Published in final edited form as:

J Gambl Stud. 2017 December ; 33(4): 1169–1185. doi:10.1007/s10899-017-9670-x.

Relationships between perceived family gambling and peer gambling and adolescent problem gambling and binge-drinking

Zu Wei Zhai^a, Sarah W. Yip^{a,b}, Marvin A. Steinberg^c, Jeremy Wampler^d, Rani A. Hoff^a, Suchitra Krishnan-Sarin^{a,e}, and Marc N. Potenza^{a,b,e,f}

^aDepartment of Psychiatry, Yale School of Medicine, New Haven, CT, 06510, United States

^bThe National Center on Addictions and Substance Abuse, Yale School of Medicine, New Haven, CT, 06510, United States

^cThe Connecticut Council on Problem Gambling, Clinton, CT, 06413, United States

^dProblem Gambling Services, Middletown, CT, 06457, United States

^eThe Connecticut Mental Health Center, New Haven, CT, 06519

^fDepartment of Neuroscience and Child Study Center, Yale School of Medicine, New Haven, CT, 06510, United States

Abstract

Purpose—The study systematically examined the relative relationships between perceived family and peer gambling and adolescent at-risk/problem gambling and binge-drinking. It also determined the likelihood of at-risk/problem gambling and binge-drinking as a function of the number of different social groups with perceived gambling.

Methods—A multi-site high-school survey assessed gambling, alcohol use, presence of perceived excessive peer gambling (Peer Excess – PE), and family gambling prompting concern (Family Concern – FC) in 2,750 high-school students. Adolescents were separately stratified into:

Address correspondence to: Zu Wei Zhai, Ph.D., Division of Prevention and Community Research, Department of Psychiatry, Yale School of Medicine, 1 Church Street, Room 727, New Haven, CT 06510, [zuwei.zhai@yale.edu], 203-737-6473.

Contributors: Drs. Hoff, Krishnan-Sarin, and Potenza designed the survey with Dr. Steinberg advising on the inclusion of gambling-related questions. Dr. Zhai conducted analyses and worked with Drs. Yip and Potenza to develop initial drafts of the manuscript. All authors provided critical feedback with respect to the content of the manuscript.

Ethical Approval: All procedures performed in human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

COMPLIANCE WITH ETHICAL STANDARDS

Conflicts of Interest: The authors report no conflicts of interest with respect to the content of this manuscript. Dr. Potenza has: consulted for and advised Lundbeck, Ironwood, Shire, INSYS Rivermend Health, Opiant/Lakelight Therapeutics and Jazz Pharmaceuticals; received research support from the National Institutes of Health, Veteran's Administration, Mohegan Sun Casino, the National Center for Responsible Gaming and its affiliated Institute for Research on Gambling Disorders, and Pfizer; participated in surveys, mailings, or telephone consultations related to drug addiction, impulse control disorders or other health topics; consulted for law offices and the federal public defender's office in issues related to impulse control disorders; provides clinical care in the Connecticut Department of Mental Health and Addiction Services Problem Gambling Services Program; performed grant reviews for the National Institutes of Health and other agencies; has guest-edited journal sections; given academic lectures in grand rounds, CME events and other clinical/scientific venues; and generated books or chapters for publishers of mental health texts. Other authors report no disclosures. The views presented in this manuscript represent those of the authors and not necessarily those of the funding agencies who had no input into the content of the manuscript.

Informed Consent: All participants gave informed consent.

1) low-risk, at-risk, and problem/pathological gambling groups; and, 2) non-binge-drinking, low-frequency -binge-drinking, and high-frequency-binge-drinking groups.

Results—Multinomial logistic regression showed that relative to each other, FC and PE were associated with greater likelihoods of at-risk and problem/pathological gambling. However, only FC was associated with binge-drinking. Logistic regression revealed that adolescents who endorsed either FC or PE alone, compared to no endorsement, were more likely to have at-risk and problem/pathological gambling, relative to low-risk gambling. Adolescents who endorsed both FC and PE, compared to PE alone, were more likely to have problem/pathological gambling relative to low-risk and at-risk gambling. Relative to non-binge-drinking adolescents, those who endorsed both FC and PE were more likely to have low- and high-frequency-binge-drinking compared to FC alone or PE alone, respectively.

Conclusions—Family and peer gambling individually contribute to adolescent at-risk/problem gambling and binge-drinking. Strategies that target adolescents as well as their closely affiliated family and peer members may be an important step towards prevention of harm-associated levels of gambling and alcohol use in youths.

Keywords

Problem Gambling; Alcohol; Binge Drinking; Family; Peers; Adolescence

INTRODUCTION

Despite legal age limits, an estimated 85% of high-school adolescents in the United States report having gambled, defined as wagering money or valuables on an event where the outcome is uncertain, in their lifetime and an estimated 73% report having done so within the last 12 months (National Research Council 1999). In North America, between 4–8% of adolescents exhibit serious problem/pathological patterns of gambling and 10–14% are considered at-risk for developing serious gambling problems (Hardoon and Derevensky 2002; Derevensky and Gupta 2000; Gupta and Derevensky 1998; Shaffer and Hall 1996). More recently, an estimated 61–68% of adolescents reported past-year gambling and 2.1–2.6% had past-year problem/pathological gambling (Huang and Boyer 2007; Welte et al. 2008). Internationally, an estimated 0.2–12.3% of adolescents exhibit problem gambling (Calado et al. 2016). Problem/pathological gambling in adolescence is further associated with increased odds of depressive symptoms, aggressive behaviors and problematic drug and alcohol use (Ellenbogen et al. 2007; Yip et al. 2011). The current study aims to improve understanding of the relationship between alcohol- and gambling-related factors, in order to inform prevention strategies targeting these behaviors during adolescence.

Greater alcohol use is associated with elevated gambling frequency and likelihood of at-risk/problem gambling (Barnes et al. 1999; Barnes et al. 2009; Rahman et al. 2014). In a nationally representative sample of young people (age 14–21 years), 37% of binge-drinkers compared to 11% of non-drinkers were also heavy gamblers, while gambling frequency and gambling problems correlated with binge-drinking and alcohol-use problems (Barnes et al. 2009). Adolescent gambling and alcohol use are linked in a network of common psychosocial risk factors including family and peer norms that promote accessibility to and

reinforce these activities (Hardoon et al. 2004; Stinchfield and Winters 1998), as well as common behavioral and neurocognitive factors (Barnes et al. 1999; Leeman and Potenza 2012). However, the relationships between different social gambling factors (e.g., perception of peer and familial gambling) and alcohol use among youth are not well understood.

