The Association Between Alcohol Consumption and Prevalent Cardiovascular Diseases Among HIV-Infected and HIV-Uninfected Men

Matthew S. Freiberg, MD, MSc,† Kathleen A. McGinnis, MS,‡ Kevin Kraemer, MD, MSc,* Jeffrey H. Samet, MD, MPH, MA,§ Joseph Conigliaro, MD,‖ R. Curtis Ellison, MD,¶ Kendall Bryant, PhD,# Lewis H. Kuller, MD, DrPH,† and Amy C. Justice, MD, PhD**†† for the VACS Project Team*

Objective: To determine whether alcohol consumption is associated with cardiovascular disease (CVD) among HIV-infected veterans.

Methods: Using established thresholds for alcohol consumption, we analyzed cross-sectional data from 4743 men (51% HIV infected) from the Veterans Aging Cohort Study, a prospective cohort of HIV-infected veterans and demographically similar HIV-uninfected veterans. Using logistic regression, we estimated the odds ratio (OR) for the association between alcohol consumption and prevalent CVD.

Results: Among HIV-infected and HIV-uninfected men, respectively, hazardous drinking (33.2% vs. 30.9%,), alcohol abuse and dependence (20.9% vs. 26.2%), and CVD (14.6% vs. 19.8%) were common. Among HIV-infected men, hazardous drinking [OR = 1.43, 95% confidence interval (CI) = 1.05 to 1.94] and alcohol abuse and dependence (OR = 1.55, 95% CI = 1.07 to 2.23) were associated with a higher prevalence of CVD compared with infrequent and moderate drinking. Among HIV-uninfected men, past drinkers had a higher prevalence of CVD (OR = 1.30, 95% CI = 1.01 to 1.67). For HIV-infected and HIV-uninfected men, traditional risk factors and kidney disease were associated with CVD.

Conclusions: Among HIV-infected men, hazardous drinking and alcohol abuse and dependence were associated with a higher prevalence of CVD compared with infrequent and moderate drinking even after adjusting for traditional CVD risk factors, antiretroviral therapy, and CD4 count.

Key Words: alcohol consumption, alcohol abuse, alcohol dependence, cardiovascular disease, HIV infection, veterans

(*J Acquir Immune Defic Syndr* 2010;53:247–253)

Received for publication February 13, 2009; accepted September 23, 2009.

From the *Division of General Internal Medicine, Department of Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA; †Department of Epidemiology, University of Pittsburgh Graduate School of Public Health, Pittsburgh, PA; ‡Center for Health Equity Research and Promotion, Veterans Affairs Pittsburgh Healthcare System, Pittsburgh, PA; §Section of General Internal Medicine, Department of Medicine, Boston University School of Medicine, Boston, MA; ‖Divisions of General Internal Medicine, Lexington Veteran Affairs Medical Center and University of Kentucky Chandler Medical Center, Lexington, KY; ¶Section of Preventive Medicine and Epidemiology, Evans Department of Medicine, Boston University School of Medicine, Boston, MA; #National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Rockville, MD; **Veteran Affairs Connecticut Healthcare System, West Haven, CT; and ††Department of Medicine, Yale University School of Medicine, New Haven, CT.

Support for this study came from the Department of Veterans Affairs; the National Institute on Alcohol Abuse and Alcoholism grants; and the National Heart, Lung, and Blood Institute: 2U10AA13566 (Alcohol Associated Outcomes Among HIV+/- Aging Veterans), K23 AA015914 (Alcohol and Coronary Heart Disease in People with HIV), RO1HL095136 (Cardiovascular Disease Mechanisms in HIV Infected and Uninfected Veterans) K24 AA0155674 (Impact of Alcohol Use on HIV Infection-In the United States and Russia), and RO1 AA013304 (Net Lifetime Health Effects of Alcohol Use and Abuse).

Presented at International Society for Biomedical Research on Alcoholism, September 11, 2006, Sydney, Australia; and at the Conference on Retroviruses and Opportunistic Infections, February 25–28, 2007.

The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veteran Affairs.

Correspondence to: Matthew S. Freiberg, MD, MSc, Departments of Medicine and Epidemiology, 230 McKee Place, Suite 600, University of Pittsburgh, Pittsburgh, PA 15213 (e-mail: freibergms@upmc.edu).

