

ORIGINAL ARTICLE



Sociodemographic and clinical factors associated with transdermal alcohol concentration from the SCRAM biosensor among persons living with and without HIV

Veronica L. Richards¹ | Yiyang Liu¹ | Jessica Orr² | Robert F. Leeman^{3,4} | Nancy P. Barnett⁵ | Kendall Bryant⁶ | Robert L. Cook¹ | Yan Wang¹

¹Department of Epidemiology, University of Florida, Gainesville, Florida, USA

²Division of Infectious Diseases, University of Miami, Miami, Florida, USA

³Department of Health Education and Behavior, University of Florida, Gainesville, Florida, USA

⁴Yale School of Medicine, New Haven, Connecticut, USA

⁵Brown University School of Public Health, Providence, Rhode Island, USA

⁶National Institute on Alcohol Abuse and Alcoholism, Bethesda, Maryland, USA

Correspondence

Veronica L. Richards, 2055 Mowry Rd, PO Box 100009, Gainesville, FL, 32610, USA.
Email: vrchh@ufl.edu

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Abstract

Background: Transdermal alcohol biosensors can objectively monitor alcohol use by measuring transdermal alcohol concentration (TAC). However, it is unclear how sociodemographic and clinical factors that influence alcohol metabolism are associated with TAC. The main aim of this study was to examine how sociodemographic factors (sex, age, race/ethnicity) and clinical factors (body mass index, liver enzymes: alanine aminotransferase [ALT] and aspartate transaminase [AST]), alcohol use disorder, and HIV status were associated with TAC while controlling for level of alcohol use.

Methods: We analyzed data from a prospective study involving contingency management for alcohol cessation among persons living with and without human immunodeficiency virus (HIV) that used the Secure Continuous Remote Alcohol Monitoring (SCRAM) biosensor. Forty-three participants ($M_{\text{age}} = 56.6$ years; 63% male; 58% people living with HIV) yielded 183 SCRAM-detected drinking days. Two indices derived from SCRAM: peak TAC (reflecting level of intoxication) and TAC area under the curve (TAC-AUC; reflecting alcohol volume)—were the main outcomes. Self-reported alcohol use (drinks/drinking day) measured by Timeline Followback was the main predictor. To examine whether factors of interest were associated with TAC, we used individual generalized estimating equations (GEE), followed by a multivariate GEE model to include all significant predictors to examine their associations with TAC beyond the effect of self-reported alcohol use.

Results: Number of drinks per drinking day ($B = 0.29$, $p < 0.01$) and elevated AST ($B = 0.50$, $p = 0.01$) were significant predictors of peak TAC. Positive HIV status, female sex, elevated AST, and number of drinks per drinking day were positively associated with TAC-AUC at the bivariate level, whereas only self-reported alcohol use ($B = 0.85$, $p < 0.0001$) and female sex ($B = 0.67$, $p < 0.05$) were significant predictors of TAC-AUC at the multivariate level.

Conclusions: HIV status was not independently associated with TAC. Future studies should consider the sex and liver function of the participant when using alcohol biosensors to measure alcohol use.

KEYWORDS

biosensor, heavy drinking, HIV, SCRAM, transdermal alcohol concentration

BACKGROUND

Transdermal alcohol biosensors can objectively measure alcohol use continuously, passively, and noninvasively (Luczak et al., 2018). In contrast, other measures of alcohol use, such as breathalyzers, biomarkers, and self-report, offer only some of these advantages. Further, the use of transdermal alcohol biosensors allows for real-time alcohol use monitoring (Davis-Martin et al., 2021). Alcohol biosensors work by measuring approximately 1% of ethanol that is eliminated through the skin (Swift, 2003). The Secure Continuous Remote Alcohol Monitor (SCRAM, Alcohol Monitoring Systems; AMS Inc.) has been used widely in the criminal justice system for alcohol-related offenses (Kilmer et al., 2013), and its use has become more prevalent in alcohol research over the past decade (Wang et al., 2018). Alcohol biosensors, including SCRAM, have been effective in monitoring alcohol use for interventions to reduce alcohol use (Alessi et al., 2017; Barnett et al., 2017; Dougherty et al., 2014, 2015b; Mathias et al., 2018). SCRAM is the most commonly used and well-validated sensor for research (Greenfield et al., 2014; Litten et al., 2010; Wang et al., 2018).

