

Posttraumatic stress disorder and alcohol misuse among women: effects of ethnic minority stressors

Sherry Lipsky¹ · Mary A. Kernic² · Qian Qiu¹ · Deborah S. Hasin³

Received: 4 October 2014 / Accepted: 4 August 2015 / Published online: 13 August 2015
© Springer-Verlag Berlin Heidelberg 2015

Abstract

Purpose The aims of this study were to examine the relationship between adult-onset posttraumatic stress disorder (PTSD) and subsequent alcohol use outcomes (frequent heavy drinking, alcohol abuse, and alcohol dependence) in non-Hispanic white, non-Hispanic black, and Hispanic US women, and whether this relationship was moderated by ethnic minority stressors (discrimination and acculturation).

Methods The study sample was drawn from two waves of the National Epidemiologic Surveys of Alcohol and Related Conditions, employing time-dependent data to conduct multiple extended Cox regression.

Results Women with PTSD were over 50 % more likely than those without PTSD to develop alcohol dependence [adjusted hazards ratio (aHR) 1.55; 95 % confidence interval (CI) 1.15, 2.08]. Hispanic and black women were at lower risk of most alcohol outcomes than white women. In race-/ethnic-specific analyses, however, PTSD only predicted alcohol abuse among Hispanic women (aHR 3.02; CI 1.33, 6.84). Higher acculturation was positively associated with all alcohol outcomes among Hispanic women and discrimination was associated with AUD among Hispanic and black women. Acculturation and

discrimination modified the effect of PTSD on AUD among Hispanic women: PTSD predicted alcohol dependence among those with low acculturation (aHR 10.2; CI 1.27, 81.80) and alcohol abuse among those without reported discrimination (aHR 6.39; CI 2.76, 16.49).

Conclusions PTSD may influence the development of hazardous drinking, especially among Hispanic women. The influence of PTSD on alcohol outcomes is most apparent, however, when ethnic minority stressors are not present.

Keywords Posttraumatic stress disorder · Alcohol misuse · Race/ethnicity · Longitudinal analysis

Introduction

PTSD is associated with alcohol misuse, although temporal precedence has not been as widely established [1–6]. Additionally, the effects of the PTSD–alcohol association among population subgroups have not been fully examined, although rates of PTSD and alcohol use disorders (AUD) differ by gender, race, and ethnicity [7–16]. Acculturation and discrimination add to the complexity of race- and ethnicity-specific effects of PTSD on alcohol misuse. Thus, it is important to consider whether these stressors help to explain the disparate results of studies to date on the intersection of PTSD and alcohol misuse among racial and ethnic minority women.

Temporal precedence of PTSD

The self-medication theory posits that PTSD precedes AUD, given that alcohol may offset or reverse psychic numbing, feelings of estrangement, and detachment in low to moderate

✉ Sherry Lipsky
lipsky@u.washington.edu

¹ Department of Psychiatry and Behavioral Sciences,
University of Washington at Harborview Medical Center,
Seattle, WA, USA

² Department of Epidemiology, University of Washington
School of Public Health, Seattle, WA, USA

³ Columbia University/New York State Psychiatric Institute,
New York, NY, USA

doses, and that it can dampen emotional flooding in high, ‘hypnotic’ doses [17, 18]. Thus, it is plausible that individuals with PTSD are likely to self-medicate the negative effects associated with major trauma. Nevertheless, study findings have been inconsistent. For example, PTSD preceded AUD in the majority (65–84 %) of comorbid individuals in the National Comorbidity Survey [2, 3]. However, other studies have found adjustment for other important confounders, such as pre-existing AUD and other psychiatric disorders, to challenge the validity of these results [4, 5]. Furthermore, some research in this area has shown gender-specific effects of trauma exposure and PTSD on AUD [5, 6] which may, when ignored, help explain the inconsistency in study findings.

Race/ethnicity

Little is known about how race or ethnicity might moderate the PTSD–alcohol misuse relationship. Although lower rates of AUD have been revealed among blacks and Hispanics compared to non-Hispanic whites in the majority of studies [7–10], findings have been mixed with regard to PTSD [11–13, 19]. A recent meta-analysis focused on Hispanics found consistent support for elevated rates of PTSD onset and severity among Hispanics relative to non-Hispanic whites [11]. On the other hand, the prevalence of PTSD was found to be greater among blacks, but not Hispanics, compared to non-Hispanic whites in a nationally representative US sample [13]. In addition, blacks may be at greater risk of persistent anxiety disorders compared to non-Hispanic whites [20, 21], perhaps as a result of higher or chronic exposure to discrimination [20, 22, 23]. Ethnic minorities are also less likely to receive treatment for PTSD [24], and persistent or untreated PTSD may provide an avenue for increased risk of AUD [21, 25–27]. Further research is needed to more clearly define the longitudinal relationship between PTSD and subsequent alcohol misuse and to better attend to gender, race, ethnicity, and ethnic minority stressors.

Acculturation

Acculturation (adoption of dominant culture practices and values) may help to explain racial and ethnic disparities in PTSD and alcohol misuse. Traditional family networks and traditional culture may have protective effects and likely decrease exposure to social stress or at least buffer the impact of that stress [28–31]. Thus, not only would PTSD be less common among less acculturated Hispanics but, once acquired, social support and identification with traditional culture may decrease any secondary risk of alcohol misuse.

Previous research has revealed that higher acculturation among Hispanics is associated with both PTSD [32–34]

and alcohol misuse [35–41]. Much of this research, however, has involved proxy measures of acculturation (nativity or length of US residence) rather than specific acculturation measures [7, 32, 42, 43]. Moreover, US nativity and higher acculturation are associated with comorbid alcohol and mental disorders, at least in cross-sectional surveys [43, 44]. US-born women are significantly more likely than immigrant women of Mexican origin, for example, to have a comorbid AUD and anxiety disorder [44] or to have comorbid psychiatric and substance use disorders [43]. What has not been studied is the effect of acculturation on the longitudinal relationship between PTSD and alcohol outcomes.

Discrimination

Discrimination, or the experience of ‘othering’ [45], can be conceptualized as a stressful life event or series of events that may affect mental health [46–49]. Discrimination has been associated with alcohol misuse and mental health disorders in several studies [22, 41, 50–57]. For example, data from the National Epidemiologic Surveys on Alcohol-Related Conditions (NESARC) [55] revealed that discrimination was significantly associated with AUD among female respondents and black respondents, but not Hispanics. On the other hand, a 15-year follow-up study of young adults found that any past year alcohol use, but not binge drinking, was significantly associated with higher levels and longer duration of discrimination among blacks [58]. Although most studies have not conducted gender- and ethnic-specific analyses, findings from the National Latino and Asian American Study suggest that discrimination is associated with an increased odds of AUD among Hispanic women, but not men [59, 60].

While studies of discrimination and mental health have revealed significant relationships, the majority of studies have involved either generic measures of discrimination or mental health [22, 50, 52, 56, 61–65]. Results from a relatively recent meta-analysis showed an increased probability of manifesting clinical levels of mental illness associated with experience of any type of discrimination [56]. Other studies have found experience of racial or ethnic discrimination to be associated with increased psychological distress among blacks, Mexican Americans, and other Hispanics [56, 66]. In one of the few studies to examine the effect of racial/ethnic discrimination on the PTSD–alcohol relationship, college students reporting discrimination at the baseline interview were found to be at risk for developing symptoms of posttraumatic stress and increased maladaptive alcohol use 1 year later [67]. PTSD symptomatology was not assessed at baseline, however. In sum, little is known about the temporal relationship between PTSD and alcohol outcomes among women with

regard to racial/ethnic status or the role of ethnic minority stressors. This study focused specifically on women, given their increased risk of PTSD and their greater levels of chronicity and severity of PTSD [14, 15]. Although the prevalence of AUD is greater among men [10, 16], men in the civilian population with comorbid PTSD and AUD are more likely to have secondary PTSD, while women are more likely to have primary PTSD [2].