INTRODUCTION

With the advent of antiretroviral therapy (ART) and improved survival,[1] alcohol has become an important health issue among HIV-infected adults. It is likely that alcohol is related to several prominent health problems among HIV-infected people including ART adherence,[2] chronic liver disease,[3] possibly HIV disease progression,[4] and cardiovascular disease (CVD).[5] Although the mechanisms for the development of CVD in HIV-infected adults are unknown, ART[6] and perhaps HIV itself[7] are associated with dyslipidemia and increased insulin resistance. In uninfected adults, moderate alcohol consumption is associated with a reduced risk of CVD,[8] improved lipid profiles,[9] increased insulin sensitivity,[10,11] and altered clotting factor profiles.[12] In contrast, hazardous alcohol consumption is associated with hyperlipidemia,[12] incident diabetes,[13] and higher CVD and total mortality rates.[14,15] Although the association between alcohol consumption and CVD risk among uninfected adults is well documented,[16–19] sparse data describe this association among HIV-infected adults. Therefore, the objective of the

present study was to examine the association between alcohol consumption and prevalent CVD among HIV-infected and HIV-uninfected adults from the Veterans Aging Cohort Study (VACS).

METHODS

Veterans

In the present study, we analyzed data on 4743 veterans from the VACS, an observational longitudinal cohort of HIV-infected and HIV-uninfected race, age, and site-matched veterans designed to understand the role of comorbid medical and psychiatric disease in determining clinical outcomes in HIV infection.[20] VACS assesses patients and providers using surveys and electronic medical record review from 8 Veterans Affairs Medical Center Infectious Disease and General Internal Medicine clinics.[20] Data collected included AIDS-defining conditions, comorbidities, health and habits, information about health care provider characteristics, and provider assessments of the participants. A full description of the measures collected and other details regarding the VACS are described elsewhere.[20] From 2002 to 2006, VACS enrolled 6467 participants. Of these, because we know that CVD behaves differently in these groups and due to limited numbers with which to model these differences, women (n = 336) and lifetime abstainers (n = 299) were excluded. Lifetime abstainers were defined as a "No, never" response to, "Have you ever had a drink containing alcohol." Those who had no International Disease Classification 9 (ICD-9) diagnosis code for CVD and were missing self-report CVD information were not included (n = 78). Of the remaining 5762, 669 were excluded for missing alcohol use data and 342 for missing covariate data. The institutional review boards at all locations approved the study, and all veterans provided written informed consent.

Independent Variable

We ascertained infrequent, moderate, and hazardous alcohol consumption using the Alcohol Use Disorders Identification Test (AUDIT).[21] We estimated quantity and frequency of alcohol consumption using the product of the responses to the first 2 questions of the AUDIT: (1) "How often do you have a drink containing alcohol?" and (2) "How many standard drinks do you have on a typical day when you are drinking?" We converted the responses to the first AUDIT question into the following variables: never = 0 times per week; monthly or less = 0.25 times per week; 2–4 times per month = 0.75 times per week; 2–3 times a week = 2.5 times per week; and 4 or more times a week = 4 times per week. For the second AUDIT question, we converted the responses into the following variables: 1 = 1 drink per day; 2 = 2 drinks per day; 3 or 4 = 3.5 drinks per day; 5 or 6 = 5.5 drinks per day; and 7 or more = 7 drinks per day. We calculated weekly drinking as the product of converted responses to questions #1 and #2 (eg, 4 times per week $\times$ 2 drinks per day = 8 drinks per week). Using the question, "When you are drinking, how often do you have 6 or more drinks on one occasion?," we defined a binge drinker as anyone who reported consuming 6 or more drinks on 1 occasion less than monthly or more. Those who responded "never" to consuming 6 or more drinks on 1 occasions were not binge drinkers.