SCRAM measures transdermal alcohol concentration (TAC) every 30 minutes, allowing researchers and clinicians to monitor whether an individual is using alcohol (to a certain extent; i.e., may not detect low-level drinking of 1–2 drinks) or not (Marques & McKnight, 2009; Roache et al., 2015). Two of the most common indices derived from TAC readings are peak TAC and area under the curve (AUC). Peak TAC is commonly used to indicate the highest level of intoxication reached (Dougherty et al., 2012), whereas TAC-AUC may better represent an individual's total exposure to alcohol during the period of interest (Dougherty et al., 2015a). While it is clear that alcohol use is correlated with both peak TAC and TAC-AUC, other factors could also influence the specific TAC.

Factors associated with alcohol metabolism may affect transdermal alcohol biosensor readings. Sociodemographic factors, such as sex, age, and race/ethnicity, have been studied extensively in regard to alcohol metabolism. Females and older adults are more vulnerable to the effects of alcohol compared with males and younger adults when the same amount of alcohol is consumed (Baraona et al., 2001; Brady & Randall, 1999; Meier & Seitz, 2008). Genetic variants of alcohol dehydrogenase 1B and alcohol dehydrogenase 2, which have been associated with greater allele frequencies in certain self-identified race/ethnicities, are linked to differences in alcohol metabolism (Jorgenson et al., 2017). Of these different factors, only sex has been demonstrated previously to be associated with TAC and only in some instances. In an alcohol administration study that measured TAC-AUC, when males and females consumed the same amount of alcohol in the same time frame, females reached significantly greater TAC-AUCs compared with males (Dougherty et al., 2015a). For peak TAC, Barnett and colleagues found mixed results, with females showing significantly higher peak TAC compared with males when the number of drinks was fewer than 5 (Barnett et al., 2014), but not 5 or more. Sex differences in peak TAC, however, were not reported

in other studies (Barnett et al., 2014; Dougherty et al., 2012; Hill-Kapturczak et al., 2015).

Clinical variables of interest include body mass index (BMI) and the liver enzymes alanine aminotransferase (ALT) and aspartate transaminase (AST). Some research shows that individuals with higher BMIs have lower blood alcohol concentrations at similar levels of alcohol use as persons with lower BMIs (Maudens et al., 2014). Dougherty et al. (2012) demonstrated that including BMI in a model improves the strength of correlation between peak TAC levels and breath alcohol concentration (BrAC). Liver enzyme levels are also important to consider since the liver is the primary organ involved in metabolizing alcohol (National Institute on Alcohol Abuse & Alcoholism, 2007). Elevated liver enzyme levels may signify liver damage (Giannini, 2005), which in turn can alter how alcohol is metabolized. AST levels are higher in alcohol-related liver disease, whereas ALT levels are often elevated in hepatitis C. Transdermal alcohol biosensors may be an especially useful tool for persons with liver disease to monitor their drinking behaviors, as they must remain abstinent to receive a liver transplant (Cabezas et al., 2016). To date, there has been no investigation regarding whether elevated levels of liver enzymes are associated with higher TAC. Though phosphatidylethanol (PEth) has been validated as an alcohol biomarker in persons with chronic liver disease and has been used to monitor alcohol use in liver transplant recipients, physicians are often unaware of their patients' alcohol use until the damage has already been done (Fleming et al., 2017; Stewart et al., 2014). With transdermal alcohol monitors, however, alcohol use can be monitored in real time and additional damage to the liver could be prevented.

