

Gambling, Alcohol, and Other Substance Use Among Youth in the United States*

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ABSTRACT. Objective: Problem gambling has been linked with substance misuse among youth in a number of regional studies, yet there have been no large representative U.S. surveys of gambling behaviors and substance use among youth. The present study is designed to compare the patterns and co-occurrence of gambling and alcohol and other substance use among youth in the United States. **Method:** A random telephone survey was conducted with 2,274 youth ages 14-21 years old living in households in every area of the United States. **Results:** Problem gambling and substance misuse are prevalent among young people. For instance, 17% of youth reported gambling 52 or more times in the past year, and the same percentage of youth drank five or more drinks on

12 or more days in the past year. Ten percent of youth reported having three or more gambling problems in the past year, and 15% of young people reported having three or more alcohol problems. Controlling for gender, age, and socioeconomic status, black youth have a significantly increased probability of frequent gambling compared with other racial/ethnic groups, yet they have a significantly decreased probability of heavy drinking. Alcohol problems and gambling problems show high co-occurrence, especially for male youth and black youth. **Conclusions:** Population subgroups with a high co-occurrence of alcohol and gambling problems are important for targeted prevention and intervention strategies. (*J. Stud. Alcohol Drugs* **70**: 134-142, 2009)

ALCOHOL, TOBACCO, AND MARIJUANA are the three substances most commonly used by youth, and the misuse of these substances constitutes a major public health problem in the United States. The widespread use of alcohol, tobacco, and marijuana has been documented for more than 3 decades in U.S. national surveys, including the National Survey of Drug Use and Health (Substance Abuse and Mental Health Services Administration [SAMHSA], 2007) and Monitoring the Future (MTF) surveys, 1975-2006 (Johnston et al., 2007). The recent 2006 MTF survey showed that two thirds (66.5%) of 12th graders drank alcohol in the past year, nearly one third (31.5%) used marijuana in the past year, and more than one fifth (21.6%) of high school seniors smoked cigarettes in the past month (Johnston et al., 2007). In 2006, 8% of the 12- to 17-year-olds and 21% of the 18- to 25-year-olds met the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), criteria for abuse or dependence on illicit drugs or alcohol (SAMHSA, 2007). Moreover, although alcohol use, cigarette smoking, and illicit substance use each constitute a significant public health problem, they are correlated with each other and with problem gambling (Barnes et al., 1999).

With the recent widespread proliferation of gambling opportunities in the United States, there has been a growing

recognition of the social consequences of problem gambling among both youth (Winters et al., 2004) and adults in the United States (Committee on the Social and Economic Impact of Pathological Gambling and Committee on Law and Justice, National Research Council, 1999). However, unlike the substance-use field, there had been no representative U.S. survey of gambling among youth until the present gambling study was completed in early 2007.

Gambling has typically been defined by asking respondents about the frequency of gambling for money on a series of games (e.g., playing the lottery, playing cards for money, betting on sporting events, internet gambling). Problem gambling is typically assessed using standardized scales that ask questions, for example, about gambling causing problems with family, with friends, or at work or school, or borrowing or stealing money to cover gambling debts and going back to recover losses ("chasing"). Problem gambling is often defined as endorsement of three or more problem items, and pathological gambling is classified when five or more problems or diagnostic criteria are endorsed (Welte et al., 2001, 2008). From regional studies, there is evidence that gambling is prevalent among youth. For instance, in a study of more than 18,000 students attending Minnesota public schools, 82.7% of the 12th-grade boys and 58.7% of the 12th-grade girls had gambled in the prior year; 22.7% of the boys and 5% of the girls had gambled weekly or more often (Winters and Anderson, 2000). In a telephone survey of 1,103 New York State youth ages 13-17 years old, Volberg (1998) reported that 75% of the adolescents had gambled in the past year and that 15% gambled weekly or more often.

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The available studies provide evidence that gambling problems may be more frequent in youth than in adults. For instance, Shaffer et al. (1997) conducted a meta-analysis of 22 surveys of adolescent gambling in various geographic regions of the United States. They determined that the rate for past-year Level 3 gambling (defined as the most severe level of disordered gambling) for adolescents was 5.8%, with an additional rate of 14.8% for Level 2 gambling (defined as subclinical levels of gambling problems). From a meta-analysis of adult gambling surveys, these same authors (Shaffer et al., 1997) found the comparable adult prevalence rates to be 1.1% and 2.8% for past-year gambling Levels 3 and 2, respectively. Because there have been no representative U.S. surveys of youth, methodologically comparable data have not been available to compare with existing U.S. adult surveys of gambling.