Using this methodology, we categorized alcohol into 3 groups: infrequent and moderate, hazardous, and abuse or dependence. Infrequent and moderate drinkers were combined to form the referent group. Using the National Institute on Alcoholism and Alcohol Abuse guidelines, we defined infrequent or moderate drinking as consuming $\leq$14 drinks per week and no binge drinking. Hazardous drinking was defined as $>$14 drinks per week or binge drinking.[22] Alcohol abuse or dependence was defined using ICD-9 codes based on prior work in the VACS.[23] Importantly, if a participant was a moderate drinker by self-report, but had an ICD-9 code documenting alcohol abuse or dependence, this participant was included in the alcohol abuse and dependent category. We defined past drinkers as those who had consumed $\geq$1 drink in their lifetime but responded "more than 12 months ago" to the question, "When was the last time you had a drink?" As stated earlier, lifetime abstainers were excluded.

Dependent Variable

Our primary outcome variable was prevalent total CVD. We defined CVD using self-reported survey data and VA ICD-9 codes. A participant had CVD if the participant responded yes to 1 of the following 4 separate questions, "Has a doctor ever told you that you had (1) angina or coronary heart disease (CHD), (2) a myocardial infarction, (3) congestive heart failure (CHF), or (4) stroke or transient ischemic attack?" or if the participant had a documented CHD, myocardial infarction, CHF, or stroke event using VA ICD-9 or CPT codes. The complete list of all ICD-9 and CPT codes used in the VACS to define CVD are listed on the VACS website.[24] Using similar methodology, variables were also constructed for CHD, CHF, and stroke, separately.

Covariates

Using VACS patient and provider survey data and Veterans Administration Medical Center pharmacy and laboratory records, we collected data on participant demographics, cardiovascular risk factors, and personal habits. Demographic data included age at VACS study entry and self-reported race/ethnicity (white, black, Hispanic, or other) and education level categorized as either having at least some college education versus high school diploma, general education development (GED), or less education. Cardiovascular risk factors were certain health conditions defined as "yes" response to the question, "Has a doctor ever told you that you had 'high cholesterol, lipids, or triglycerides,' 'diabetes or high blood sugar or sugar,' and 'hypertension or high blood pressure'." Participants were also considered to have "high cholesterol" if there was a documented prescription for an HMG-coreductase inhibitor identified in the pharmacy benefits management database. Current smoking was defined as a yes response to, "Do you now smoke cigarettes?" Body mass index was defined as self-reported weight in kilograms divided by self-reported height in meters squared. HIV-related risk factors included hepatitis C virus (HCV), defined as a positive HCV antibody test, HCV RNA test, or ICD-9 code (070.41, 070.44, 070.51, 070.54 or V02.62), CD4 cell count, and use of and

adherence to ART. We collected data on CD4 cell counts from 180 days before and up to 7 days after the time of enrollment. We defined ART as the use of any antiretroviral medication within the previous 90 days before and up to 7 days after the time of enrollment into the VACS study. For those participants taking ART, nonadherence was defined as having missed at least 1 dose of ART medication in the 4 days before completing the VACS baseline questionnaire. Adherent was not having missed any ART medications in the 4 days before completing the VACS baseline questionnaire. Additional covariates included cocaine use, defined as a yes response to having used cocaine at least once in the past year; self-reported "liver disease or bad liver or cirrhosis;" kidney disease defined as a glomerular filtration rate <30 mL·min^{-1}·1.73 m^{-2}; and regular exercise defined as engaging in regular activities (eg, brisk walking, jogging) long enough to work up a sweat at least 3 times a week.

Statistical Analysis

We obtained descriptive statistics for all variables and assessed the relationship between HIV, alcohol consumption, CVD, and other covariates using *t* tests for continuous variables and χ^2 analysis for categorical variables. We constructed 2 logistic regression models to estimate the odds ratio (OR) for prevalent CVD using level of alcohol use as the main independent variable although adjusting covariates for HIV-infected and HIV-uninfected participants separately. Model 1 adjusted for age, race/ethnicity, and traditional cardiovascular risk factors. Model II adjusted for all covariates in model 1 plus cocaine use, liver disease, kidney disease, exercise, and education. Model 2 for HIV infected also included CD4 cell count and use of and adherence to ART. Secondary analyses also examined the association between level of alcohol use and CVD-specific diagnoses (ie, CHD, CHF, and stroke). Additional analyses were also performed to test separately for the interaction between HIV status and alcohol consumption and the following traditional cardiovascular risk factors: hypertension, hypercholesterolemia, diabetes, and current smoking.

