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Unhealthy Alcohol and Illicit Drug Use are Associated with Decreased Quality of HIV Care

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Abstract

Background—HIV-infected patients with substance use experience suboptimal health outcomes, possibly to due to variations in care.

Objectives—To assess the association between substance use and the quality of HIV care (QOC) received.

Research Design—Retrospective cohort study.

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Subjects—HIV-infected patients enrolled in the Veterans Aging Cohort Study.

Measures—We collected self-report substance use data and abstracted 9 HIV quality indicators (QIs) from medical records. Independent variables were unhealthy alcohol use (AUDIT-C score ≥4) and illicit drug use (self-report of stimulants, opioids, or injection drug use in past year). Main outcome was the percentage of QIs received, if eligible. We estimated associations between substance use and QOC using multivariable linear regression.

Results—The majority of the 3,410 patients were male (97.4%) and Black (67.0%) with a mean age of 49.1 years (SD 8.8). Overall, 25.8% reported unhealthy alcohol use, 22% illicit drug use, and participants received 81.5% (SD=18.9) of QIs. The mean percentage of QIs received was lower for those with unhealthy alcohol use vs. not (59.3% vs. 70.0%, p<.001) and those using illicit drugs vs. not (57.8% vs. 70.7%, p<.001). In multivariable models, unhealthy alcohol use (adjusted β −2.74; 95% CI −4.23, −1.25) and illicit drug use (adjusted β −3.51 95% CI −4.99, −2.02) remained inversely associated with the percentage of QIs received.

Conclusions—Though the overall QOC for these HIV-infected Veteran patients was high, gaps persist for those with unhealthy alcohol and illicit drug use. Interventions that address substance use in HIV-infected patients may improve the QOC received.

Keywords

Alcohol; Quality of Health Care; HIV; Quality Indicators; Health Care; Opioid-Related Disorders

INTRODUCTION

Combined antiretroviral treatment (cART) use has increased survival among HIV-infected patients from a few years to decades [1–2]. This has transformed treatment of HIV disease into the management of a chronic illness. As with other chronic illnesses (e.g., diabetes and heart failure), national guidelines have been proposed to promote evidence-based management of HIV-infection and prevention of HIV-related complications and associated conditions [3–4]. The 2010 U.S. National HIV/AIDS Strategy identifies improving the quality of care for persons living with HIV as a national priority [5]. Consensus is emerging for national standards to measure the quality of HIV care received using a uniform set of quality indicators (QI) [6].

The Institute of Medicine reviewed guidelines intended to improve the quality of care for HIV-infected individuals and recommended measuring the quality of care in vulnerable populations such as those who abuse substances [7]. Unhealthy alcohol use and illicit drug use are prevalent among HIV-infected patients. The quality of HIV care received may be lower for HIV-infected patients with injection drug use [8], opioid dependence [9], and illicit drug use [10]. Though HIV-infected individuals are particularly susceptible to the harms of unhealthy consumption, little is known about the effect of unhealthy alcohol use (defined by quantity criterion of >14 and >7 drinks per week, or >5 drink and >4 drinks per occasion in the last year, for males and females, respectively) on the quality of HIV care received. A few studies, however, have reported unhealthy alcohol use to be associated with suboptimal receipt of antiretroviral therapy, antiretroviral adherence and outcomes [11–13]. Furthermore, treatment of substance use disorders may improve the quality of HIV care received, but few patients access treatment [14–15]. In a recent study of HIV-infected patients with opioid dependence, improving access to treatment with office-based buprenorphine increased the percentage of recommended HIV care indicators received [9]. Thus, the effects of alcohol and drug use on quality of care are likely modifiable and quantification of their impact is an important step toward identifying appropriate interventions to improve quality of care.

