Adverse childhood experiences, mental health, and excessive alcohol use: Examination of race/ethnicity and sex differences

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Abstract

Responses from N = 60,598 interviews from the 2010 Behavioral Risk Factor Surveillance System (the 10 states and the District of Columbia that included the optional Adverse Childhood Experience (ACE) module) were used to test whether associations between childhood adversity and adult mental health and alcohol behaviors vary by race/ethnicity and sex. ACE items were categorized into two types – household challenges and child abuse. Outcomes were current depression, diagnosed depression, heavy drinking and binge drinking. Logistic regression models found ACEs significantly associated with depression and excessive alcohol use, but sex did not moderate any relationships. Race/ethnicity moderated the relationship between ACEs and heavy drinking. In stratified analyses, compared to those not exposed to ACEs, non-Hispanic blacks who experienced either type of ACE were about 3 times as likely to drink heavily; Non-Hispanic whites who experienced child abuse or both ACE types were 1.5–2 times as likely to drink heavily; and Hispanics who experienced household challenges or both ACE types were 1.2 and 11 times as likely to report heavy drinking. ACEs impact depression and excessive alcohol use similarly across men and women. With the exception of heavy drinking, ACEs appear to have the same association with excessive alcohol use across race/ethnicity. It may be prudent to further investigate why the relationship between ACEs and heavy drinking may differ by race/ethnicity such that prevention strategies can be developed or refined to effectively address the needs of all sub-groups.

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Conflicts of interest

The authors have no conflicts of interest to report.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

1. Introduction

Identifying, understanding, and addressing factors associated with inequitable distribution of health risks and problems, including various forms of violence, is a leading principle that undergirds the field of public health. Understanding factors that place groups at greater risk for poor outcomes can inform development of effective prevention and intervention strategies and help assure that limited resources are used efficiently while addressing the needs of the most vulnerable. With regard to mental health and alcohol use problems a significant amount of evidence exists which indicates that outcomes differ by both sex and race/ethnicity. The current study, thus, aims to further understanding regarding these differences.

Studies have indicated that males are at increased risk for heavy drinking and binge drinking; while females are at increased risk for mental health conditions, such as depression (Hasin, Goodwin, Stinson, & Grant, 2005; Wittchen, Zhao, Kessler, & Eaton, 1994). Additionally, studies have indicated that whites are more likely than racial/ethnic minorities to consume alcohol, engage in at risk alcohol use (Keyes et al., 2015) and to have mood disorders (Hasin et al., 2005; Kessler, Berglund, Demler, & et al., 2003; Williams, González, Neighbors, & et al., 2007). Research also reveals that though some racial/ethnic minorities tend to consume less alcohol they are at greater risk of experiencing substance abuse or dependence (Mulia, Ye, Greenfield, & Zemore, 2009; Witbrodt, Mulia, Zemore, & Kerr, 2014; Zapolski, Pedersen, McCarthy, & Smith, 2014).

A number of factors, from many levels of the social ecology, may influence the processes that give rise to these differences. Given adverse childhood experiences (ACEs) are known to be associated with increased risk of these negative outcomes, one potential explanation may be that the sexes and individuals from different race/ethnic groups are differentially exposed to ACEs and that this may give rise to disparities in mental health and alcohol use outcomes. ACE measures traditionally include different types of child abuse and neglect and several household related challenges (e.g., parental mental health and intimate partner violence, household member incarceration and etc.). Given that racial/ethnic minorities have faced historic and contemporary processes of discrimination that have increased the odds of exposure to social and economic disadvantage (Darity, 2005), and that poverty is highly correlated with child abuse and neglect (Su et al., 2015), it is reasonable to expect that studies would indicate that racial/ethnic minorities would experience higher ACE burden than other groups. Similarly, structural factors may also place females at greater risk of ACE exposure. Certain structural factors (e.g., gender pay inequity) and social norms (e.g., norms not supportive of gender equity; hostile attitudes towards women) may contribute to development of environments that offer female as compared to male children more risk for, or less protection against adversities (Graham-Bermann & Brescoll, 2000; Lansford, Deater-

Deckard, Bornstein, Putnick, & Bradley, 2014). Given research has demonstrated that higher ACE exposure is associated with poorer health outcomes (Felitti et al., 1998; Gilbert et al., 2015) it is important to further understanding of population sub-group differences in the burden of ACEs by sex and race/ethnicity and potential differential impact of ACEs on mental health and excessive alcohol use.