RESULTS

Hazardous alcohol consumption and alcohol abuse or dependence were common among both HIV-infected and HIV-uninfected veterans in the VACS (Table 1). Nearly two-thirds of the veterans were African American. As compared with uninfected veterans, HIV-infected veterans had significantly lower prevalence of several cardiovascular risk factors including hypercholesterolemia, diabetes, hypertension, and mean BMI levels ($P < 0.001$ for all, Table 1). In contrast, HIV-infected veterans had significantly higher prevalence of smoking, HCV, and liver disease ($P < 0.001$ for all). The prevalences of CVD (14.6% vs. 19.8%, $P < 0.001$), CHD (8.6% vs. 14.7%, $P < 0.001$), CHF (4.5% vs. 5.9%, $P = 0.03$), and stroke (5.8 vs. 6.5, $P = 0.30$) were lower among HIV-infected veterans compared with HIV-uninfected veterans.

In both model 1 (adjusted for traditional CVD risk factors) and model 2 (fully adjusted model), hazardous alcohol consumption and alcohol abuse or dependence were associated with an increased prevalence of CVD compared with infrequent or moderate alcohol use for HIV-infected veterans but not HIV-uninfected veterans (Tables 2 and 3). In a model including both HIV-infected and HIV-uninfected veterans (not shown), an interaction term between HIV status and alcohol level was statistically significant ($P = 0.01$). Among HIV-uninfected veterans, past alcohol consumption was associated with a higher prevalence of CVD in both models 1 and 2 (Table 3). For both HIV-infected and HIV-uninfected veterans, traditional risk factors including age, hypercholesterolemia, hypertension, and smoking were associated with a significantly increased prevalence of CVD in models 1 and 2. Kidney disease was also significantly associated with prevalent CVD among HIV-infected and HIV-uninfected veterans (Tables 2 and 3).

When we performed secondary analyses examining separately the interaction between HIV status and traditional cardiovascular risk factors, HIV infection interactions with hypertension ($P = 0.03$), diabetes ($P = 0.04$), and current smoking ($P = 0.01$) were all statistically significant.

We also ran models adjusted for traditional CVD risk factors predicting CHD, CHF, and stroke for HIV-infected and HIV-uninfected veterans. Among HIV-infected veterans, hazardous drinking was statistically significantly associated with CHF (OR = 1.74, 95% CI = 1.04 to 2.91); alcohol abuse or dependence was significantly associated with CHD (OR = 1.67, 95% CI = 1.06 to 2.64) and CHF (OR = 1.99, 95% CI = 1.12 to 3.55); and past drinking was significantly associated with stroke (OR = 1.97, 95% CI = 1.30 to 2.98). Among HIV-uninfected veterans, there were no statistically significant associations between hazardous alcohol consumption and alcohol abuse or dependence and CHD, CHF, or stroke. However, past drinking was statistically significantly associated with stroke (OR = 1.78, 95% CI = 1.24 to 2.54 (data not otherwise shown).

When we examined the association between binge drinking and CVD in a model adjusted for CVD risk factors, there was an increase in the prevalence of CVD among binge drinkers for HIV-infected veterans (OR = 1.30, 95% CI = 1.02 to 1.66). For uninfected veterans, there was no statistically significant increase in CVD among binge drinkers (OR = 1.03, 95% CI = 0.82 to 1.30).

DISCUSSION

In the VACS cohort, among HIV-infected veterans, hazardous drinking and alcohol abuse or dependence were significantly associated with an increased prevalence of CVD as compared with infrequent and moderate drinkers. This association remained significant after adjustment for age, race/ethnicity, traditional CVD risk factors, HCV and liver disease, kidney disease, exercise, education, CD4 count, and adherence to ART. Among HIV-uninfected veterans, past alcohol consumption was associated with a significantly increased prevalence of CVD. In addition to several of the traditional CVD risk factors, renal disease was also significantly associated with a higher prevalence of CVD for both HIV-infected and HIV-uninfected veterans.

