Published in final edited form as:
Am J Addict. 2011 ; 20(2): 166–173. doi:10.1111/j.1521-0391.2010.00116.x.

The Co-occurrence of Gambling with Substance Use and Conduct Disorder among Youth in the U.S

Grace M. Barnes, PhD, **John W. Welte, PhD**, **Joseph H. Hoffman, MA**, and **Marie-Cecile O. Tidwell, PhD**
Research Institute on Addictions, University at Buffalo, Buffalo, New York

Abstract

The co-occurrence of gambling with substance use and conduct disorder was examined in a representative U.S. household sample of 2,274 youth 14 to 21 years old. The findings show that problem gambling occurs within a problem behavior syndrome with other substance use behaviors and conduct disorder. Male gender, being black, and being Hispanic were found to be significant in predicting problem gambling over and above the effects of all four substance use and conduct disorder variables. Clinical interventions for one specific problem behavior in youth should consider assessing the other problem behaviors as well.

Introduction

Substance use and delinquent behavior co-occur among youth,[1] constituting what has been called a problem behavior syndrome.[2,3] The concept of a syndrome of problem behavior indicates that as one adolescent problem behavior increases, the likelihood of the occurrence of other problem behaviors also increases. Moreover, if problem behaviors co-occur, then they may share common antecedent explanatory factors. With increasing recognition that youthful gambling is a serious public health issue, gambling among youth has been integrated within problem behavior research.[4-7] However, most of the studies examining the relationships between gambling and substance use have been carried out in selected school districts; and the findings may not generalize to the U.S. as a whole. Furthermore, most studies have not compared a full range of potentially co-occurring problem behaviors, including gambling, alcohol, tobacco, marijuana, and conduct disorder, in the same analysis. The present investigation will address gaps in the existing research by providing a comparative analysis of the associations between gambling and other addictive behaviors (alcohol, tobacco and marijuana use) as well as conduct disorder using a representative household sample of U.S. youth people aged 14 to 21 years old.

Gambling and substance use

Until the present U.S. survey of gambling among youth,[8,9] there were no large nationally representative household studies of gambling among young people. Nonetheless, important findings about the co-occurrence of gambling and substances have come from large school surveys in selected geographic areas of the U.S. and Canada. Based on a sample of over 20,000 Minnesota school students, Winters and colleagues found that students were 3.8 times more likely to be weekly or daily gamblers if they were also weekly or daily drug users as compared with those who used drugs less than that or not at all.[10] Similarly, in a

Address correspondence to Dr. Barnes, Research Institute on Addictions, University at Buffalo, 1021 Main Street, Buffalo, NY 14203. barnes@ria.buffalo.edu.

Declaration of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

sample of high school students in Montreal, Canada, Ste-Marie et al.[11] found that probable pathological gamblers reported more daily and weekly alcohol consumption, use of other illicit drugs and smoked more cigarettes on a daily basis as compared with non-gamblers and non-problem gamblers. Engwall et al.[12] found that college students identified as problem gamblers, compared with other students, were significantly more likely to be heavy drinkers, to have negative consequences of alcohol consumption, and to be regular tobacco and marijuana users.

Using data from a U.S. sample of 534 16- and 17-year-olds, Duhig et al.[13] found that a greater proportion of moderate to high-frequency drinkers reported past year gambling than did the group of abstainers/low-frequency drinkers (66% vs. 38%). Using the same study, Lynch et al.[14] reported that adolescent-onset gambling as compared with later-onset gambling was associated with more severe substance use disorders.

Petry and Tawfik[15] interviewed 255 adolescents who were in treatment for marijuana abuse; 22% experienced gambling problems. Furthermore, the problem gamblers as compared with non-problem gamblers reported a greater frequency of overall drug and alcohol use, and a greater intensity of marijuana use.

Gambling and delinquency/conduct disorder

Blaszczynski and Nower[16] developed a conceptual model of problem gambling in which they defined one pathway as being ‘antisocial impulsivist’ problem gamblers with elevated levels of impulsivity and antisocial personality disorder. According to this model, the impulsivity often commences in childhood with conduct disorder. In a study of 7-13 grade students in Ontario, Canada, Hardoon et al.[17] found that probable pathological gamblers exhibited significantly higher levels of conduct problems than did other gamblers and nongamblers. Using two longitudinal samples of adolescents, Barnes et al.[4] found significant correlations between delinquency and gambling constructs.