Early studies suggest that the quality of HIV care received is generally high for HIV-infected populations receiving care in a large integrated health care system [16] and the Veterans Health Administration (VHA) [8, 10]. The VA health care system underwent an extensive systems re-engineering in the mid-1990's that improved the quality of care for Veterans, overall [17]. Assessment of HIV-specific National Quality Forum QIs demonstrates these benefits have extended to the VHA's more than 40,000 HIV-infected Veterans each year, as well [10]. Although this study revealed mixed associations between ever having used illicit drugs and individual quality indicators, it did not focus on Veterans with current (past year) substance use and was limited by its reliance on past medical visit ICD-9 codes for opiate, cocaine, or amphetamine use. Addressing current alcohol and illicit drug use may improve the number of quality indicators met, thereby improving the overall quality of care provided to this vulnerable population.

The objective of the current study is to assess the impact of current (past year) unhealthy alcohol consumption and illicit drug use on the quality of HIV care received in HIV-infected Veterans. We hypothesized that quality of HIV care received would be lower among HIV-infected patients with unhealthy alcohol and illicit drug use, compared to those without use.

METHODS

Setting & Participants

We conducted a cross-sectional analysis of quality indicators among HIV-infected patients enrolled in the Veterans Aging Cohort Study (VACS), which is an ongoing, enrolling study that has been described previously [18–19]. Briefly, VACS is a cohort study of HIV-infected patients receiving care at 8 VHA infectious disease clinics, and age, race, and site matched HIV uninfected patients enrolled in general medicine clinics. This analysis includes participant baseline data from start of enrollment in June 2002 to July 2008. VACS clinic sites are located at Veterans Health Administration (VHA) facilities in Atlanta, GA; Baltimore, MD; Bronx, NY; Houston, TX; Los Angeles, CA; New York City, NY; Pittsburgh, PA; and Washington, DC. VACS is IRB approved at the coordinating center at the VA Connecticut Healthcare System and the VA and university affiliates of participating sites. At baseline enrollment, participants completed baseline surveys and provided permission to access all their information within the VHA, including medication, laboratory, pharmacy, diagnostic, and utilization data. Six follow-up surveys have been administered to date at approximately yearly intervals. We used data from the baseline survey and administrative data for this analysis.

Measures

We measured 9 individual QIs from therapeutic (cART, *Pneumocystis jirovecii* [PCP] & *Mycobacterium avium* complex [MAC] prophylaxis from medication data, if eligible in the 12 months after baseline), monitoring (at least 2 CD4 tests per year at least 90 days apart, and at least 2 HIV clinic visits per year at least 90 days apart in the 12 months after baseline), screening (any Hepatitis C [HCV] antibody or RNA quantitative PCR testing in the 12 months after or any time prior to baseline ("ever"), and lipid screening in the 12 months after baseline), and prevention (pneumococcal vaccine in the 12 months after or any time prior to baseline ("ever"), and influenza vaccine in the 12 months after baseline) quality domains (Table 1). QIs were only assessed if a patient was eligible to receive the indicated care process (e.g. the cART QI was only considered "met" if the participant's CD4 count nadir was < 350 cells/mL^3). Participants were eligible to receive as few as 5 and as many as 9 QIs. These QIs were originally developed according to modified Delphi methods for use in the HIV Cost and Utilization Study and RAND [20], adapted for use in the VA [8, 10, 21],

reviewed in an Institute of Medicine Report.[7], and recently adopted as a set of national consensus panel quality indicators for HIV care [6].

The primary outcome measure for this analysis was the percentage of QIs each participant received, if eligible, as previously used to estimate the overall quality of healthcare in the United States [22] and adapted for HIV-infected populations [9]. For example, if 6 QIs were met for a person who was eligible to receive 9, that person received 66.6% (6/9 × 100) of the QIs for which he or she was eligible. Secondary outcome measures included each of the individual QIs (Table 1).

The main independent variables were self-reported unhealthy alcohol use and illicit drug use from the baseline survey. Unhealthy alcohol use in the past 12 months (recent use) was defined by the three-item Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) score greater than or equal to 4 [23], which includes at-risk drinking, alcohol abuse, and dependence [24]. This instrument is a universal, annual screening measure for Veterans in primary care clinics, prompts assessment for risky alcohol use, and has been used as a measure of unhealthy alcohol use in a variety of patient populations. Illicit drug use in the past 12 months was defined by any self-reported use of stimulants, opioids, or injection drugs in past year [25–26].