Numerous prospective studies among men without HIV report that moderate alcohol consumption is associated with a lower risk of CHD, ischemic stroke, and CVD.[8,14,17,19] In

TABLE 1. Characteristics of the HIV-Infected and HIV-Uninfected Veterans

Characteristics	HIV infected (n = 2422)	Uninfected (n = 2321)	*P*
Demographics			
Mean age yrs (± SD)	49.1 ± 8.7	50.8 ± 9.6	$P < 0.001$
Race/ethnicity (%)			
White	21.8	25.4	$P = 0.003$
Black	65.8	61.4	
Hispanic	8.8	10.2	
Other	3.6	3.0	
>High school education (%)	60.3	58.1	$P = 0.12$
Alcohol consumption (%)			
Past consumption (no alcohol consumption for >1 year)	25.3	27.1	$P = 0.15$
Current infrequent or moderate consumption	45.9	42.9	$P < 0.001$
Current hazardous consumption	33.2	30.9	
Ever alcohol abuse or dependence diagnosis	20.9	26.2	
Cardiovascular risk factors (%)			
Hypercholesterolemia	30.8	41.5	$P < 0.001$
Diabetes	15.2	25.2	$P < 0.001$
Hypertension	32.5	46.8	$P < 0.001$
Current smoking	54.3	47.1	$P < 0.001$
Body mass index	25.2 ± 4.4	28.9 ± 5.6	$P < 0.001$
HIV-related factors			
Hepatitis C positive (%)	46.4	26.4	$P < 0.001$
Mean CD4 count cells/mm^3*	405.0 ± 264.3	—	—
Antiretroviral use†	—	—	—
Not using ART	19.8	—	—
Not Adherent but on ART	26.8	—	—
Adherent on ART	53.5	—	—
Additional covariates (%)			
Cocaine use	23.8	18.1	$P < 0.001$
Liver disease‡	17.2	10.6	$P < 0.001$
Kidney disease (GFR < 30)	2.2	1.1	$P = 0.005$
Regular exercise	54.8	55.6	$P = 0.58$
Type of CVD			
CVD	14.6	19.8	$P < 0.001$
CHD	8.6	14.7	$P < 0.001$
CHF	4.5	5.9	$P = 0.03$
Stroke	5.8	6.5	$P = 0.30$

*Data available only on 2176 veterans.
†Data available only on 2380 veterans.
‡Data available on 4725.

contrast, less data are available focusing on the association between hazardous alcohol consumption, alcohol abuse, and alcohol dependence and CVD. In the present study, among HIV-infected veterans, there was a significant increase in the prevalence of CVD for hazardous drinking and alcohol abuse and dependence as compared with infrequent and moderate drinking. Although the association between alcohol and CVD risk has been thought to be mediated in part by alterations in lipid profiles and levels of clotting factors, prior work in the VACS also demonstrates a temporal and dose–response relationship between alcohol consumption and medication adherence.[25]

Among HIV-uninfected veterans, the association between prevalent CVD and hazardous or abuse and dependence levels of alcohol consumption did not reach statistical significance. In our analyses, interaction terms between HIV status and alcohol consumption, hypertension, diabetes, and current smoking were all significant suggesting that the association between hazardous alcohol consumption, alcohol abuse and dependence, and prevalent CVD is more pronounced among HIV-infected compared with uninfected individuals.

Further, uninfected past drinkers had an increased prevalence of CVD compared to HIV infected past drinkers. It is possible that many of the uninfected veterans who were past drinkers were hazardous alcohol consumers who quit drinking for health-related reasons (ie, sick quitters). Prior research has suggested that "sick quitters" have a higher burden of comorbid disease and thus are at greater risk for CVD.[26] When determining whether HIV-infected individuals in care have a higher or lower risk of CVD compared with uninfected individuals, one must be very clear about the way in which risk

TABLE 2. The Association Between Alcohol Consumption and Other Covariates and CVD Among HIV-Infected Veterans