Little research has been conducted relating alcohol biosensor readings to alcohol use disorders (AUD) or HIV: 2 additional clinical factors. Alcohol metabolism may differ between those with and without an AUD. Tolerance is one aspect of AUD, characterized by an adaptation in alcohol metabolism (Haass-Koffler & Perciballi, 2020); thus, it is plausible that TAC may differ in persons with AUD. It is unclear whether HIV affects alcohol metabolism and thus TAC. People living with HIV (PLWH) have reported feeling a "buzz" at lower levels of self-reported alcohol use than persons without HIV (McGinnis et al., 2016). Further, PLWH with higher HIV viral loads reach significantly higher BACs than persons with lower HIV viral loads at similar levels of alcohol use in a laboratory setting (McCance-Katz et al., 2012). If HIV infection does impact TAC, alcohol sensor readings might differ among these individuals, thus affecting assessment and intervention research incorporating alcohol biosensors among PLWH. There is some evidence of relationships among AUD, HIV, and other alcohol biomarkers. For example, PEth has been demonstrated to be more sensitive in persons with AUD and less sensitive in PLWH (Hahn et al., 2021; Reisfield et al., 2020). Ethyl glucuronide (EtG) and ethyl sulfate (EtS) were less sensitive among persons with AUD (Reisfield et al., 2020). Additionally, using a point-of-care EtG test in a sample of PLWH, persons who had been on antiretroviral therapies for at least a year had higher odds of underreporting their alcohol use (Vinikoor et al., 2018). However, several studies that utilized

alcohol biomarkers included homogenous populations consisting entirely of persons with AUD or PLWH, in which relationships among AUD, HIV, and biomarkers could not be studied.

The main aim of this study was to determine whether socio-demographic factors (sex, age, race/ethnicity) and clinical factors (body mass index, liver enzymes: ALT and AST, AUD, and HIV status) are associated with TAC while controlling for level of alcohol use. Findings from this study will provide important information on whether transdermal alcohol biosensors work equivalently for all persons, or whether special considerations are needed. Ultimately, these findings could inform the application of transdermal alcohol biosensors (e.g., whether specific tailoring is needed) in alcohol monitoring and intervention research among different populations.

METHODS

We analyzed data from “the 30-Day Challenge”, a prospective study involving contingency management (CM) for alcohol cessation among persons living with and without HIV (Shortell et al., 2019). Study procedures were approved by all participating Institutional Review Boards. All study participants provided informed consent.

Participants

We recruited participants from the Miami, Florida, area from HIV clinics, community outreach, and a contact registry. Key aspects of the parent study included cognitive testing and neuroimaging, but these results are outside the scope of the current study. Persons were eligible if they were between 45 and 75 years old; living with or without HIV (confirmed); current heavy drinkers (≥ 14 drinks/week for women, ≥ 21 drinks/week for men); English speakers; willing to participate in CM to reduce alcohol use; and willing to wear the SCRAM biosensor for at least 30 days. Persons were not eligible to participate if they had a neurological disorder (e.g., dementia, stroke, seizures, traumatic brain injury); past opportunistic brain infection; major psychiatric disturbance, including severe major depression; unstable medical conditions (e.g., cancer); magnetic resonance imaging (MRI) contraindications (e.g., pregnancy, severe claustrophobia, metal implants); physical impairment precluding motor response or lying still; inability to demonstrate an understanding of key aspects of the study, or currently participating in other alcohol research.

Procedures

All in-person procedures were conducted at either the University of Miami or Florida International University. After providing consent, participants entered into an enrollment eligibility phase, in which they would wear the SCRAM biosensor for a prebaseline “test period” during which they provided self-reported drinking information. The purpose of this test period was to confirm that the participant

did meet drinking criteria, that they could tolerate the SCRAM monitor, and to demonstrate that the monitor accurately detected drinking days prior to participants entering a CM period. The SCRAM monitor was installed on the participant's preferred leg and locked in place once the participant was ready to leave the laboratory. The participant was given instructions about the monitor, including not to submerge the device in water, to avoid using alcohol-based items (e.g., perfume, bug spray), and not to wear socks under the monitor. Participants were instructed to drink as they normally would during the test week for all but one day of their choosing, in which a day of abstinence was required to assure that the monitor could accurately distinguish between drinking days and abstaining days. During the test week, a research assistant called the participant every other day and collected information about self-reported drinking, including the number of drinks on each drinking day. When the participants returned at the end of the test week, the data on the ankle monitor were uploaded to the SCRAM system using the DirectConnect device. After the test week, the participant completed a baseline assessment that included additional questionnaires and blood testing.