Covariates

Covariates included gender (male, female), race/ethnicity (White, Black, Latino, Other), age in years, education level (at least a high school graduate or GED vs. less), periods of homelessness (ever vs. never), and VACS clinic site. We assessed comorbid conditions including hepatitis C (HCV) antibody positive (yes/no) from laboratory data and ICD-9 codes, diabetes diagnosis (yes/no) from ICD-9 codes, laboratory, and pharmacy data, and depressed mood based on participant-reported Prime MD Patient Health Questionnaire (PHQ-9) score greater than10 from the VACS baseline survey [27–28].

Analysis

Patient characteristics and individual QIs are described overall and by unhealthy alcohol use (yes/no) and recent illicit drug use (yes/no). Continuous variables (age) were compared using t-tests and categorical variables were compared using chi-square tests. We estimated associations between unhealthy alcohol and illicit drug use and the mean percentage of QIs received using bivariate and multivariable linear regression. All covariates were examined in bivariate models. Covariates were included in multivariable models if significant at $p < 0.20$ in bivariate analysis or based on *a priori* hypotheses. Multivariable models were adjusted for site by including site as a covariate in the models. Variance inflation factors were examined to identify whether there were issues with colinearity.

We conducted several sensitivity analyses. Since the distribution of the primary outcome variable of percentage of QIs received was non-normal, we considered alternative dependent variables, e.g. dichotomizing the percentage of QIs received at an arbitrary level ≥ 80% (yes/no). Use of a dichotomous variable did not alter the association between substance use and quality of care in multivariable analysis. Furthermore, the clinical meaningfulness of an 80% QIs received threshold if unknown. We consequently retained the continuous measure for ease of communicating results. We also assessed the role of HIV clinic visits in driving the results by repeating multivariable analyses limited to only participants with 2 or more HIV clinic visits. This approach did not substantially alter the results of the original model. Stata/SE version 11.0 (StataCorp, College Station, Texas) was used to perform all statistical analyses.

RESULTS

The majority of 3,410 HIV-infected participants were male (97.4%), Black (67.0%) and had completed a high school education or GED (58.7%); mean age was 49.1 years (SD 8.8) (Table 2). Eighty-three percent were prescribed HIV antiretroviral medications, 75.9% had a CD4 count greater than 200 cells/mL^3, and 49.1% had an undetectable HIV viral load. Substance use was prevalent, with 25.8% reporting unhealthy alcohol use, 29.1% reporting illicit drug use, and 11.5% reporting both unhealthy alcohol and illicit drug use in past year. Marijuana (27.7%) and cocaine (21.9%) were the most frequently used drugs, and 7.1% reported injection drug use in the past year. Participants with unhealthy alcohol use were more frequently male, younger, homeless, depressed, and HCV-infected, and less frequently had diabetes, a high school education, prescribed cART, or an undetectable HIV viral load compared with those without unhealthy alcohol use. Participants with illicit drug use were more frequently ever homeless, had depressed mood, and HCV-infected, and less frequently had diabetes, a high school education, prescribed cART, or an undetectable HIV viral load compared with those without illicit drug use.

Overall, HIV-infected patients received a mean 81.5% (Standard deviation [SD] 18.9) of HIV QIs for which they were eligible (Table 3). Mean QI completion was overall lower for those with vs. without recent unhealthy alcohol use (78.4% vs. 82.7%, p<.001), and those with vs. without illicit drug use (77.7% vs. 83.1%, p<.001). Participants with recent unhealthy alcohol use less frequently received CD4 cell count monitoring, at least 2 HIV visits per year, lipid screening, and influenza vaccinations compared with non-unhealthy users. Participants with recent illicit drug use less frequently received cART, but more frequently received PCP and MAC prophylaxis compared with non-users. They also less frequently received CD4 cell count monitoring, at least 2 HIV visits per year, lipid screening, and pneumococcal and influenza vaccinations compared with non-users.