	Model I CHD Risk Factor Adjusted*	Model II Full Model†
	OR (95% CI), n = 2422	OR (95% CI), n = 2143‡
Demographics		
Age (per 10-year age group)	1.49 (1.29 to 1.73)	1.53 (1.30 to 1.79)
Race		
White	1.0	1.0
Black	0.97 (0.71 to 1.32)	0.95 (0.67 to 1.34)
Hispanic	0.91 (0.54 to 1.53)	0.86 (0.49 to 1.51)
Other	1.86 (0.99 to 3.49)	1.80 (0.92 to 3.52)
>Than high school education	—	1.53 (1.16 to 2.03)
Alcohol consumption		
Infrequent and moderate	1.0	1.0
Hazardous	1.35 (1.01 to 1.79)	1.43 (1.05 to 1.94)
Abuse and dependence	1.51 (1.09 to 2.09)	1.55 (1.07 to 2.23)
Past drinkers (>12 months without a drink) vs. past drinkers (<12 months without a drink or currently drinking)	1.31 (0.99 to 1.71)	1.33 (0.99 to 1.80)
Cardiovascular risk factors		
Hypercholesterolemia	2.37 (1.84 to 3.07)	2.36 (1.77 to 3.13)
Diabetes	1.58 (1.17 to 2.12)	1.71 (1.25 to 2.34)
Hypertension	3.18 (2.45 to 4.12)	2.94 (2.22 to 3.90)
Current smoking	1.80 (1.38 to 2.36)	1.79 (1.33 to 2.41)
Body mass index	0.99 (0.96 to 1.02)	0.99 (0.96 to 1.02)
HIV-related risk factors		
No HCV and no liver disease	—	1.0
No HCV and liver disease	—	1.23 (0.90 to 1.68)
Hepatitis C and no liver disease	—	1.94 (0.99 to 3.80)
Hepatitis C positive and liver disease	—	1.30 (0.88 to 1.92)
Mean CD4 count cells/mm^3‡	—	1.00 (1.00 to 1.00)
Antiretroviral use‡		
Adherent	—	1.00
Therapy and not adherent	—	1.01 (0.74 to 1.38)
No therapy	—	1.05 (0.73 to 1.50)
Other covariates		
Cocaine use	—	1.07 (.76 to 1.52)
Kidney disease (GFR< 30 $mL \cdot min^{-1} \cdot 1.73\ m^{-2}$)	—	2.39 (1.24 to 4.61)
Regular exercise	—	0.81 (0.62 to 1.05)

*CHD risk factor model adjusts for age (in 10-year intervals), race/ethnicity, alcohol consumption, hypercholesterolemia, diabetes, hypertension, current smoking, and body mass index.

†Full Model simultaneously adjusts for age (in 10-year intervals), race, education, alcohol consumption, hypercholesterolemia, diabetes, hypertension, current smoking, body mass index, HCV and liver disease status, cocaine use, kidney disease, exercise, use of and adherence to ART, and CD4 count.

‡Sample size was 2143 for HIV infected because of missing data for CD4 count and ART.

is measured (events being compared) and the comparison population being used. Some prior studies comparing HIV-infected and HIV-uninfected individuals have reported that HIV-infected individuals have a higher prevalence of CVD risk factors[27] or increased Framingham risk score.[28] These studies assume that CVD risk factors are identical between those with and without HIV infection, an assumption that may not be valid. Other studies have reported increased relative risk of incident CVD events or hospitalizations compared with uninfected individuals.[29–32] One of these[30] used a population-based control group. Population-based controls may represent a healthier population as compared with a demographically and behaviorally similar population. VACS used age, race/ethnicity, and clinical site-matched controls. All of the prior studies were conducted in substantially younger populations of both HIV-infected and HIV-uninfected individuals. We observed that the prevalence of CVD was lower among HIV-infected veterans as compared with HIV-uninfected veterans in a population predominated by middle aged and older men. Moreover, most prior studies did not include data on hazardous alcohol consumption, alcohol abuse and dependence, or HCV infection, each of which are important comorbidities among those infected with HIV and can potentially alter cardiovascular risk. Of note, the typical Framingham risk factors (ie, age, hypertension, hypercholesterolemia, diabetes, and smoking) were all significantly associated with CVD in our analyses among HIV-infected veterans. Additionally, kidney disease, as estimated by GFR,

TABLE 3. The Association Between Alcohol Consumption and Other Covariates and CVD Among HIV-Uninfected Veterans