Primary predictor

The primary predictor was self-reported alcohol consumption (i.e., number of drinks consumed per day) during the test period. We defined a drinking day as 6am–6am the next day. We then converted the reported alcohol consumption into standard drinks. A standard drink was defined as 12 oz. of beer or wine cooler, 5 oz. of wine, or 1.5 oz. of liquor (National Institute on Alcohol Abuse & Alcoholism, n.d.).

Primary outcomes

We defined a SCRAM-detected drinking day from 6 am–6 am the next day. TAC data were collected and stored on the AMS server using the company's DirectConnect device. The data were accessed and downloaded through a password-protected portal. We used the Transdermal Alcohol Sensor Data Macro (TASMAC Software; Barnett et al., 2015) to read and interpret data from the SCRAM biosensor. The TASMAC utilizes previously published criteria, designed to be more sensitive than the default SCRAM criteria established by the AMS Inc., to detect drinking episodes (Barnett et al., 2011). The TASMAC then calculates peak TAC and TAC-AUC for each detected episode. Only TAC data collected during the test period from participants determined to be eligible for the parent study were included in the present analysis.

Peak TAC

We defined peak TAC as the highest TAC value reached within each SCRAM-detected drinking day. If there were multiple drinking

episodes within a single drinking day, we chose the peak TAC with the highest value.

Daily TAC-AUC

We defined daily TAC-AUC as the sum of all TAC-AUC from detected drinking episodes that began on the SCRAM-detected drinking day. If there were multiple drinking episodes within a single drinking day, we added the TAC-AUCs together.

Covariates

Demographics

Participants self-reported their sex, age, and race/ethnicity by survey at baseline. Sex was defined as sex assigned at birth and was dichotomized as "Female" or "Male". Age was treated as a continuous variable. Race and ethnicity were asked separately but combined for this analysis. Due to a limited sample, participants were dichotomized as either "Non-Hispanic Black" or "Other," which consisted of non-Hispanic White and Hispanic participants.

BMI

Each participant had their height and weight measured at baseline to calculate their BMI (Centers for Disease Control & Prevention, 2020). BMI was treated as a continuous variable.

ALT and AST

At baseline, nurses collected blood samples for a variety of clinical assessments, including liver enzymes alanine aminotransferase (ALT) and aspartate transaminase (AST). The liver enzymes were measured at a commercial laboratory (Quest or LabCorp) and categorized as normal or elevated. A normal value for ALT in adult women was defined

as <33 U/L and in adult men was <45 U/L (LabCorp, 2013). A normal value for AST in adults was defined as 8 to 33 U/L (UCSF Health, 2019). Values above the normal range were considered elevated.

Severe AUD

At baseline, participants answered the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) Assessment questions for alcohol use disorder (AUD) (American Psychiatric Association, 2013; National Institute on Alcohol Abuse & Alcoholism, 2016). Participants were considered to have a severe AUD if they scored a 6 or higher on the DSM-5 questions (National Institute on Alcohol Abuse & Alcoholism, 2016). Those with a score ≤ 5 were considered not to have a severe AUD.

HIV status

HIV status was confirmed by medical records, copies of laboratory test results, or an HIV-related medication (for PLWH), or by a confirmatory blood test (for persons without HIV). PLWH were considered virally suppressed if they had an HIV viral load less than 200 copies per milliliter (based on lower limit of detection).

Data analysis

We examined data from 44 participants with 201 SCRAM-detected drinking days collected between December 2017 and March 2020. We excluded SCRAM-detected drinking days on which participants reported no drinking ($n = 12$) or that had missing self-reported data ($n = 6$). One participant did not have any matching self-report to SCRAM-detected drinking days and was thus excluded from this analysis. The final analysis included data from 43 participants with 183 drinking days (mean = 4.3 days contributed/person; range = 1–12 days contributed/person).