The present study will extend previous research by examining the relationships between three levels of youthful gambling and various problems behaviors, including levels of alcohol, tobacco and marijuana use as well as conduct disorder. The study uses a large representative U.S. general population sample of youth and young adults. This sample allows for analyses of co-occurrence of gambling and other problem behaviors while taking into account important sociodemographic factors. More specifically, the research questions are: do alcohol use, tobacco use, marijuana use and symptoms of conduct disorder individually predict gambling behaviors after taking into account gender, age, race/ethnicity and socioeconomic status; further, is there evidence of a syndrome of problem behaviors when predicting problem gambling and taking into account all of the other problem behaviors and sociodemographic factors in the same analysis?

Methods

A representative household sample of 2,274 U.S. young people, aged 14 to 21 years, was interviewed using computer-assisted telephone interviewing. The telephone sample was randomly selected from a sampling frame of all working telephone blocks in the U.S. The response rate was 71% based on completed interviews divided by completed interviews plus refusals. Weighting adjustments were used to align the sample with age and race distributions from the U.S. census. Details about the procedures have been published elsewhere.[8,9]

Dependent Measures

Gambling and heavy gambling—Respondents were asked lifetime and past-12-month frequency of gambling for money on 15 types of gambling, including: office pools, raffles, or charitable small stakes gambling; lottery; pulltabs; betting on the Internet; any gambling activity at a casino, riverboat, or cruise ship; card games; bowling, or playing basketball, pool, golf, backgammon, darts, or some other game of skill; betting on sports events; and buying sports cards hoping to make money on "insert cards." The variable, g*ambling in the past year*, was a dichotomous measure defined as gambling at least once in the past year based on the 15 types of gambling. *Heavy gambling* was a dichotomous measure defined as gambling 52 or more times in the past year, which is roughly equivalent to gambling once a week or more often and permits comparisons with other samples using comparable definitions for heavy gambling.[7,18,19]

Gambling problems—Respondents who answered that they had gambled more than five times in their life were asked a series of questions about gambling problems (lifetime and past 12 months). Three separate series of questions were asked. The first set was the South Oaks Gambling Screen, Revised for Adolescents (SOGS-RA;[20,21]). The scale assessed 12 gambling problems, e.g., going back another day to win back money you lost; gambling with more money than you had planned to; and borrowed or stolen money in order to bet or cover gambling debts. The Cronbach's Alpha was a satisfactory .72. The second set of questions about gambling problems was the Fisher DSM-IV-MR-J scale for adolescents.[22] This 12 question scale, based on DSM-IV, included items such as needing to gamble with more and more money to get the same amount of excitement; returning another day after losing money gambling to try and win back money lost ("chasing"); and stealing money from family or from outside the family to spend on gambling. The Cronbach's Alpha was . 72. The third set of questions about gambling problems was an adaptation for adolescents of the adult questions for pathological gambling from the Diagnostic Interview Schedule (DIS-IV;[23]), based on DSM-IV criteria for pathological gambling.[24] This scale included 15 gambling problems, including: having to increase the amount of money gambled to keep it exciting; trying to quit or cut down on gambling; and raising money to gamble by writing bad checks, stealing, or some other illegal way. Thirteen items were identical in the adult and youth surveys. A question from the adult study about "has your gambling caused you trouble with a spouse/partner or family member" was expanded in the youth survey to also cover parents and close friends. A question about whether "you missed a day or more of school" which was not in the adult study was added to the youth study. The Cronbach's Alpha for the 15 items was .77.

The three youth scales added together yielded a very high Cronbach's Alpha of .89. Using the three scales, a *dichotomous measure of gambling problems* was defined as having 3 or more gambling problems in the past year. This cut point is consistent with past reports[9] although there is no definitive definition of problem gambling among youth. A cut point of 3 or more gambling problems is also empirically based; it represents the top 10% of the problem gambling distribution in the present study and thereby yields sufficient power for the subsequent analysis.

Independent Measures

Any alcohol use, heavy drinking and problem drinking—A drink of alcohol was defined as a drink of beer, ale, malt liquor, wine, fortified wine, wine coolers, liquor, and flavored malt beverages or any other beverage containing alcohol. *Drinkers* were defined as those respondents who indicated that they had a drink of any beverage containing alcohol in the past 12 months. A dichotomous measure of *heavy drinking* (also called binge drinking)

was based on whether or not respondents indicated that they drank five or more drinks in one day on 12 or more days in the past 12 months.