One empirically supported model of problem behaviors indicates that perceived environmental variables regarding family and peer gambling contribute to the likelihood of adolescent gambling and problem gambling status (Jessor and Jessor 1973, 1977; Donovan et al. 1999; Wickwire et al. 2007). Indeed, at-risk and pathological adolescent gamblers perceive more family members and peers with gambling problems than adolescent non-gamblers (Hardoon et al. 2004). Gambling family and peer social groups further establish environments that encourage youths to share in gambling activities (Brown 1987), as supported by evidence that adolescent at-risk/problem gambling is associated with having gambled with family and friends (Yip et al. 2011; Kong et al. 2014).

Adolescents who experienced family members participating in and promoting gambling identify gambling as socially acceptable and less harmful, leading to increased likelihoods of gambling initiation and perseveration (Gupta and Derevensky 1997; Campbell et al. 2011; Rahman et al. 2014). For example, perceived parental gambling may double the rate of adolescent at-risk and problem gambling (Govoni et al. 1996). Parents who gamble may facilitate their children's participation in certain types of gambling, including providing monetary support and purchasing lottery tickets/scratch cards for them (Wood and Griffiths 1998; Laundergan et al. 1990; Ladouceur et al. 1994). Hence, perceived gambling in a family may contribute significantly to the likelihood of adolescent at-risk/problem gambling.

While the effects of family-related gambling remain relatively stable over early development, peer gambling factors may be particularly important for initiation and maintenance of gambling in adolescence (Foster et al. 2015; Foster et al. 2014; Gupta and Derevensky 1997). Adolescents with at-risk/problem gambling are more likely to have friends who also gamble (Gori et al. 2015). Additionally, adolescents who perceive greater peer gambling appear more likely to develop at-risk/problem gambling (Langhinrichsen-Rohling et al. 2004). As such, adolescents who gamble are preferentially involved with peers who share norms favoring gambling, and this may lead to reciprocal reinforcement of gambling behaviors and exacerbation of problematic engagement (Foster et al. 2015; Delfabbro and Thrupp 2003; Clark and Winters 2002; Curran et al. 1997). Taken together, family and peer gambling may have different mechanisms of effect that may vary with respect to influencing adolescent gambling. However, with an estimated 86% of gambling youths having gambled with family and 75% having gambled with friends, the frequent co-occurrence of family and peer gambling makes it difficult to distinguish the unique effects of perceived gambling in each social group (Gupta and Derevensky 1997). The individual relationships between perceived gambling in family and perceived gambling in peers and adolescent problem gambling remain to be disentangled. Examining the relative likelihood of at-risk/problem gambling in adolescents in relation to the perceived gambling within each combination of social groups may be used to resolve this problem. This approach, which separately compares perceived gambling in family alone or in peers alone to their combined

presence or absence, isolates the individual effects of perceived gambling in each social group that would otherwise be difficult to detect.

Although some aspects of the relationships of perceived attitudes towards gambling and alcohol use and problem-gambling severity in adolescents have been examined (Rahman et al. 2014; Leeman et al. 2014), an understanding of how perceived family gambling relates to adolescent drinking remains limited (Lorenz and Shuttlesworth 1983). Additionally, to our knowledge, no studies have investigated the relative effects of perceived family and peer gambling on adolescent binge-drinking. An improved understanding of the relationships between alcohol use and perceived family and peer gambling would provide a better foundation for developing improved prevention and treatment among vulnerable adolescents.

The current study aims to determine the relative and additive effects of perceived gambling in family and peers on adolescent at-risk/problem gambling and binge-drinking. We hypothesized that perceived gambling of family and peers, relative to each other, would both be associated with the likelihood of adolescent at-risk/problem gambling and binge-drinking. The study also tests the hypothesis that the likelihood of at-risk/problem gambling and binge-drinking would increase with the number of social groups with perceived concerning or excessive levels of gambling.

METHODS

Recruitment and Survey Characteristics

Full recruitment and consenting procedures and sample characteristics have been described in detail previously (Schepis et al. 2008). Briefly, invitations to participate were extended to all 4-year and non-vocational or special-education high-schools in the state of Connecticut. Further targeted recruitment was conducted to ensure adequate representation of all geographic regions of the state. Among schools that were interested in participating, permission was additionally obtained from school boards and/or superintendents as necessary. The total sample consisted of 4,523 adolescents surveyed over the course of one academic year from schools in all four geographical quadrants of Connecticut, as well as schools from the three tiers of the state's family-socioeconomic-status-related district reference groups to ensure adequate socioeconomic representation. Within each participating school, the survey was administered on a single day by a member of the research team. Students were reminded that participation was voluntary and all answers would be kept confidential and anonymous. Less than 1% of student refused to participate. Detailed descriptions of the recruitment procedures, variables, and classification of responses were previously presented (Potenza et al. 2011; Schepis et al. 2008; Yip et al. 2011). The survey consisted of 154 questions assessing a broad range of demographic characteristics, health/functioning measures, gambling (defined to students as "any game you bet on for money or anything else of value"), substance use and other risk behaviors, and included items derived from established measures (e.g., Massachusetts Gambling Screen, Shaffer et al. 1994) and national surveys (e.g., Youth Cihild Risk Behavior Survey, Eisenmann et al. 2002; and National Gambling Impact Study 2007).

Demographic Variables

Demographic findings for the overall survey have been previously published (Schepis et al. 2008; Yip et al. 2011). Sample demographics were consistent with those reported in the 2000 Census of Connecticut residents aged 14–18 years. Demographic variables examined herein regarding adolescent problem-gambling severity and alcohol use included gender, race/ethnicity, grade in school, and family structure (e.g., living with one parent).

Alcohol Use

Binge-Drinking-Severity Groups: As previously described (Camenga et al. 2014), participants were stratified into one of four drinking groups: non-drinking, non-binge-drinking, low-frequency-binge-drinking, and high-frequency-binge-drinking. Participants with no lifetime alcohol use were classified as non-drinking. Participants who reported consuming at least 1 standard drink of alcohol without a binge pattern were classified as non-binge-drinking. Participants who reported consuming 5 or more drinks per occasion on 1 to 5 days in the past 30 days were classified as low-frequency-binge-drinking, while those who reported consuming 5 or more drinks per occasion on 6 or more days were classified as high-frequency-binge-drinking. Among the total sample of survey participants, 2,750 (60.8%) adolescents who reported gambling in the past year had sufficient alcohol-use data to be classified into the binge-drinking groups. Nine-hundred-and-six (32.9%) adolescents were classified as non-drinking, and analyses on binge-drinking focused on the 1844 adolescents who reported alcohol use.