Both recent unhealthy alcohol use (adjusted β coefficient [β] −2.74; 95% CI −4.23, −1.25) and illicit drug use (adjusted β −3.51 95% CI −4.99, −2.02) were inversely associated with the percentage of QIs received, after adjusting for age, gender, race, a history of homelessness, diabetes, depressed mood, and site (Table 4). In addition, Black and Other race/ethnicity, homelessness, and depression were associated with lower quality of HIV care received. Quality of HIV care received was higher among participants age ≥ 50 years, those with diabetes, and for males compared with females.

DISCUSSION

Overall, our data suggest that the quality of HIV care received by patients at these VA sites is high. Fulfilling of individual QI indicators (e.g., antiretroviral use and PCP prophylaxis) was comparable with that recently reported for large integrated healthcare systems [10, 16] and better than levels reported for Ryan White-funded clinics for several QIs [9, 29]. Gaps in quality of HIV care received persist, however, for patients with recent unhealthy alcohol and illicit drug use, as well as for HIV-infected Veterans with Black race/ethnicity, female gender, homelessness, and depression. Our study quantifies the magnitude of effect of unhealthy alcohol and illicit drug use on the quality of HIV care received and suggests that targeted interventions to improve the quality of care among these patients may be indicated.

Patients with unhealthy alcohol use in the past year, on average, received 4.3% fewer indicated HIV care processes than patients without unhealthy alcohol use. To our knowledge, our study is the first to report the effects of current unhealthy alcohol use on the quality of HIV care received. The effect of alcohol use on quality of care for other chronic illnesses is mixed. Massachusetts Medicaid clients with substance use, including alcohol,

were less likely to receive diabetes and asthma indicators [30]. In contrast, HCV-infected private insurance beneficiaries with alcohol use were more likely to receive seven HCV quality indicators compared with non-drinkers [31] and alcohol was not a predictor of receipt of care among National Health and Nutrition Examination Survey (NHANES) participants with severe hypertension [32]. Quality of acute myocardial infarction care was comparable for most quality indicators, but lower for receipt of beta blockers at discharge in those with vs. without alcohol-related diagnoses [33]. The mechanisms of observed disparities in quality of care for unhealthy alcohol users in the current study merit further investigation, but may include decreased patient engagement in HIV care (as evidenced by their decreased likelihood of attending ≥ 2 HIV clinic visits) and competing medical needs (as evidenced by increased HCV prevalence) that distract providers from addressing preventive care.

Patients with illicit drug use in the past year, on average, received 5.4% fewer indicated HIV care processes than patients without illicit drug use. This is consistent with prior studies demonstrating a lower proportion of QIs met for HIV-infected patients with hard drug use [10] and opioid dependence [9]. The percent of patients for whom individual QIs were met was mixed in the current study, with illicit drug users less likely to receive 6 of 9 QIs (including antiretroviral therapy) and more likely to receive 2 of 9 QIs (including PCP prophylaxis) compared with non-users. Similarly, Backus *et al.* reported mixed directions in receipt of care processes for U.S. military Veterans, with illicit drug users more likely to receive 4 of 10 QIs and more likely to receive 5 of 10 QIs[10]. Illicit drug users were less likely to receive potent antiretroviral therapy and there was non-significant trend toward greater receipt of PCP prophylaxis. The reasons for this divergence in receipt of medication-based QIs are unclear and merit further study. One hypothesis is that providers may be less likely to offer cART to drug users due to concerns about suboptimal adherence precipitating resistance, which is less important for PCP and MAC prophylaxis [34]. Evidence suggests there is no difference in antiretroviral resistance rates between HIV-infected drug users and non-users [35].

The differences observed in quality of care for patients with and without substance abuse generates the hypothesis that interventions that increase engagement of HIV-infected patients with substance abuse may improve the quality of HIV care received. For example, substance use treatment in HIV-infected individuals is associated with improved ART adherence [36], decreased emergency department visits and hospitalizations [37], and increased receipt of primary care [38], but substance use treatment is often underutilized.[39–42]. In a recent study, opioid-dependent, HIV-infected patients receiving office-based buprenorphine/naloxone from their HIV providers experienced a 6% increase in average quality of care received over 12 months follow-up. Patients receiving buprenorphine had more visits with their HIV provider during follow-up and were more likely to improve QOC compared with those receiving other treatment [9]. Similarly, both patients with unhealthy alcohol use and those with recent illicit drug use in the current study were less likely to have at least 2 visits per year. Other non-addiction-specific interventions that increase adherence to HIV clinic visits may increase opportunities for receipt of indicated care processes, as well.