Respondents who answered that they had had a drink of any alcoholic beverage more than 5 times in their life, were asked a series of 57 questions taken from the Adolescent Diagnostic Interview (ADI), Light[25] based on the DSM-IV criteria for alcohol abuse and dependence.[24] Of the 57 questions, 19 questions asked about alcohol abuse symptoms in the past 12 months, including: missing school or work more than once or twice; driving a car or motorcycle while drunk on alcohol; having legal problems because of alcohol; having problems with friends or family; and getting into physical fights. The remaining 38 items asked about alcohol dependence symptoms, including tolerance (needing larger amounts of alcohol than previously to get drunk), and withdrawal (having shakes or tremors of the hands after stopping or cutting down on drinking). The *problem drinking* dichotomous measure was defined as having 3 or more alcohol symptoms in the past year; this cut point represents 15% of the sample.

Tobacco use, heavy use and tobacco dependence—Tobacco use was assessed using questions about use of tobacco. Dichotomous measures of tobacco use and smoking 10+ cigarettes per day were derived. To assess tobacco dependence symptoms, the six questions reflecting DSM-IV criteria for substance dependence were used based on the work of Kandel and Chen in a national sample of the U.S. population aged 12 and older.[24,26] Respondents were asked, for example, about using more tobacco than intended, inability to cut down, needing larger amounts of tobacco to get the same effect and having withdrawal symptoms from tobacco. A dichotomous variable represented having three or more tobacco dependence symptoms in the past year; this cut point represents 4% of the sample.

Marijuana use, heavy marijuana use and marijuana-related problems—Marijuana use and heavy use (52+ times) variables were based on the frequency of marijuana or hashish in the past 12 months. Marijuana problems and dependence questions paralleled those for alcohol. The cut point of three or more symptoms of dependence represents 7% of the sample.

Conduct disorder—The measure of antisocial behavior for the present study was the current conduct disorder measure from the NIMH Diagnostic Interview Schedule for Children (DISC).[27] The DSM-IV standard for conduct disorder uses 15 criteria, e.g., frequent bullying, frequent initiating of fights, stealing with confrontation, forcing someone into sexual activity, arson, vandalism, breaking and entering, running away overnight at least twice, and frequent truancy from school beginning before age 13. The DISC conduct disorder section asks 26 behavioral questions, each of which maps onto one of the 15 criteria. Examples are: “Have you ever shoplifted - that is, stolen something from a store when no one is looking?” and “Have you ever broken into a house, a building or a car?” Respondents were also asked how often they had done each behavior in the past 12 months. To be classified for current conduct disorder, respondents had to have at least 3 symptoms in the past 12 months; this cut point represents 7% of the sample. Although a DSM-IV diagnosis of conduct disorder technically applies only to those individuals aged 18 years and younger, this same measure was administered to all respondents in the study including those aged 19 to 21 for whom assessment of APA's antisocial personality disorder would otherwise apply. Clinical diagnosis was not the aim of this general population epidemiologic study and therefore, it was deemed important to obtain a standard measurement of youthful deviant behavior for the entire sample.

Demographic Predictor Variables—*Gender* was coded 0 for female, 1 for male. *Age* was measured in years (14 - 21). R*ace/ethnicity* was: White (non Hispanic), Black (non

Hispanic), Hispanic, and Other. *Socioeconomic status (SES)* was based on the mean of four equally weighted factors: mother's years of education, father's years of education, mother's occupational prestige, and father's occupational prestige.[8,28]

Results

In the total sample of 2,274 young people, 68% gambled in the past year. Among past year drinkers, 82% gambled as compared with a 53% rate of gambling among non-drinkers. Among past-year smokers and marijuana users, 82% and 86%, respectively, gambled as compared with 62% and 64% gambling among non-smokers and those who did not use marijuana. Fifty-six percent of young people with no conduct disorder gambled in the past year as compared with a 76% rate of gambling among respondents with one or more criteria for conduct disorder. The bivariate correlations between the number of gambling problems in the past year and each of the other four problem behaviors were all statistically significant at the $p < .001$ level. The strongest correlations were between gambling problems and alcohol problems (.36) and between gambling problems and conduct disorder symptoms (.31).