Early ACE research, utilizing a clinic based sample in a single state, indicated women more frequently reported ACEs, but did not specify whether differences were statistically significant (Anda et al., 1999). More recent survey based research with representative data from a limited number of states indicates that men and women have similar prevalence of many ACEs. Noted differences include women more frequently report sexual abuse, substance abuse and mental illness in the home, and multiple ACEs (CDC, 2010; Cunningham et al., 2014); and men more frequently report exposure to verbal abuse (Cunningham et al., 2014). The limited extant research on racial/ethnic differences in ACEs is mixed. The few studies that assess differences consistently indicate that compared to non-Hispanic whites, non-Hispanic blacks and Hispanics more often report multiple ACEs (CDC, 2010; Gilbert et al., 2015). One study though indicates non-Hispanic blacks report the lowest prevalence on most ACEs (CDC, 2010); while another study indicates non-Hispanic blacks and Hispanics compared to non-Hispanic whites more frequently report ACEs that are not necessarily directed at the child but are reflective of challenges that exist in the household (Lee and Chen, in progress).

Numerous studies have linked adverse childhood experiences to poor mental health outcomes (Afifi, Boman, Fleisher, & Sareen, 2009; Afifi et al., 2008; Anda et al., 2002; Chapman et al., 2004; Dube et al., 2001; Edwards, Holden, Felitti, & Anda, 2003; Isohookana, Riala, Hakko, & Räsänen, 2013; Lu, Mueser, Rosenberg, & Jankowski, 2008; Schilling, Aseltine, & Gore, 2007; Schilling et al., 2008; Stein, Leslie, & Nyamathi, 2002; Young, Abelson, Curtis, & Nesse, 1997) and problem substance use behaviors, motives, and outcomes in adulthood (Afifi et al., 2009; Anda et al., 2007, 2002; Chung et al., 2010; Douglas et al., 2010; Dube, Anda, Felitti, Edwards, & Croft, 2002; Dube et al., 2003, 2006; Felitti et al., 1998; Rothman, Edwards, Heeren, & Hingson, 2008; Stein et al., 2002). Additionally, a number of studies have linked individual and combined adversities to adolescent outcomes, such as early initiation of alcohol use, binge drinking, and heavy episodic drinking (Dube et al., 2006; Rothman et al., 2008; Shin, Edwards, & Heeren, 2009). Evidence regarding mediators of relationships between adversities and such outcomes in adolescence and adulthood is currently limited. An understanding of factors that moderate such relationships is also lacking as studies have rarely examined race/ethnicity and sex differences in the impact of ACEs on these outcomes. Furthermore, the limited extant research primarily focuses on assessing sex differences and findings have been mixed.

For example, a community-based study of childhood adversity that drew its sample from public schools in a major U.S. metropolitan area cautiously reports (because the number of male students that reported sexual victimization was small) that among these youth sexual abuse was more detrimental to male than female depression and drug use (Schilling et al., 2007). Another study conducted in northern Europe suggests accumulation of ACEs (i.e., experiencing three or more) increases the risk of hopelessness in women, but not men

(Haatainen et al., 2003). A study utilizing a community based U.S. urban sample did not detect sex differences in the relationship between ACEs and mental health and substance use outcomes (Mersky, Topitzes, & Reynolds, 2013). In contrast, a study on race/ethnicity and sex differences that utilized a sample from male and female correctional facilities in the U.S. found associations between sexual abuse and depression were stronger for men and greatest for non-Hispanic black men; while net of exposure to several types of ACEs, non-Hispanic Blacks and Hispanics were significantly less depressed than non-Hispanic white men and women (Roxburgh & MacArthur, 2014). The only other study we are aware of that identifies racial/ethnic differences in ACE impact reports associations between parental alcohol or drug use and cumulative ACEs (i.e., experiencing five or more) and depression among non-Hispanic whites but not non-Hispanic blacks or Hispanics (Schilling et al., 2007). Since the few studies on sex and race/ethnic specific associations of ACEs, mental health, and substance use problems lack consistency – utilize very different samples (e.g., U.S. metropolitan area school district, urban, and correctional samples as well as a European community based sample), assess different outcomes (e.g., hopelessness, depression, alcohol use, and drug use) – and offer mixed findings, both with respect to sex and race/ethnicity, additional research is needed to better understand whether these factors moderate the impact of ACEs on these outcomes. As strategies regarding how best to intervene and or prevent early and long-term implications of ACEs on mental health and alcohol use are developed and refined, they should also build on what is known about whether sex and race/ ethnicity act as moderators. Such information may help inform whether and in what ways strategies should focus on the needs of population sub-groups.

