cannot infer causality in observed associations with HRQOL in view of the cross-sectional study design. For example, decreased physical HRQOL could theoretically predispose to increased illicit opiate dependence instead of vice versa.

HRQOL is impaired in persons living with HIV/AIDS, particularly among patients with current illicit drug use and polysubstance use. This study is among the first to identify strong associations between decreased HRQOL and current illicit amphetamine and sedative use in HIV-infected patients. Illicit use of amphetamines and sedatives contributed

more to decreases in HRQOL than other substance in this study. Improved screening and development of effective treatments for amphetamine and sedative use disorders may have a greater impact on improving HRQOL in patients living with HIV/AIDS than interventions focusing on other substance use disorders.

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