For decades, social theorists have posited that various types of problem behaviors, such as substance use and delinquency, co-occur in adolescents, constituting what Jessor and colleagues termed a *problem behavior syndrome* (Donovan and Jessor, 1985; Jessor and Jessor, 1977) and what Hirschi and Gottfredson (1994) termed the generality of deviance. Only recently has adolescent gambling behavior been tested within the context of general deviance theory (e.g., Welte et al., 2004). From regional samples, significant relationships were found between gambling, alcohol misuse, and illicit drug use (e.g., Barnes et al., 2005; Welte et al., 2004; Winters et al., 2004). Studies among adults also revealed that gambling pathology was significantly associated with alcohol- and substance-use disorders, as well as nicotine dependence (e.g., Cunningham-Williams and Cottler, 2001; Cunningham-Williams et al., 1998; Griffiths et al., 2002; Petry, 2007). In a U.S. adult survey of gambling, Welte and colleagues (2001) reported that the odds ratio (OR) of current alcohol dependence with current gambling pathology was very large: 23.1; that is, the odds of being a pathological gambler were 23 times greater if one was currently alcohol dependent than if one was not alcohol dependent.

Despite clear evidence that substance misuse and problem gambling are co-occurring problem behaviors, there are no studies examining these behaviors in a large representative U.S. sample of youth, taking into account important sociodemographic factors, especially age, gender, race/ethnicity, and socioeconomic status. Thus, a goal of the present study was to compare the sociodemographic patterns of gambling and gambling-related problems among youth ages 14-21 in the United States with patterns of alcohol, tobacco, and marijuana use. Based on problem behavior theory, we hypothesized that gambling and gambling problems would have a significant co-occurrence (correlation) with substance use. Furthermore, we hypothesized that males and whites, who have been shown to have higher rates of substance use than their counterparts, would have comparably higher correlations of gambling and substance use.

Method

Sampling procedures

A nationally representative household sample of 2,274 U.S. household residents ages 14-21 was obtained by random-digit-dial telephone sampling procedures. The telephone sample, purchased from Survey Sampling International (Shelton, CT), was selected randomly from a sampling frame of all working telephone blocks in the United States. The sample was stratified by county and by telephone block within the county. This resulted in a sample that was spread across the United States according to population and not clustered by geographic area.

Because the sample was one of household telephone numbers, cell phone numbers were not intentionally included in the sample. Nonetheless, some cell phone numbers became a part of the sample because phone numbers from landline exchanges may be ported to cell phones; and some telephone exchanges (often in less populated areas) contain both landline and cell numbers. Estimates from the National Health Interview Survey for 2005-2006 (Centers for Disease Control and Prevention, 2006) show that between 7.6% and 8.6% of U.S. households with children had only wireless telephone service or no telephone service. Weighting can reduce potential bias created by not including cell-phone-only users in a household sample, which was done in the present study (see below).

Respondents were interviewed from August 2005 through January 2007 by trained interviewers using computer-assisted telephone interviewing. A total of 156,000 numbers were called; 4,467 numbers were determined to be households with eligible respondents ages 14-21. Of the 4,467 eligible respondents, 2,274 respondents completed interviews, 935 individuals refused to participate, 923 could not be contacted, 329 were "unable" to participate primarily for mental or physical reasons, and 6 interviews were omitted from the dataset based on interviewer concerns about truthfulness of responses. The response rate was 51% based on completed interviews divided by completions, plus refusals, noncontacts, others "unable" to participate, and omitted interviews. The response rate based on completed interviews divided by completed interviews plus refusals was 71%. Each telephone number was called at least seven times to determine if that number was assigned to a household containing an eligible respondent. Once a household was designated as eligible, the number was called until an interview was obtained or refusal conversion had failed. When there were multiple persons ages 14-21 within a household, a respondent was selected randomly using the next-birthday probability method, which has been shown to yield higher completion rates than other methods requiring enumeration (e.g., Beebe et al., 2007; Salmon and Nichols, 1983).

Parental permission to participate in the survey was obtained for respondents selected who were younger than age 18; 95% of these parents agreed that their children might participate. Subjects were mailed a check for \$25 for their time participating in the study. Interviews were conducted in all 50 states and the District of Columbia.

