

Washington University School of Medicine

Digital Commons@Becker

---

Open Access Publications

---

2018

## Risk factors associated with gambling involvement among a national sample of African American and European American young adults

Manik Ahuja

*Washington University in St. Louis*

Renee Cunningham-Williams

*Washington University in St. Louis*

Kimberly B. Werner

*University of Missouri-St. Louis*

Kathleen K. Bucholz

*Washington University School of Medicine in St. Louis*

Follow this and additional works at: [https://digitalcommons.wustl.edu/open\\_access\\_pubs](https://digitalcommons.wustl.edu/open_access_pubs)

**Please let us know how this document benefits you.**

---

### Recommended Citation

Ahuja, Manik; Cunningham-Williams, Renee; Werner, Kimberly B.; and Bucholz, Kathleen K., "Risk factors associated with gambling involvement among a national sample of African American and European American young adults." *Journal of Substance Abuse & Alcoholism*. 6, 3. 1081. (2018).

[https://digitalcommons.wustl.edu/open\\_access\\_pubs/7433](https://digitalcommons.wustl.edu/open_access_pubs/7433)

This Open Access Publication is brought to you for free and open access by Digital Commons@Becker. It has been accepted for inclusion in Open Access Publications by an authorized administrator of Digital Commons@Becker. For more information, please contact [vanam@wustl.edu](mailto:vanam@wustl.edu).

## Research Article

# Risk Factors Associated With Gambling Involvement among a National Sample of African American and European American Young Adults

Manik Ahuja<sup>1\*</sup>, Renee M Cunningham-Williams<sup>1</sup>, Kimberly B. Werner<sup>2</sup>, and Kathleen K. Bucholz<sup>3</sup>

<sup>1</sup>Brown School of Social Work, Washington University in St. Louis, USA

<sup>2</sup>Missouri Institute of Mental Health, University of Missouri – Saint Louis, USA

<sup>3</sup>Department of Psychiatry, Washington University School of Medicine, USA

**\*Corresponding author**

Manik Ahuja, Brown School of Social Work, Washington University in St. Louis, Saint Louis, MO 63110, USA, Email: manik.ahuja@wustl.edu

Submitted: 01 October 2018

Accepted: 12 October 2018

Published: 16 October 2018

ISSN: 2373-9363

Copyright

© 2018 Ahuja et al.

OPEN ACCESS

**Keywords**

- Problem gambling and child maltreatment; Gambling involvement; Forms of gambling; Gambling and substance use; Gambling and African American

**Abstract**

In the current research, we examined the association of key risk and protective factors for gambling involvement from the domains of family environment, conduct problems/delinquency, substance use, and depressive psychopathology in a nationally representative sample. The sample was comprised of 13,291 young adults (ages 18-26; Mean age=22.8) self-identifying as European American (n=9,939) or African American (n=3,335) who participated in Wave III (n=15,170) of the restricted-use National Longitudinal Study of Adolescent to Adult Health. We used separate logistic regressions to study participation in specific gambling categories (lottery games, casino-type games, other games). Childhood neglect, physical discipline, and current alcohol use was associated across each of the three gambling categories. Our results also revealed differences between European American and African American subjects. Current cannabis use was associated with all three categories among African Americans, while current cigarette use was associated among European Americans for lottery games, and depression (female) was associated with other games. We also applied multinomial logistic regression to study gambling involvement based on the number of gambling categories that the participant engaged in 2 or more (referent), only 1, or none at all. Our results revealed that delinquency/conduct symptoms (AOR=0.83) along with cannabis use (African American; AOR=0.66), cigarette use (European American; AOR=0.83), current alcohol use (AOR=0.66) were associated with gambling in two categories vs. gambling in one category. Childhood physical discipline (AOR=0.75) and childhood neglect (AOR=0.75) were associated with gambling in two categories vs. no gambling. Further are needed to investigate the developmental pathways leading to increased gambling involvement among African American and European American adolescents and young adults.

**INTRODUCTION**

Gambling among adolescents and young adults is a growing problem with potential for adverse consequences including increases in substance use [1], exacerbation and or development of psychiatric disorders, and gambling problems later in life [2]. Adolescence [2], and young adulthood [3], are periods where risky behaviors such as gambling often begin. Both the availability and access to gambling have continued to grow and it is considered a socially accepted form of entertainment [4], putting more individuals at risk for gambling problems [5]. Known risk factors for problem gambling include childhood maltreatment, delinquency/conduct problems, substance use, and depression [6-13]. There are also differences across race and gender, with males are more likely to gamble than their female counterparts, and African Americans have been found to be disproportionately affected by adverse consequences from gambling in comparison to European Americans [14,15].

**Forms of gambling**

Gambling is available in many forms [16], but all have a common theme: the chance of winning something of greater value than the amount at risk [17], with some forms more addictive than others [7,16]. Gambling comes in many forms such as electronic gaming machines (EGM), sports betting, lotteries, and street gambling (e.g. craps, dice), each with unique characteristics. For example, the characteristics of EGM's offer immediate payout, numerous small wins and are skill-based [7], and are distinct from lottery games which often offer one large payout and has no skill involved. Gambling 'involvement' is often operationalized to reflect the number of forms of gambling in which an individual's participates; for example one who participates in sports betting and craps is considered involved in multiple forms of gambling. High gambling involvement – defined as participating in many forms of gambling – appears to be associated with problem gambling [17-19]. Although an individual may gamble problematically in just one form of

gambling, gambling in multiple forms is more common among problem gamblers [16]. The more numerous and varied forms of gambling that individuals engage in increase the likelihood that they will find a game to their liking, participate regularly, which may lead to problem gambling [16].