Gambling Measures

Problem-Gambling-Severity Groups: Participants were stratified into one of four gambling groups: non-gambling, low-risk gambling, at-risk gambling, problem/pathological gambling. Participants who reported no past-year gambling were classified as non-gambling. All other gambling groups were defined using items from the Massachusetts Gambling Screen (MAGS) (Shaffer et al. 1994), a validated self-report assessment tool based on DSM-IV criteria for pathological gambling (American Psychiatric Association 2000; Weinstock et al. 2004) included in the survey. Only the participants who responded to all MAGS items were stratified into gambling groups. As in prior studies (Yip et al. 2014; Potenza et al. 2011; Rahman et al. 2012; Slavin et al. 2013), participants who reported past-year gambling but did not endorse any DSM-IV diagnostic criteria for pathological gambling were classified as having low-risk gambling. Participants who endorsed one to two diagnostic criteria were classified as having at-risk gambling, while those who endorsed three or more were classified as having problem/pathological gambling. Among the 2,750 participants (identified above) who reported gambling in the past year, 2,484 (90.3%) adolescents had sufficient MAGS data to be classified into the gambling groups. Four-hundred-and-fifty-four (18.3%) adolescents were classified as non-gambling and analyses on gambling groups subsequently focused on the remaining 2,030 adolescents who reported gambling.

Perceived Gambling: Perceived peer gambling and family gambling were assessed using the questions: “Has gambling of a close family member caused you worry or concern?” (Family Concern – FC) and “How many of your peers do you think gamble too much?” (Peer Excess – PE). Any affirmative response was encoded as “yes”, or otherwise was encoded as “no”.

These questions were selected as they reflect the adolescents' observation and awareness of concerning familial and excessive peer gambling behaviors.

2.5 Statistical Analyses

Data entry and verification procedures have been reported previously (Yip et al. 2011). To examine the relative effects of perceived family and peer gambling, FC and PE were entered conjointly as the independent variables in multinomial logistic regression against adolescent problem-gambling severities, and in a separate analysis, against binge-drinking severities. The lowest problem-gambling (low-risk gambling) and binge-drinking (non-binge-drinking) severities were used as reference categories.

The additive models of FC and PE were examined separately using logistic regressions. To determine the individual effect of FC alone, compared to the presence or absence of both FC and PE in an additive model, perceived concerning or excessive gambling in no social groups (no FC or PE) vs. one group (FC alone) vs. two groups (both FC and PE), affirmative responses to FC and PE questions were coded into a dummy variable: X1 (no FC and PE = 1, FC alone = 0, both FC and PE = 2). For the individual effects of PE alone, perceived concerning or excessive gambling in no social groups vs. one group (PE alone) vs. two groups, affirmative responses were coded into a dummy variable: X2 (no FC and PE = 1, PE alone = 0, both FC and PE = 2). X1 and X2 represented perceived concerning or excessive gambling in family alone and peers alone, respectively, compared to gambling in both social groups and no social groups. X1 and, in separate analyses, X2 were entered as the independent variable in logistic regressions against problem-gambling-severity group (e.g., low-risk gambling vs. at-risk gambling) and against binge-drinking group (e.g., non-binge-drinking vs. low-frequency-binge-drinking). As "0" (perceived gambling in one group) was the reference category, its associations with problem gambling and binge-drinking compared to "1" (perceived gambling in no social groups) are presented as inverse odds ratio (ORs) and 95% confidence intervals (CIs) to allow easier interpretations of findings. Comparing the individual effects of FC alone or PE alone to the presence or absence of both necessitates two different reference categories, which produce separate regression models. Furthermore, in models with multiple reference categories, selection of one reference category may unmask effects that would otherwise not be observable had a different reference category been selected (Yarnold and Soltysik 2010). Hence, X1 and X2 were analyzed separately.

RESULTS

Demographic Characteristics

Of the 2,484 participants with completed MAGS data, 53.9% reported low-risk gambling, 17.4% reported at-risk gambling, and 10.4% reported problem/pathological gambling. The problem/pathological-gambling group included the highest frequencies of all race/ethnicity categories, except Caucasian. Ninth graders were the most prevalent across all gambling groups except for the non-gambling group, in which 11th graders were the most prevalent. Among the 2,750 participants who reported gambling in the past year and had completed alcohol-use data necessary for statistical analyses, 23.2% reported non-binge-drinking, 29.9% low-frequency binge-drinking, and 14.0% high-frequency binge-drinking. Analyses

indicated differences in gender, ethnicity, grade in school, and family structure between participants in the gambling groups and alcohol-use groups. Given the potential confounding influence of these differences, all analyses controlled for the demographic variables. These data are summarized in Table 1.

Problem-Gambling Severity

Results of multinomial logistic regression analyses examining the relative effects of perceived family and peer gambling on at-risk/problem gambling showed that compared to the reference category of low-risk gambling, FC and PE were both associated with greater likelihoods of at-risk gambling (FC: OR=1.65, $p=.009$, 95%CI=1.13–2.39; PE: OR=1.52, $p=.001$, 95%CI=1.18–1.95) and problem/pathological gambling (FC: OR=2.77, $p<.001$, 95%CI=1.85–4.17; PE: OR=1.97, $p<.001$, 95%CI=1.42–2.75).

Results of logistic regressions assessing the additive model of perceived concerning or excessive gambling in neither family nor peer social groups versus one group (FC alone or PE alone) and versus two groups on adolescent problem-gambling severity are summarized in Table 2. Adolescents who endorsed FC alone, compared to no endorsement, were more likely to have at-risk (OR=2.58, $p<.001$, 95%CI=1.46–4.57) and problem/pathological (OR=3.60, $p<.001$, 95%CI=1.75–7.35) gambling relative to low-risk gambling, but not problem/pathological gambling compared to at-risk gambling (OR=1.25, $p=.57$, 95%CI=.58–2.70). Adolescents who endorsed both FC and PE, compared to FC alone, did not differ in likelihood of at-risk or problem/pathological gambling (all $p>.05$).

Adolescents who endorsed PE alone, compared to no endorsement, were more likely to have at-risk (OR=1.67, $p<.001$, 95%CI=1.27–2.19) and problem/pathological gambling (OR=2.11, $p<.001$, 95%CI=1.46–3.06) relative to low-risk gambling, but not problem/pathological gambling compared to at-risk gambling (OR=1.19, $p=.41$, 95%CI=.79–1.79). Adolescents who endorsed both FC and PE, compared to PE alone, were more likely to have problem/pathological gambling relative to both low-risk (OR=2.66, $p<.001$, 95%CI=1.61–4.40) and at-risk gambling (OR=2.08, $p=.01$, 95%CI=1.18–3.66), but not at-risk gambling relative to low-risk gambling (OR=1.28, $p=.33$, 95%CI=.78–2.09).