The current study addresses these gaps in the literature by examining the temporal relationship between adult-onset PTSD and subsequent alcohol use outcomes (frequent heavy drinking, alcohol abuse, and alcohol dependence) and whether this differs between non-Hispanic white, non-Hispanic black, and Hispanic US women. This study also examines whether ethnic minority stressors (discrimination and acculturation) moderate the PTSD–alcohol relationship. We hypothesized that ethnic minority women with PTSD are at greater risk of poor alcohol outcomes than non-Hispanic white women, and that those with higher acculturation or discrimination would be at further risk. This study has the unique potential of identifying racial-/ethnic-specific risk factors associated with poor alcohol outcomes in the milieu of trauma, which can inform the development of secondary prevention and intervention efforts targeting PTSD-affected women.

Materials and methods

Sampling methodology

The study sample was drawn from two waves of NESARC. These surveys have been previously described elsewhere in detail [68]. In brief, Wave 1 of NESARC was conducted in 2001–2002 and Wave 1 respondents were re-interviewed in Wave 2 (2004–2005). The sample was weighted to adjust for nonresponse at the household and person levels; the selection of one person per household; and over-sampling of young adults, Hispanics, and non-Hispanic blacks. Once weighted, the data were adjusted to be representative of the US population based on the 2000 Decennial Census. The survey response rate was 81 % for Wave 1 and 86.7 % for Wave 2; the overall cumulative survey response rate including both waves was 70.2 %.

The current study includes 11,308 non-Hispanic white (hereafter referred to as white), 4261 non-Hispanic African American/black (hereafter referred to as black), and 3640 Hispanic females. The small sample size (<5 %) of other races/ethnicities precluded their inclusion. This study also focuses exclusively on adult-onset PTSD and subsequent AUD outcomes given that the majority of PTSD among women first occurs in adulthood [69]. We followed subjects through time beginning at age 18 until an occurrence

of an alcohol outcome or censoring at Wave 2 follow-up (i.e., at the time of the interview at Wave 2). Subjects with alcohol outcomes prior to age 18 or preceding the onset of PTSD were excluded.

Measures

PTSD

A diagnosis of PTSD was based on the Alcohol Use Disorder and Associated Disability Interview Schedule-DSM-IV Version (AUDADIS-IV), using the only or ‘worst’ traumatic event experienced by the respondent. Test–retest reliabilities of a lifetime diagnosis is good ($\kappa = 0.65$) and the internal consistency of symptom scales associated with PTSD is acceptable ($\alpha = 0.69$) [70]. Age of onset was missing for <1 %. History of PTSD was modeled as a time-dependent dichotomous variable (0/1) coded as positive from the age of PTSD onset forward.

Alcohol measures

Frequent heavy drinking is defined as 4+ drinks among women in a single day at least once a month in the respondent’s heaviest drinking period based on quantity/frequency measures. The reliability of these measures is good [intraclass correlation coefficient (ICC) 0.70] [71]. Age of onset was missing for <1 %. The AUDADIS-IV [71] was used to measure alcohol abuse (without dependence) and alcohol dependence (with or without abuse) diagnoses. Reliabilities associated with lifetime and past year alcohol abuse and dependence diagnoses were good ($\kappa = 0.70$ and 0.74, respectively) [71]. Age of onset for alcohol abuse alone and alcohol dependence with or without abuse was missing for 6.0–7.8 and 0.0–1.6 %, respectively, of study respondents, with only minor differences by race/ethnicity.

Explanatory/potentially confounding factors

Socio-demographic characteristics

Measures from Wave 2 included self-identified race and Hispanic ethnicity (non-Hispanic white and non-Hispanic black); age (in years); education (in years); marital status, marital status change from Wave 1; health insurance in past year; and total household income in past year. Multiracial respondents were categorized by NESARC according to the following order of preference: (1) black or African American, (2) American Indian and Alaska Native, (3) Native Hawaiian and other Pacific Islander, (4) Asian, and (5) white. Nativity and years lived in the USA were categorized among Hispanic respondents as having lived in the

USA for 20 or more years (or born in the USA); 10–19 years; 5–9 years; or <5 years. Too few black (<10 %) and white (<5 %) respondents were born outside of the USA to be categorized as such.

Social support and social networks

Social support/networks were assessed at Wave 2 by two instruments. The Interpersonal Support Evaluation List (ISEL12) [70] measures the respondents' perceptions of the current availability to them of potential social resources (e.g., "If I were sick, I know I would find someone to help me with my daily chores"). The Social Network Index [70] assesses participation in 12 types of social relationships with whom the respondent had contact with at least once every 2 weeks, recoded as number of network types. The test–retest reliability for these instruments is good (ICC = 0.63 and 0.70, respectively) [70].

Major depressive disorder

Major depressive disorder (MDD) was defined as ever having a DSM-IV MDD diagnosis (excluding substance-induced disorders and those due to a general medical condition). Test–retest reliabilities for the past year and lifetime diagnoses were good ($\kappa = 0.59$ and 0.65 , respectively) as were those for symptom scales (ICC 0.71) [70, 71]. To account for the effect of treatment on depression, depression was categorized as no depression, depression with any treatment for depression over the lifetime (sought help from 'counselor/therapist/doctor/other person', went to the emergency room, or was hospitalized), and depression without any treatment.

Family history

Family history of problem drinking/alcoholism has been well established as a useful indicator in determining a clinical prognosis of AUD [72]. To control for this as a potential confounder, family history was assessed by asking if any blood/natural relative (parents, siblings, children) was ever "an alcoholic or problem drinker". Responses were recoded as the proportion of first-degree relatives who were alcoholic/problem drinkers (0, <25, 15–49, and ≥ 50 %).

Moderating variables

Acculturation

This measure is based on the 11-item acculturation scale adapted from the Brief Acculturation Rating Scale-II for Mexican Americans [73–77]. Acculturation items focused

strongly on language use (current and in childhood), proficiency, and preference, as well as race–ethnic social preferences, and rated using a five-point scale (1–5). The test–retest reliability of the acculturation scale is excellent (ICC 0.79) and the internal consistency is good ($\alpha = 0.85$) [70]. For the purposes of this study, acculturation was categorized as low (11–21), medium (35–43), and high (44–55); due to sample size constraints, acculturation was dichotomized as low (11–21) vs. moderate to high (12–55) in main effects models of AUD and when testing effect modification.

Discrimination

The ethnic and racial discrimination scales in the AUDA-DIS-IV were modeled after the Experiences with Discrimination scales developed by Krieger et al. [78–81]. The original scales were expanded to reflect the past 12 months and prior to the past 12 months. Good test–retest reliability (ICC 0.68 and 0.64 for prior to last 12 months and past 12 months, respectively) was demonstrated, and internal consistency ($\alpha = 0.69$ and 0.74 , respectively) was acceptable [70]. For the purposes of this study, the two time periods were combined to create a lifetime measure of discrimination and dichotomized (ever/never) due to sample size constraints.