### Family environment

Childhood maltreatment and negative family environment during the child rearing years have been associated with problem gambling [20]. Child maltreatment can be defined as either abuse or neglect by a parent or that results in harm, potential for harm, or threat of harm to a child [6,21]. One form of child maltreatment is physical discipline, which involves acts of hitting a child as a means of discipline [22]. Another form of childhood maltreatment is childhood neglect, which has been associated with gambling problems in adults [6,23].

Another aspect of the child rearing environment, and potentially a protective factor for maladaptive outcomes, includes childhood religiosity. Religiosity includes practices and activities that are related to a religious tradition within a community, regular church attendance, belief or adherence to religious doctrines or values [24]. A strong "moral code" in a family regarding behaviors such as gambling may be a protective factor and may explain why those with high religiosity are less likely to gamble excessively or more likely to abstain from gambling [25].

### Delinquency/Conduct problems

Studies have shown that individuals who have gambling problems also engage in other risky behaviors [7,26]. According to Richard and Shirley Jessor's *Problem Behavior Theory*, it is common to engage in multiple risky behaviors [27]. These include illicit drug use, tobacco use, alcohol abuse, and conduct problems/delinquent behaviors [7,26]. Substance use and misuse are known risk factors and co-occurring behaviors for youth and adults reporting gambling problems and gambling disorder [13,20,28,30]. In a nationally representative sample, Petry (2005) found significant associations between gambling problems and substance use disorder where 73.2% had an alcohol use disorder, 60.4% had nicotine dependence, and 38.1% had a drug use disorder [31]. The high prevalence of alcohol misuse among adult gamblers has also been observed among adolescents [32]. Prior studies among adolescents have found daily and weekly alcohol consumption, risky alcohol consumption, cannabis, and regular cigarette smoking to be associated with problem gambling [33-37]. Conduct problems have also been found to be associated with problem gambling [10,26]. Delinquent behaviors such as theft, selling drugs, shoplifting, and engaging in physical fights are common among problem gamblers [38,39].

### Depression

Problem gambling is also known to be associated with depression [40,41]. Others have noted that gambling may be a means to relieve depression symptoms [42]. Engaging in gambling may be viewed as a manifestation of mal-adaptive coping for depression, anxiety, and other affective disorders [43-45]. There is evidence in some studies that females may gamble to alleviate depression [46].

## Racial Differences in gambling involvement

While European Americans gamble at higher rates than African Americans across a lifetime, African American's have a greater likelihood to develop gambling problems once they start gambling [47] and suffer from a higher risk of gambling related consequences. Among gamblers, Cunningham-Williams et al., found that a higher proportion of African Americans in comparison to European Americans endorsed loss of control, financial problems, illegal behaviors, and interference with daily activities associated with gambling [48]. Using a nationally representative sample, Algeria found that African Americans (2.2%) had significantly higher overall prevalence of disordered gambling than European Americans (1.2%). Sacco et al., found that African Americans reported twice the likelihood of endorsing two symptoms of gambling disorder than other race/ethnic groups [49]. Barnes observed that that being African American predicted heavy gambling and problem gambling even after adjusting for problems with alcohol, tobacco, and marijuana use and symptoms of conduct disorder [26].

In this study, we will analyze data from a nationally representative sample from the U.S. in order to elucidate the relationships between key risk and protective factors, specific types of gambling and levels of gambling involvement. We will examine across multiple domains of risk including the family rearing environment, delinquency/conduct problems, substance use, depression, and test for differences across race and gender.

## MATERIALS AND METHODS

### Participants and procedure

This study used survey data from Wave I and Wave III of the National Longitudinal Study of Adolescent to Adult Health (Add Health) [50]. In the Add Health study, over 20,000 American adolescents were initially enrolled starting in grades 7-12. The analytic sample used here was comprised of 13,291 young adults (ages 18-26; Mean age=22.8) who self-identified as European American (74.8%; n=9,939) or African American (25.2%; n=3,352); those who identified as both (n=131) or who chose another race/ethnicity (n=1961) were excluded from these analyses. A complete gambling section was introduced in Wave III, and thus only those who completed Wave III were included in this study as they were queried about their gambling behaviors. Data from other earlier waves were used as described below.

### Measures

**Specific gambling behaviors:** Participants were queried at Wave III whether they had ever gambled in three distinct gambling categories: 1) lottery games (i.e. daily, scratch-offs, or lotto); 2) casino-type games (i.e. casino tables, or video games including craps, blackjack, roulette, slot machines, or video poker) and 3) Other games (consisting of bingo for money, betting on horse races or sporting events, or taken part in any other kinds of gambling for money). Three separate dependent variables were created, based on endorsement of each category including *lottery games*, *casino-type games*, and *other games*, with 1 representing yes, and 0 representing no for each gambling category.

The second outcome investigation used a three level outcome

variable of gambling involvement. Responses were based on how many gambling categories were engaged in: 1) gambled in two or more categories (referent) 2) gambled in one category 3) never gambled.