To compensate for multiple eligible respondents in the household, cases were statistically weighted inversely to their probability of selection. Weighting adjustments were also used to align the sample with the age and race distributions from the U.S. census for 2005. No weighting was necessary for gender. Respondents who were ages 14-18 were fairly equally distributed in the sample as they are in the U.S. census. However, 20- and 21-year-olds were underrepresented in the sample, and therefore they were "weighted up." The proportions of whites and blacks were similar to those reported in the U.S. census; Hispanics and Asians were slightly underrepresented in the sample, and therefore their weights were adjusted upward.

Dependent measures

Gambling behavior. Respondents were asked whether they had ever gambled for money on each of 15 types of gambling, including participating in office pools, raffles, or charitable small-stakes gambling; playing the lottery; purchasing pulltabs; gambling on the Internet; betting on any gambling activity at a casino, a riverboat, or a cruise ship; in card games; betting while bowling or playing basketball, pool, golf, backgammon, darts, or some other game of skill; betting on sports events; and buying sports cards (i.e., hoping to make money on "insert cards"). For each type of gambling ever done, respondents were then asked whether they had gambled on that type in the past 12 months; and, if so, they were asked the frequency—every day, at least once a week (if so, how many days per week), at least once a month (if so, how many days per month), or at least once in the past 12 months (if so, how many days during the past 12 months). The frequencies for each of the 15 types of gambling were summed to derive the variable, total number of times gambled in the past year. Gambling in the past year was a dichotomous measure defined as gambling at least once in the past year, and 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 (e.g., Barnes et al., 2002; Welte et al., 2004).

Gambling problems. Respondents who answered affirmatively to the screening question about gambling more than five times in their lives were asked a series of questions about gambling problems. Three separate series of questions were asked. The first set was the South Oaks Gambling Screen, Revised for Adolescents (SOGS-RA; Winters et al.,

1993). This instrument is a modified version of the SOGS (Lesieur and Blume, 1987). Respondents were first asked whether they had ever experienced each of 12 gambling problems, including going back another day to win back money they lost; having arguments with family or friends or problems at school or work; gambling with more money than they had planned to; and borrowing or stealing money to bet or cover gambling debts. For each item answered affirmatively, respondents were then asked whether they had experienced that problem in the past 12 months. The SOGS-RA measure was defined as the total number of past-year problem gambling symptoms, ranging from 0 to 12.

The second set of questions about gambling problems was the Fisher DSM-IV-MR-J scale for adolescents (Fisher, 2000). This is a 12-question scale based on DSM-IV. Respondents were first asked if they had ever experienced each of the 12 gambling problems. These included thinking about or planning to gamble; 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. For each item answered affirmatively, respondents were then asked whether they had experienced that problem in the past 12 months. The Fisher problem gambling scale was defined as the number of items endorsed in the past year, ranging from 0 to 12.

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, Version IV (DIS-IV; Robins et al., 1996), again based on the 10 DSM-IV criteria for pathological gambling (American Psychiatric Association, 1994). Respondents were first asked if they had ever experienced each of the 15 gambling problems. These problems included spending a lot of time thinking about ways to get money to gamble; using gambling as a way of getting out of a bad mood; increasing the amount of money gambled to keep it exciting; going back to the same place where they lost money to try to win it back; trying to quit or cut down on gambling; and raising money to gamble by writing bad checks, stealing, or some other illegal way. There were only two modifications for adolescents of the adult DIS questions. First, the adult question about gambling causing trouble with a spouse/partner or family member was changed to ask about trouble with a parent, other family member, or close friend. Second, an additional question was added that asked, "Have you missed a day or more of school because of your gambling?" For each item answered affirmatively, respondents were then asked how often they had experienced that problem in the past 12 months. The response options were 1 (never), 2 (once or twice), 3 (sometimes), or 4 (often). The DIS problem gambling scale was the number of items endorsed as having occurred in the past year and could range from 0 to 15.

The measure of past-year gambling problems was the total number of symptoms endorsed from the three separate measures. Although each scale has items that map onto a particular American Psychiatric Association (1994) diagnostic criterion for pathological gambling, there is variability in question wording and in the number of items to measure a criteria. The correlation matrix of all 0, 1 variables revealed no correlations above .7; and a principal components analysis of all 39 items showed the correlation between the total scale and the principal component to be .97. Thus, the total scale for assessing problem gambling was maintained. A dichotomous measure of gambling problems was also defined as having three or more gambling problems in the past year.