The relationships between having 3 or more gambling problems in the past year and having substance abuse problems or conduct disorder also reveal strong associations (Figure 1). For instance, among those who reported 3 or more alcohol problems in the past year, 26% also had 3 or more gambling problems as compared with a 7% rate of problem gambling among respondents who did not report 3+ alcohol problems. Young people with current conduct disorder (3+ criteria in the past year) had nearly four times the rate of problem gambling (31%) as compared with those who did not meet the criteria for conduct disorder (8%).

A series of logistic regressions were performed with three levels of gambling involvement (any gambling, heavy gambling, and problem gambling) as the dichotomous dependent variables and specific problem behaviors and sociodemographic factors as the independent variables. Table 1 shows six logistic regressions with any gambling in the past year as the dependent variable. In the first logistic regression, only demographic factors were entered showing that males had 2.4 times the odds of being a gambler as did females. Each year of increasing age resulted in a 10% increase in overall gambling. Blacks were significantly less likely to gamble than were whites (the reference group). The next four logistic regressions in Table 1 show the separate effect of each problem behavior (alcohol use, tobacco use, marijuana use and one or more conduct disorder symptoms) while taking into account the demographic factors. Each problem behavior is significantly associated with overall gambling with the odds ratios ranging from 2.3 to 4.0. The strongest association with overall gambling is with alcohol use, such that those who drank alcohol in the past year had 4 times the odds of being a gambler after controlling for gender, age, race/ethnicity and socioeconomic status as compared with non-drinkers. The last column of Table 1 shows that when all four problem behaviors are entered into the analysis along with the demographic factors, all four behaviors remain significant in predicting overall gambling; however, the odds ratios for each problem behavior were somewhat reduced from the analysis with only the respective problem behavior. Thus, taking into account all four problem behaviors as well as the demographic factors, drinkers versus non-drinkers had 3.0 times the odds of gambling as compared with an odds ratio of 4.0 when alcohol was considered without the other three problem behaviors.

Table 2 displays the results of six logistics regressions paralleling those in Table 1 except that heavy gambling (gambled 52+ times in the past year) is the dependent variable and independent variables include the same demographic factors but with heavy alcohol use, heavy tobacco use and heavy marijuana use as potential co-occurring problem behaviors.

(There is no parallel measure of "heavy conduct disorder" and therefore conduct disorder is not included in the analysis in Table 2.) Considering just the demographic factors, males had nearly five times (OR=4.9) the odds of being a heavy gambler as females. Heavy gambling increased with age. Unlike the findings for any gambling (Table 1), being black and being Hispanic, as compared with being white, resulted in an increased risk of heavy gambling. Lower socioeconomic status was also associated with increased heavy gambling. When the three independent behaviors, heavy alcohol use, heavy tobacco use and heavy marijuana use were each entered separately into logistic regressions, they resulted in 2 to 3 times the odds of being a heavy gambler as compared with non-heavy substance users. When the three heavy use variables were included at the same time, the magnitude of the odds ratios decreased with heavy tobacco use becoming non-significant in predicting heavy gambling. Heavy alcohol users still had nearly three times the odds (OR=2.9) of being a heavy gambler as non-heavy drinkers.

Table 3 shows the results of six logistic regressions with problem gambling (i.e., three or more problem gambling symptoms in the past year) as the dependent variable. Being male, as compared to being female, was associated with over seven times the odds of being a problem gambler. Increased age was once again significantly associated with increased problem gambling; however, the remaining sociodemographic factors were not significant in predicting problem gambling. Each of the four problem independent variables (alcohol problems, tobacco problems, marijuana problems and conduct disorder) were significant in predicting problem gambling, with alcohol problems and conduct disorder having the highest odds ratios (4.8 and 4.4, respectively). When all four problem behaviors, as well as all demographic variables, were considered together (last column of Table 3), only alcohol problems and conduct disorder remainder significant in predicting problem gambling with odds ratios of 3.9 and 2.9 for alcohol problems and conduct disorder, respectively. Taking into account all of the demographic and problem variables also confirmed the importance of male gender in predicting problem gambling. Males had over six times the odds of being a problem gambler than females even after considering problems associated with substance use and conduct disorder. In the final analysis with all variables considered, being black and being Hispanic each resulted in a 60% increase in problem gambling as compared with the white reference group (Table 3). Thus, being male, black, Hispanic, having alcohol problems and conduct disorder symptoms are significant risk factors for problem gambling among youth and young adults in the U.S.