Data analysis

Descriptive statistics were used to compare socio-demographic, PTSD, and alcohol factors by race/ethnicity. We used extended Cox regression which, unlike the general form of proportional hazards Cox regression, allows for the examination of covariates that are time dependent (change value with time). The resultant risk estimate, the hazard ratio, is the ratio of instantaneous risk of the outcome among the exposed relative to the unexposed and is roughly comparable in its interpretability to a relative risk. Adjusted hazard ratios (aHR) and 95 % confidence intervals (CI) were calculated for the first onset of each outcome (frequent heavy drinking, alcohol abuse, and alcohol dependence) among respondents with prior adult-onset PTSD compared to those without PTSD for the total sample and by race/ethnicity. In each model, socio-demographic factors were retained as a block and the remaining potential confounders were retained in the model if they were independently associated with the outcome ($p \leq 0.10$ at entry to allow for only the potentially relevant variables to be included) or if they confounded the exposure–outcome relationship (≥ 10 % change in exposure–outcome HR) [82]. These factors have been associated with PTSD and/or AUD in prior research [72, 83–91]. As previously noted, family history of alcohol misuse (problem drinking/

alcoholism) is a well-established risk factor for alcohol use disorders [72]. Depression and social support or social networks have been shown to have a strong association with PTSD [15, 92] and comorbid AUD [90]. A time-varying covariate for alcohol abuse was also included in the alcohol dependence models, given the high prevalence of co-occurrence of abuse and dependence and apparent heterogeneity across racial/ethnic groups [93, 94]. Acculturation and nativity among Hispanics and discrimination among Hispanic and black women were also examined as independent predictors in subsequent models. Finally, effect modification of the exposure–outcome relationship by acculturation among Hispanic women and discrimination among black and Hispanic women were examined for each outcome; if the interaction term was significant at $p \leq 0.10$, estimates were calculated for the exposure and referent groups. Due to sample size constraints, acculturation/nativity and discrimination among Hispanic women were assessed in separate models.

Since <10 % of cases were missing data on any of the covariates of interest, we conducted complete case analysis rather than employing multiple imputation. STATA MP 11 (Stata Corporation, College Station, TX, USA), which accounted for the complex survey design of NESARC, was employed for all analyses.

Results

Sample description

Significant racial/ethnic differences were revealed in socio-demographic and alcohol factors among respondents (Table 1). Of note, black and Hispanic women were more likely to be younger and to have lower socioeconomic status than white women, but were less likely to have a family history of problem drinking, frequent heavy drinking, and AUD. Black women were least likely to be married.

Survival analysis

Main effects models

Table 2 illustrates the findings of the main effects models predicting lifetime risk of each alcohol outcome associated with prior adult-onset PTSD in the total sample and by race/ethnicity. In the total sample, women with PTSD were approximately 50 % more likely to develop alcohol dependence compared to those without PTSD (aHR 1.55; CI 1.15, 2.08). Black and Hispanic women were at decreased risk of most alcohol outcomes. MDD with or without treatment was positively associated with poor

alcohol outcomes, while increased social networks and, to a lesser degree, social support were protective. Concurrent alcohol abuse also predicted alcohol dependence.

Race/ethnicity

In ethnic-specific analyses, PTSD predicted alcohol abuse only among Hispanics (aHR 3.02; CI 1.33, 6.84). MDD estimates varied by alcohol outcome and by race/ethnicity. MDD without treatment was consistently associated with poor alcohol outcomes across all racial/ethnic groups, while MDD with treatment was associated with alcohol abuse only among whites and with alcohol dependence in all groups. Concurrent alcohol abuse was positively associated with alcohol dependence in each group, although the estimates were significantly higher among black and Hispanic women. Increased social networks were protective of poor alcohol outcomes among white women and, to a lesser degree, among black women. On the other hand, lower social support was positively associated with alcohol dependence among white women and protective of frequent heavy drinking and alcohol abuse among Hispanic women.

Ethnic minority stressors

Acculturation

Higher acculturation was associated with poor alcohol outcomes among Hispanic women (data not shown). Women with medium and high acculturation (scoring 35–43 and 44–55, respectively) were three times more likely than those with low acculturation (aHR 3.15, CI 1.16, 8.58 and aHR 3.48, CI 1.35, 8.95, respectively) to be frequent heavy drinkers. Similar findings were revealed for alcohol abuse and alcohol dependence (high/medium vs. low acculturation: aHR 3.55, CI 1.91, 6.61 and aHR 3.56, CI 1.58, 8.01, respectively). In addition, having been born outside the USA was protective of alcohol dependence (aHR 0.43, CI 0.23, 0.80).

Discrimination

Discrimination was positively associated with alcohol outcomes among black and, to a lesser degree, Hispanic women (data not shown). Hispanic women experiencing discrimination were 70 % more likely to have alcohol abuse than their counterparts who did not report discrimination (aHR 1.68, CI 1.06, 2.67). Similarly, black women experiencing discrimination were 50–80 % more likely than those without reported discrimination to have alcohol abuse or alcohol dependence (aHR 1.46, CI 1.05, 2.03 and aHR 1.82, CI 1.27, 2.61, respectively).

Table 1 Descriptive characteristics of female respondents: National Epidemiologic Survey on Alcohol and Related Conditions, 2001–2002 and 2004–2005

Characteristic	Total sample			Non-Hispanic white			Non-Hispanic black			Hispanic		
	N	%	SE	N	%	SE	N	%	SE	N	%	SE
Age group***												
20–29	2657	15.67	0.38	1374	13.91	0.45	586	18.79	0.79	697	23.62	1.08
30–39	3751	17.90	0.35	1927	16.16	0.39	867	20.80	0.82	957	26.02	1.01
40–49	4015	21.01	0.40	2233	20.61	0.49	932	22.18	0.77	850	22.30	0.85
50–59	3265	17.56	0.34	2013	18.37	0.42	766	16.84	0.64	486	13.18	0.69
60–69	2262	11.46	0.30	1428	12.27	0.34	539	10.53	0.49	295	7.22	0.67
70+	3259	16.40	0.36	2333	18.69	0.44	571	10.87	0.55	355	7.66	0.70
Marital status***												
Married	8995	57.13	0.68	5927	61.25	0.61	1179	33.33	0.91	1889	56.52	1.82
Cohabiting	562	2.94	0.17	294	2.53	0.18	89	2.48	0.26	179	6.09	0.64
Separated/widowed/divorced	6250	24.85	0.42	3653	24.37	0.47	1677	31.94	0.85	920	20.21	1.18
Never married	3402	15.08	0.49	1434	11.85	0.41	1316	32.24	0.90	652	17.18	1.09
Education***												
<High school	3112	13.79	0.55	1181	10.29	0.37	779	16.4	0.88	1152	33.6	2.02
High school diploma	5370	28.30	0.51	3197	28.71	0.57	1266	29.34	1.02	907	24.48	1.01
Some college	6138	32.79	0.54	3704	33.00	0.65	1392	35.07	0.95	1042	28.92	1.38
Bachelor's degree or higher	4589	25.12	0.62	3226	28.00	0.71	824	19.18	0.92	539	13.00	1.30
Household income***												
<20,000	5307	22.34	0.57	2544	19.25	0.56	1675	35.65	1.26	1088	27.79	1.47
20,000–49,999	6921	35.15	0.54	3903	33.59	0.64	1587	38.24	0.86	1431	41.84	1.41
50,000–99,999	4968	29.46	0.55	3304	31.80	0.59	791	20.48	1.01	873	24.17	1.37
100,000+	2013	13.05	0.53	1557	15.36	0.66	208	5.63	0.61	248	6.20	0.62
Health insurance category***												
Private insurance	12,536	69.62	0.75	8350	75.14	0.58	2314	54.70	1.19	1872	50.25	1.91
Medicare	2273	9.75	0.30	1174	9.05	0.34	709	14.64	0.63	390	8.91	0.93
Subsidized insurance	1738	7.23	0.40	599	4.93	0.28	584	13.20	0.76	555	15.52	1.63
No health insurance	2617	13.41	0.46	1158	10.88	0.41	642	17.46	1.16	817	25.31	1.57
Adult-onset frequent heavy drinking***												
Yes	2552	14.44	0.47	1787	16.01	0.53	404	10.03	0.74	361	9.33	0.66
No	15,878	85.56	0.47	9002	83.99	0.53	3710	89.97	0.74	3166	90.67	0.66
Adult-onset alcohol abuse***												
Yes	1844	11.33	0.45	1369	13.17	0.48	271	6.93	0.64	204	4.89	0.53
No	15,011	88.67	0.45	8288	86.83	0.48	3616	93.07	0.64	3107	95.11	0.53
Adult-onset alcohol dependence***												
Yes	1613	10.17	0.41	1084	11.12	0.44	294	8.05	0.66	235	6.99	0.70
No	15,011	89.83	0.41	8288	88.88	0.44	3616	91.95	0.66	3107	93.01	0.70
Adult-onset PTSD***												
Yes	1747	8.70	0.28	1003	8.43	0.32	435	9.89	0.67	309	9.12	0.81
No	17,462	91.30	0.28	10,305	91.57	0.32	3826	90.11	0.67	3331	90.88	0.81