Additionally, studies on ACEs have typically examined individual and cumulative effects of ACEs as compared to the impacts of direct forms of adversity (e.g., experiences directed at the child – child abuse) and indirect forms of adversity (e.g., experiences within the household that can affect the child – household challenges). A significant number of studies on ACEs have also relied on clinic-based samples (Afifi et al., 2008; Anda et al., 2007; Chapman et al., 2004; Chung et al., 2010; Dube et al., 2001, 2002, 2003, 2006; Lu et al., 2008; Young et al., 1997). Thus, to address gaps in the current literature we will utilize data from the largest, on-going, U.S. state-based, random digit dialed health survey system, the Behavioral Risk Factor Surveillance System (BRFSS), which in recent years has included an optional ACE module. Namely, the current paper will examine whether: (1) relationships between ACEs and outcomes such as depression and excessive alcohol use differ by race/ ethnicity and sex; and (2) impacts differ by exposure type [e.g., child abuse (direct) and household challenges (indirect)].

Given previous research indicating female and non-Hispanic white vulnerability to depression; male and non-Hispanic white vulnerability to risky alcohol behaviors; as well as the more limited information on risk of ACEs, broadly measured, to female and non-Hispanic white mental health the study hypotheses are as follows: (1) the association between ACEs and mental health outcomes will be stronger for women as compared to men and non-Hispanic whites as compared to other racial/ethnic groups; and (2) the association between ACEs and excessive alcohol use (including heavy drinking and binge drinking) will be stronger for men as compared to women and non-Hispanic whites as compared to other racial/ethnic groups. Similarly, given that ACEs can impact in direct and indirect ways, we

expect individuals who report direct experiences (e.g., child abuse) will be at greater risk for poor outcomes than those who report indirect experiences (e.g., household challenges). We also expect that those who report they had both direct and indirect experiences (e.g., both child abuse and household challenges) will be at greatest risk for depression and excessive alcohol use.

2. Methods

2.1. Sample

The data comes from the Behavioral Risk Factor Surveillance System. BRFSS is an on-going, cross-sectional, state-based system designed for measuring health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury in the U.S. population, persons aged 18 years or older, who live in households. In 2010 this data was collected via landline telephone interviews. BRFSS data are weighted to take into account differences in the probability of selection at various stages of sampling and to adjust the differences in age, race, and sex between the sample and the study population, thus allowing for the generalization of findings to the adult population. The current study specifically utilizes a collection of probability samples from 10 states (Hawaii, Maine, Ohio, Nebraska, Nevada, Pennsylvania, Utah, Vermont, Washington, Wisconsin) and the District of Columbia, where the optional ACE module was included in the survey. Five of these states, Hawaii, Nevada, Vermont, Wisconsin and Ohio, also included the Anxiety/Depression optional module. All states included alcohol measures as a part of the core survey. As the analysis dataset used in this study is a subset of data from 2010 BRFSS rather than the entire 2010 BRFSS data (BRFSS, 2010), appropriate weight components were applied such that based on analysis results, statistical inference about ACE experiences and alcohol behaviors can be made about the adult population in those 11 locals where the ACE module and core survey were administered. Similarly statistical inference about ACE experiences and depression can be made about the adult population in the 5 five locals where the ACE module and the Anxiety/Depression module were administered.

Of the 11 locales that implemented the ACE module in 2010, response rates calculated using the formula defined by the Council of American Survey Research Organizations (CASRO) – the percentage of known and likely eligible units that are complete or partially complete (completed more than 50% of the core questionnaire interviews) – ranged from 47% in Pennsylvania to 68.8% in Nebraska, with a median of 52.8% (CDC, 2010). The calculation assumed that units with unknown eligibility status had the same proportion of eligible and ineligible units in the known portion of the sample, thus an estimated percentage of the unknown eligibility units were included in the denominator of the response rate computational formula to provide conservative response rates. Additionally, the cooperation rate, defined by CASRO as the proportion of all respondents interviewed among all eligible units in which a respondent was selected and actually contacted, ranged from 68.8% in Washington to 82.4% in Nebraska, with a median of 74.1%.

There are 60,598 respondents (23,966 males and 36,632 females) in the analysis dataset. The analyses are based on the 98% of respondents who had non-missing race/ethnicity information; thus, other reports and articles that use 2010 data may contain different

estimates. The weighted race/ethnic breakdown of the weighted sample is as follows: Hispanic (4.0%), non-Hispanic black (5.1%), and non-Hispanic white (82.9%). These categories were included as they were the grouping with sufficient numbers to analyze separately. We concluded that combining all other categories into a single group would produce results that were uninformative. Thus, all other categories were omitted from the analysis. Ages of the respondents ranged from 18 to 99 years with a mean age of 48 years old. Slightly more than 34% were between 18 and 39 years, while 40% were between 40 and 59 years, and 26% were age 60 or older. Females comprised about 51% of the population; while males comprised about 49%.