Alcohol consumption and misuse. Past-year average alcohol consumption was calculated from quantity/frequency questions for beer, ale, malt liquor, wine, fortified wine, wine coolers, distilled spirits, and flavored malt beverages. Past year drinkers were defined as those respondents whose daily average past-year alcohol consumption was greater than zero. Heavy drinking was assessed using questions about the past-year frequency of drinking five or more drinks in 1 day. A dichotomous measure of heavy drinking was defined as drinking five or more drinks in 1 day on 12 or more days in the past year. Respondents were also asked whether they had had a drink of any beverage containing alcohol more than five times in their lives. Respondents who answered affirmatively were asked a series of questions taken from the DIS-IV (Robins et al., 1996), based on the DSM-IV criteria for alcohol abuse and dependence (American Psychiatric Association, 1994). There were 19 questions asking 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 sex when drunk on alcohol, having legal problems because of alcohol, having problems with friends or family, getting into physical fights, and having frequent arguments with your parents or other adults about your alcohol use. There were also 38 items asking about alcohol-dependence symptoms, including tolerance (needing larger amounts of alcohol than previously to get drunk), having to use alcohol to relieve or reduce hangover or withdrawal symptoms, and trying to reduce or control your alcohol use. The alcohol problems variable was defined as the total number of alcohol abuse or dependence symptoms in the past year, ranging from 0 to 57. A dichotomous measure of alcohol misuse was also defined as having three or more alcohol problems in the past year.

Tobacco use and tobacco dependence symptoms. Tobacco use was assessed using questions about use of tobacco, including cigarettes, cigars, cigarillos, or pipes and smokeless tobacco in the past 12 months and the number of cigarettes, cigars, etc., smoked on a typical day. From these variables, dichotomous measures of tobacco use and smoking 10 or more cigarettes, cigars, etc., per day were derived. To assess tobacco dependence symptoms, six questions reflect-

ing DSM-IV criteria for substance dependence were used (American Psychiatric Association, 1994; Kandel and Chen, 2000). Respondents were asked, for example, about using more tobacco than intended, being unable to cut down, needing larger amounts of tobacco to get the same effect, and having withdrawal symptoms from tobacco. For the present analyses, scores on these six symptoms were totaled for number of tobacco symptoms in the past year, and a dichotomous variable was made representing having three or more tobacco dependence symptoms in the past year.

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.

Predictor measures

Predictor measures were sociodemographic characteristics. Gender was coded 0 for female and 1 for male. Age was measured in years (range: 14-21). Respondents were asked whether they considered themselves Spanish, Hispanic, Latino, or Chicano. They were also asked, "What is your race?" Response choices were white (or white Hispanic), black or African American (or black Hispanic), Asian, American Indian or Alaska Native, and mixed. The measure of race/ethnicity was white (non-Hispanic), black (non-Hispanic), Hispanic, and other.

Socioeconomic status. Socioeconomic status was based on the mean of four equally weighted factors: (1) mother's years of education, (2) father's years of education, (3) mother's occupational prestige, and (4) father's occupational prestige. Occupational prestige was coded from census occupation categories using the method described by Hauser and Warren (1997). We also asked a series of questions (e.g., home ownership, number of books in the home, receipt of food stamps) that were used as predictor variables to impute education or occupational prestige when these variables were missing. Imputation was performed by the SPSS Missing Value program (SPSS, Inc., Chicago, IL).

Results

In this U.S. nationally representative sample of youth ages 14-21, more than two thirds (68%) of the respondents gambled in the past year. This overall rate of gambling was characterized by participation in a variety of gambling activities in the past year. The most commonly reported gambling activity was card games, with one third (33%) of the youth reporting this activity; males reported card games more often than females (45% vs 21%). The second most commonly endorsed item was office pools, raffles, or charitable small stakes gambling (30%); this item ranked second for both males (37%) and females (24%). Lottery play was endorsed

TABLE 1. Gambling, alcohol, tobacco, and marijuana use, heavy use, and related problems, past year