First, we conducted descriptive analysis on demographic (e.g., sex, age, race/ethnicity) and baseline variables (e.g., BMI, severity of

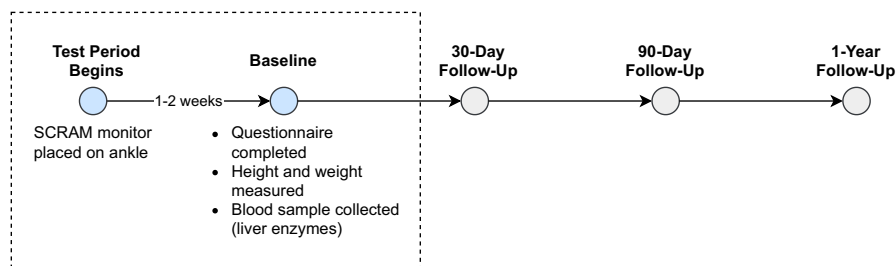


FIGURE 1 Timeline of the 30-Day Challenge Study. Participants enter into a test period in which they wear the SCRAM ankle monitor for 1–2 weeks and drink normally, reporting their alcohol use to a research assistant every other day. Following the test period, participants complete the baseline visit, where they complete a questionnaire, have their height and weight measured, and blood collected. While these are the only measures used for the present analysis, additional study measures are collected at baseline, and 3 follow-up periods, including a neurocognitive battery and fMRIs

AUD, liver function) to characterize the study sample. We examined the distributions for all continuous variables and log-transformed self-reported number of drinks per drinking day, peak TAC, and daily TAC-AUC due to their non-normality (Figure 1). We used generalized estimating equations models (GEE; normal distribution, autoregression correlation structure, identity link; Liang and Zeger, 1986) to identify the association of factors including sex, age, race/ethnicity, BMI, liver function, AUD severity, and HIV status with TAC while controlling for level of alcohol use. We examined bivariate associations between each factor and peak TAC or TAC-AUC using separate GEE models with self-reported number of drinks and 1 factor (e.g., sex) being the independent variables and Peak TAC or TAC-AUC as the dependent variable. We then used a multivariate model that included all predictors that had a p -value ≤ 0.10 in the bivariate models (Pardo & Alonso, 2019).

RESULTS

Of the 43 participants included in the study, 58% were living with HIV. Thirty-four (79%) identified as Black, non-Hispanic; 5 (12%) identified as White, non-Hispanic; and 4 (9%) identified as Hispanic. The mean age of the sample was 56.6 (SD = 4.7 years), and the mean BMI of the sample was 27.1 (SD = 5.9). The majority of participants (63%) met criteria for a severe AUD. Three participants (7%) had elevated ALT levels, and 9 participants (19%) had elevated AST levels (Table 1). Most participants with HIV (84%) were virally suppressed at baseline. The median number of self-reported number of drinks per drinking day was 6.3 (IQR = 4.5–10.0; Figure 1). The median peak TAC was 0.08 (IQR = 0.04–0.14; Figure 1). The median daily TAC-AUC was 20.54 (IQR = 9.05–57.34; Figure 1).

Factors associated with peak TAC

In the individual GEE analyses examining the association between number of self-reported drinks (log-transformed) and peak TAC (log-transformed), elevated AST (ref: normal; beta = 0.50, $p = 0.01$) was the only variable other than self-reported number of drinks (beta = 0.29, $p < 0.01$), significantly associated with peak TAC. Sex, age, race/ethnicity, BMI, ALT, severe AUD, and HIV status were not significantly associated with peak TAC when controlling for self-reported number of drinks.