**Independent variables:** *Physical discipline* and *childhood neglect* were coded as a binary variable with 1 representing any instance, and 0 representing 'never'. To assess physical discipline, participants answered at Wave III 'How often had your parents or other adult care-givers slapped, hit, or kicked you'. Childhood neglect was based on 'By the time you started 6th grade, how often had your parents or other adult care-givers left you home alone when an adult should have been with you?'. *Religiosity* was obtained in Wave I and was coded binary, with 1 representing weekly attendance at religious services once or more per week, and 0 representing less than weekly attendance or non-attendance.

To assess *delinquency/conduct problems*, the following questions from Wave I were used: how often did you: 1) paint graffiti or signs on someone else's property or in a public place? 2) Deliberately damage property that didn't belong to you? 3) Lie to your parents or guardians about where you had been or whom you were with? 4) Take something from a store without paying for it? 5) Get into a serious physical fight? 6) Hurt someone badly enough to need bandages or care from a doctor or nurse? 7) Run away from home? 8) Use a weapon in a fight? 9) How often did you drive a car without its owner's permission? 10) Did you take part in a fight where a group of your friends was against another group? 11) Use a weapon to get something from someone? 12) Sell marijuana or other drugs? A three level variable was created reflecting 3 or more behaviors, 1-2 behaviors, or no behaviors (referent).

*Current cannabis use* was assessed based on report of any instance of cannabis use in the last 30 days from Wave III. *Current cigarette use* was based on report of cigarette smoking in the last 30 days. *Current alcohol use* was based on alcohol use in the last 2 weeks; alcohol use in the past 30 days was not asked. *Depression* was based on participant report from Wave 3 of having received a lifetime diagnosis for depression, with 1 representing yes, and 0 representing no.

### Other variables

Race and gender were coded binary, African Americans as 1 and European Americans as 0. Gender was also coded as 1/0 with females as 1, and males as 0.

*Age* at Wave III interview and *income* and *parent interview* from Wave I were used as control variables in all models. Income was based on parent's report of household income in the baseline wave I interview, and categorized into as high income (>\$75,000), middle income (\$25,000-74,999) (referent), and low income (<\$25,000).

### Statistical analysis

Data preparation was conducted in SAS 9.4 (SAS Institute, 2002-2008), and statistical analyses were conducted with STATA 14 (Stata Corp, 2015).

In Table 1, we display prevalence for all variables assessed

across each specific gambling category; and gambling involvement levels. In Table 2, we used logistic regression; we ran three separate models for each specific type of gambling category to determine significant risk and protective factors. Multinomial regression (Table 3) was used to study the associations of independent variables with levels of gambling involvement (2 or more categories as referent category, 1 category, and non-gamblers).

### Interaction terms

We tested for interactions for race and gender interactions across all independent variables. In the first step, we independently tested each independent variable with our outcome variable separately for significant race interactions. In cases where an interaction was present, we included all significantly associated interaction terms simultaneously in a model. If the interaction remained significant, we re-parameterized them in our final models (Table 2 and Table 3).

## RESULTS AND DISCUSSION

### Results

**Sample characteristics:** Males were over-represented in all gambling categories, compared to their female counterparts in the full sample, and casino type and other games, in 2 or more gambling categories. African Americans were underrepresented consistently across specific types of gambling, 2 or more gambling and were over represented in among those who had never gambled. Some over-representations among those with physical discipline, neglect, current substance use and conduct problems, especially involvement in 2-3 gambling categories.

**Specific gambling types:** Displayed in Table 2 are results from the models testing association of independent variables across gambling categories. Physical discipline (AOR=1.12-1.25) and current alcohol use (AOR=1.56-1.93) were associated across all three gambling categories. Childhood neglect was associated with lottery games (AOR=1.13), casino-type games (AOR=1.27), and a significantly associated race interaction for 'other games', with African Americans (AOR=1.36) at an elevated risk. Current cannabis use reported significant race interactions across all three categories, with African Americans at a higher risk for lottery games (AOR=1.64), casino-type games (AOR=2.31), and 'other games' (AOR=2.17). Current cigarette use was associated with casino-type games (AOR=1.13), 'other games' (AOR=1.27), and a significantly associated race interaction for lottery games among European Americans (AOR=1.47). The interaction of depression and gender was significantly associated for 'other games' in which females with depression (AOR=0.52) were at a significantly lower risk than males. Low income (<\$25,000) was associated with reduced odds for casino-type games (AOR=0.92). Religiosity was not found to be associated with any of the gambling categories.

**Gambling involvement:** We examined the odds of gambling in 1 category, and non-gamblers vs. gambling in two or more categories (referent). Current alcohol use was associated with both gambling in one category (AOR=0.66), and non-gambling (AOR=0.44). Current cigarette use among European Americans was associated with both gambling in one category (AOR=0.83),