PTSD posttraumatic stress disorder, SE standard error

*** Significant difference between racial/ethnic groups $p < 0.001$

Ethnic minority stressors as effect modifiers

Acculturation moderated the relationship between PTSD and alcohol dependence among Hispanic women (data not

shown). PTSD predicted alcohol dependence among those with lower acculturation (aHR 10.2; CI 1.27, 81.80), but not among those with higher acculturation (aHR 1.14; CI 0.46, 2.87). Discrimination moderated the relationship

Table 2 Main effects models predicting lifetime risk of alcohol outcomes associated with prior adult-onset PTSD among female respondents by race/ethnicity, National Epidemiologic Survey on Alcohol and Related Conditions, 2001–2002 and 2004–2005

Risk factors	Total sample		Non-Hispanic white		Non-Hispanic black		Hispanic	
	HR	95 % CI	HR	95 % CI	HR	95 % CI	HR	95 % CI
Frequent heavy drinking								
PTSD	1.23	0.78–1.95	1.08	0.55–2.09	1.43	0.74–2.77	1.94	0.67–5.64
Race/ethnicity ^a			–	–	–	–	–	–
Black	0.70	0.51–0.96						
Hispanic	0.58	0.44–0.76						
MDD ^b								
MDD with treatment	1.22	0.98–1.53	1.15	0.90–1.46	1.16	0.64–2.10	2.30	1.22–4.35
MDD w/o treatment	1.56	1.22–2.00	1.40	1.01–1.94	1.68	1.01–2.80	2.69	1.34–5.39
Social networks ^c	0.86	0.80–0.92	0.85	0.78–0.92	0.85	0.74–0.98	–	–
Social support ^d	–	–	–	–	–	–	–	–
Fair							0.54	0.31–0.95
Low							0.42	0.24–0.72
Alcohol abuse								
PTSD	1.19	0.84–1.68	1.11	0.73–1.69	0.82	0.36–1.87	3.02	1.33–6.84 ^e
Race/ethnicity ^a			–	–	–	–	–	–
NH black	0.46	0.37–0.58						
Hispanic	0.43	0.34–0.55						
MDD ^b								
MDD with treatment	1.33	1.12–1.60	1.28	1.05–1.57	1.25	0.67–2.35	2.55	1.56–4.16
MDD w/o treatment	1.43	1.14–1.80	1.39	1.08–1.77	1.98	1.24–3.16	1.53	0.72–3.25
Social networks ^c	0.93	0.88–0.98	0.92	0.87–0.98	–	–	–	–
Social support ^d	–	–	–	–	–	–	–	–
Fair							0.71	0.45–1.13
Low							0.57	0.34–0.97
Alcohol dependence								
PTSD	1.55	1.15–2.08	1.59	1.11–2.29	1.10	0.61–1.97	1.65	0.64–4.23 ^f
Race/ethnicity ^a			–	–	–	–	–	–
NH black	0.93	0.75–1.16						
Hispanic	0.71	0.53–0.95						
MDD ^b								
MDD with treatment	2.52	2.10–3.03	2.42	1.98–2.97	2.67	1.66–4.28	2.96	1.67–5.24
MDD w/o treatment	1.80	1.44–2.25	1.62	1.22–2.14	2.36	1.46–3.81	2.33	1.26–4.34
Concurrent alcohol abuse	3.18	2.65–3.82	2.75	2.23–3.39	6.30	4.01–9.89	7.61	4.07–14.21
Social networks ^c	0.92	0.87–0.98	0.92	0.86–0.99	0.91	0.82–1.02	–	–
Social support ^d	–	–	–	–	–	–	–	–
Fair	1.31	1.06–1.62	1.36	1.06–1.73	–	–	–	–
Low	1.29	1.03–1.62	1.33	1.02–1.75	–	–	–	–

HR Hazard Ratio, adjusted for all factors with values included as well as age, education, health insurance, household income, marital status, marital status change between survey waves, and family history of problem drinking/alcoholism, CI confidence interval, PTSD posttraumatic stress disorder, MDD major depressive disorder

–, Variable not included in the model

^a Reference group is non-Hispanic white

^b Reference group is no MDD

^c Number of social network types; risk decreases as number increases

^d Reference group is high level of social support

^e Significant interaction between PTSD and reported discrimination; PTSD predicted alcohol abuse only among Hispanic women without discrimination; see text for results

^f Significant interaction between PTSD and acculturation; PTSD predicted alcohol dependence among Hispanic women with low acculturation; see text for results

between PTSD and alcohol outcomes only among Hispanic women (data not shown). PTSD predicted alcohol abuse among Hispanic women without reported discrimination (aHR 6.39; CI 2.76, 16.49), but not among those having experienced discrimination (aHR 1.30; CI 0.33, 5.19).

Discussion

This is the first study to our knowledge to examine the temporal relationship between PTSD and alcohol outcomes among women using time-dependent data from the entire adulthood experiences of women, with a specific focus on racial/ethnic minorities and ethnic minority stressors. The key findings in this study suggest that PTSD influences the development of AUD in women. This is most apparent among ethnic minorities when other stressors are not present. Specifically, Hispanic women with low acculturation or without reported discrimination are at greatest risk of poor alcohol outcomes following the onset of PTSD.

PTSD and alcohol outcomes

Our findings that PTSD predicted alcohol dependence in the total sample extends those of previous studies. In a 3-year prospective follow-up study using two waves of NESARC data, similar alcohol outcomes were revealed for male and female respondents combined [4]. PTSD predicted alcohol dependence in that study, but the risk decreased and became nonsignificant after taking into account other psychiatric disorders, perhaps due to the complex interrelationships among comorbid disorders [95, 96]. Other studies [1, 6] also have demonstrated that PTSD increases the risk for AUD, although either incidence or temporal sequencing of events was not addressed. Moreover, the majority of previous researches have not been gender specific, although some researches have identified important differences in risk of PTSD and AUD based on gender [10, 14–16].

Race/ethnicity

While there were no significant racial/ethnic differences in lifetime prevalence of PTSD, the current study revealed that white women with PTSD were at increased risk of subsequent alcohol dependence and Hispanic women with PTSD were at increased risk of developing alcohol abuse. The findings with regard to Hispanic women are consistent with previous studies showing elevated rates of PTSD onset and severity among Hispanics relative to non-Hispanic whites [11]. Our findings for black women were unexpected, however, given that prior research has

demonstrated a greater risk of persistent anxiety disorders among blacks [20, 21, 25–27] and decreased treatment for PTSD among ethnic minorities compared to non-Hispanic whites [24]. As previously noted, persistent disorders and lack of treatment would suggest an increased risk of AUD. Nevertheless, the extant literature has not shown consistent findings in racial/ethnic disparities in PTSD, AUD, and comorbid disorders [7–12, 97, 98] but, again, most studies have not utilized time-dependent data.