Variable (weighted <i>n</i>)	Gambled %	Drank alcohol %	Smoked tobacco %	Used marijuana %	Gambled ≥52 times %	Drank ≥5 drinks on 12 or more days %	Smoked ≥10 cigarettes per day %	Used marijuana ≥52 times %
Sociodemographic group								
Total sample (2,274)	68	51	26	18	17	17	7	9
Gender								
Female (1,126)	58‡	48†	22‡	15‡	8‡	11‡	7 ^{NS}	6‡
Male (1,148)	77	54	31	21	27	24	7	11
Age, in years ^a								
14-15 (588)	60‡	25‡	14‡	8‡	13‡	4‡	1‡	3‡
16-17 (583)	64	44	19	17	17	11	4	8
18-19 (564)	74	64	33	23	19	24	9	12
20-21 (539)	72	74	42	23	21	31	16	13
Race								
White, not Hispanic (1,408)	70‡	57‡	31‡	19*	15‡	21‡	9‡	9 ^{NS}
Black, not Hispanic (334)	60	30	16	14	24	8	2	10
Hispanic (373)	71	49	22	16	21	16	5	8
Socioeconomic status								
Low (758)	63‡	40‡	28 ^{NS}	14†	18‡	14†	10‡	8‡
Middle (761)	72	54	28	21	22	20	7	12
High (755)	68	59	23	18	13	17	4	6
	≥3 gambling problems		≥3 alcohol problems		≥3 tobacco- dependence symptoms		≥3 marijuana problems	
Sociodemographic group								
Total sample (2,274)	10		15		4		7	
Gender								
Female (1,126)	3‡		11‡		3 ^{NS}		5‡	
Male (1,148)	16		19		4		10	
Age, in years ^a								
14-15 (588)	7 ^{NS}		5‡		2‡		4‡	
16-17 (583)	10		10		2		7	
18-19 (564)	13		23		5		9	
20-21 (539)	9		24		6		9	
Race								
White, not Hispanic (1,408)	9 ^{NS}		17‡		5†		8 ^{NS}	
Black, not Hispanic (334)	11		11		1		8	
Hispanic (373)	12		14		3		8	
Socioeconomic status								
Low (758)	9 ^{NS}		14 ^{NS}		3 ^{NS}		7†	
Middle (761)	11		17		5		10	
High (755)	9		15		3		5	

Notes: ^{NS} = not significant. ^aLinear test of significance used for age variable.
 χ^2 : * $p \leq .05$; † $p \leq .01$; ‡ $p \leq .001$.

by 29% of the youth, with nearly even percentages of both males (30%) and females (29%) reporting this activity in the past year. The fourth most commonly endorsed type of gambling type was sports betting, which was reported by 23% of youth, with a sizable difference between males (35%) and females (11%). Internet gambling had the lowest endorsement of any game, with only 2% of young people reporting this activity in the past year (Welte et al., in press).

With regard to substance use, one half (51%) of the sample of youth consumed alcohol, one quarter (26%) of the young people smoked tobacco in the past year, and nearly one fifth (18%) used marijuana (Table 1). Moreover, significant proportions of young people engaged in these behaviors frequently and experienced gambling and substance-use-related problems. For instance, 17% of youth gambled 52 or more times in the past year (roughly equivalent to once a week or more), and the same percentage of youth drank

five or more drinks on 12 or more days in the past year. Ten percent of young people had three or more gambling problems, and 15% had three or more alcohol-related problems. Males had significantly higher rates than females on every gambling and substance-use/misuse variable considered, except for smoking. Whereas males had a higher overall prevalence of smoking than females (31% vs 22%), the rates of smoking 10 or more cigarettes per day were the same for males and females (7%); and the rates for three or more tobacco-dependence symptoms were similar for males (4%) and females (3%). Heavy gambling and gambling-related problems showed the greatest proportionate difference according to gender, such that more than one quarter of the males (27%) gambled 52 or more times in the past year, compared with 8% of females. Likewise, 16% of males experienced three or more gambling problems, compared with 3% of females. Heavy drinking showed a similar gender gap,

with one quarter (24%) of the males characterized by heavy drinking (i.e., drank five or more drinks on 12 or more days in the past year) and 11% of the females so classified.

All of the substance-use and substance-problem variables showed a highly significant increase with age. For instance, among the 14- to 15-year-olds, 25% had consumed alcohol, and 4% had done so heavily. Drinking and heavy drinking increased sharply to 74% and 31%, respectively, for those ages 20-21. The gambling by age relationships were also highly significant, except for gambling problems by age, which was not significant. Thus, 60% of 14- to 15-year-olds had gambled, and 13% had gambled heavily (≥ 52 times). Gambling and heavy gambling were 72% and 21%, respectively, among 20- to 21-year-olds.