Adolescent Binge-Drinking Severity

Results of multinomial logistic regression analyses examining relative effects of perceived concerning family and excessive peer gambling on adolescent binge-drinking severity showed that, compared to the reference category of non-binge-drinking, FC (OR=1.43, $p=.04$, 95%CI=1.01–2.03), but not PE (OR=1.09, $p=.49$, 95%CI=.86–1.37), was associated with a higher likelihood of low-frequency binge-drinking. Neither FC (OR=1.11, $p=.66$, 95%CI=.87–1.73) nor PE (OR=1.21, $p=.20$, 95%CI=.90–1.63) was associated with high-frequency binge-drinking.

Results of logistic regression assessing the effects of perceived concerning or excessive gambling on neither family nor peer social groups versus one group (FC alone or PE alone) and versus two groups on adolescent binge-drinking are summarized in Table 3. Endorsement of FC alone compared to no endorsement was not associated with low-frequency or high-frequency binge-drinking (all $p>.05$). Adolescents who endorsed both FC

and PE, compared to FC alone, were more likely to have high-frequency binge-drinking (OR=2.57, $p=.04$, 95% CI=1.04–6.42) and approached but did not reach a significantly greater likelihood of low-frequency binge-drinking (OR=1.86, $p=.06$, 95% CI=.97–3.57), relative to non-binge-drinking, but no significance was found for high-frequency relative to low-frequency drinking (OR=1.41, $p=.42$, 95% CI=.61–3.29).

Endorsement of PE alone, compared to no endorsement, was not associated with low-frequency or high-frequency binge-drinking (all $p>.05$). Adolescents who endorsed both FC and PE, compared to PE alone, were more likely to have low-frequency (OR=1.95, $p=.006$, 95% CI=1.21–3.12) relative to non-binge-drinking, but not high-frequency relative to non-binge drinking (OR=1.53, $p=.14$, 95% CI=.86–2.73) or low-binge drinking (OR=.92, $p=.75$, 95% CI=.56–1.51).

DISCUSSION

This study aimed to determine the relative and additive effects of perceived concerning or excessive gambling in family and peers on adolescent at-risk/problem gambling and binge-drinking. Consistent with the first hypothesis, in multinomial logistic regression, perceived concerning levels of gambling in family and excessive gambling in peers (were both associated with greater likelihoods of at-risk and problem/pathological gambling. However, perceived concerning gambling in family, but not excessive gambling in peers, was associated with a greater likelihood of binge-drinking. Consistent with the second hypothesis, perceived concerning or excessive gambling in only one of either family or peer social groups, compared to no social groups, was associated with greater likelihoods of adolescent at-risk gambling and problem/pathological gambling, relative to low risk-gambling. However, perceived concerning or excessive gambling in both social groups was associated with greater likelihoods of problem/pathological gambling compared to excessive gambling in peers alone, but not concerning gambling in parents alone. Finally, concerning or excessive gambling in both social groups was associated with a greater likelihood of low- and high-frequency binge-drinking, respectively, compared to concerning or excessive gambling in peers alone and family alone.

Perceived Gambling and Adolescent Problem-Gambling Severity

While the prevalence of family and peer gambling experiences in adolescents was previously documented, few studies systematically examined their individual contributions to adolescent at-risk/problem gambling (Gupta and Derevensky 1998; Yip et al. 2011). The current results indicate that perceived concerning or excessive gambling in family and peers, relative to each other, were both associated with greater likelihoods of at-risk and problem/pathological gambling. This is consistent with previous studies that documented perceived peer and familial environmental influences on adolescent gambling (Delfabbro and Thrupp 2003; Langhinrichsen-Rohling et al. 2004; Gupta and Derevensky 1997). Extending these studies, perceived concerning gambling in family alone related to increased likelihood of adolescent at-risk and problem/pathological gambling. Separately, perceived excessive gambling in peers alone was also related to increased likelihood of adolescent at-risk and problem/pathological gambling. Previous independent analyses have shown that adolescents

with at-risk and probable pathological gambling perceived more members of their family (parents/step-parents, siblings, and other relatives) and peer (friends and classmates) social groups to have gambling problems (Hardoon et al. 2004). Hence, while family and peer gambling are not mutually exclusive, our findings suggest that perceived concerning or excessive gambling in one social group is sufficient to indicate greater risk for risky or problematic gambling.

Having perceived concerning or excessive gambling in both family and peers compared to peers alone was associated with greater likelihoods of adolescent problem/pathological gambling. This suggests that the inclusion of perceived concerning family gambling may be related to increased risk for problem/pathological gambling from peer gambling alone. The considerable contributions of family gambling on youth's development of gambling behaviors and risk for gambling problems have been observed in cross-sectional and prospective studies (Winters et al. 2002; Versini et al. 2012). To illustrate, Gambino et al., (1993) estimated that individuals who reported a family history for gambling problems were 12 to 30 times more likely to score in the probable pathological range on the South Oaks Gambling Screen. Family members, being the first source of social influences, occupy a unique role on determining children's propensity towards gambling and other behavioral problems (Spear 2000; McComb and Sabiston 2010). Initial experiences and observations of gambling behavior may be largely attributed to family members, thereby accounting for a large portion of variance in adolescent gambling behaviors (Fortune et al. 2013; Jacobs 2000). It is also possible that shared genetic factors (conferring increased vulnerability for gambling problems) might contribute to the association between adolescent gambling and familial gambling.

Perceived concerning or excessive gambling in both family and peers compared to family alone was not associated with problem/pathological gambling. The importance of peer gambling increases during adolescence, a period of elevated risk-taking that may be reinforced by social approval, and is often subsequent to experiences of family gambling (Delfabbro and Thrupp 2003). Early experiences of gambling, particularly "wins" during the first few attempts at gambling, may promote the desire to gamble in adolescents (Delfabbro and Thrupp 2003). Taken together with the increased risk for gambling problems among those with family gambling problems (Gambino et al. 1993), the lack of distinguishable increases in the likelihood of problem/pathological gambling associated with perceived concerning or excessive gambling in both social groups compared to family alone was not surprising.