**Table 1:** Descriptive Statistics by Forms of Gambling and Levels of Gambling Involvement (N=13,291).

Variable	Lottery Games (n=8,040, 60.5%)	Casino- type games (n=5,895, 44.3%)	Other games (n=5,341, 40.2%)	Gambled in 2 or more Categories (n=7415, 55.8%)	Gambled in 1 category (n=3,240,24.4%)	Non-gamblers (n=3,536, 26.6%)	Total Sample (n=13,291)
	Gambling by Category (n, %)			Levels of Gambling Involvement (n, %)			
Gender							
Male	3925 (48.8)	3117 (52.9)	3100 (58.0)	3450 (53.8)	1302 (40.2)	1437 (39.5)	6189 (46.6)
Female	4115 (51.2)	2778 (47.1)	2241 (42.0)	2965 (46.2)	1938 (59.8)	2199 (60.5)	7102 (53.4)
Race							
African American	1468 (18.8)	1077 (18.3)	1051 (19.7)	1139 (17.8)	795 (24.5)	1318 (39.0)	3352 (25.2)
European American	6572 (81.2)	4818 (81.7)	4290 (80.3)	5276 (82.2)	2445 (75.5)	2218 (61.0)	9939 (74.8)
Income <sup>a</sup>							
Low Income (<\$25,000)	3151 (39.2)	2287 (40.4)	2089 (40.1)	2510 (39.1)	1280 (39.5)	1484 (40.8)	5274 (39.7)
Middle Income (\$25,000-74,999)	3316 (41.2)	2470 (41.9)	2208 (41.3)	2667 (41.6)	1319 (40.7)	1459 (40.1)	5445 (40.1)
High Income (>= \$75,000)	833 (10.4)	594 (10.1)	559 (10.5)	649 (10.1)	346 (10.7)	380 (10.5)	1375 (10.3)
Physical Discipline	2363 (29.4)	1732 (29.3)	1663 (31.1)	1940 (30.2)	870 (26.7)	769 (21.2)	3579 (26.9)
Childhood Neglect	3292 (39.1)	2330 (39.5)	2186 (40.9)	2600 (40.5)	1206 (37.2)	1111 (30.6)	3917 (37.0)
Religious Attendance >1 per week	3061 (38.1)	2215 (37.6)	1996 (37.4)	2421	1257 (38.8)	1393 (38.6)	5079 (38.2)
Current Cigarette Use <sup>b</sup>	3096 (38.5)	2264 (38.4)	2164 (40.5)	2564 (40)	1032 (31.9)	848 (23.3)	444 (33.4)
Current Alcohol Use <sup>c</sup>	3126 (38.9)	2500 (42.4)	2378 (44.5)	2760 (43)	938 (29.0)	664 (18.2)	4362 (32.9)
Current Cannabis Use <sup>b</sup>	2030 (25.3)	1626 (27.6)	1583 (29.6)	1815 (28.3)	622 (19.2)	485 (13.3)	2922 (22.0)
Delinquency/Conduct Problems >=3	514 (6.4)	419 (7.1)	487 (9.1)	501 (7.8)	127 (3.9)	111 (3.1)	739 (5.6)
Delinquency/Conduct Problems, 1-2	2043 (25.4)	1501 (25.5)	1466 (27.4)	1665 (26)	793 (24.5)	797 (21.9)	3255 (24.5)
Depression	928 (11.5)	673 (11.4)	580 (10.9)	719 (11.2)	390 (12.0)	366 (10.7)	1475 (11.1)

Note: <sup>a</sup> 9.1% of the sample refused to report household income, and are not displayed. <sup>b</sup> past 30 day use. <sup>c</sup> past 2 week use

**Table 2:** Adjusted Odds ratios for risk and protective factors by Gambling category.

Independent Variable	Lottery games	Casino-type games	Other games
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Physical Discipline	<b>1.2 (1.10-1.30)***</b>	<b>1.11 (1.02-1.20)***</b>	<b>1.25 (1.15-1.36)***</b>
Childhood Neglect <sup>c</sup>	<b>1.27 (1.16-1.37)***</b>	<b>1.13 (1.05-1.23)***</b>	
African American			<b>1.36 (1.16-1.59)***</b>
European American			1.07 (0.98-1.16)
Religious Attendance >=1 per week	0.96 (0.89-1.04)	0.97 (0.91-1.03)	1 (0.91-1.09)
Current Cigarette Use <sup>c</sup>		<b>1.13 (1.03-1.22)***</b>	<b>1.27 (1.17-1.38)***</b>
European American	<b>1.47 (1.33-1.61)***</b>		
African American	1.15 (0.95-1.39)		
Current Alcohol Use	<b>1.56 (1.43-1.70)***</b>	<b>1.73 (1.59-1.86)***</b>	<b>1.93 (1.78-2.09)***</b>
Current Cannabis Use <sup>c</sup>			<b>1.33 (1.21-1.46)***</b>
African American	<b>1.64 (1.38-1.98)***</b>	<b>2.31 (1.91,2.79)***</b>	<b>2.17 (1.78-2.65)***</b>
European American	<b>1.12 (1.00-1.25)*</b>	<b>1.33 (1.20-1.48)***</b>	<b>1.38 (1.24-1.53)***</b>