Discussion

The findings support the concept that gambling behaviors and gambling problems are part of a more general problem behavior syndrome associated with substance use behaviors and conduct disorder. All of the problem behaviors considered – alcohol, tobacco, marijuana and conduct disorder – have strong associations with gambling, even after controlling for sociodemographic factors. However, the largest odds ratios observed were for the relationships between problem drinking and problem gambling and between conduct disorder and problem gambling. These associations between problem gambling and alcohol-related problems and conduct disorder remained even after the other problem behaviors (tobacco dependence and marijuana problems) were taken into account. The finding that the odds ratios for all four problem behaviors decrease from the analyses where each is considered alone to where all four problem behaviors are considered together is evidence for the shared variance of all of these behaviors, and therefore, for the problem behavior syndrome.

This study extends research on the co-occurrence of gambling and other problem behaviors among youth in that it is based on the only representative household sample of gambling

among 14 to 21 year olds in the U.S. It further extends previous research in that it simultaneously takes into account respective substance use and conduct disorder variables and key sociodemographic factors. Thus, the findings from this national U.S. study, showing a high co-occurrence between gambling and substance use, confirm findings from various other adolescent surveys in the U.S.,[13,29] in Canada,[11,17] and among college students.[12] In their review of youth gambling problems, Derevensky et al.,[5] concluded that youth with gambling problems are likely to engage in multiple, comorbid addictive behaviors.

Although no other studies have examined the relationships between gambling and DSM-IV conduct disorder in youth samples, the present findings are consistent with those of Hardoon et al.[17] who showed a strong association between a 12-item conduct disorder scale (Connors-Wells Scale) and probable pathological gambling among secondary school students in Ontario, Canada. Previously published analyses of the relationship between only problem gambling and conduct disorder in this dataset showed that early-onset problem gamblers (i.e., those with onset of at-risk or problem gambling at 14 years or earlier) had a higher risk for conduct disorder than late-onset problem gamblers.[30] It was suggested that these early-onset problem gamblers may fit into Blaszczynski and Nower's[16] etiological group termed “anti-social impulsivist problem gamblers who are characterized by impulsiveness and aspects of antisocial personality disorder or conduct disorder. This type of problem gambling was suggested to emerge early in life and have a genetic etiological basis.

Studies among adult samples, also have linked problem gambling to antisocial personality disorder.[31,32] In a large sample of men in twin pairs from the Vietnam Era Twin Registry, Slutske and colleagues[33] examined the relationships between pathological gambling and antisocial personality disorder and concluded that the significant co-occurrence was partially due to their sharing a common genetic vulnerability.

In two regional longitudinal samples of youth, Barnes, Welte and colleagues[4] showed that gambling, substance use and delinquency were correlated and that these problem behaviors had shared antecedents within three explanatory domains – sociodemographic factors, individual factors and socialization factors. Black youth had lower levels of problem behaviors than white youth. Moral disengagement predicted both gambling and drug use among males and peer delinquency predicted gambling, substance use and delinquency among females. Although this study was longitudinal in design, only the prevalence of gambling was assessed and not problems associated with gambling.

A striking commonality in all of the present analyses was the strong effect of male gender in predicting gambling behaviors and gambling problems. Male gender was important in explaining gambling, especially problem gambling, over and above the influence of substance use or conduct disorder. The problem behavior literature has consistently shown that males have higher levels of multiple problem behaviors than females, including alcohol abuse, illicit drug use and delinquency.[34] The findings that males have six to seven times the odds of being a problem gambler as do females is strong evidence of the need for increased prevention and intervention efforts for gambling as well as co-occurring substance abuse and conduct disorder among young males.

The main effect of higher levels of gambling with increased age throughout adolescence and into young adulthood is consistent with the literature on youthful gambling.[10] Thus, interventions which begin early may have increased likelihood of success in lessening the upward trajectory of gambling problems.

This study further showed that blacks and Hispanics were more likely than other young people to be frequent/heavy gamblers, even after controlling for socioeconomic status.