	Model I CHD Risk Factor Adjusted*	Model II Full Model†
	OR (95% CI), n = 2321	OR (95% CI), n = 2321
Demographics		
Age (per year)	1.73 (1.53 to 1.96)	1.74 (1.53 to 1.97)
Race		
White	1.0	1.0
Black	0.69 (0.53 to 0.89)	0.67 (0.51 to 0.87)
Hispanic	1.11 (0.75 to 1.65)	1.09 (0.73 to 1.63)
Other	1.51 (0.82 to 2.78)	1.56 (0.85 to 2.88)
>Than high school education	—	0.93 (0.74 to 1.16)
Alcohol consumption		
Infrequent and moderate	1.0	1.0
Hazardous	0.99 (0.76 to 1.29)	0.97 (0.75 to 1.27)
Abuse and dependence	1.10 (0.81 to 1.49)	0.98 (0.71 to 1.35)
Past drinkers (>12 months without a drink) vs. past drinkers (<12 months without a drink or currently drinking)	1.27 (0.99 to 1.62)	1.30 (1.01 to 1.67)
Cardiovascular risk factors		
Hypercholesterolemia	2.83 (2.23 to 3.60)	2.88 (2.26 to 3.68)
Diabetes	1.07 (0.83 to 1.37)	1.04 (0.80 to 1.34)
Hypertension	2.24 (1.76 to 2.85)	2.26 (1.77 to 2.88)
Current smoking	1.37 (1.07 to 1.76)	1.33 (1.03 to 1.73)
Body mass index	1.00 (0.98 to 1.02)	1.00 (0.98 to 1.02)
HIV-related risk factors		
No HCV and no liver disease	—	1.0
No HCV and liver disease	—	0.90 (0.65 to 1.24)
Hepatitis C and no liver disease	—	1.52 (0.80 to 2.87)
Hepatitis C positive and liver disease	—	1.14 (0.76 to 1.72)
Other covariates		
Cocaine use	—	1.46 (1.04 to 2.05)
Kidney disease (GFR<30 $mL \cdot min^{-1} \cdot 1.73\ m^{-2}$)	—	2.42 (1.03 to 5.72)
Regular exercise	—	1.08 (0.86 to 1.36)

*CHD risk factor model adjusts for age (in 10-year intervals), race, alcohol consumption, hypercholesterolemia, diabetes, hypertension, current smoking, and body mass index.
†Full model simultaneously adjusts for age (in 10-year intervals), race/ethnicity, education, alcohol consumption, hypercholesterolemia, diabetes, hypertension, current smoking, body mass index, HCV and liver disease status, cocaine use, kidney disease, and exercise.

was also significantly associated with CVD. This result is consistent with prior findings among HIV-uninfected people.[33]

The present study has several limitations that warrant comment. As this study is cross sectional, we cannot comment on cause and effect with regard to alcohol consumption and the risk of CVD. Further, associations with prevalent CVD may differ from those with incident disease in HIV because at least some risk factors (hyperlipidemia and glucose intolerance) increase with exposure to antiretroviral treatment. As there were only men in the present study, our findings may not be generalizable to women. As several variables in the analyses involved self-reported data, there is the possibility of nondifferential misclassification. Further, there may have been some nondifferential misclassification among those who were HCV antibody positive but without HCV RNA because HCV infection spontaneously resolves in 10%–15%.[34] In addition, there is the possibility of misclassification among the HIV-uninfected VACS participants. However, the possibility of seroconversion of an HIV-uninfected participant is unlikely. In the prior decade of conducting the VACS studies, less than 0.2% of the patients classified as HIV uninfected have been subsequently identified as infected. It would also be helpful to have had more complete data to differentiate past drinkers into those who quit for health-related reasons versus nonhealth-related reasons. However, we did include alcohol diagnoses which helped to further categorize current drinking, particularly among those who were currently infrequent or moderate drinkers. Finally, we found significant interaction terms suggesting that risk factors for CVD demonstrate different associations with CVD among those infected with HIV compared with uninfected individuals. These findings underscore the importance of studying actual clinical events rather than risk factors if we are to gain a better understanding of CVD risk among those with HIV infection.

In conclusion, hazardous alcohol consumption and alcohol abuse or dependence were associated with an increased prevalence of CVD among HIV-infected veterans compared with infrequent and moderate alcohol consumption. This association persisted even after adjustment for traditional CVD risk factors, HIV-related risk factors including HCV, use

of and adherence to ART, and CD4 count. This association did not reach significance among uninfected demographically similar comparators suggesting that the effect of alcohol may be more pronounced among those infected with HIV.

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