Delinquency/Conduct Problems, >=3	0.94 (0.82-1.09)	1.04 (0.91-1.20)	1.1 (0.96-1.26)
Delinquency/Conduct Problems, 1-2	0.93 (0.85-1.02)	1.01 (0.93, 1.10)	0.96 (0.89-1.05)
Depression <sup>d</sup>	0.89 (0.79-1.00)	0.96 (0.85-1.07)	
Female			<b>0.52 (0.46-0.61)***</b>
Male			<b>0.77 (0.63-0.94)**</b>
Female Gender <sup>a</sup>			<b>0.52 (0.48-0.56)***</b>
Low Income	0.93 (0.87-1.01)	<b>0.92 (0.85-0.99)*</b>	0.95 (0.88-1.03)
High Income	0.99 (0.87-1.12)	0.93 (0.83-1.05)	1.02 (0.90-1.15)
Gender (Female) <sup>a</sup>	0.95 (0.87-1.02)	<b>0.76 (0.70-0.82)***</b>	<b>0.56 (0.52-0.61)***</b>
African American <sup>b</sup>	<b>0.44 (0.39-0.48)***</b>	<b>0.51 (0.45-1.54)***</b>	<b>0.59 (0.52-0.66)***</b>
Age	<b>1.16 (1.14-1.19)***</b>	<b>1.29 (1.26-1.31)***</b>	<b>1.09 (1.08-1.11)***</b>

Note: p = .05; \*p < .05; \*\*p < .01; \*\*\*p < .001. <sup>a</sup>males used as reference group. <sup>b</sup> European American used as reference group. <sup>c</sup> Significant interaction with race d=significant interaction with gender. (p <= .05) bolded. AOR=Adjusted Odds Ratio

**Table 3: Association of Risk and Protective Factors by Levels of Gambling Involvement.**

Independent Variable	1 Gambling Category <sup>a</sup>	Non-gamblers <sup>a</sup>
	RRR (95% CI)	RRR (95% CI)
Physical Discipline	0.91 (0.82-1.02)	<b>0.75 (0.67-0.83)***</b>
Childhood Neglect	0.92 (0.83-1.01)	<b>0.75 (0.68-0.82)***</b>
Religious Attendance >=1 per week	0.98 (0.96-1.08)	1.03 (0.97-1.10)
Current Cigarette Use		
European American	<b>0.83 (0.74-0.92)***</b>	<b>0.66 (0.58,0.74)***</b>
African American	0.93 (0.73-1.18)	0.81 (0.65-1.02)
Current Alcohol Use	<b>0.66 (0.60-0.73)***</b>	<b>0.44 (0.39-0.49)***</b>
Current Cannabis Use <sup>b</sup>		
African American	<b>0.65 (0.52-0.84)***</b>	<b>0.35 (0.28-0.45)***</b>
European American	<b>0.73 (0.64-0.83)***</b>	<b>0.7 (0.61-0.81)***</b>
Conduct Problems, >=3	<b>0.83 (0.71-0.99)*</b>	0.94 (0.79,1.11)
Delinquency/Conduct Problems, 1-2	1.01 (0.92-1.13)	1.02 (0.91-1.13)
Depression <sup>c</sup>	1.13 (0.98-1.30)	1.14 (1.28-1.53)
Gender (Female)	<b>1.5 (1.37,1.64)***</b>	<b>1.4 (1.28-1.53)***</b>
Race (African American)	<b>1.38 (1.21-1.57)***</b>	<b>2.66 (2.37-3.00)***</b>
Low Income	<b>1.02 (0.90-1.12)</b>	1.08 (0.98-1.19)
High Income	<b>1.05 (0.91-1.15)</b>	1.04 (0.89-1.21)
Age	<b>0.82 (0.80-0.84)***</b>	<b>0.77 (0.74-0.79)***</b>

Note: p = .05; \*p < .05; \*\*p < .01; \*\*\*p < .001, (p ≥ .05) bolded. <sup>a</sup> Gambled in two or more categories used as reference group. <sup>b</sup> Significant race interaction <sup>c</sup> Significant gender interaction. RRR=Relative Risk Ratio

as well as non-gambling (AOR=0.66). Current cannabis use among African Americans was associated with gambling in one category (AOR=0.66) and non-gambling (AOR=0.35). Among European Americans cannabis use was associated with gambling in one category (AOR=0.73), and non-gambling (AOR=0.70). Childhood physical discipline (AOR=0.75), and childhood neglect (AOR=0.75) were associated only with non-gambling. Endorsing three or more delinquency/conduct problems was associated with gambling in one category (AOR=0.83).

## Discussion

Based on data from a nationally representative sample of

young adults, the current study has identified associations of risk for specific gambling categories and levels of gambling involvement for both African American and European Americans. This study extends past research focusing on levels of gambling involvement by analyzing variables from multiple domains simultaneously in the same model, including familial risk, substance use, and individual risk factors such as delinquency/conduct problems, and depression. This study has the advantage of being based on a large nationally representative sample of young adults and findings are nationally generalizable which is imperative to understand associated risk factors.

One key finding was the consistent association of childhood maltreatment across all three specific gambling categories (Table 2), as well as single and increased involvement (Table 3). These findings add to the growing body of literature that have identified associations between childhood maltreatment and gambling outcomes [6,20,23,51]. Childhood maltreatment is an area that must not be overlooked as approximately, one in eight children will experience some form of maltreatment by age 18 [52]. Clinicians and treatment providers should query about maltreatment history as part of their assessment, as problem gamblers are more likely to have a history of childhood maltreatment [6]. Race differences were also present as African Americans that experienced neglect was associated with a higher risk of gambling in the 'other games' category than European Americans. African Americans youth are vulnerable to neglect, as rates have been reported to be consistently higher among African Americans than other race/ethnic groups [53,54].