Being black and being Hispanic each contributed significantly in predicting heavy gambling and problem gambling after taking into account the parallel alcohol, tobacco, marijuana and conduct disorder variables. These findings are consistent with national studies of gambling among adults. In a U.S. comorbidity survey, Kessler et al.[35] found that blacks had 8.4 times the odds of pathological gambling than whites. In a national study of gambling among adults in the U.S., Welte et al.[36] also found that minority and lower-socioeconomic-status persons had a higher-than-average prevalence of gambling pathology even after adjusting for gambling behaviors, substance use, criminal behaviors, gender and age. Some investigators have explained this finding in terms of lower-socioeconomic-status persons viewing gambling as a form of investment and a possible escape from poverty.[36,37]

The present study clearly shows that gambling behaviors and problem gambling in young people are strongly related to other problem behaviors, particularly substance use and conduct disorder. Furthermore, there are important sociodemographic predictors of gambling problems over and above the effects of other problem behaviors. Male, black, and Hispanic young people are at an elevated risk of problem gambling. Increased prevention and intervention strategies are warranted to address co-occurring gambling, substance use and antisocial behaviors among youth in the U.S. Clinical interventions for one problem behavior – problem gambling, substance abuse or conduct disorder – might well assess for the other problems as well.

Acknowledgments

This study was funded by grant R01MH63761 from the National Institute of Mental Health, National Institutes of Health, Bethesda, MD (Dr. Welte).

References

1. Elliott, DS.; Huizinga, D.; Ageton, SS. Explaining Delinquency and Drug Use. Beverly Hills, CA: Sage; 1985.
2. Donovan JE, Jessor R. Structure of problem behavior in adolescence and young adulthood. J Consult Clin Psych. 1985; 53:890–904.
3. Jessor, R.; Jessor, SL. Problem Behavior and Psychosocial Development: A Longitudinal Study of Youth. New York: Academic Press; 1977.
4. Barnes GM, Welte JW, Hoffman JH, Dintcheff BA. Shared predictors of youthful gambling, substance use and delinquency. Psychol Addict Behav. 2005; 19:165–174. [PubMed: 16011387]
5. Derevensky, JL.; Gupta, R.; Dickson, L.; Hardoon, K.; Deguire, AE. Understanding youth gambling problems - A conceptual framework. In: Romer, D., editor. Reducing Adolescent Risk - Toward an Integrated Approach. Thousand Oaks, CA: Sage Publications, Inc.; 2003. p. 239-246.
6. Vitaro F, Brendgen M, Ladouceur R, Tremblay RE. Gambling, delinquency, and drug use during adolescence: Mutual influences and common risk factors. J Gamb Stud. 2001; 17:171–190.
7. Welte JW, Barnes GM, Hoffman JH. Gambling, substance use and other problem behaviors among youth: A test of general deviance models. J Crim Just. 2004; 32:297–306.
8. Welte JW, Barnes GM, Tidwell MCO, Hoffman JH. The prevalence of problem gambling among U.S. adolescents and young adults: Results from a national survey. J Gamb Stud. 2008; 24:119–133.
9. Barnes GM, Welte JW, Hoffman JH, Tidwell MCO. Gambling, alcohol, and other substance use among youth in the United States. J Stud Alcohol Drugs. 2009; 70:134–142. [PubMed: 19118402]
10. Winters, KC.; Arthur, N.; Leitten, W.; Botzet, A. Gambling and drug abuse in adolescence. In: Derevensky, JL., editor. Gambling Problems in Youth: Theoretical and Applied Perspectives. New York, NY: Kluwer Academic/Plenum Publishers; 2004. p. 57-80.
11. Ste-Marie C, Gupta R, Derevensky JL. Anxiety and social stress related to adolescent gambling behavior and substance use. J Child Adoles Subst. 2006; 15:55–74.
12. Engwall D, Hunter R, Steinberg M. Gambling and other risk behaviors on university campuses. J Am Coll Health. 2004; 52:245–255. [PubMed: 15134098]