While perceived concerning family gambling considerably influenced youth at-risk/problem gambling, the current findings indicate that neither it alone, nor the inclusion of perceived excessive peer gambling, was associated with increased likelihood of adolescent problem/pathological gambling relative to at-risk gambling. Separately, the likelihood of adolescent problem/pathological gambling relative to at-risk gambling was not related to perceived excessive peer gambling alone, but a significant association was found in perceived gambling in both family and peers compared to peers alone. This may be attributed to perceived gambling in family exacerbating peer influences on adolescent at-risk/problem gambling. To elaborate, Magoon and Ingersoll (2006) demonstrated that perceived family

gambling moderated the relationship between perceived peer gambling and adolescent gambling behavior. Hence, adolescents who perceived excessive gambling in only peers – thus excluding the interaction with concerning familial gambling – were less likely to have more severe problem-gambling. While not directly examined in this study, several factors, including inadequate parental management of adolescent practices and poor family involvement, may help to further explain the relationship between family context and peer influences on the likelihood of adolescent at-risk/problem gambling (Magoon and Ingersoll 2006; Hartos et al. 2000). Furthermore, gambling among parents and family in other cultures and countries may similarly affect family context factors such as family cohesion and filial respect (Papineau 2005). However, as the current findings have limited generalizability to other cultural contexts, more research is needed to examine potential effects of family and peer gambling among different countries.

Perceived Gambling and Adolescent Binge-Drinking

In multinomial logistic regression, perceived concerning or excessive gambling in the family relative to peers was associated with a greater likelihood of binge-drinking. Further analyses with logistic regression on perceived concerning gambling in family alone did not yield an association with adolescent binge-drinking. These findings suggest that while perceived concerning family gambling may have a greater contribution to the increased risk of adolescent binge-drinking, it may not be attributed solely to perceived family gambling practices. Perceived concerning or excessive gambling in both groups was associated with greater likelihood of the more severe high-frequency binge-drinking compared to gambling in family alone. Adolescent drinking commonly occurs among peers who may provide a social context for delinquency, as well as model and reinforce risky drinking behaviors (Cashwell and Vacc 1996; Barnes et al. 2006; Ingram et al. 2007; Eisenberg et al. 2014). Our findings raised the possibility that experiences of peer gambling may facilitate engagement of more severe drinking in adolescents with familial gambling. Given preferential associations amongst individuals who share gambling behaviors and favor friendships in which gambling is the predominant extracurricular activity (Shead et al. 2010; Gupta and Derevensky 1997, 2000), as well as the high rates of alcohol and gambling problem co-occurrences (Barnes et al. 2009), exposure to peer gambling may increase opportunities to observe risky drinking behaviors and the likelihood to also initiate risky drinking (Barnes et al. 2009; Eisenberg et al. 2014).

Separately, logistic regression on perceived excessive gambling in peers alone did not yield an association with adolescent binge-drinking severity, but perceived concerning or excessive gambling in both groups compared to peers alone was associated with low-frequency binge relative to non-binge drinking. Though limited, related research suggests that family factors, including family involvement, moderate peer and adolescent drug use, and may delay initiation (Brook et al. 1986; Kosterman et al. 2000). Similar to the association found in perceived concerning or excessive gambling in both groups compared to peers alone, poor family functioning may also help to explain the relationship between perceived social gambling and low-frequency binge drinking. However, further research is necessary to understand more precisely potential contributing factors.

Study Strengths and Limitations

This study has several strengths, including the characterization of problem-gambling and binge-drinking severities across a large sample of adolescents who reported perceiving gambling among two important social groups. To our knowledge, this is the first study to investigate the likelihood of at-risk/problem gambling and binge-drinking in adolescents with the inclusion of each additional social group that had gambling, and the first to do so in a large sample.

The findings should be considered in the context of study limitations. First, the data were collected via survey of individual adolescents, and adolescents' own gambling behavior, as well as observed gambling behavior among family and peers, may be subject to biases. Future studies would benefit from separate assessment of familial and peer gambling behaviors. Second, multilevel modeling was not performed to account for nesting within schools or districts. Subsequent analyses may assess possible confounds due to school compositions and geographic locations. However, analyses in the current study controlled for possible confounding demographic variables. Third, different descriptors (concerning or excessive) were used to assess perceived familial and peer gambling. Further, the cross-sectional design limits the ability to make causal inferences (e.g., whether FC leads to frequent binge-drinking or binge-drinking leads to FC).

CONCLUSIONS

To our knowledge, this is the first study to systematically examine the likelihood of problem-gambling and binge-drinking severities between adolescents with perceived gambling in varying combinations of family and peer social groups. While perceived gambling in either family or peers were each related to adolescent at-risk and problem/pathological gambling, the inclusion of family gambling confers considerable risk for more severe problem/pathological gambling in adolescents who perceived peer gambling. The inclusion of gambling in peers may provide the social context of engaging in more severe binge-drinking in adolescents with family gambling. Together, the current findings indicate that experiences of family and peer gambling have unique influences that may be incorporated in targeted prevention of social risk factors in adolescent problem gambling and binge-drinking. Strategies that educate adolescents as well as their family and social peers may be an important step towards prevention of risky/problematic gambling and binge-drinking in youths.

Acknowledgments

This project was supported by National Institute of Health (grant numbers R01 DA019039 and RL1 AA017539). ZWZ receives support from T32 DA019426 and SWY receives support from K01 DA039299. This work was also supported by the Connecticut Mental Health Center, the Connecticut State Department of Mental Health and Addiction Services, the National Center on Addictions and Substance Abuse, and a Center of Excellence in Gambling Research Award from the National Center for Responsible Gaming. The funding agencies had no role in study design; data collection, analysis and interpretation; preparation of the manuscript; or the decision to submit the paper for publication.