Data analyses in this study were conducted using SUDAAN (version 11.0.1), a complex survey data analysis software designed for properly accounting for sampling design features such as unequal probability of sample selection and stratification.

2.2. Measures

The BRFSS questionnaire is comprised of core questions, optional CDC modules, and state-added questions. States ask all core questions; and they can also choose to include optional modules or include state added questions. In 2010 additional items on adverse childhood experiences were included as an optional module in 11 locales. The ACE module consists of 11 questions that assess experience prior to age 18 with nine types of childhood adversity including emotional, physical and sexual abuse; mental illness, alcoholism and drug abuse in the household; parental intimate partner violence and separation or divorce; and presence in the home of someone who experienced incarceration.

The nine individual ACE types are based on the following 11 questions: "*Now, looking back before you were 18 years of age*" – (1) Did you live with anyone who was depressed, mentally ill or suicidal? (ACE1); (2) Did you live with anyone who was a problem drinker or alcoholic? (ACE2); (3) Did you live with anyone who used illegal street drugs or who abused prescription medications? (ACE3); (4) Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facilitates? (ACE4); (5) Were your parents separated or divorced? (ACE5); (6) How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up? (ACE6); (7) Before age 18, how often did a parent or adult in your home ever hit, beat, kick or physically hurt you in any way? Do not include spanking. (ACE7); (8) How often did a parent or adult in your home ever swear at you, insult you, or put you down? (ACE8); (9) How often did anyone at least 5 years older than you or an adult, ever touch you sexually? (ACE9); (10) How often did anyone at least 5 years older than you or an adult try to make you touch them sexually? (ACE10); (11) How often did anyone at least 5 years older than you or an adult, force you to have sex? (ACE11).

Questions one through eight map onto individual ACE measures – Household Mental Illness, Household Alcoholism, Household Drug Abuse, Incarceration History in Home, Parental Separation or Divorce, Parental Intimate Partner Violence, Physical Abuse, and Emotional Abuse. Each measure was coded "yes" if a respondent endorsed the respective experience. The sexual abuse measure was constructed using items 9 through 11. If a respondent answered positively any of the 3 items they were coded "yes" for sexual abuse.

In addition, three dichotomous ACE measures were computed for descriptive analyses to code respondents by experience type: (1) household challenges only, (2) child abuse only, or (3) both household challenges and child abuse. Last, a 4 category ACE variable was computed for logistic regression models with the following categories: (1) child abuse only, (2) household challenges only, (3) both child abuse and household challenges, and (4) neither child abuse nor household challenges.

Mental health measures came from two areas of the survey. The first measure is based on the following survey item: (1) "Has a doctor or other healthcare provider EVER told you that you have a depressive disorder (including depression, major depression, dysthymia, or minor depression)?". Those who answered affirmatively were coded for lifetime depression diagnosis. The second measure – current depression – was constructed using 8 questions that comprise the brief Patient Health Questionnaire (PHQ) screen for major depressive disorder. The PHQ-8 is a standardized and validated set of questions that asks about the number of days in the past 2 weeks the respondent had experienced a particular depressive symptom (e.g., little interest or pleasure in doing things; feeling down, depressed, or hopeless; trouble falling or staying asleep or sleeping too much; feeling tired or having little energy; poor appetite or overeating; feeling bad about yourself; trouble concentrating; moving or speaking so slowly (or the opposite) that others could have noticed). The scores are summed to produce a total score between 0 and 24 points. A score greater than or equal to 10 is frequently used as a cut point and typically represents clinically significant depression (Kroenke et al., 2009). The cut-point for the current measure was set at 8 based on research indicating there are no significant differences in the diagnostic properties of the PHQ for cut off scores between 8 and 11 (Manea, Gilbody, & McMillan, 2012).

Last, we assessed two measures of excessive alcohol use, including binge drinking and heavy drinking. Since women absorb and metabolize alcohol differently than men, sex differences were taken into account by BRFSS when the measures were computed. Male participants were coded as binge drinkers if in the past 30 days, on one occasion they consumed 5 or more drinks, females were coded as binge drinkers if in the same period of time they consumed 4 or more drinks. Similarly, male respondents who reported they had more than two drinks a day and female respondents who reported they had more than one drink per day were coded as heavy drinkers.