Acculturation

The effect of acculturation on the relationship between PTSD and alcohol outcomes in this study is also unexpected, given prior research demonstrating greater risk of mental health disorders and AUD among US-born compared to immigrant Hispanics, those with longer residence in the USA, and higher acculturation [7, 33, 42, 44, 99]. Although traditional family networks and traditional culture have been shown to buffer the impact of stress, higher acculturation may lead to increased help seeking for traumatic events [28–31, 100, 101]. The net effect in each case would be to decrease the likelihood of self-medication with alcohol. An alternative explanation is that in the absence of acculturation as a stressor, the role of PTSD in alcohol outcomes becomes more evident. Our findings should be interpreted with caution, however, given the wide confidence intervals in the effect modification models. Nevertheless, the emergence of AUD in the absence of an additional stress factor has been demonstrated in at least one previous study. Lipsky et al. [102] found that childhood trauma moderated the relationship between potentially traumatic intimate partner violence and alcohol misuse mainly among black respondents, with an increased risk of a poor alcohol outcome among those without childhood trauma. Hispanic women were not included in that study.

Discrimination

Discrimination also played a similar role to that of acculturation in the PTSD–alcohol relationship in this study, with PTSD predicting alcohol abuse only among Hispanic women without reported discrimination. While the paucity of prior research on this specific relationship makes it difficult to compare our findings to other studies, one study found discrimination to increase the risk of PTSD symptoms and alcohol misuse among Hispanic college students, although temporal relationships could not be established [67]. It is clear from the extant literature, however, that discrimination has a detrimental effect on mental health and alcohol misuse among ethnic minorities [22, 51, 53–58, 66, 103, 104].

Why this relationship was not revealed among black women is difficult to explain, given prior findings of positive associations between discrimination and poor mental health and alcohol outcomes among blacks overall [51, 53, 54, 56–58]. It is possible that black women engage additional social resources that ameliorate the effect of PTSD on alcohol misuse or that social norms regarding drinking are strongly negative in black women overall. Few studies have examined these relationships among black women specifically and have focused mainly on depression or distress [105–108]. In a study of black families [109], for example, distress (general anxiety and depression symptoms) partially mediated the discrimination–substance use relationship. In a comparison of the strengths of the various paths for males and females in that study, the models looked very similar. Other sociocultural factors, such as trauma cognitions (the way people think about themselves, others, and the safety of the world), may change after experiencing a traumatic event [110]. In one study of individuals with comorbid PTSD and alcohol dependence, negative views about one’s self and the world were more strongly associated with adverse consequences of drinking and alcohol craving severity among blacks than whites [110].

Limitations

There are several limitations to consider in interpreting the findings of this study. First, the measurement of potentially traumatic experiences is limited by the retrospective assessment of events, which may underestimate the prevalence [3, 111]. Nevertheless, PTSD was based on the only or ‘worst’ event experienced by the respondent, which may lead to a higher rate of detection [9, 111–114]. Alcohol misuse and AUD were also assessed retrospectively in each survey wave. Recall bias may have occurred biasing the estimates downward, particularly for lifetime occurrences of alcohol misuse [115]. On the other hand, test–retest reliability of NESARC variables has been demonstrated to be good overall [70, 71]. It should also be noted that with the changes in criteria in the DSM-V, the prevalence rates of AUD as compared to DSM-IV may in fact increase [116]. Second, lifetime measures were utilized for MDD, MDD treatment, and discrimination, whereas social support and acculturation were current assessments at Wave 2 by the respondents. Thus, it was not possible to determine the temporal sequencing of these variables with PTSD and alcohol misuse outcomes. Third, it is possible that refusers, the impaired, and deceased were more likely to have DSM-IV disorders, biasing the estimate of the PTSD–alcohol relationship downward, although most studies have revealed a modest to no effect based on

loss to follow-up [117–121]. Moreover, the response rate for Wave 2 (86.7 %) was excellent, decreasing the effect of nonresponse on the outcomes under study. Finally, if respondents had developed an AUD prior to age 18 or prior to PTSD, they would have been excluded from the analysis; this may have led to decreased power or unavoidable selection bias.

Conclusions

The novel findings from this study highlight the importance of determining the risk of AUD associated with prior onset of PTSD from a gendered as well as racial/ethnic perspective and the role ethnic minority stressors play in this relationship. The use of a nationally representative sample and the availability of time-dependent measures to determine lifetime risk extend the current literature which has, to date, been based mainly on nonrepresentative or cross-sectional data or limited to changes between study or survey waves. The current findings suggest that screening and intervention programs for PTSD in health and social service settings have the potential to interrupt trajectories that carry higher risk for alcohol misuse and AUD among women. An increasing body of evidence points to the need for integrated treatment that addresses both complex trauma and substance abuse, which has better potential to improve both PTSD and alcohol outcomes among women [122, 123].

Additional research is needed to determine if there are racial/ethnic differences in treatment needs and efficacy related to PTSD [124]. Identification of sociocultural and contextual factors associated with poor alcohol outcomes in the face of traumatic experiences is especially critical in informing the development of relevant and sensitive alcohol prevention and intervention efforts. The effects of acculturation on specific types of help seeking for traumatic events in particular need to be more clearly delineated. Although discrimination is not easily modifiable on an individual basis, public health efforts to address bias and discrimination remain key. Finally, given that AUD varies across Hispanic subgroups [7], it will be important in future research to examine the PTSD–alcohol relationship within these subgroups as well as other ethnic minority groups.

Acknowledgments This study was funded by the National Institutes of Health, National Institute of Alcohol Abuse and Alcoholism (NIH/NIAAA) Grant R01 AA 018686. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NIH/NIAAA.

Compliance with ethical standards

Conflict of interest The authors report no conflicts of interest.