References

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, D.C: 2000.
- Barnes GM, Hoffman JH, Welte JW, Farrell MP, Dintcheff BA. Effects of Parental Monitoring and Peer Deviance on Substance Use and Delinquency. *Journal of Marriage and Family*. 2006; 68(4): 1084–1104. DOI: 10.1111/j.1741-3737.2006.00315.x
- Barnes GM, Welte JW, Hoffman JH, Dintcheff BA. Gambling and alcohol use among youth: Influences of demographic, socialization, and individual factors. *Addictive Behaviors*. 1999; 24(6): 749–767. [http://dx.doi.org/10.1016/S0306-4603\(99\)00048-9](http://dx.doi.org/10.1016/S0306-4603(99)00048-9). [PubMed: 10628510]
- Barnes GM, Welte JW, Hoffman JH, Tidwell MC. Gambling, alcohol, and other substance use among youth in the United States. *J Stud Alcohol Drugs*. 2009; 70(1):134–142. [PubMed: 19118402]
- Brook JS, Whiteman M, Gordon AS, Nomura C, Brook DW. Onset of adolescent drinking: a longitudinal study of intrapersonal and interpersonal antecedents. *Adv Alcohol Subst Abuse*. 1986; 5(3):91–110. [PubMed: 3728195]
- Brown RIF. Models of gambling and gambling addictions as perceptual filters. [journal article]. *Journal of gambling behavior*. 1987; 3(4):224–236. DOI: 10.1007/bf01019882
- Calado F, Alexandre J, Griffiths MD. Prevalence of Adolescent Problem Gambling: A Systematic Review of Recent Research. *J Gambl Stud*. 2016; doi: 10.1007/s10899-016-9627-5
- Camenga DR, Kong G, Bagot K, Hoff RA, Potenza MN, Krishnan-Sarin S. Marijuana and alcohol use and attempted smoking cessation in adolescent boys and girls. *Subst Abus*. 2014; 35(4):381–386. DOI: 10.1080/08897077.2014.958207 [PubMed: 25174418]
- Campbell C, Derevensky J, Meerkamper E, Cutajar J. Parents' Perceptions of Adolescent Gambling: A Canadian National Study. *Journal of Gambling Issues*. 2011; :36–53. DOI: 10.4309/jgi.2011.25.4
- Cashwell CS, Vacc NA. Family Functioning and Risk Behaviors: Influences on Adolescent Delinquency. *The School Counselor*. 1996; 44(2):105–114.
- Clark DB, Winters KC. Measuring risks and outcomes in substance use disorders prevention research. *J Consult Clin Psychol*. 2002; 70(6):1207–1223. [PubMed: 12472298]
- Curran PJ, Stice E, Chassin L. The relation between adolescent alcohol use and peer alcohol use: a longitudinal random coefficients model. *J Consult Clin Psychol*. 1997; 65(1):130–140. [PubMed: 9103742]
- Delfabbro P, Thrupp L. The social determinants of youth gambling in South Australian adolescents. *Journal of Adolescence*. 2003; 26(3):313–330. [http://dx.doi.org/10.1016/S0140-1971\(03\)00013-7](http://dx.doi.org/10.1016/S0140-1971(03)00013-7). [PubMed: 12770529]
- Derevensky JL, Gupta R. Prevalence estimates of adolescent gambling: a comparison of the SOGS-RA, DSM-IV-J, and the GA 20 questions. *J Gambl Stud*. 2000; 16(2–3):227–251. [PubMed: 14634314]
- Donovan JE, Jessor R, Costa FM. Adolescent problem drinking: stability of psychosocial and behavioral correlates across a generation. *J Stud Alcohol*. 1999; 60(3):352–361. [PubMed: 10371263]
- Eisenberg D, Golberstein E, Whitlock JL. Peer effects on risky behaviors: new evidence from college roommate assignments. *J Health Econ*. 2014; 33:126–138. DOI: 10.1016/j.jhealeco.2013.11.006 [PubMed: 24316458]
- Eisenmann JC, Bartee RT, Wang MQ. Physical activity, TV viewing, and weight in U.S. youth: 1999 Youth Risk Behavior Survey. *Obes Res*. 2002; 10(5):379–385. DOI: 10.1038/oby.2002.52 [PubMed: 12006637]
- Ellenbogen S, Derevensky J, Gupta R. Gender differences among adolescents with gambling-related problems. *J Gambl Stud*. 2007; 23(2):133–143. DOI: 10.1007/s10899-006-9048-y [PubMed: 17265189]
- Fortune EE, MacKillop J, Miller JD, Campbell WK, Clifton AD, Goodie AS. Social density of gambling and its association with gambling problems: an initial investigation. *J Gambl Stud*. 2013; 29(2):329–342. DOI: 10.1007/s10899-012-9303-3 [PubMed: 22527489]

- Foster DW, Hoff RA, Pilver CE, Yau YH, Steinberg MA, Wampler J, et al. Correlates of gambling on high-school grounds. *Addict Behav.* 2015; 51:57–64. DOI: 10.1016/j.addbeh.2015.07.006 [PubMed: 26232102]
- Foster DW, Neighbors C, Rodriguez LM, Lazowitz B, Gonzales R. Self-Identification as a Moderator of the Relationship Between Gambling-Related Perceived Norms and Gambling Behavior. [journal article]. *Journal of Gambling Studies.* 2014; 30(1):125–140. DOI: 10.1007/s10899-012-9346-5 [PubMed: 23143706]
- Gambino B, Fitzgerald R, Shaffer H, Renner J, Courtnage P. Perceived family history of problem gambling and scores on SOGS. [journal article]. *Journal of Gambling Studies.* 1993; 9(2):169–184. DOI: 10.1007/bf01014866
- Gori M, Potente R, Pitino A, Scalese M, Bastiani L, Molinaro S. Relationship Between Gambling Severity and Attitudes in Adolescents: Findings from a Population-Based Study. *J Gambl Stud.* 2015; 31(3):717–740. DOI: 10.1007/s10899-014-9481-2 [PubMed: 25063468]
- Govoni R, Rupcich N, Ron Frisch G. Gambling behavior of adolescent gamblers. *J Gambl Stud.* 1996; 12(3):305–317. DOI: 10.1007/bf01539325 [PubMed: 24234038]
- Gupta R, Derevensky JL. Familial and social influences on juvenile gambling behavior. *J Gambl Stud.* 1997; 13(3):179–192. [PubMed: 12913385]
- Gupta R, Derevensky JL. Adolescent Gambling Behavior: A Prevalence Study and Examination of the Correlates Associated with Problem Gambling. *J Gambl Stud.* 1998; 14(4):319–345. [PubMed: 12766444]
- Gupta R, Derevensky JL. Adolescents with gambling problems: from research to treatment. *J Gambl Stud.* 2000; 16(2–3):315–342. [PubMed: 14634318]
- Hardoon KK, Derevensky JL. Child and Adolescent Gambling Behavior: Current Knowledge. *Clinical Child Psychology and Psychiatry.* 2002; 7(2):263–281. DOI: 10.1177/1359104502007002012
- Hardoon KK, Gupta R, Derevensky JL. Psychosocial variables associated with adolescent gambling. *Psychol Addict Behav.* 2004; 18(2):170–179. DOI: 10.1037/0893-164x.18.2.170 [PubMed: 15238059]
- Hartos JL, Eitel P, Haynie DL, Simons-Morton BG. Can I Take the Car?: Relations Among Parenting Practices and Adolescent Problem-Driving Practices. *Journal of Adolescent Research.* 2000; 15(3):352–367. DOI: 10.1177/0743558400153003
- Huang JH, Boyer R. Epidemiology of youth gambling problems in Canada: a national prevalence study. *Can J Psychiatry.* 2007; 52(10):657–665. [PubMed: 18020113]
- Ingram JR, Patchin JW, Huebner BM, McCluskey JD, Bynum TS. Parents, Friends, and Serious Delinquency: An Examination of Direct and Indirect Effects Among At-Risk Early Adolescents. *Criminal Justice Review.* 2007; 32(4):380–400. DOI: 10.1177/0734016807311436
- Jacobs DF. Juvenile gambling in North America: an analysis of long term trends and future prospects. *J Gambl Stud.* 2000; 16(2–3):119–152. [PubMed: 14634310]
- Jessor R, Jessor SL. The Perceived Environment in Behavioral Science: Some Conceptual Issues and Some Illustrative Data. *American Behavioral Scientist.* 1973; 16(6):801–828. DOI: 10.1177/000276427301600602
- Jessor R, Jessor SL. Problem behavior and psychosocial development: A longitudinal study of youth. 1977
- Kong G, Tsai J, Krishnan-Sarin S, Cavallo DA, Hoff RA, Steinberg MA, et al. A latent class analysis of pathological-gambling criteria among high school students: associations with gambling, risk and health/functioning characteristics. *J Addict Med.* 2014; 8(6):421–430. DOI: 10.1097/adm.000000000000074 [PubMed: 25275877]
- Kosterman R, Hawkins JD, Guo J, Catalano RF, Abbott RD. The dynamics of alcohol and marijuana initiation: patterns and predictors of first use in adolescence. *Am J Public Health.* 2000; 90(3):360–366. [PubMed: 10705852]
- Ladouceur R, Dube D, Bujold A. Gambling among primary school students. *J Gambl Stud.* 1994; 10(4):363–370. DOI: 10.1007/bf02104902 [PubMed: 24234970]
- Langhinrichsen-Rohling J, Rohde P, Seeley JR, Rohling ML. Individual, family, and peer correlates of adolescent gambling. *J Gambl Stud.* 2004; 20(1):23–46. DOI: 10.1023/b:jogs.0000016702.69068.53 [PubMed: 14973396]