2.3. Analysis

While point estimates in prevalence were made for the adult population of interest, the differences in prevalence by sex and by race/ethnicity were evaluated by using chi-square test statistics comparing across subgroups. In addition to prevalence estimates and tests of differences, associations between ACE domains and outcomes of interest were ascertained with consideration of potential interacting and confounding effects using mathematical modeling and following model building hierarchical principles. Specifically, logistic models were built to assess whether experiencing child abuse, household challenges, or both child abuse and household challenges as compared to experiencing neither was associated with each outcome of interest (current and lifetime depression, binge drinking and heavy drinking) and whether the association was modified by sex and race/ethnicity. Preliminary

models with a number of potential confounders (e.g., marital status, education, and income) were tested. After observing weak effects a decision was made to focus on the most parsimonious model. The final models were adjusted for age. When an interaction term was found to be significant, stratified analysis were conducted to further assess associations.

3. Results

3.1. Descriptive analyses

Most frequently reported ACEs were as follows: emotional abuse (33%), parental separation/divorce (22%), and household alcoholism (21%). Over 11% of the study population reported only experiencing household challenges, 15% of the study population reported only experiencing some form of child abuse, and 23% of the study population reported experiencing both household challenges and some form of child abuse. With respect to the excessive alcohol use and mental health measures, 16% reported binge drinking, 5% reported heavy drinking, 7% reported ever diagnosed with depression, and 6% reported current depression.

As shown in Table 1, there are differences by sex and race/ethnicity for the many individual ACEs and the ACE types. Household mental illness, parental separation/divorce, incarceration history in home, emotional abuse, household challenges only, child abuse only, and both child abuse and household challenges differed significantly by sex. Females more frequently reported household mental illness, parental separation/divorce and challenges in the childhood home. Males more frequently reported having lived in a home with someone who had a history of incarceration and experiencing emotional abuse, only child abuse, and both child abuse and household challenges. With respect to race/ethnicity, household challenges ACEs – household drug abuse, parental separation/divorce, incarceration history in home, parental intimate partner violence – were more frequently reported by non-Hispanic blacks and Hispanics as compared to non-Hispanic whites. Hispanics, though, more frequently reported childhood physical abuse and household alcoholism than non-Hispanic whites. Furthermore, non-Hispanic blacks were significantly less likely than non-Hispanic whites to report experiencing child abuse only. The most prevalent ACE, emotional abuse, significantly differed by sex but not by race/ethnicity.

Most ACEs were found to be associated with the four outcomes of interest. Individuals who reported particular ACEs compared to those who did not, more frequently indicated depression and excessive alcohol use (see Table 2). Additionally as shown in Table 3, there were significant differences by sex for all outcome measures. Specifically, as expected, significantly higher proportions of males as compared to females reported binge drinking (22.0% vs. 11.0%), and heavy drinking (5.6% vs. 4.6%); while significantly higher proportions of females reported diagnosed depression (20.6% vs.13.4%) and current depression (16.4% vs. 11.7%). In contrast, significant race/ethnicity differences were not found for depression and the only association identified for excessive alcohol use was binge drinking. Binge drinking was significantly more prevalent among non-Hispanic Whites than among non-Hispanic Blacks (16.9% and 10.8%, respectively).

3.2. Multivariate analyses

As described in the Methods section, the relationship between each of the four outcome variables and sex, age, race/ethnicity, and ACE type measures were modeled using logistic regression. Results, as shown in Table 4, indicate consistent positive associations between the ACE types and outcomes of interest. However, only in the case of depression outcomes, were the odds ratios for those who experienced both child abuse and household challenges significantly higher than those who experienced only child abuse or household challenges. Additionally, across all outcomes of interest, odds ratios for child abuse only and household challenges only did not appear to differ.

When ACE by sex and ACE by race/ethnicity interaction terms were included in each model, only one model indicated a significant interaction. There were no significant ACE by sex interactions for depression or excessive alcohol use outcomes. The heavy drinking and race/ethnicity interaction, however, was statistically significant. Thus, stratified analyses were further conducted to ascertain the association between ACE type measure and heavy drinking behavior while controlling for sex and age. As shown in Table 5, ACE type was significantly associated with heavy drinking for all groups, but in different ways.

More specifically, non-Hispanic whites who reported child abuse only compared to those who reported neither child abuse or household challenges were 1.5 times as likely to report heavy drinking. Non-Hispanic whites who reported both child abuse and household challenges compared to those who reported neither were nearly 2 times as likely to report heavy drinking. Last, among non-Hispanic whites, only experiencing household challenges did not increase risk of heavy drinking. In contrast, Hispanics who reported household challenges only compared to Hispanics who reported neither child abuse or household challenges were 5.8 times as likely to report heavy drinking. Hispanics who reported both child abuse and household challenges compared to those who reported neither were 11 times as likely to report heavy drinking. For Hispanics who reported child abuse only, there was no indication of increased the risk of heavy drinking. Last, non-Hispanic blacks who reported child abuse only or household challenges only were over 3 times as likely as non-Hispanic blacks who reported neither to report heavy drinking.