References

- Epstein JN, Saunders BE, Kilpatrick DG, Resnick HS (1998) PTSD as a mediator between childhood rape and alcohol use in adult women. *Child Abuse Negl* 22(3):223–234
- Kessler RC, Crum RM, Warner LA, Nelson CB, Schulenberg J, Anthony JC (1997) Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Arch Gen Psychiatry* 54(4):313–321
- Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB (1995) Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry* 52(12):1048–1060
- Grant BF, Goldstein RB, Chou SP, Huang B, Stinson FS, Dawson DA, Saha TD, Smith SM, Pulay AJ, Pickering RP, Ruan WJ, Compton WM (2009) Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Mol Psychiatry* 14(11):1051–1066
- Breslau N, Davis GC, Schultz LR (2003) Posttraumatic stress disorder and the incidence of nicotine, alcohol, and other drug disorders in persons who have experienced trauma. *Arch Gen Psychiatry* 60(3):289–294
- Breslau N, Davis GC, Peterson EL, Schultz L (1997) Psychiatric sequelae of posttraumatic stress disorder in women. *Arch Gen Psychiatry* 54(1):81–87
- Alegria M, Canino G, Shrout PE, Woo M, Duan N, Vila D, Torres M, Chen C, Meng X (2008) Prevalence of mental illness in immigrant and non-immigrant US Latino groups. *Am J Psychiatry* 165(3):359–369
- Breslau J, Aguilar-Gaxiola S, Kendler KS, Su M, Williams D, Kessler RC (2006) Specifying race-ethnic differences in risk for psychiatric disorder in a USA national sample. *Psychol Med* 36(1):57–68
- Breslau N, Kessler RC, Chilcoat HD, Schultz LR, Davis GC, Andreski P (1998) Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma. *Arch Gen Psychiatry* 55(7):626–632
- Hasin DS, Stinson FS, Ogburn E, Grant BF (2007) Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Arch Gen Psychiatry* 64(7):830–842
- Alcantara C, Casement MD, Lewis-Fernandez R (2013) Conditional risk for PTSD among Latinos: a systematic review of racial/ethnic differences and sociocultural explanations. *Clin Psychol Rev* 33(1):107–119
- Asnaani A, Richey JA, Dimaite R, Hinton DE, Hofmann SG (2010) A cross-ethnic comparison of lifetime prevalence rates of anxiety disorders. *J Nerv Ment Dis* 198(8):551–555
- Alegria M, Fortuna LR, Lin JY, Norris FH, Gao S, Takeuchi DT, Jackson JS, Shrout PE, Valentine A (2013) Prevalence, risk, and correlates of posttraumatic stress disorder across ethnic and racial minority groups in the United States. *Med Care* 51(12):1114–1123
- Breslau N (2009) The epidemiology of trauma, PTSD, and other posttrauma disorders. *Trauma Violence Abuse* 10(3):198–210
- Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB (1995) Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry* 5(1):1–13
- Cohen E, Feinn R, Arias A, Kranzler HR (2007) Alcohol treatment utilization: findings from the national epidemiologic survey on alcohol and related conditions. *Drug Alcohol Depend* 86(2–3):214–221
- Khantzian EJ (1985) The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence. *Am J Psychiatry* 142(11):1259–1264
- Khantzian EJ (1997) The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harv Rev Psychiatry* 4(5):231–244
- Nazroo JY (2003) The structuring of ethnic inequalities in health: economic position, racial discrimination, and racism. *Am J Public Health* 93(2):277–284
- Gibbs TA, Okuda M, Oquendo MA, Lawson WB, Wang S, Thomas YF, Blanco C (2013) Mental health of African Americans and Caribbean blacks in the United States: results from the national epidemiological survey on alcohol and related conditions. *Am J Public Health* 103(2):330–338
- Breslau J, Kendler KS, Su M, Gaxiola-Aguilar S, Kessler RC (2005) Lifetime risk and persistence of psychiatric disorders across ethnic groups in the United States. *Psychol Med* 35(3):317–327
- Kessler RC, Mickelson KD, Williams DR (1999) The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. *J Health Soc Behav* 40(3):208–230
- Soto JA, Dawson-Andoh NA, BeLue R (2011) The relationship between perceived discrimination and generalized anxiety disorder among African Americans, Afro Caribbeans, and non-Hispanic whites. *J Anxiety Disord* 25(2):258–265
- Roberts AL, Gilman SE, Breslau J, Breslau N, Koenen KC (2011) Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States. *Psychol Med* 41(1):71–83
- Breslau N, Davis GC (1992) Posttraumatic stress disorder in an urban population of young adults: risk factors for chronicity. *Am J Psychiatry* 149(5):671–675
- McFarlane AC (1998) Epidemiological evidence about the relationship between PTSD and alcohol abuse: the nature of the association. *Addict Behav* 23(6):813–825
- Stewart SH, Pihl RO, Conrod PJ, Dongier M (1998) Functional associations among trauma, PTSD, and substance-related disorders. *Addict Behav* 23(6):797–812
- Escobar JI (1998) Immigration and mental health: why are immigrants better off? *Arch Gen Psychiatry* 55(9):781–782
- Escobar JI, Gomez J, Tuason VB (1983) Depressive phenomenology in North and South American patients. *Am J Psychiatry* 140(1):47–51
- Scribner R (1996) Paradox as paradigm—the health outcomes of Mexican Americans. *Am J Public Health* 86(3):303–305
- Turner RJ, Lloyd DA, Taylor J (2006) Stress burden, drug dependence and the nativity paradox among US Hispanics. *Drug Alcohol Depend* 83(1):79–89
- Vega WA, Sribney WM, Aguilar-Gaxiola S, Kolody B (2004) 12-month prevalence of DSM-III-R psychiatric disorders among Mexican Americans: nativity, social assimilation, and age determinants. *J Nerv Ment Dis* 192(8):532–541
- Alegria M, Canino G, Stinson FS, Grant BF (2006) Nativity and DSM-IV psychiatric disorders among Puerto Ricans, Cuban Americans, and non-Latino Whites in the United States: results from the national epidemiologic survey on alcohol and related conditions. *J Clin Psychiatry* 67(1):56–65
- Heilemann MV, Kury FS, Lee KA (2005) Trauma and post-traumatic stress disorder symptoms among low income women of Mexican descent in the United States. *J Nerv Ment Dis* 193(10):665–672
- Alegria M, Mulvaney-Day N, Torres M, Polo A, Cao Z, Canino G (2007) Prevalence of psychiatric disorders across Latino subgroups in the United States. *Am J Public Health* 97(1):68–75