- Laundergan J, Schaefer J, Eckoff K, Pirie P. Adult survey of Minnesota gambling behaviour: A benchmark. Report to the Minnesota Department of Human Resources. Mental Health Division, Minneapolis. 1990
- Leeman RF, Patock-Peckham JA, Hoff RA, Krishnan-Sarin S, Steinberg MA, Rugle LJ, et al. Perceived parental permissiveness toward gambling and risky behaviors in adolescents. *J Behav Addict*. 2014; 3(2):115–123. DOI: 10.1556/jba.3.2014.012 [PubMed: 25215222]
- Leeman RF, Potenza MN. Similarities and differences between pathological gambling and substance use disorders: a focus on impulsivity and compulsivity. *Psychopharmacology (Berl)*. 2012; 219(2): 469–490. DOI: 10.1007/s00213-011-2550-7 [PubMed: 22057662]
- Lorenz VC, Shuttlesworth DE. The impact of pathological gambling on the spouse of the gambler. *Journal of Community Psychology*. 1983; 11(1):67–76. DOI: 10.1002/1520-6629(198301)11:1<67::AID-JCOP2290110107>3.0.CO;2-O
- Magoon ME, Ingersoll GM. Parental modeling, attachment, and supervision as moderators of adolescent gambling. *J Gambl Stud*. 2006; 22(1):1–22. DOI: 10.1007/s10899-005-9000-6 [PubMed: 16385392]
- McComb JL, Sabiston CM. Family influences on adolescent gambling behavior: a review of the literature. *J Gambl Stud*. 2010; 26(4):503–520. DOI: 10.1007/s10899-010-9181-5 [PubMed: 20349270]
- National Gambling Impact Study, C. Gambling Impact and Behavior Study, 1997–1999: [United States]. Inter-university Consortium for Political and Social Research (ICPSR) [distributor]; 2007.
- National Research Council. Pathological Gambling: A Critical Review. Washington, DC: The National Academies Press; 1999.
- Papineau E. Pathological Gambling in Montreal's Chinese Community: An Anthropological Perspective. [journal article]. *Journal of Gambling Studies*. 2005; 21(2):157–178. DOI: 10.1007/s10899-005-3030-y [PubMed: 15870985]
- Potenza MN, Wareham JD, Steinberg MA, Rugle L, Cavallo DA, Krishnan-Sarin S, et al. Correlates of at-risk/problem internet gambling in adolescents. *J Am Acad Child Adolesc Psychiatry*. 2011; 50(2):150–159. e153. DOI: 10.1016/j.jaac.2010.11.006 [PubMed: 21241952]
- Rahman AS, Balodis IM, Pilver CE, Leeman RF, Hoff RA, Steinberg MA, et al. Adolescent alcohol-drinking frequency and problem-gambling severity: adolescent perceptions regarding problem-gambling prevention and parental/adult behaviors and attitudes. *Subst Abus*. 2014; 35(4):426–434. DOI: 10.1080/08897077.2014.951754 [PubMed: 25147928]
- Rahman AS, Pilver CE, Desai RA, Steinberg MA, Rugle L, Krishnan-Sarin S, et al. The relationship between age of gambling onset and adolescent problematic gambling severity. *J Psychiatr Res*. 2012; 46(5):675–683. DOI: 10.1016/j.jpsychires.2012.02.007 [PubMed: 22410208]
- Schepis TS, Desai RA, Smith AE, Cavallo DA, Liss TB, McFetridge A, et al. Impulsive sensation seeking, parental history of alcohol problems, and current alcohol and tobacco use in adolescents. *J Addict Med*. 2008; 2(4):185–193. [PubMed: 19956365]
- Shaffer HJ, Hall MN. Estimating the prevalence of adolescent gambling disorders: A quantitative synthesis and guide toward standard gambling nomenclature. *J Gambl Stud*. 1996; 12(2):193–214. DOI: 10.1007/BF01539174 [PubMed: 24233916]
- Shaffer HJ, Labrie R, Scanlan KM, Cummings TN. Pathological gambling among adolescents: Massachusetts Gambling Screen (MAGS). *J Gambl Stud*. 1994; 10(4):339–362. DOI: 10.1007/bf02104901 [PubMed: 24234969]
- Shed NW, Derevensky JL, Gupta R. Risk and protective factors associated with youth problem gambling. *Int J Adolesc Med Health*. 2010; 22(1):39–58. [PubMed: 20491417]
- Slavin M, Pilver CE, Hoff RA, Krishnan-Sarin S, Steinberg MA, Rugle L, et al. Serious Physical Fighting and Gambling-Related Attitudes and Behaviors in Adolescents. *J Behav Addict*. 2013; 2(3):167. [PubMed: 24294502]
- Spear LP. The adolescent brain and age-related behavioral manifestations. *Neurosci Biobehav Rev*. 2000; 24(4):417–463. [pii]. [PubMed: 10817843]
- Stinchfield R, Winters KC. Gambling and Problem Gambling among Youths. *Annals of the American Academy of Political and Social Science*. 1998; 556:172–185.