In summary, analysis results indicated that: (1) household challenges only increased the risk of heavy drinking for non-Hispanic blacks and Hispanics; (2) child abuse only increased the risk of heavy drinking for non-Hispanic blacks and non-Hispanic whites; and (3) exposure to both household challenges and child abuse increased the risk of heavy drinking for Hispanics and non-Hispanic whites.

4. Discussion

The objectives of this study were to use a large, non-clinical, probabilistic sample to assess whether: (1) relationships between ACEs and outcomes such as depression and excessive alcohol use differ by race/ethnicity and sex; and (2) impacts differ by ACE type [e.g., child abuse (direct) and household challenges (indirect)]. Using ACE measures from the 2010 BRFSS data from 10 states and the District of Columbia we found associations between

ACEs and both types of health measures. These results were largely consistent with those in the wider literature on the impact of ACEs on mental health and substance use behaviors.

Our study, however, extends the literature in a number of ways. The BRFSS sample in this analysis, though not representative of the entire country as a result of voluntary adoption of the ACE module by states, is a collection of probabilistic samples from nearly every U.S. region. Given this, the current study findings contribute to the literature by providing evidence in support of a general impact of ACEs on mental health and excessive alcohol use. Second, our findings indicate that child abuse and household challenges independently increase the risk of depression, binge drinking and heavy drinking. This suggests that there may be value in examining underlying mechanisms between these ACE types and the aforementioned health problems and risk behaviors. Last, though sex was not found to moderate the relationship between the ACE types and the measures of interest, findings suggest that race/ethnicity may moderate the relationship between ACE types and heavy drinking.

Thus, though the main effect of sex on mental health outcomes was larger for women than men, as expected; the effect of ACEs across the sexes was the same. Similarly, the effect of sex on excessive alcohol use was larger for men than women; but, the effect of ACEs on risky alcohol behaviors were the same across the sexes. With respect to race/ethnicity, expected differences in mental health outcomes were not found and the impact of ACEs on depression was the same across race/ethnic subgroups. Expected race/ethnic differences in binge drinking were, however found; but, again, the impact of ACEs on binge drinking was the same across race/ethnic sub-groups. Last, expected race/ethnic differences in heavy drinking were not found; but, the impact of ACEs on heavy drinking was found to differ by race/ethnic group. Thus, the study findings indicate that ACEs did not differentially increase odds of excessive alcohol use in men as compared to women; but did increase likelihood of heavy drinking among certain racial/ethnic minority groups. Instead of greatest impact among, non-Hispanic whites, the findings indicate the odds ratio for Hispanics who reported both child abuse and household challenges was significantly higher than that of non-Hispanic whites who reported both. This is important given the paradoxical evidence regarding lower (or similar) alcohol consumption, yet higher alcohol problems among some racial/ethnic groups (Mulia et al., 2009; Witbrodt et al., 2014; Zapolski et al., 2014).

These findings should be interpreted within the context of limitations. First the data are self-reported. Such data are subject to potential recall bias. Additionally, given the sensitive nature of the questions, the data are potentially affected by the desire of respondents to provide socially desirable responses. If respondents did not recall or chose not to reveal childhood adversity, mental health diagnoses, or risky alcohol use behaviors, the power to detect significant differences may have been reduced or strength of associations may have been under-estimated. Additional factors related to study design may have also influenced findings. For example, individuals without landline telephones and who lived in institutions were excluded from the survey. Cellphone only users tend to be younger, more disadvantaged, and more likely to have engaged in binge drinking (Blumberg, Luke, & Cynamon, 2006). Individuals in institutions may have higher likelihood of childhood adversity and consequent mental health and alcohol related problems. Furthermore, age may

have bearing on willingness to disclose sensitive information. The study sample is skewed toward older, non-Hispanic whites, perhaps due to these and other reasons. In comparison to the original ACE study sample, the sample in the current study was slightly younger and slightly less racially diverse, which limits generalizability of the findings. However, the sample was large enough to allow examination of moderation by race/ethnicity and findings can be generalized to sample specific locales which reflect most regions of the United States. Though beyond the scope of this study, it is possible that within group differences may have influenced the outcomes. For example, outcomes for English-speaking Hispanics and Spanish-speaking Hispanics may have been different for a number of reasons, including acculturation. Another measurement limitation is that the operationalization of heavy drinking has changed since the BRFSS data was collected in 2010. The measure now focuses on high average weekly consumption rather than per day metrics. Last, given previous research indicates an association between binge drinking and population level alcohol policies (Naimi et al., 2014) it is possible that the alcohol policy environment in the locales included in the study sample may moderate patterns of excessive drinking. Policy environment was not included in the analysis; however, resources were examined and indicate that the policy environments in the states that comprise the sample were somewhat similar (CDC, 2016; Naimi et al., 2014).