Gambling and alcohol, in particular, showed some differing patterns among racial/ethnic groups. Gambling was lowest among blacks (60%), compared with non-Hispanic whites (70%) and Hispanics (71%). However, heavy gambling was highest among blacks (24%), compared with whites (15%) and Hispanics (21%). This is a different pattern than for alcohol, in which the prevalence of any alcohol use in the past year was highest among whites (57%) and lowest among blacks (30%); blacks also had lower rates of heavy drinking (8%) than whites (21%) and Hispanics (16%). For tobacco, nearly one third (31%) of white young people smoked tobacco, and 19% used marijuana. For blacks, the rate of smoking was significantly less (16%) than for whites, yet this rate of smoking among blacks was similar to the rate of marijuana use for blacks (14%). The rate of having three or more marijuana problems in the past year was the same (8%) for whites, blacks, and Hispanics.

The mean times gambled and various substances used showed again the large gender gap in gambling, alcohol, and

marijuana behaviors (Table 2). The average times gambled in the past year was more than five times as great for males as for females (80.2 vs 7.6 times). The average number of days males drank five or more drinks was more than twice as many as for females (18.7 vs 7.6 days); and likewise the mean number of days males used marijuana was nearly double that of females (28.6 vs 15 days). The three related problem indicators were also significantly different for males and females in the expected direction. Although males smoked more cigarettes per day than females, the mean number of tobacco symptoms did not differ for males and females. There were significant age-related mean differences in gambling and substance use. For instance, mean times gambled in the past year was 36.1 among 14- to 15-year-olds and 59.6 times among 20- to 21-year-olds. The number of days 14- to 15-year-olds drank five or more drinks was 2.6, which dramatically increased to 27.6 days for 20- to 21-year-olds. The differences in mean number of times gambled were significant for race/ethnicity. The mean times gambled was 95.7 times in the past year for blacks, with rates half as great for Hispanics (48.1) and even lower for whites (37.4). In contrast, mean number of days respondents drank five or more drinks was lower (9.2) among blacks than among whites (15.1) and Hispanics (11.7). Levels of marijuana use were not significantly different across the three racial/ethnic groupings.

Logistic regression analyses were performed (not displayed) predicting dichotomous dependent variables as shown in Table 1. The sociodemographic predictor variables—gender, age, race/ethnicity, and socioeconomic status—were entered together in the analysis. These multivariate analyses confirmed the findings in earlier tables. The odds of a male being a heavy gambler were 4.9 times the odds

TABLE 2. Mean times gambled, days drank ≥ 5 drinks, number of cigarettes per day and days used marijuana, and mean number of related problems, past year

Sociodemographic group	Mean no. times gambled	Mean no. days drank ≥ 5 drinks	Mean no. cigarettes per day	Mean no. days used marijuana	Mean no. gambling problems	Mean no. alcohol problems	Mean no. tobacco symptoms	Mean no. marijuana problems
Total sample	47.6	13.2	1.6	21.8	0.8	1.4	0.23	0.66
Gender								
Female	14.4 [‡]	7.6 [‡]	1.3 [†]	15.0 [‡]	0.2 [‡]	1.0 [‡]	0.20 ^{NS}	0.42 [‡]
Male	80.2	18.7	1.9	28.6	1.3	1.7	0.26	0.91
Age, in years ^a								
14-15	36.1 [†]	2.6 [‡]	0.4 [‡]	5.3 [‡]	0.6 [†]	0.5 [‡]	0.11 [‡]	0.33 [†]
16-17	45.4	6.0	0.9	17.6	0.6	0.9	0.15	0.74
18-19	50.5	18.0	2.2	31.5	1.1	2.0	0.31	0.83
20-21	59.6	27.6	3.1	34.5	0.9	2.1	0.37	0.76
Race								
White, not Hispanic	37.4 [‡]	15.1 [*]	1.9 [†]	20.9 ^{NS}	0.7 ^{NS}	1.5 [*]	0.29 [‡]	0.66 ^{NS}
Black, not Hispanic	95.7	9.2	1.1	27.4	1.1	1.0	0.10	0.82
Hispanic	48.1	11.7	1.3	21.9	0.8	1.3	0.18	0.78
Socioeconomic status								
Low	49.9 ^{NS}	12.9 ^{NS}	1.9 [‡]	19.6 [‡]	0.7 [†]	1.2 [*]	0.24 [*]	0.66 [‡]
Middle	53.6	13.4	1.8	30.2	1.0	1.6	0.28	0.93
High	39.3	13.4	1.1	15.6	0.7	1.2	0.18	0.40

Notes: ^{NS} = not significant. ^aLinear test of significance used for age variable. Analysis of variance: ^{*} $p \leq .05$; [†] $p \leq .01$; [‡] $p \leq .001$.