Among African Americans, we found current cannabis use to be associated with higher risk of gambling across all three categories and associated with gambling in two categories versus one category (Table 3). Our results revealed that African Americans who were current users of cannabis were significantly more likely to gamble across multiple gambling types than European Americans. These results are in line with prior research that finds adverse consequences of cannabis use greater among the African American community than among other racial/ethnic groups [55,56]. One key finding is the impact of cannabis use on African Americans, who are at increased odds of gambling (across each gambling category and gambling in 2 or more categories) than European Americans that use cannabis. Despite recent changes in legislation and more widespread legalization of cannabis, consequences associated with cannabis use remain intact. Cannabis use remains prevalent among youth as one in three 10th graders report cannabis use and most adolescents do not view its use as harmful [57]. We recommend tailored cannabis use prevention programs that address the needs of African American adolescents and young adults.

Associations of lottery games with current cigarette use were greater for European Americans than for African Americans, along with gambling in two categories vs. one category. European Americans typically have higher smoking prevalence in adolescence and young adulthood than African Americans [58], although African Americans are more likely to smoke than European Americans by age 29, due to a crossover effect [59]. Although it well known that substance use and gambling often co-occur, limited prior research has identified how individual substance use and gambling differ by race, as was demonstrated by both cigarette and cannabis use. In contrast, associations of gambling with current alcohol use were similar across European American and African American subjects. The measure of alcohol use, however, was broad and not specifically indicative of heavy use.

Endorsing three or more delinquency/conduct problems were associated with increased gambling involvement in 2 or more categories vs. one category. This finding is consistent with prior literature which emphasized the co-occurrence of conduct problems with other addictive behaviors [7,26]. Depression

was found to be associated with a lower risk of gambling in the 'other games' category among females. One possible explanation may be attributed to gambling as generally a social activity, and withdrawal from social activities is an established consequence of depression. Depression may be present more in treatment-enrolled problem gamblers than in those recruited from the community [60]. To surprise, religiosity and income were not found to be associated with any form of gambling or levels of gambling involvement. Prior research has emphasized the protective nature of religiosity in relation to gambling [25]. One explanation may be the weakness of the measure, as attendance during childhood may not necessarily reflect commitment to religion. Overall, the findings of this study advance our knowledge significantly of factors that influence gambling at the category and involvement levels, and how they may differ by race.

## CONCLUSION

### Limitations and future directions

Our findings should be viewed in the context of a number of key limitations. First, is the broad categorization of games associated within each category. For example, games such as casino games, or video games including craps, blackjack, roulette, slot machines, and video poker were categorized in one overall category (casino games). In the third category, bingo and sports betting were categorized in another category. Sports betting can be considered a high-risk activity, while bingo is generally considered a lower risk social activity. While we based our outcome on the number of gambling categories, it is also possible that one plays multiple games at a high frequency within a single category. Categorization also makes it difficult to identify games that are at the highest risk. Since games within a category are different, we could not differentiate risks associated with a particular game. Second, the instrument used was broad based did not include specific diagnostic criteria for gambling disorders or substance use disorders. Third, there was lack of consistency in substance use measures. For example, cannabis use and cigarette used past 30 day use measures, while alcohol use used a past 15 day measure. Finally, what is unknown is the severity of physical discipline incurred. Physical discipline may involve physical trauma that is severe and may hurt for subsequent days, as the magnitude was not captured in this study. Overall, while there were several limitations, the large sample size and the broad range of covariates were a benefit to the study, considering the serious implications associated with gambling involvement. Additional research is warranted in this area, including further investigation of differences by race, which will lead to improved and more precisely targeted prevention and treatment strategies.

## ACKNOWLEDGEMENTS

### Contributors

All authors contributed substantially to the research project and manuscript preparation, and all authors have approved the final article.

## DISCLOSURES

### Role of the funding source

This research was funded by the National Institute on Drug Abuse (T32DA015035). NIH had no role in the study design,