Given the harms associated with early onset of mental health problems and excessive alcohol use it is important to identify effective approaches to prevent or interrupt negative outcomes. Better understanding of whether and why risk operates differently for subgroups can assist in these efforts. As such, findings of the current study suggest that additional research may be warranted regarding the moderating effect of race/ethnicity on the relationship between childhood adversity and heavy drinking. Studies that further understanding of which ACEs are most prevalent and salient for which subgroups as well as whether mediating mechanisms operate differently by subgroup have important implications for the development of culturally competent primary prevention initiatives that promote creation of safe, stable, nurturing relationships and environments to prevent and or interrupt risks conferred by childhood adversity. CDC suggests that such prevention initiatives be comprehensive – including components such as economic supports for families, social norms changes around parenting, and quality and accessibility improvements in child care and education (Fortson, Klevens, Merrick, Gilbert, & Alexander, 2016). Understanding subgroup specific risks will strengthen development of such comprehensive approaches by enabling practitioners and policy makers to tailor strategic components in ways that may enhance prevention effectiveness among population subgroups. Furthermore, given there is evidence that population level alcohol policies are effective in reducing excessive drinking (The Community Guide Task Force, 2015) it is possible that such policies may reduce adversity in the lives of children, which in turn may influence long term reductions in excessive alcohol consumption.

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Table 1

Weighted Analyses, Prevalence of Adverse Childhood Experiences (ACEs) by Sex and by Race/Ethnicity, Behavioral Risk Factor Surveillance System, Ten States and the District of Columbia, 2010.

Adverse Childhood Experience	Female%	Male%	p	Non-Hispanic, Black%	Hispanic%	Non-Hispanic, White%	p
Household Mental Illness S	19.83	13.67	<0.001	13.29	14.20	17.14	0.01
Household Alcoholism R	24.97	19.87	0.63	25.99	**28.43**	22.18	0.01
Household Drug Abuse R	9.74	9.46	0.61	**16.30**	**15.21**	8.95	<0.001
Parental Separation/Divorce S,R	23.77	23.35	0.03	**45.02**	**30.94**	22.22	<0.001
Incarceration History in Home S,R	5.55	6.69	0.02	**16.32**	**11.78**	5.11	<0.001
Parental IPV R	16.08	14.48	0.72	**22.55**	20.69	14.28	<0.001
Physical Abuse R	16.61	16.37	0.07	17.24	**24.42**	15.77	<0.001
Emotional Abuse	35.01	36.58	<0.001	32.55	37.48	35.81	0.18
Sexual Abuse	14.89	6.21	0.06	12.45	12.06	10.31	0.10
ACE Type							
Child Abuse only S,R	13.47	16.86	<0.001	**11.31**	14.90	15.48	0.01
Household Challenges only S	12.12	10.56	0.01	13.82	13.31	11.21	0.07
Both S	34.37	43.70	<0.001	32.13	37.05	39.53	0.05

Note: Chi-square tests indicated significance at p < 0.05.

S = Female prevalence significantly different from male prevalence.

R = Black and/or Hispanic prevalence significantly different from White prevalence; sub-group meeting criteria for significance highlighted in bold.

Table 2

Prevalence of Outcomes by Adverse Childhood Experience(s), Behavioral Risk Factor Surveillance System, 2010.[a]

Adverse Childhood Experience	Current Depression%	Diagnosed Depression%	Binge Drinking%	Heavy Drinking%
Household Mental Illness				
Y	32.34	38.26	19.21	6.99
N	10.72 [*]	13.20 [*]	15.68 [*]	4.81 [*]
Household Alcoholism				
Y	26.65	28.52	20.46	7.80
N	10.24 [*]	13.62 [*]	15.04 [*]	4.41 [*]
Household Drug Abuse				
Y	30.84	31.65	26.05	8.88
N	12.10 [*]	15.41 [*]	15.19 [*]	4.72 [*]
Parental Separation/Divorce				
Y	20.85	22.40	20.75	6.52
N	11.61 [*]	15.29 [*]	14.84 [*]	4.70 [*]
Incarceration History in Home				
Y	32.68	27.15	25.43	9.12
N	12.73 [*]	16.40 [*]	15.65 [*]	4.91 [*]
Parental IPV				
Y	29.89	30.68	19.85	6.74
N	10.87 [*]	14.45 [*]	15.52 [*]	4.79 [*]
Physical Abuse				
Y	29.74	33.29	19.92	7.50
N	10.77 [*]	13.57 [*]	15.57 [*]	4.71 [*]
Emotional Abuse				
Y	22.90	26.46	19.96	6.71
N	9.20 [*]	11.81 [*]	14.24 [*]	4.25 [*]
Sexual Abuse				
Y	35.09	39.42	16.86	6.49
N	11.49 [*]	14.26 [*]	16.28	4.93 [*]
Child Abuse only				
Y	11.30	14.80	18.59	5.37
N	14.64 [*]	17.48	15.93	5.05
Household Challenges only				
Y	15.15	16.36	17.14	5.19
N	13.96 [*]	17.13	16.23	5.08
Child Abuse & Household Challenges				
Y	11.30	14.80	18.59	5.37
N	28.75 [*]	33.06 [*]	20.14	7.57 [*]