36. Caetano R, Ramisetty-Mikler S, Wallisch LS, McGrath C, Spence RT (2008) Acculturation, drinking, and alcohol abuse and dependence among Hispanics in the Texas-Mexico border. *Alcohol Clin Exp Res* 32(2):314–321
37. Zemore SE (2005) Re-examining whether and why acculturation relates to drinking outcomes in a rigorous, national survey of Latinos. *Alcohol Clin Exp Res* 29(12):2144–2153
38. Zemore SE (2007) Acculturation and alcohol among Latino adults in the United States: a comprehensive review. *Alcohol Clin Exp Res* 31(12):1968–1990
39. Caetano R, Ramisetty-Mikler S, Caetano Vaeth PA, Harris TR (2007) Acculturation stress, drinking, and intimate partner violence among Hispanic couples in the US. *J Interpers Violence* 22(11):1431–1447
40. Caetano R, Ramisetty-Mikler S, Rodriguez LA (2009) The Hispanic Americans Baseline Alcohol Survey (HABLAS): the association between birthplace, acculturation and alcohol abuse and dependence across Hispanic national groups. *Drug Alcohol Depend* 99(1–3):215–221
41. Savage JE, Mezuk B (2014) Psychosocial and contextual determinants of alcohol and drug use disorders in the National Latino and Asian American Study. *Drug Alcohol Depend* 139:71–78
42. Alegria M, Sribney W, Woo M, Torres M, Guarnaccia P (2007) Looking beyond nativity: the relation of age of immigration, length of residence, and birth cohorts to the risk of onset of psychiatric disorders for Latinos. *Res Hum Dev* 4(1):19–47
43. Ortega AN, Rosenheck R, Alegria M, Desai RA (2000) Acculturation and the lifetime risk of psychiatric and substance use disorders among Hispanics. *J Nerv Ment Dis* 188(11):728–735
44. Vega WA, Sribney WM, Achara-Abrahams I (2003) Co-occurring alcohol, drug, and other psychiatric disorders among Mexican-origin people in the United States. *Am J Public Health* 93(7):1057–1064
45. Viruell-Fuentes EA (2007) Beyond acculturation: immigration, discrimination, and health research among Mexicans in the United States. *Soc Sci Med* 65(7):1524–1535
46. Kessler RC, Neighbors HW (1986) A new perspective on the relationships among race, social class, and psychological distress. *J Health Soc Behav* 27(2):107–115
47. Miller FS (1992) Network structure support: its relationship to the psycho-social development of black females. In: Powell G (ed) *The psycho-social development of minority group children*. Brunner/Mazel, New York, pp 275–306
48. Thompson VL (2002) Racism: perceptions of distress among African Americans. *Community Ment Health J* 38(2):111–118
49. Williams DR, Neighbors HW, Jackson JS (2003) Racial/ethnic discrimination and health: findings from community studies. *Am J Public Health* 93(2):200–208
50. Gee GC, Spencer M, Chen J, Yip T, Takeuchi DT (2007) The association between self-reported racial discrimination and 12-month DSM-IV mental disorders among Asian Americans nationwide. *Soc Sci Med* 64(10):1984–1996
51. Gibbons FX, Gerrard M, Cleveland MJ, Wills TA, Brody G (2004) Perceived discrimination and substance use in African American parents and their children: a panel study. *J Pers Soc Psychol* 86(4):517–529
52. Karlsen S, Nazroo J (2002) The impact of ethnic identity and racism on the health of ethnic minority people. *Sociol Health Illn* 2(1):1–20
53. Kwate NO, Valdimarsdottir HB, Guevarra JS, Bovbjerg DH (2003) Experiences of racist events are associated with negative health consequences for African American women. *J Natl Med Assoc* 95(6):450–460
54. Martin JK, Tuch SA, Roman PM (2003) Problem drinking patterns among African Americans: the impacts of reports of discrimination, perceptions of prejudice, and “risky” coping strategies. *J Health Soc Behav* 44(3):408–425
55. McLaughlin KA, Hatzenbuehler ML, Keyes KM (2010) Responses to discrimination and psychiatric disorders among Black, Hispanic, female, and lesbian, gay, and bisexual individuals. *Am J Public Health* 100(8):1477–1484
56. Sellers RM, Caldwell CH, Schmeelk-Cone KH, Zimmerman MA (2003) Racial identity, racial discrimination, perceived stress, and psychological distress among African American young adults. *J Health Soc Behav* 44(3):302–317
57. Yen IH, Ragland DR, Greiner BA, Fisher JM (1999) Racial discrimination and alcohol-related behavior in urban transit operators: findings from the San Francisco Muni Health and Safety Study. *Public Health Rep* 114(5):448–458
58. Borrell LN, Jacobs DR Jr, Williams DR, Pletcher MJ, Houston TK, Kiefe CI (2007) Self-reported racial discrimination and substance use in the coronary artery risk development in adults study. *Am J Epidemiol* 166(9):1068–1079
59. Otiniano Verissimo AD, Grella CE, Amaro H, Gee GC (2014) Discrimination and substance use disorders among latinos: the role of gender, nativity, and ethnicity. *Am J Public Health* 104(8):1421–1428
60. Otiniano Verissimo AD, Gee GC, Ford CL, Iguchi MY (2014) Racial discrimination, gender discrimination, and substance abuse among Latina/os nationwide. *Cult Divers Ethnic Minor Psychol* 20(1):43–51
61. Pascoe EA, Smart Richman L (2009) Perceived discrimination and health: a meta-analytic review. *Psychol Bull* 135(4):531–554
62. Brown T, Williams DR, Jackson JJ, Neighbors HW, Torres M, Sellers SL, Brown KT (2000) “Being Black and feeling blue”: the mental health consequences of racial discrimination. *Race Soc* 2(2):117–131
63. Loo CM, Fairbank JA, Scurfield RM, Ruch LO, King DW, Adams LJ, Chemtob CM (2001) Measuring exposure to racism: development and validation of a Race-Related Stressor Scale (RRSS) for Asian American Vietnam veterans. *Psychol Assess* 13(4):503–520
64. Mays VM, Cochran SD (2001) Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *Am J Public Health* 91(11):1869–1876
65. Siefert K, Bowman PJ, Heflin CM, Danziger S, Williams DR (2000) Social and environmental predictors of maternal depression in current and recent welfare recipients. *Am J Orthopsychiatry* 70(4):510–522
66. Gee GC, Ryan A, Laflamme DJ, Holt J (2006) Self-reported discrimination and mental health status among African descendants, Mexican Americans, and other Latinos in the New Hampshire REACH 2010 Initiative: the added dimension of immigration. *Am J Public Health* 96(10):1821–1828
67. Cheng HL, Mallinckrodt B (2015) Racial/ethnic discrimination, posttraumatic stress symptoms, and alcohol problems in a longitudinal study of Hispanic/Latino college students. *J Couns Psychol* 62(1):38–49
68. Grant BF, Dawson DA (2006) Introduction to the national epidemiologic survey on alcohol and related conditions. *Alcohol Res Health* 29(2):74–78
69. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Arch Gen Psychiatry* 62(6):593–602
70. Ruan WJ, Goldstein RB, Chou SP, Smith SM, Saha TD, Pickering RP, Dawson DA, Huang B, Stinson FS, Grant BF (2008) The alcohol use disorder and associated disabilities interview schedule-IV (AUDADIS-IV): reliability of new psychiatric

- diagnostic modules and risk factors in a general population sample. *Drug Alcohol Depend* 92(1–3):27–36
71. Grant BF, Dawson DA, Stinson FS, Chou PS, Kay W, Pickering R (2003) The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug Alcohol Depend* 71(1):7–16
 72. Milne BJ, Caspi A, Harrington H, Poulton R, Rutter M, Moffitt TE (2009) Predictive value of family history on severity of illness: the case for depression, anxiety, alcohol dependence, and drug dependence. *Arch Gen Psychiatry* 66(7):738–747
 73. Coronado GD, Thompson B, McLerran D, Schwartz SM, Koepsell TD (2005) A short acculturation scale for Mexican-American populations. *Ethn Dis* 15(1):53–62
 74. Cuellar I, Arnold B, Maldonado R (1995) Acculturation Rating Scale for Mexican Americans-II: a revision of the original ARSMA scale. *Hisp J Behav Sci* 17(3):275–304
 75. Cuellar I, Bastida E, Braccio SM (2004) Residency in the United States, subjective well-being, and depression in an older Mexican-origin sample. *J Aging Health* 16(4):447–466
 76. Deyo RA, Diehl AK, Hazuda H, Stern MP (1985) A simple language-based acculturation scale for Mexican Americans: validation and application to health care research. *Am J Public Health* 75(1):51–55
 77. Solis JM, Marks G, Garcia M, Shelton D (1990) Acculturation, access to care, and use of preventive services by Hispanics: findings from HHANES 1982–84. *Am J Public Health* 80(Suppl):11–19
 78. Krieger N (1990) Racial and gender discrimination: risk factors for high blood pressure? *Soc Sci Med* 30(12):1273–1281
 79. Krieger N, Sidney S (1997) Prevalence and health implications of anti-gay discrimination: a study of black and white women and men in the CARDIA cohort. *Coronary Artery Risk Development in Young Adults*. *Int J Health Serv* 27(1):157–176
 80. Krieger N, Sidney S, Coakley E (1998) Racial discrimination and skin color in the CARDIA study: implications for public health research. *Coronary Artery Risk Development in Young Adults*. *Am J Public Health* 88(9):1308–1313
 81. Krieger N, Smith K, Naishadham D, Hartman C, Barbeau EM (2005) Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health. *Soc Sci Med* 61(7):1576–1596
 82. Maldonado G, Greenland S (1993) Simulation study of confounder-selection strategies. *Am J Epidemiol* 138:923–936
 83. Shalev AY, Freedman S, Peri T, Brandes D, Sahar T, Orr SP, Pitman RK (1998) Prospective study of posttraumatic stress disorder and depression following trauma. *Am J Psychiatry* 155(5):630–637
 84. Freedman SA, Brandes D, Peri T, Shalev A (1999) Predictors of chronic post-traumatic stress disorder. A prospective study. *Br J Psychiatry* 174:353–359
 85. Platt J, Keyes KM, Koenen KC (2014) Size of the social network versus quality of social support: which is more protective against PTSD? *Soc Psychiatry Psychiatr Epidemiol* 49(8):1279–1286
 86. Dinenberg RE, McCaslin SE, Bates MN, Cohen BE (2014) Social support may protect against development of posttraumatic stress disorder: findings from the heart and soul study. *Am J Health Promot* 28(5):294–297
 87. Mutschler J, Eifler S, Dirican G, Grosshans M, Kiefer F, Rossler W, Diehl A (2013) Functional social support within a medical supervised outpatient treatment program. *Am J Drug Alcohol Abuse* 39(1):44–49
 88. Trocchio S, Chassler D, Storbjork J, Delucchi K, Witbrodt J, Lundgren L (2013) The association between self-reported mental health status and alcohol and drug abstinence 5 years post-assessment for an addiction disorder in US and Swedish samples. *J Addict Dis* 32(2):180–193
 89. Leggio L, Kenna GA, Fenton M, Bonenfant E, Swift RM (2009) Typologies of alcohol dependence. From Jellinek to genetics and beyond. *Neuropsychol Rev* 19(1):115–129
 90. Goldstein RB, Dawson DA, Chou SP, Grant BF (2012) Sex differences in prevalence and comorbidity of alcohol and drug use disorders: results from wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *J Stud Alcohol Drugs* 73(6):938–950
 91. Cranford JA, Nolen-Hoeksema S, Zucker RA (2011) Alcohol involvement as a function of co-occurring alcohol use disorders and major depressive episode: evidence from the national epidemiologic survey on alcohol and related conditions. *Drug Alcohol Depend* 117(2–3):145–151
 92. Rytwinski NK, Scur MD, Feeny NC, Youngstrom EA (2013) The co-occurrence of major depressive disorder among individuals with posttraumatic stress disorder: a meta-analysis. *J Trauma Stress* 26(3):299–309
 93. Hasin DS, Grant BF (2004) The co-occurrence of DSM-IV alcohol abuse in DSM-IV alcohol dependence: results of the national epidemiologic survey on alcohol and related conditions on heterogeneity that differ by population subgroup. *Arch Gen Psychiatry* 61(9):891–896
 94. Mojtabai R, Singh P (2007) Implications of co-occurring alcohol abuse for role impairment, health problems, treatment seeking, and early course of alcohol dependence. *Am J Addict* 16(4):300–309
 95. Keyes KM, Eaton NR, Krueger RF, McLaughlin KA, Wall MM, Grant BF, Hasin DS (2012) Childhood maltreatment and the structure of common psychiatric disorders. *Br J Psychiatry* 200(2):107–115
 96. Krueger RF (1999) The structure of common mental disorders. *Arch Gen Psychiatry* 56(10):921–926
 97. Huang B, Grant BF, Dawson DA, Stinson FS, Chou SP, Saha TD, Goldstein RB, Smith SM, Ruan WJ, Pickering RP (2006) Race-ethnicity and the prevalence and co-occurrence of diagnostic and statistical manual of mental disorders, fourth edition, alcohol and drug use disorders and axis I and II disorders: United States, 2001 to 2002. *Compr Psychiatry* 47(4):252–257
 98. Smith SM, Stinson FS, Dawson DA, Goldstein R, Huang B, Grant BF (2006) Race/ethnic differences in the prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the national epidemiologic survey on alcohol and related conditions. *Psychol Med* 36(7):987–998
 99. Caetano R, Ramisetty-Mikler S, Rodriguez LA (2009) The Hispanic Americans Baseline Alcohol Survey (HABLAS): the association between birthplace, acculturation and alcohol abuse and dependence across Hispanic national groups. *Drug Alcohol Depend* 99(1–3):215–221
 100. Lorenzo-Blanco EI, Delva J (2012) Examining lifetime episodes of sadness, help seeking, and perceived treatment helpfulness among US Latino/as. *Community Ment Health J* 48(5):611–626
 101. Turner RJ, Lloyd DA, Taylor J (2006) Stress burden, drug dependence and the nativity paradox among US Hispanics. *Drug Alcohol Depend* 83(1):79–89
 102. Lipsky S, Kernic MA, Qiu Q, Wright C, Hasin DS (2014) A two-way street for alcohol use and partner violence: Who's driving it? *J Fam Violence* 29(8):815–828
 103. Karlsen S, Nazroo JY (2002) Relation between racial discrimination, social class, and health among ethnic minority groups. *Am J Public Health* 92(4):624–631
 104. Finch BK, Kolody B, Vega WA (2000) Perceived discrimination and depression among Mexican-origin adults in California. *J Health Soc Behav* 41(3):295–313