13. Duhig AM, Maciejewski PK, Desai RA, KrishnanSarin S, Potenza MN. Characteristics of adolescent past-year gamblers and non-gamblers in relation to alcohol drinking. Addict Behav. 2007; 32:80–89. [PubMed: 16814934]
14. Lynch WJ, Maciejewski PK, Potenza MN. Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. Arch Gen Psychiat. 2004; 61:1116–1122. [PubMed: 15520359]
15. Petry NM, Tawfik Z. Comparison of problem-gambling and non-problem-gambling youths seeking treatment for marijuana abuse. J Am Acad Child Psy. 2001; 40:1324–1331.
16. Blaszczynski A, Nower L. A pathways model of problem and pathological gambling. Addiction. 2002; 97:487–499. [PubMed: 12033650]
17. Hardoon KK, Gupta R, Derevensky JL. Psychosocial variables associated with adolescent gambling. Psychol Addict Behav. 2004; 18:170–179. [PubMed: 15238059]
18. Barnes GM, Welte JW, Hoffman JH, Dintcheff BA. Gambling and alcohol use among youth: Influences of demographic, socialization and individual factors. Addict Behav. 1999; 24:749–767. [PubMed: 10628510]
19. Barnes GM, Welte JW, Hoffman JH, Dintcheff BA. Effects of alcohol misuse on gambling patterns in youth. J Stud Alcohol. 2002; 63:767–775. [PubMed: 12529078]
20. Winters KC, Stinchfield RD, Fulkerson J. Toward the development of an adolescent gambling problem severity scale. J Gamb Stud. 1993; 9:63–84.
21. Lesieur HR, Blume SB. The South Oaks Gambling Screen: A new instrument for the identification of pathological gamblers. Am J Psychiat. 1987; 144:1184–1188. [PubMed: 3631315]
22. Fisher S. Developing the DSM-IV criteria to identify adolescent problem gambling in non-clinical populations. J Gamb Stud. 2000; 16:253–273.
23. Robins, L.; Marcus, L.; Reich, W.; Cunningham, R.; Gallagher, T. NIMH Diagnostic Interview Schedule - Version IV (DIS-IV). St Louis, MO: Department of Psychiatry, Washington University School of Medicine; 1996.
24. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th. Washington, DC: American Psychiatric Association; 1994.
25. Winters, KC.; Henley, GA. Adolescent Diagnostic Interview Schedule and Manual. Los Angeles, CA: Western Psychological Services; 1993.
26. Kandel DB, Chen K. Extent of smoking and nicotine dependence in the United States: 1991 - 1993. Nicot Tobacco Res. 2000; 2:263–274.
27. Shaffer D, Fisher P, Lucas C, Dulcan M, Schwab-Stone M. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): Description, differences from previous versions, and reliability of some common diagnoses. J Am Acad Child Adolesc Psychiatry. 2000; 39:28–38. [PubMed: 10638065]
28. Hauser RM, Warren JR. Socioeconomic indexes for occupations: A review, update, and critique. Sociol Methodol. 1997; 27:177–298.
29. Winters KC, Anderson N. Gambling involvement and drug use among adolescents. J Gamb Stud. 2000; 16:175–198.
30. Welte JW, Barnes GM, Tidwell MCO, Hoffman JH. Association between problem gambling and conduct disorder in a national survey of adolescents and young adults in the United States. J Adoles Health. 2009; 45:396–401.
31. Cunningham-Williams RM, Cottler LB, Compton WM, 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 Gamb Stud. 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 Clin Psychiatry. 2005; 66:564–574. [PubMed: 15889941]
33. Slutske WS, Eisen S, Xian H, et al. A twin study of the association between pathological gambling and antisocial personality disorder. J Abnorm Psychol. 2001; 110:297–308. [PubMed: 11358024]
34. Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance – United States, 2007. MMWR. 2008; 57(No. SS-4)

35. Kessler RC, Hwang I, LaBrie R, et al. DSM-IV pathological gambling in the National Comorbidity Survey replication. Psych Med. 2008; 38:1351–1360.

36. Welte JW, Barnes GM, Wieczorek WF, Tidwell M, Parker J. Alcohol and gambling pathology among U.S. adults: Prevalence, demographic patterns and comorbidity. J Stud Alcohol Drugs. 2001; 62:706–712.

37. Schissel B. Betting against youth: The effects of socioeconomic marginality on gambling among young people. Youth & Soc. 2001; 32:473–491.