- Versini A, LeGauffre C, Romo L, Ades J, Gorwood P. Frequency of gambling problems among parents of pathological, versus nonpathological, casino gamblers using slot machines. *Am J Addict*. 2012; 21(1):86–95. DOI: 10.1111/j.1521-0391.2011.00190.x [PubMed: 22211351]
- Weinstock J, Whelan JP, Meyers AW. Behavioral assessment of gambling: an application of the timeline followback method. *Psychol Assess*. 2004; 16(1):72–80. DOI: 10.1037/1040-3590.16.1.72 [PubMed: 15023094]
- Welte JW, Barnes GM, Tidwell MC, Hoffman JH. The prevalence of problem gambling among U.S. adolescents and young adults: results from a national survey. *J Gambl Stud*. 2008; 24(2):119–133. DOI: 10.1007/s10899-007-9086-0 [PubMed: 18097737]
- Wickwire EM, Whelan JP, Meyers AW, Murray DM. Environmental correlates of gambling behavior in urban adolescents. *J Abnorm Child Psychol*. 2007; 35(2):179–190. DOI: 10.1007/s10802-006-9065-4 [PubMed: 17219080]
- Winters KC, Stinchfield RD, Botzet A, Anderson N. A prospective study of youth gambling behaviors. *Psychology of Addictive Behaviors*. 2002; 16(1):3–9. DOI: 10.1037/0893-164X.16.1.3 [PubMed: 11934084]
- Wood RT, Griffiths MD. The acquisition, development and maintenance of lottery and scratchcard gambling in adolescence. *J Adolesc*. 1998; 21(3):265–273. DOI: 10.1006/jado.1998.0152 [PubMed: 9657894]
- Yarnold PR, Soltysik RC. Aggregated vs. referenced categorical attributes in UniODA and CTA. *Optimal Data Analysis*. 2010; 1:46–49.
- Yip SW, Desai RA, Steinberg MA, Rugle L, Cavallo DA, Krishnan-Sarin S, et al. Health/functioning characteristics, gambling behaviors, and gambling-related motivations in adolescents stratified by gambling problem severity: findings from a high school survey. *Am J Addict*. 2011; 20(6):495–508. DOI: 10.1111/j.1521-0391.2011.00180.x [PubMed: 21999494]
- Yip SW, Mei S, Pilver CE, Steinberg MA, Rugle LJ, Krishnan-Sarin S, et al. At-Risk/Problematic Shopping and Gambling in Adolescence. *J Gambl Stud*. 2014; doi: 10.1007/s10899-014-9494-x

Table 1

Demographic characteristics of gambling and alcohol-use groups

	LRG (n=1340)		ARG (n=432)		PPG (n=258)		NBD (n=638)		LFBD (n=821)		HFBD (n=385)	
	%		%		%		%		%		%	
Gender												
Male	51.6		75.7		77.5		40.6		47.0		57.1	
Female	47.2		23.1		20.2		58.3		52.4		40.5	
Ethnicity												
African American	9.3		13.7		19.8		10.7		4.8		9.4	
Caucasian	74.2		72.0		59.7		78.1		82.9		77.9	
Asian	4.0		3.7		8.1		3.1		1.9		4.9	
Hispanic	14.3		14.8		25.6		11.4		14.1		18.2	
Other	16.4		15.3		20.2		14.6		13.2		15.1	
Grade												
9th	29.0		33.6		30.6		27.9		23.9		18.2	
10th	26.6		25.0		26.7		27.0		26.6		24.7	
11th	26.5		22.9		22.1		27.4		28.1		33.2	
12th	17.6		18.5		19.4		17.7		21.2		23.4	
Family Structure												
One parent	24.6		20.6		22.5		24.0		24.1		27.3	
Two parent	68.7		70.1		58.1		71.0		70.5		59.7	
Other	5.2		6.9		16.3		4.1		4.5		10.1	
Family and Peer Gambling												
Family concern	9.6		14.4		22.1		10.3		13.8		12.7	
Peer excess	38.6		46.1		52.3		39.5		43.8		43.6	

*
p .05,**
p .01,***
p .001

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Demographic and gambling categories are non-exclusive (i.e., students asked to select all applicable categories)
LRG (low-risk gambling), ARG (at-risk gambling), PPG (problem/pathological gambling)
NBD (non-binge-drinking), LFBD (low-frequency binge-drinking, HFBD (high-frequency binge-drinking)

Table 2
Additive effects of perceived family and peer gambling on adolescent problem-gambling severity

	ARG vs. LRG		PPG vs. LRG		PPG vs. ARG	
	OR	95% CI	OR	95% CI	OR	95% CI
X1						
Family Concern Alone	2.58***	1.46–4.57	3.60***	1.75–7.35	1.25	0.58–2.70
Family Concern and Peer Excess	0.8	0.40–1.61	1.55	0.70–3.44	2.05	0.87–4.86
X2						
Peer Excess Alone	1.67***	1.27–2.19	2.11***	1.46–3.06	1.19	0.79–1.79
Peer Excess and Family Concern	1.28	0.78–2.09	2.66***	1.61–4.40	2.08**	1.18–3.66

^a p=.06,
* p .05,
** p .01,
*** p .001

LRG (low-risk gambling), ARG (at-risk gambling), PPG (problem/pathological gambling)

Table 3
Additive effects of perceived family and peer gambling on adolescent binge-drinking severity

	LFBD vs. NBD		HFBD vs. NBD		HFBD vs. LFBD	
	OR	95% CI	OR	95% CI	OR	95% CI
X1						
Family Concern Alone	1.06	0.63–1.78	0.66	0.30–1.43	0.66	0.31–1.39
Family Concern and Peer Excess	1.86 ^a	0.97–3.57	2.57 [*]	1.04–6.42	1.41	0.61–3.29
X2						
Peer Excess Alone	1.01	0.78–1.29	1.1	0.80–1.51	1.04	0.77–1.41
Peer Excess and Family Concern	1.95 ^{**}	1.21–3.12	1.53	0.86–2.73	0.92	0.56–1.51

^a p=.06,
* p .05,
** p .01,
*** p .001

NBD (non-binge-drinking), LFBD (low-frequency binge-drinking), HFBD (high-frequency binge-drinking)