Factors associated with TAC-AUC

With daily TAC-AUC (log-transformed) as the outcome, female sex (ref: male; beta = 0.79, $p < 0.01$), elevated AST (ref: normal; beta = 0.85, $p = 0.02$), and positive HIV status (ref: negative; beta = 0.50, $p = 0.09$) were each associated with higher TAC-AUC at an alpha level of less than or equal to 0.1 when controlling for the self-reported number of drinks and thus included in the multivariate

TABLE 1 Baseline characteristics of the sample ($N = 43$)

Characteristic	Frequency (%)
Sex	
Female	16 (37%)
Male	27 (63%)
Age	
Mean (SD)	56.6 (4.7)
Race/ethnicity	
Non-Hispanic, Black	34 (79%)
Other ^a	9 (21%)
BMI	
Mean (SD)	27.1 (5.9)
ALT ^b	
Elevated	3 (7%)
Normal	40 (93%)
AST ^c	
Elevated	9 (19%)
Normal	35 (81%)
Severe AUD ^d	
No	15 (37%)
Yes	27 (63%)
HIV Status	
Negative	18 (42%)
Positive	25 (58%)
Drinks at Baseline	
Median (IQR)	6.3 (4.5–10.0)

Abbreviations: BMI, body mass index; HIV, human immunodeficiency virus; IQR, interquartile range; SD, standard deviation.

^aOther race/ethnicity denotes self-identified as White ($n = 5$) or Hispanic ($n = 4$)

^bNormal alanine aminotransferase (ALT) <33 U/L (female) and <45 U/L (male)

^cNormal aspartate transaminase (AST) = 8–33 U/L.

^dSevere alcohol use disorder (AUD) >5 on screener based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) Assessment.

model. In the multivariate model (Table 2), number of self-reported drinks and female sex remained significantly positively associated with TAC-AUC (beta = 0.67, $p = 0.02$).

DISCUSSION

In this study, we conducted a secondary data analysis to determine whether sociodemographic and clinical factors were independently associated with TAC while controlling for self-reported number of drinks. Among our sample of 43 individuals who reported heavy drinking, having an elevated level of AST was significantly associated with a greater peak TAC when controlling for self-reported number of drinks. Female sex was associated with greater daily TAC-AUC

TABLE 2 Results from the adjusted GEE model of factors that are associated with daily transdermal alcohol concentration area under curve (TAC-AUC)

Characteristic	B	SE B	95% CI
Self-Reported Drinks	0.85***	0.18	(0.50–1.21)
Gender			
Female	0.67**	0.29	(0.10–1.24)
Male	Ref	Ref	Ref
AST ^a			
Elevated	0.67	0.38	(–0.07–1.40)
Normal	Ref	Ref	Ref
HIV Status			
Positive	0.39	0.28	(–0.17–0.93)
Negative	Ref	Ref	Ref

Note: The primary outcome variable (TAC-AUC) and primary exposure variable (self-reported drinks) were log-transformed due to non-normality; model controlled for self-reported drinks, HIV status, gender, and AST.

Abbreviations: CI, confidence interval; GEE, generalized estimating equations; HIV, human immunodeficiency virus; SE, standard error.

** $p < 0.05$; *** $p < 0.0001$.

^aNormal aspartate transaminase (AST) = 8–33 U/L

while controlling for self-reported number of drinks, AST, and HIV status.

Our data suggest that peak TAC measured by SCRAM may be influenced by levels of the liver enzyme AST. Those with elevated AST, which may signify liver alcohol-related liver disease (Giannini, 2005), had significantly greater peak TACs, possibly reflecting altered alcohol metabolism. The association between elevated AST and TAC may have important clinical implications, as transdermal alcohol monitors could be used to monitor alcohol consumption among persons with liver disease, especially those who need to maintain complete abstinence to receive a liver transplant (Cabezas et al., 2016). Our study was the first to examine liver function and its impact on TAC, and this association warrants further investigation, as only a small proportion of our sample (19%) had elevated AST levels. Peak TAC was not influenced by factors other than the number of drinks and AST, which is consistent with past literature (Barnett et al., 2014; Dougherty et al., 2012). Barnett et al. (2014) conducted a multivariable analysis with variables that were significantly associated with drinking episode (rather than drinking day) detection in univariate analyses, including a sex-by-heavy drinking interaction, BMI, alcohol dependence, SCRAM bracelet version, and the number of self-reported drinks, revealing that only number of self-reported drinks was significantly associated with peak TAC. Dougherty et al. (2012) conducted a laboratory study in which participants consumed alcohol and had their peak TAC and breath alcohol concentration measured. Similarly, sex and BMI were not significantly associated with peak TAC.