collection, analysis, or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

## REFERENCES

1. Ferentzy P, Turner NA. History of Problem Gambling: Temperance, Substance Abuse, Medicine, and Metaphors. New York, NY: Springer, 2013.
2. Castren S, Grainger M, Lahti T, Alho H, Salonen AH. At-risk and problem gambling among adolescents: A convenience sample of first-year junior high school students in Finland. *Substance Abuse Treatment, Prevention, and Policy*. 2015; 10: 9.
3. Breyer JL, Botzet AM, Winters KC, Stinchfield RD, August G, Realmuto G. Young adult gambling behaviors and their relationship with the persistence of ADHD. *J Gambl Stud*. 2009; 25: 227-238.
4. Kristiansen S, Trabjerg CM. Legal gambling availability and youth gambling behaviour: A qualitative longitudinal study. *Int J Social Welfare*. 2017; 26: 218-229.
5. Calado F, Griffiths MD. Problem gambling worldwide: An update and systematic review of empirical research (2000-2015). *J Behav Addict*. 2016; 5: 592-613.
6. Lane W, Sacco P, Downton K, Ludeman E, Levy L, Tracy JK. Child maltreatment and problem gambling: A systematic review. *Child Abuse Negl*. 2016; 58: 24-38.
7. Welte JW, Barnes GM, Tidwell M, Hoffman JH. The association of form of gambling with problem gambling among American youth. *Psychol Addict Behav*. 2009; 23: 105-112.
8. Rodriguez-Monguio R, Errea M, Volberg R. Comorbid pathological gambling, mental health, and substance use disorders: Health-care services provision by clinician specialty. *J Behav Addict*. 2017; 6: 406-415.
9. Dickson L, Derevensky J, Gupta R. Youth gambling problems: examining risk and protective factors. *Int Gamb Stud*. 2008; 8: 25-47.
10. Hardoon K, Derevensky J. Social influences involved in children's gambling behavior. *J Gambling Studies*. 2001; 17: 191-216.
11. Lussier I, Derevensky J, Gupta R, Vitaro F. Risk, compensatory, protective, and vulnerability factors related to youth gambling problems. *Psychology of Addictive Behaviors*. 2014; 28: 404-413.
12. Messerlian C, Derevensky J, Gupta R. "Youth gambling problems: a public health perspective". *Health Promot Int*. 2005; 20: 69-79.
13. Shead NW, Derevensky JL, Gupta R. Risk and protective factors associated with youth problem gambling. *Int J Adolesc Med Health*. 2010; 22: 39-58.
14. Barry DT, Stefanovics EA, Desai RA, Potenza MN. Differences in the associations between gambling problem severity and psychiatric disorders among black and white adults: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Am J Addict*. 2011; 20: 69-77.
15. Wong G, Zane N, Saw A, Chan AKK. Examining gender differences for gambling engagement and gambling problems among emerging adults. *J Gambl Stud*. 2013; 29: 171-189.
16. Welte JW, Tidwell MC, Barnes GM, Hoffman JH, Wieczorek WF. The relationship between the number of types of legal gambling and the rates of gambling behaviors and problems across US States. *J Gambl Stud*. 2016; 32: 379-390.
17. Binde P, Romild U, Volberg RA. Forms of gambling, gambling involvement and problem gambling: evidence from a Swedish population survey. *Int Gamb Stud*. 2017; 17: 490-507.
18. Parke A, Blaszczynski A. Key issues in product-based harm minimization. London: Sophro, 2016.
19. Holtgraves T. Gambling, gambling activities, and problem gambling. *Psychology of Addictive Behaviors*. 2009; 23: 295-302.
20. Welte JW, Tidwell MCO, Barnes GM, et al. The relationship between the number of types of legal gambling and the rates of gambling behaviors and problems across US States. *J Gambl Stud*. 2016; 32: 379-390.
21. Saugeres L, Thomas A, Moore S. 'It wasn't a very encouraging environment': Influence of early family experiences on problem and at-risk gamblers in Victoria. *Australia International Gambling Studies*. 2014; 14: 132-145.
22. Leeb RT, Paluzzi L, Melanson C, Simon T, Arias I. Child maltreatment surveillance: Uniform definitions for public health and recommended data elements (Version 1.0.) Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. 2008.
23. Afifi TO, Brownridge DA, Cox BJ, Sareen J. Physical punishment, childhood abuse, and psychiatric disorders. *Child Abuse Negl*. 2006; 30: 1093-1103.
24. Hodgins DC. The association between childhood maltreatment and gambling problems in a community sample of adult men and women. *Psychol Addictive Behav*. 2010; 24: 548-554.
25. Smith Christian, Snell Patricia. *Souls in Transition: The Religious & Spiritual Lives of Emerging Adults*. Oxford: Oxford University Press. 2009.
26. Casey DM, Williams RJ, Mossière AM, Schopflocher DP, Wood RT. role of family, religiosity, and behavior in adolescent gambling. *J Adolescence*. 2011; 34: 841-851.
27. Barnes GM. Gambling on the lottery: Sociodemographic correlates across the lifespan. *J Gambl Stud*. 2011; 27: 575-586.
28. Donovan JE. Problem behavior theory and the explanation of adolescent marijuana use. *J Drug Issues*. 1996; 26: 379-404.
29. Del Pino-Gutiérrez A, Jiménez-Murcia S, Fernández-Aranda F, Agüera Z, Granero R, Hakansson A, et al. The relevance of personality traits in impulsivity-related disorders: from substance use disorders and gambling disorder to bulimia nervosa. *J Behav Addict*. 2017; 6: 396-405.
30. McGrath, Barrett. The comorbidity of tobacco smoking and gambling: a review of the literature. *Drug Alcohol Rev*. 2006; 28: 676-681.
31. Cunningham-Williams RM, Cottler LB, Compton EM, Spitznagel EL, Ben-Abdallah, A. Problem gambling and comorbid psychiatric and substance use disorders among drug users recruited from drug treatment and community settings. *J Gambling Studies*. 2000; 16: 347-376.
32. Petry NM, Stinson FS, Grant BF. Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clinical Psychiatry*. 2000; 66: 564-574.
33. Noël X. Why adolescents are at risk of misusing alcohol and gambling. *Alcohol and Alcoholism*. 2014; 49: 165-172.
34. Weinberger AH, Franco CA, Hoff RA, Pilver CE, Steinberg MA, Rugle L, et al. Gambling behaviors and attitudes in adolescent high-school students: relationships with problem-gambling severity and smoking status. *J Psychiatr Res*. 2015; 65: 131-138.
35. Edgren R, Castrén S, Jokela M, Salonen, AH. At-risk and problem gambling among Finnish youth: The examination of risky alcohol consumption, tobacco smoking, mental health and loneliness as gender-specific correlates. *Nordic Stud Alcohol Drugs*. 2016; 11: 1-19.