In our study, other groups besides substance users experienced important gaps in the quality of their HIV care. Black patients received fewer QIs than white patients, consistent with prior data suggesting decreased cART utilization in Black HIV-infected patients [10, 43–44]. VACS participants who reported a history of ever having been homeless received lower quality of care, on average, as well, consistent with prior studies suggesting substantial barriers to care for homeless individuals [45–46]. Depressed participants also received fewer QIs compared with non-depressed participants. Prior studies demonstrate suboptimal HIV outcomes for depressed patients [47] which can improve with depression treatment, particularly for those with substance abuse [36]. The VA has recently developed new QIs and

multidisciplinary care team interventions for depression care in HIV-infected Veterans [48–49]. Males received more QIs than females, a finding opposite of that observed in the U.S. population [50]. Relatively few HIV-infected females were included in our dataset, and female veterans likely represent a more vulnerable group compared with females in the general U.S. population [51–53]. Further studies that address reasons for and interventions to address disparities in the quality of HIV care received by patients of Black race/ethnicity, and those who are female, homeless or depressed are urgently needed. Since Black race/ethnicity, homelessness, and depression were also associated with increased substance use in our data, our multivariable findings may underestimate the negative association between substance use and quality of HIV care, as suggested by attenuation of effect size when these were included in the multivariable model (Table 4). HIV clinics in the VHA are well-positioned to serve as models for improving ongoing engagement in care for all patients with unhealthy alcohol and illicit drug use.

Patients with diabetes experienced increased quality of HIV care compared to those without. This may represent the overlap in the management of HIV and other chronic conditions. Influenza and pneumococcal vaccinations, for example, are indicated for both HIV-infection and diabetes; providers may benefit from increased awareness of the need for these in a patient with both conditions. Also, patients with both HIV and diabetes may require more frequent visits, increasing the opportunity to receive indicated care processes. Further research is required to assess the role of multiple comorbid chronic illnesses, which are highly prevalent in HIV-infected populations, on receipt of HIV quality of care indicators.

Our study findings should be interpreted with respect to several potential limitations. First, our sample of predominantly male U.S. military Veterans may have limited generalizability to other HIV-infected populations. VACS participants, however, received overall QI levels comparable to another large HIV-infected VHA sample and an analysis of quality of care in 13,064 HIV-infected Kaiser Permanente beneficiaries [10, 16]. Second, we were unable to measure some QIs due to limitations of medical record data collection and validation (e.g., high risk sexual behavior screening). Inclusion of these QIs in electronic medical record collection would facilitate assessment of such QIs for both clinical and research purposes. Third, we were unable to account for QIs delivered by non-VA providers. This is unlikely to bias results of most QIs (e.g., most HIV-infected Veterans fill prescription for cART at VA pharmacies), but may be important for QIs commonly delivered in non-VA settings (e.g., influenza vaccinations). Fourth, there is the possibility that missed or canceled clinic visits could result in not receiving QIs. While there is not a uniform indicator for missing or canceled clinic visits in the dataset, we are reassured by a sensitivity analysis that we conducted, limited to only participants with at least 2 visits, which did not change our findings. Finally, we did not collect data on provider or facility-level characteristics that might contribute to quality of HIV care received.

In summary, despite overall high levels of quality of care for HIV-infected patients in VHA care, gaps persist for those with unhealthy alcohol and illicit drug use and other vulnerable subgroups. As chronic illness management becomes an increasingly dominant aspect of HIV care, ongoing measurement of care processes and strategies to improve the quality of HIV care received become paramount. Our findings advance the National HIV/AIDS Strategy goal of improving care for persons living with HIV [5] by identifying populations that may particularly benefit from targeted quality improvement efforts. Effective interventions are likely multifaceted, team-based interventions that better integrate mental health and addiction treatment with HIV primary care [9, 49, 54].