of a female being a heavy gambler. Being male, compared with being female, was also strongly predictive of having had three or more gambling problems (OR = 7.3) and being a heavy drinker (OR = 3.1). Age was a significant predictor of all of the gambling and substance misuse variables considered, even after taking into account gender, race/ethnicity, and socioeconomic status; that is, as age increased from age 14 to 21, heavy gambling and substance misuse also significantly increased with each year of age. The odds of a black young person being a heavy gambler were 1.8 times the odds for a white young person. However, with regard to heavy drinking, blacks had only about one third the odds of being a heavy drinker (OR = 0.3) as did whites. Similarly, blacks, compared with whites, were far less likely to be heavy smokers (OR = 0.2), less likely to have had alcohol problems (OR = 0.5), and less likely to have had tobacco dependence symptoms (OR = 0.3). Hispanics showed this same discrepancy in the odds of heavy gambling and substance use as did blacks. Thus, an Hispanic young person had 1.4 times the odds of being a heavy gambler as did a white young person; yet, as was the case for black young people, Hispanics had less chance of being heavy drinkers (OR = 0.7), being heavy smokers (OR = 0.3), or having alcohol problems (OR = 0.7) and tobacco problems (OR = 0.5) than did whites.

There was a strong co-occurrence of gambling and substance use in this sample of young people; more specifically, heavy gambling and gambling problems were significantly associated with heavy drinking, smoking, and marijuana use (all chi-square and correlations were $p < .001$). Among non-drinkers, 11% of young people were heavy gamblers whereas, among heavy drinkers, 37% were classified as heavy gamblers. Similarly, the rate of heavy gambling was twice as great for those young people who smoked marijuana 52 or more days (36%) as for those who had not smoked marijuana (15%). Correlations between gambling and substance misuse showed that times gambled and gambling problems were each significantly related to the frequency of heavy alcohol use, tobacco and marijuana use, and with problems/symptoms associated with each of the three substances. For males, in particular, there was a strong association between alcohol problems and gambling problems ($r = .42$), which was significantly higher than the correlation of alcohol problems and gambling problems for females ($r = .21$). Blacks had the highest correlation between alcohol problems and gambling problems ($r = .71$), compared with correlations of .32 and .25 for Hispanics and whites, respectively. (Comparisons of correlations between males and females and between blacks vs Hispanics and blacks vs whites were at the $p < .001$ level using a z test for comparison of correlation coefficients.)

Discussion

From this first large nationally representative survey of gambling among youth in the United States, it is clear that

gambling is a prevalent behavior, with more than two thirds of young people gambling in the past year and a significant minority of youth gambling weekly and having gambling-related problems. Although the comparison of these national data with regional data is imprecise, owing to different sampling procedures, the numbers appear to be approximately comparable to some other regional datasets. For instance, the average age in this U.S. survey is roughly equivalent to that of the 12th graders in Winters and Anderson's (2000) large school survey in Minnesota. They found that 22.7% of the 12th-grade boys (vs 27% in this national study) and 5% of the 12th-grade girls (vs 8% in the current study) had gambled weekly or more often in the past year. It is feasible to compare the rates of gambling among youth in the present study with those of adults in the United States, because comparable procedures and measures were used in the present study as in a national adult study by Welte and colleagues (2002). From this comparison, gambling is not higher among youth than among adults in the United States. From past meta-analysis studies, it was indicated that problem gambling was higher among youth in the United States than among adults (Shaffer et al., 1997). This finding is not supported by the present data. The past-year prevalence of gambling was 82% in the adult study (Welte et al., 2002) versus 68% in the present youth study; however, weekly gambling is nearly comparable for males in the youth study (27%) as for males in the adult survey (29%). For females, there is a twofold difference in weekly gambling, with 17% for adult females and 8% for female youth. The mean times gambled reported in both studies show this same gender pattern between youth and adult surveys. Adult females gambled an average of 46 times in the previous year, whereas, in the present study, female youth gambled 14.4 times. In sharp contrast, young males in the present U.S. survey actually had a higher past-year mean rate of gambling (80.2 times) than did adult males (74 times) in the U.S. adult survey (Welte et al., 2002). These comparisons may imply that regular gambling emerges earlier for young males than for young females whose gambling may peak later in adulthood. The gender gap for gambling is larger in the present study than are the gender differences for substances, showing three times the rate of heavy gambling among males compared with females, two times the rate of heavy drinking among males compared with females, a slightly higher rate of heavy marijuana use among males compared with females, and the same rates of heavy smoking for both genders. These gender patterns generally conform to those in the most recent surveys of substance use among young people in the United States (cf. Johnston et al., 2007; SAMHSA, 2007).