There is a paucity of literature related to TAC-AUC, which may better reflect an individual's total exposure to alcohol in a day relative

to peak TAC. Our data suggest TAC-AUC is significantly associated with sex, in that females reach greater TAC-AUCs at similar levels of drinking compared to males after controlling for covariates (e.g., HIV status, liver function). Data from a laboratory study conducted by Dougherty et al. (2015a) had similar findings, suggesting that women reached higher TAC-AUCs at lower levels of drinking. Given that TAC-AUC may represent the cumulative burden of alcohol, this finding may provide evidence to support current recommendations for lower alcohol consumption for women compared to men (Office of Disease Prevention & Health Promotion, 2015).

At the bivariate level, HIV status was marginally associated with TAC-AUC. In other words, PLWH in our sample had a trend toward greater TAC-AUCs compared with persons without HIV, after controlling for self-reported number of drinks. However, this relationship did not remain once adjusting for sex and AST. Additionally, HIV status was not associated with peak TAC at any point in our analysis; the SCRAM data show no significant differences between people with and without HIV. Only 1 prior study to our knowledge has examined HIV status or HIV viral load as a predictor of alcohol intoxication; McCance-Katz et al. (2012) found higher HIV viral load was positively associated with BAC. Several differences in study populations and designs may help explain the difference in findings, including that TAC, while correlated with BAC, is not identical, that McCance-Katz et al. used laboratory methods vs. self-reported naturalistic drinking in our study, and that our PLWH participants mostly had viral load suppression, while all participants in McCance-Katz et al. were living with HIV, served as their own controls (beginning as virally unsuppressed and finishing as virally suppressed) and were on average more than 10 years younger than our sample.

Strengths and limitations

Our study is the first to our knowledge to examine whether liver enzymes or HIV status have a main effect on the transdermal alcohol concentration as an objective measure of alcohol use after controlling for self-reported alcohol consumption level. Strengths of this study include a high proportion of matched SCRAM and self-reported drinking days and low levels of missing data. Additional strengths of this study include the use of objective measurements of HIV viral load, liver enzymes, and BMI.

The data are limited, however, in that the match between self-reported drinking and TAC could not be perfectly accounted for. Specifically, self-reported drinking reflected all drinks consumed that day, whereas peak TAC may occur during one or more episodes during a single day. Obtaining drinking data in real time, such as by using ecological momentary assessment, would have allowed for the comparison of peak TACs from such drinking episodes. Further, our sample was fairly homogenous, in that most participants tended to have achieved viral load suppression; thus, we did not have the statistical power to determine whether HIV viral load was associated with TAC. Our small sample size also limited our statistical power, and thus, it is possible that we did not

detect some actual differences as being statistically significant. Additionally, persons who identify as Black were overrepresented in our sample population (almost 80%); thus, this is not the ideal population to determine whether TAC differs by race/ethnicity. Lastly, our sample consisted of older adults so results may not generalize to younger samples.

Future directions

Future research is needed to collect data from larger samples and to include more data points and detailed self-reported drinking patterns throughout the day to increase the power to detect significant differences. Further, a newer generation of wrist-worn biosensors is now available that are more user-friendly (Wang et al., 2018). These new devices are smaller and should make enrolling participants easier due to lower stigma, thus leading to more generalizable data. Additional research to determine whether these new wrist-worn biosensors work equivalently for persons living with and without HIV is needed.

CONCLUSIONS

HIV status was not significantly associated with peak TAC or daily TAC-AUC. AST and self-reported number of drinks were significantly associated with peak TAC. Sex and self-reported number of drinks were both significantly associated with daily TAC-AUC. Liver function and sex should be considered and potentially controlled for in future studies involving the SCRAM monitor.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

ORCID

Veronica L. Richards  <https://orcid.org/0000-0002-1391-0607>

Robert F. Leeman  <https://orcid.org/0000-0002-7003-8907>

Nancy P. Barnett  <https://orcid.org/0000-0001-9634-8287>

Yan Wang  <https://orcid.org/0000-0001-7265-778X>

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