36. Wanner B, Vitaro F, Ladouceur R, Brendgen M, Tremblay R. Joint trajectories of gambling, alcohol and marijuana use during adolescence: a person- and variable-centered developmental approach. *Addict Behav.* 2006; 31: 566-580.
37. Hammond CJ, Pilver CE, Rugle L, Steinberg MA, Mayes LC, Malison RT, et al. An exploratory examination of marijuana use, problem-gambling severity, and health correlates among adolescents. *J Behav Addict.* 2014; 3: 90-101.
38. Ste-Marie C, Gupta R, Derevensky JL. Anxiety and social stress related to adolescent gambling behavior and substance use. *J Child Adolesc Subst Abuse.* 2006; 15: 55-74.
39. Kryszajts DT, Hahmann TE, Schuler A, Hamilton-Wright, S, Ziegler CP, Matheson FI. Problem gambling and delinquent behaviours among adolescents: a scoping review. *J Gambl Stud.* 2018; 34: 893-914.
40. Slavin M, Pilver CE, Hoff RA. Serious physical fighting and gambling-related attitudes and behaviors in adolescents. *J Behav Addict.* 2013; 2: 167-178.
41. Lorains FK, Cowlshaw S, Thomas SA. Prevalence of comorbid disorders in problem and pathological gambling: systematic review and meta-analysis of population surveys. *Addiction.* 2011; 106: 490-498.
42. Gupta R, Derevensky JL. An empirical examination of Jacobs' General Theory of Addictions: Do adolescent gamblers fit the theory? *J Gambl Stud.* 1998; 14: 17-49.
43. Storr CL, Lee GP, Derevensky JL. Gambling and life events among urban adolescents. *J Gambl Stud.* 2012; 28: 325-336.
44. Blaszczynski A, Nower L. A pathways model of problem and pathological gambling. *Addiction.* 2002; 97: 487-499.
45. Kim SW, Grant JE, Eckert ED, Faris PL, Hartman BK. Pathological gambling and mood disorders: clinical associations and treatment implications. *J Affect Disord.* 2006; 92: 109-116.
46. Holdsworth L, Hing N, Breen H. Exploring women's problem gambling: A review of the literature. *Int Gambl Stud.* 2012; 12: 199-213.
47. Kessler RC, Hwang I, Labrie R, Petukhova M, Sampson NA, Winters KC, et al. DSM-IV pathological gambling in the National Comorbidity Survey Replication. *Psychol Med.* 2008; 38: 1351-1360.
48. Cunningham-Williams, RM, Ostmann, EL, Spitznagel, EL, Books, SJ. Racial/ethnic variation in the reliability of DSM-IV pathological gambling disorder. *J Nerv Ment Dis.* 2007; 195: 551-559.
49. Alegria A, Petry N, Hasin D, Liu S, Grant B, Blanco C. Disordered gambling among racial and ethnic groups in the US: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *CNS Spectr.* 2009; 14: 132-142.
50. Carolina Populations Center (CPC), "The national longitudinal study of adolescent health," University of North Carolina, Chapel Hill, 1998.
51. Sharma P. Sacco. Adverse childhood experiences and gambling: Results from a national study. *J Social Work Practice in the Addictions.* 2015; 15: 25-43.
52. Wildeman C, Emanuel N, Leventhal JM, Putnam-Hornstein E, Waldfogel J, Lee H. The prevalence of confirmed maltreatment among US children, 2004 to 2011. *JAMA Pediatr.* 2014; 168: 706-713.
53. Putnam-Hornstein E. Report of maltreatment as a risk factor for injury death: a prospective birth cohort study. *Child Maltreat.* 2011; 16: 163-174.
54. Mennen FE, Kim K, Sang J, Trickett PK. Child neglect: definition and identification of youth's experiences in official reports of maltreatment. *Child Abuse Neglect.* 2010; 34: 647-658.
55. Vidourek RA, King KA, Nabors LA, Merianos AL. Students' benefits and barriers to mental health help-seeking. *Health Psychol Behav Med.* 2014; 2: 1009-1022.
56. Clark TT, Nguyen AB, Belgrave FZ. Risk and protective factors for alcohol and marijuana use among African-American rural and urban adolescents. *J Child Adolescent Substance Abuse.* 2011; 20: 205-220.
57. D'Amico EJ, Tucker JS, Pedersen ER, Shih RA. Understanding rates of marijuana use and consequences among adolescents in a changing legal landscape. *Curr Addict Rep.* 2017; 4: 343-349.
58. Bares CB, Kendler KS, Maes HHM. Racial differences in heritability of cigarette smoking in adolescents and young adults. *Drug Alcohol Depend.* 2016; 166: 75-84.
59. Kandel DB, Schaffran C, Griesler PC, Hu M-C, Davies M, Benowitz N. Salivary cotinine concentration versus self-reported cigarette smoking: three patterns of inconsistency in adolescence. *Nicotine Tob Res.* 2006; 8: 525-537.
60. Knezevic B, Ledgerwood DM. Gambling severity, impulsivity, and psychopathology: comparison of treatment- and community-recruited pathological gamblers. *Am J Addict.* 2012; 21: 508-515.

#### Cite this article

Ahuja M, Cunningham-Williams RM, Werner KB, Bucholz KK (2018) Risk Factors Associated With Gambling Involvement among a National Sample of African American and European American Young Adults. *J Subst Abuse Alcohol* 6(3): 1081.