Gambling has a higher prevalence in the early teens, compared with alcohol and other substances. That 60% of 14- to 15-year-olds have gambled and 13% of this youngest category of teens have gambled weekly (≥ 52 times) in the past year implies that prevention efforts against problem

gambling must begin early. Perhaps some parents allow their children to participate in various gambling activities because they view these games as harmless recreation. Given that frequent gambling is linked with other problem behaviors, acceptance of gambling among children is an issue for public health education.

Consistent with other U.S. surveys of substance use among youth (Johnston et al., 2007; SAMHSA, 2007), the present national survey shows that blacks have lower overall rates of substance use than do whites. However, although substance use is correlated with gambling, the patterns of gambling according to racial/ethnic groups are not the same as the patterns for substance use. With socioeconomic status controlled, the odds of heavy gambling are significantly higher for blacks than whites, whereas the odds of heavy drinking are significantly lower for blacks than whites. Most regional surveys of youthful gambling have not had large subgroups of minority young people, and therefore these discrepancies between the patterns of substance use and gambling according to race/ethnicity have not been widely reported. These findings, however, are consistent with a comparable survey of adults in the United States in which Welte et al. (2001) reported that blacks, compared with whites, had a lower rate of overall gambling but higher rates of frequent (twice a week or more) and problem/pathological gambling. With gender, age, and socioeconomic status controlled, these investigators further reported that blacks, compared with whites, had 1.6 times the odds of being a frequent gambler, 3.7 times the odds of being a current pathological or problem gambler, and 5.8 the odds of being a DIS-IV pathological gambler (Welte et al., 2001). Thus, the differences between blacks and whites are greater as the severity of problem gambling increases.

Consistent with problem behavior theory (e.g., Donovan and Jessor, 1985) and the generality of deviance theoretical perspective (Hirschi and Gottfredson, 1994), this U.S. study of youthful gambling shows significant co-occurrence between gambling and substance misuse. These findings are consistent with the body of research from various regional samples in the United States, Canada, and England. In a large Minnesota school survey, for example, Winters and Anderson (2000) found a strong co-occurrence between adolescent problem gambling and regular use of substances. Likewise, Petry and Tawfik (2001), in a clinical study of adolescents with DSM-IV lifetime cannabis abuse or dependence, found that problem gamblers had a greater frequency of overall substance use than their nonproblem gambler counterparts. Regional studies among adults also have shown that gambling pathology is significantly associated with alcohol and substance abuse and dependence (e.g., Cunningham-Williams and Cottler, 2001; Griffiths et al., 2002; Welte et al., 2001). School surveys in England (Griffiths and Sutherland, 1998) and Canada (e.g., Hardoon et al., 2004; Ladouceur et al., 1999; Ste-Marie et al., 2006) also showed that gamblers were significantly more likely to use alcohol

and other substances than nongamblers. An implication of the problem behavior perspective of co-occurring gambling and substance use is that these unique behaviors may have shared antecedent factors (cf. Barnes et al., 2005).

The present study extends previous work by demonstrating that not only is there a significant co-occurrence between gambling and substance use among youth but also that this relationship is considerably stronger in some population subgroups than others. In particular, young males and blacks show a very high co-occurrence for alcohol problems and gambling problems. Thus, males and black adolescents are particularly important groups for targeted prevention and intervention strategies.

There are some methodological limitations of the present study. Despite the sample being a large representative U.S. sample of young people ages 14-21, the oldest respondents had the lowest response rates. To compensate for this, statistical weighting of the data to reflect census distributions in the U.S. population was done. In addition, it has been established that substance-use rates vary depending on the mode of administration in surveys. Sudman (2001) showed that school-based national surveys, such as the MTF surveys, yielded higher prevalence rates of substance use than household surveys (i.e., the National Survey on Drug Use and Health). Sudman noted that respondents tended to underreport socially undesirable behavior based on the perceived level of anonymity in the particular survey. Thus, the anonymous school survey yielded higher prevalence estimates of illegal drug use, whereas household surveys without anonymity yielded lower estimates of drug use. Although the MTF surveys and the National Survey on Drug Use and Health do not include questions on gambling, a comparison of present findings on substance use with these surveys showed that the rates of substance use are more comparable to the most recent household study (SAMHSA, 2007) than they are to the school survey (Johnson et al., 2007). Thus, the relatively high rates of gambling and substance use in the present study are nonetheless conservative ones.

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