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Table 1

HIV Quality of Care Indicators

Quality indicators were assessedfor each participantin the 12 months following theirbaseline surveydate.

Quality Indicator	"Pass" Criteria	Eligibility Criteria
Medications		
ART	Receipt of ART in past 12 months	CD4 nadir ≤ 350 cells/mL^{3}ever
PCP proph	Receipt of dapsone, tmp/smx, atovaquone, pentamidine in 12 months	CD4 count ≤ 200 cells/mL^3 in 12 months
MAC proph	Receipt of clarithromycin, azithromycin, or rifabutin in 12 months	CD4 count ≤ 50 cells/mL^3 in 12 months
Screening		
Hyperlipidemia	Lipid test in 12 months	On ART
Hepatitis C	Hepatitis C antibody or RNA test, ever	All
Prevention		
Pneumovax	Pneumococcal vaccine, ever	All
Influenza	Influenza vaccine in 12 months	All
Monitoring		
CD4	≥ 2CD4 counts performed in 12 months, at least 90 days apart	All
HIV Visits	≥ 2 HIV clinic visits in 12 months, at least 90 days apart	All

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Table 2

Participant Characteristics, Overall and by Substance Use (n=3410).

	Overall	Current Unhealthy Alcohol Use			Current Illicit Drug Use		
	(n=3410)	Yes (n=864)	No (n=2483)	P value	Yes (n=967)	No (n=2355)	P value
Mean Age (SD)	49.1 (8.8)	48.1	49.5	**<.001**	48.6	49.2	.065
Male Gender (%)	97.4	98.4	97.1	**.046**	97.2	97.5	.689
Race/ethnicity				.845			**<.001**
White	19.6	19.1	20.0		12.8	22.8	
Black	67.0	67.9	66.7		75.6	63.1	
Latino	9.4	9.5	9.4		7.5	23.2	
Other	4.0	3.5	3.9		4.1	4.0	
CD4 > 200	75.9	74.6	76.5	.258	70.0	78.1	**<.001**
HIV RNA < 500	49.1	42.9	51.5	**<.001**	41.4	51.9	**<.001**
On Antiretrovirals	83.2	79.2	84.6	**<.001**	80.3	84.4	**.004**
> High School/GED	58.7	54.0	60.8	**.001**	52.5	61.9	**<.001**
Ever Homeless	42.1	47.6	40.1	**<.001**	22.8	8.0	**<.001**
HCV Positive	53.6	58.2	52.1	**.002**	66.8	48.1	**<.001**
Diabetes	19.9	10.1	21.5	**<.001**	14.3	20.0	**<.001**
Depression	22.2	27.6	20.5	**<.001**	31.3	18.6	**<.001**
Unhealthy Alcohol Use	25.8	-	-	**-**	39.7	20.6	**<.001**
Drug Use						-	
Opiates	9.5	13.0	8.4	**<.001**	33.6	-	
Cocaine	21.9	38.1	16.0	**<.001**	77.0	-	
Stimulants	4.3	6.4	3.7	**.001**	15.3	-	
Marijuana	27.7	38.8	23.6	**<.001**	49.6		

	Overall	Current Unhealthy Alcohol Use			Current Illicit Drug Use		
	(n=3410)	Yes (n=864)	No (n=2483)	P value	Yes (n=967)	No (n=2355)	P value
Injection Drug Use	7.1	10.5	6.1	**<.001**	25.1	-	

Table 3

HIV Quality of Care Indicators and Summary Score, by Current Substance Use Status (n=3410)