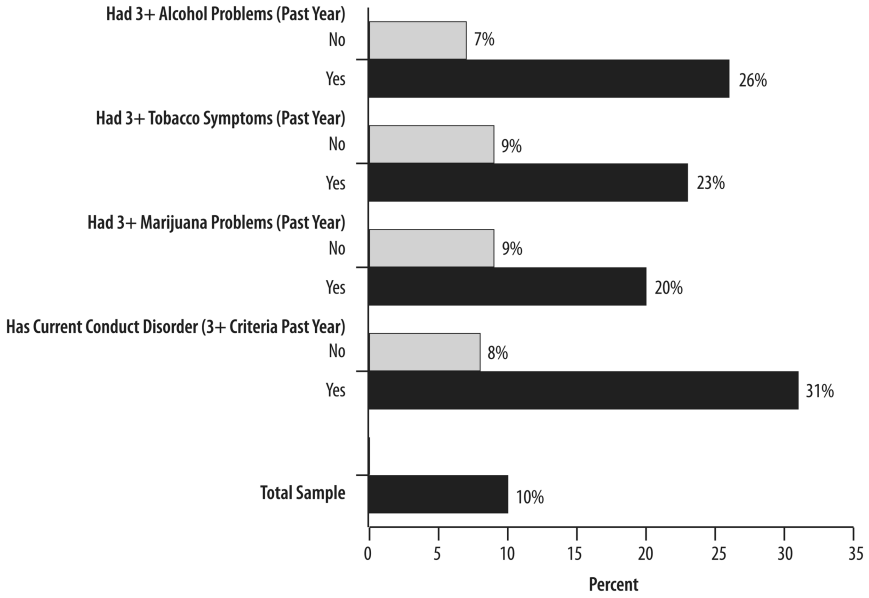

Figure 1. Percent of 14 to 21 Year Olds with Three or More Gambling Problems According to Alcohol Problems, Tobacco Symptoms, Marijuana Problems and Conduct Disorder (N = 2,274)

Table 1

Six logistic regressions with any gambling in the past year as the dependent variable and demographic factors, any alcohol use, any tobacco use, any marijuana use and any conduct disorder in the past year as independent variables (n=2258)

	Demographic factors only	Demographics and alcohol use	Demographics and tobacco use	Demographics and marijuana use	Demographics and any conduct disorder	Demographics and all four problem behaviors
Male	2.4***	2.4***	2.3***	2.4***	2.4***	2.3***
Age (in years)	1.1***	1.0ns	1.1***	1.1***	1.1***	1.0ns
Black	0.7**	0.9ns	0.8*	0.7**	0.7**	0.9ns
Hispanic	1.1ns	1.2ns	1.2ns	1.2ns	1.0ns	1.2ns
Socioeconomic status	1.1ns	1.0ns	1.1*	1.0ns	1.0ns	1.0ns
Alcohol use	X	4.0***	X	X	X	3.0***
Tobacco use	X	X	2.3***	X	X	1.3*
Marijuana use	X	X	X	3.1***	X	1.6**
Conduct disorder	X	X	X	X	2.5***	2.0***

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Six logistic regressions with heavy gambling (52+ times) in the past year as the dependent variable and demographic factors, heavy alcohol use, heavy tobacco use, heavy marijuana use as independent variables (n=2258)

	Demographic factors only	Demographics and heavy alcohol use	Demographics and heavy tobacco use	Demographics and heavy marijuana use	Demographics and all three problem behaviors
Male	4.9***	4.2***	4.8***	4.7***	4.1***
Age (in years)	1.1***	1.0ns	1.1***	1.1***	1.0ns
Black	1.8***	2.2***	2.0***	1.8**	2.3***
Hispanic	1.4*	1.6**	1.6**	1.5**	1.7***
Socioeconomic status	0.9*	0.9*	0.9*	0.9*	0.9*
Heavy Alcohol use	X	3.2***	X	X	2.9***
Heavy Tobacco use	X	X	2.0***	X	1.2ns
Heavy Marijuana use	X	X	X	2.4***	1.7**

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Six logistic regressions with 3+ gambling problems as the dependent variable and demographic factors, 3+ alcohol problems, 3+ tobacco symptoms, 3+ marijuana problems and 3+ conduct disorder symptoms in the past year as independent variables (n=2258)

	Demographic Factors Only	Demographics and 3+ Alcohol Problems	Demographics and 3+ tobacco dependence symptoms	Demographics and 3+ Marijuana Problems	Demographics and 3+ conduct disorder symptoms	Demographics and All Four Problem Behaviors
Male	7.3***	6.4***	7.3***	7.1***	6.7***	6.3***
Age (in years)	1.1*	1.0ns	1.1*	1.1*	1.1**	1.0ns
Black	1.4ns	1.6*	1.5ns	1.4ns	1.3ns	1.6*
Hispanic	1.4ns	1.6*	1.5ns	1.4ns	1.5ns	1.6*
Socioeconomic Status	1.0ns	1.0ns	1.0ns	1.0ns	1.0ns	1.0ns
3+ Alcohol Problems	X	4.8***	X	X	X	3.9***
3+ Tobacco Symptoms	X	X	2.7***	X	X	1.5ns
3+ Marijuana Problems	X	X	X	1.9**	X	0.7ns
3+ Conduct Disorder Symptoms	X	X	X	X	4.4***	2.9***

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Am J Addict. Author manuscript; available in PMC 2013 September 10.