[*] Chi-square tests indicated significance at p < 0.05.

[a] Five states included the Anxiety/Depression Module, Ten states and D.C. included the ACE module and Alcohol Measures from the core survey.

Table 3

Prevalence of Outcomes by Sex and by Race/Ethnicity, Behavioral Risk Factor Surveillance System, 2010.[a]

Outcomes	Female%	Male%	p	Non-Hispanic, Black %	Hispanic %	Non-Hispanic, White %	p
Current Depression[S]	16.38	11.72	< 0.001	18.08	11.38	13.79	0.08
Diagnosed Depression[S]	20.55	13.38	< 0.001	16.78	13.65	17.61	0.33
Heavy Drinking[S]	4.59	5.64	0.01	4.22	3.60	5.34	0.07
Binge Drinking[S,R]	11.02	21.97	< 0.001	**10.84**	15.57	16.89	< 0.001

Note: Chi-square tests indicated significance at p < 0.05.

S = Female prevalence significantly different from male prevalence.

R = Black and/or Hispanic prevalence significantly different from White prevalence; sub-group meeting criteria for significance highlighted in bold.

[a]
5 states included the ACE and Anxiety/Depression Modules, 10 states and D.C. included the ACE module and Alcohol Measures from the core survey.

Table 4

Association between the ACE Measure and Depression and Binge Drinking, Adjusted Odds Ratio (95% CI). Behavioral Risk Factor Surveillance System, 2010.[a]

	Current Depression	Diagnosed Depression	Binge Drinking
Sex (Male, reference)			
Female	1.39 (1.13–1.73)[*]	1.63 (1.34–1.98)[*]	0.45 (0.40–0.51)[*]
Race/Ethnicity (White, reference)			
Non-Hispanic, Black	1.22 (0.86–1.74)[NS]	0.84 (0.58–1.22)[NS]	0.51 (0.38–0.70)[*]
Hispanic	0.69 (0.45–1.07)[NS]	0.69 (0.41–1.14)[NS]	0.63 (0.49–0.83)[*]
ACE Type (Neither, reference)			
Child Abuse	1.86 (1.36–2.55)[*]	1.74 (1.32–2.28)[*]	1.39 (1.18–1.65)[*]
Household Challenges	2.41 (1.69–3.42)[*]	1.81 (1.34–2.44)[*]	1.36 (1.12–1.65)[*]
Both	5.58 (4.32–7.22)[*]	4.91 (3.91–6.16)[*]	1.49 (1.29–1.72)[*]

Note: Models adjusted for age, race/ethnicity, and sex.

NS = Not significant.

[*] Significance level: $p < 0.05$.

[a] 5 states included the ACE and Anxiety/Depression Modules, 10 states and D.C. included the ACE module and Alcohol Measures from the core survey.

Table 5

Association between the ACE Measure and Heavy Drinking, Stratified by Race/Ethnicity, Adjusted Odds Ratio (95% CI). Behavioral Risk Factor Surveillance System, Ten States and the District of Columbia, 2010.

Independent Variables	1: Non-Hispanic Black	2: Hispanic	3: Non-Hispanic White
Sex (Male, reference)			
Female	0.83 (0.37–1.87)[NS]	0.23 (0.10–0.53)[NS]	0.85 (0.72–1.02)[NS]
ACE Type (Neither, reference)			
Child Abuse	3.17 (1.12–9.00)[*]	1.28 (0.28–5.80)[NS]	1.47 (1.14–1.91)[*]
Household Challenges	3.62 (1.28–10.20)[*]	5.84 (1.77–19.28)[*]	1.34 (0.99–1.82)[NS]
Both	2.46 (0.95–6.40)[NS]	11.19 (3.86–32.42)[*]	1.98 (1.60–2.45)[*]

Note: Models adjusted for age and sex.

NS = Not significant.

[*]Significance level: $p < 0.05$.