105. Seawell AH, Cutrona CE, Russell DW (2014) The Effects of General Social Support and Social Support for Racial Discrimination on African American Women's Well-Being. *J Black Psychol* 40(1):3–26
106. Maddox T (2013) Professional women's well-being: the role of discrimination and occupational characteristics. *Women Health* 53(7):706–729
107. Logie C, James L, Tharao W, Loutfy M (2013) Associations between HIV-related stigma, racial discrimination, gender discrimination, and depression among HIV-positive African, Caribbean, and Black women in Ontario, Canada. *AIDS Patient Care STDS* 27(2):114–122
108. Donovan RA, Huynh QL, Park IJ, Kim SY, Lee RM, Robertson E (2013) Relationships among identity, perceived discrimination, and depressive symptoms in eight ethnic-generational groups. *J Clin Psychol* 69(4):397–414
109. Gibbons FX, Kingsbury JH, Weng CY, Gerrard M, Cutrona C, Wills TA, Stock M (2014) Effects of perceived racial discrimination on health status and health behavior: a differential mediation hypothesis. *Health Psychol* 33(1):11–19
110. Williams M, Jayawickreme N, Sposato R, Foa EB (2012) Race-specific associations between trauma cognitions and symptoms of alcohol dependence in individuals with comorbid PTSD and alcohol dependence. *Addict Behav* 37(1):47–52
111. McKinney CM, Harris TR, Caetano R (2009) Reliability of self-reported childhood physical abuse by adults and factors predictive of inconsistent reporting. *Violence Vict* 24(5):653–668
112. Breslau N, Peterson EL, Schultz LR (2008) A second look at prior trauma and the posttraumatic stress disorder effects of subsequent trauma: a prospective epidemiological study. *Arch Gen Psychiatry* 65(4):431–437
113. Kessler RC (1997) The effects of stressful life events on depression. *Annu Rev Psychol* 48:191–214
114. Schraedley PK, Turner RJ, Gotlib IH (2002) Stability of retrospective reports in depression: traumatic events, past depressive episodes, and parental psychopathology. *J Health Soc Behav* 43(3):307–316
115. Greenfield TK, Kerr WC (2008) Alcohol measurement methodology in epidemiology: recent advances and opportunities. *Addiction* 103(7):1082–1099
116. Bartoli F, Carra G, Crocama C, Clerici M (2015) From DSM-IV to DSM-5 alcohol use disorder: an overview of epidemiological data. *Addict Behav* 41:46–50
117. Badawi MA, Eaton WW, Myllyluoma J, Weimer LG, Gallo J (1999) Psychopathology and attrition in the Baltimore ECA 15-year follow-up 1981–1996. *Soc Psychiatry Psychiatr Epidemiol* 34(2):91–98
118. Bergman P, Ahlberg G, Forsell Y, Lundberg I (2010) Non-participation in the second wave of the PART study on mental disorder and its effects on risk estimates. *Int J Soc Psychiatry* 56(2):119–132
119. Caetano R, Ramisetty-Mikler S, McGrath C (2003) Characteristics of non-respondents in a US national longitudinal survey on drinking and intimate partner violence. *Addiction* 98(6):791–797
120. Torvik FA, Rognmo K, Tambs K (2012) Alcohol use and mental distress as predictors of non-response in a general population health survey: the HUNT study. *Soc Psychiatry Psychiatr Epidemiol* 47(5):805–816
121. Van Loon AJ, Tijhuis M, Picavet HS, Surtees PG, Ormel J (2003) Survey non-response in the Netherlands: effects on prevalence estimates and associations. *Ann Epidemiol* 13(2):105–110
122. Cohen LR, Hien DA (2006) Treatment outcomes for women with substance abuse and PTSD who have experienced complex trauma. *Psychiatr Serv* 57(1):100–106
123. Hien DA, Campbell AN, Ruglass LM, Hu MC, Killeen T (2010) The role of alcohol misuse in PTSD outcomes for women in community treatment: a secondary analysis of NIDA's Women and Trauma Study. *Drug Alcohol Depend* 111(1–2):114–119
124. Amaro H, Dai J, Arevalo S, Acevedo A, Matsumoto A, Nieves R, Prado G (2007) Effects of integrated trauma treatment on outcomes in a racially/ethnically diverse sample of women in urban community-based substance abuse treatment. *J Urban Health* 84(4):508–522