	Overall		Recent UnhealthyAlcohol Use (n=3347)					Recent Illicit Drug Use (n=3322)				
			Yes (n=864)		No (n=2,483)		P value	Yes (n=967)		No (n=2,355)		P value
Mean % QIs Received (SD)	3410	81.5 (18.9)	78.4(20.4)		82.7(18.3)		<.001	77.7 (20.1)		83.1 (18.3)		<.001
	No. Eligible	**% Received**	**No. Eligible**	**% Received**	**No. Eligible**	**% Received**		**No. Eligible**	**% Received**	**No. Eligible**	**% Received**	
On cART Therapy	1790	89.4	459	88.9	1295	89.6	.682	569	86.1	1176	91.2	**.001**
PCP Prophylaxis	786	91.9	210	91.4	559	92.3	.688	279	95.0	493	90.1	**.016**
MAC Prophylaxis	195	86.2	52	92.3	138	84.1	.140	77	96.1	115	79.1	**.001**
≥ 2 CD4 Counts	3410	77.6	864	71.5	2483	79.9	**<.001**	967	70.9	2355	80.0	**<.001**
≥ 2 HIV Visits	3410	87.1	864	82.8	2483	88.5	**<.001**	967	82.8	2355	88.7	**<.001**
HCV Screening	3410	95.2	864	94.8	2483	95.3	.526	967	95.6	2355	95.0	.492
Lipid Screening	2838	79.9	684	73.8	2100	81.7	**<.001**	776	73.1	1988	82.4	**<.001**
Pneumococcal Vaccine	3410	88.0	864	87.0	2483	88.2	.350	967	84.6	2355	89.3	**<.001**
Influenza Vaccine	3410	55.8	864	52.9	2483	57.1	**.033**	967	49.0	2355	58.6	**<.001**

Table 4

Bivariate and Multivariable Associations between Patient Characteristics and the Mean Percent of HIV Quality IndicatorsReceived, if eligible(n=3410).

	Mean % QIs Received	Bivariate β Coefficient(95% CI)	Multivariable β Coefficient (95% CI)
Age (years)	p<.001		
<50 (n=1786)	79.8	1.0	1.0
≥50 (n=1624)	83.4	**3.62 (2.35, 4.89)**	**2.86 (1.54, 4.18)**
Race/Ethnicity	p<.001		
White (n=667)	84.2	1.0	1.0
Black (n=2,284)	80.9	**−3.31 (−4.94, −1.68)**	**−2.93 (−4.63, −1.21)**
Latino (n=322)	82.0	−2.18 (−4.69, 0.33)	−0.65 (−3.29, 1.98)
Other/Unk (n= 137)	78.6	**−5.56 (−9.03, −2.08)**	**−4.79 (−8.33, −1.25)**
Gender	p=.003		
Female (88)	76.3	1.0	1.0
Male (3322)	81.7	**5.35 (1.35, 9.36)**	**4.09 (0.07, 8.11)**
> High School Ed	p=.336		
No (n=1397)	81.4	1.0	--
Yes (n=1984)	81.7	0.31 (−0.99, 1.61)	
Ever Homeless	p<.001		
No (n=1966)	83.8	1.0	1.0
Yes (n=1431)	78.5	**−5.27 (−6.55, −4.00)**	**−3.39 (−4.73, −2.04)**
Hepatitis C +	p=.450		
No (n=1581)	81.5	1.0	--
Yes (n=1829)	81.6	0.01 (−1.27, 1.28)	
Diabetes	p<.001		
No (n=2781)	80.6	1.0	1.0
Yes (n=629)	85.8	**5.23 (3.60, 6.86)**	**4.17 (2.48, 5.85)**
Depression	p<.001		
No (n=2633)	82.1	1.0	1.0
Yes (n=749)	79.4	**−2.65 (−4.19, −1.11)**	−1.11 (−2.68, 0.45)
Unhealthy Alcohol Use	p<.001		
No (n=2483)	82.7	1.0	1.0
Yes (n=864)	78.4	**−4.28 (−5.74, −2.82)**	**−2.74 (−4.23, −1.25)**
Illicit Drug Use	p<.001		
No (n=2355)	83.1	1.0	1.0
Yes (n=967)	77.7	**−5.36 (−6.77, −3.95)**	**−3.51 (−4.99, −2.02)**
IDU in past 12 months	p=.005		

	Mean % QIs Received	Bivariate β Coefficient(95% CI)	Multivariable β Coefficient (95% CI)
No (n=3108)	81.8	1.0	--
Yes (n=239)	78.3	−3.52 (−6.01, −1.02)	