



HHS Public Access

Author manuscript

Int Gambl Stud. Author manuscript; available in PMC 2016 January 01.

Published in final edited form as:

Int Gambl Stud. 2015 January 1; 15(1): 55–71. doi:10.1080/14459795.2014.990396.

Gambling and Substance Use: Co-occurrence among Adults in a Recent General Population Study in the United States

Grace M. Barnes^{*}, John W. Welte, Marie-Cecile O. Tidwell, and Joseph H. Hoffman

Research Institute on Addictions, University at Buffalo, The State University of New York, 1021 Main Street, Buffalo, NY 14203, U.S.A

Abstract

This study is an up-to-date examination of gambling behaviors as well as gambling problems and their relationships to substance use and abuse. Further, the co-occurrence between problem gambling and substance abuse is studied using a large-scale, representative sample of adults aged 18 years and older in the United States. This random-digit-dial national survey was carried out in 2011–2013 with completed interviews from 2,963 respondents. Of the four gambling and substance use behaviors considered, past year gambling was the most prevalent (76.9%), followed by alcohol use (67.6%), tobacco use (28.7%) and marijuana use (11.2%). Problem gambling and the three substance abuse measures were highly related. Current problem gambling (3+ DIS criteria) was predicted by being male, being black, having low socioeconomic status and by alcohol abuse/dependence, tobacco dependence, and marijuana abuse/dependence. Thus, problem gambling is linked to other problem behaviors, especially substance abuse. Consequently, effective treatment approaches should screen and intervene for both problem gambling as well as co-occurring substance abuse.

Keywords

gambling; substance use; comorbidity; survey; United States

Introduction

Research carried out for over a decade shows that various types of substance abuse and problem gambling co-occur, such that people exhibiting an elevated level of substance use and abuse are more likely than others to also show an elevated risk of problem gambling (e.g., Gerstein et al., 1999; Welte et al., 2001). Problem behavior theory has been posited as a conceptual framework for co-occurring substance abuse and other problem behaviors (Jessor & Jessor, 1977; Donovan & Jessor, 1985). More recently, there is empirical support for problem gambling occurring within this problem behavior syndrome with the same underlying factors influencing multiple problem behaviors (Barnes et al., 2009).

^{*}Address correspondence to: Grace M. Barnes, Ph.D., Research Institute on Addictions, University at Buffalo, 1021 Main Street, Buffalo, NY 14203; barnes@ria.buffalo.edu; Telephone: 716-887-2505; Fax: 716-887-2477.

Disclosure Statement

None of the authors has any conflict of interest.

Despite this body of previous work providing evidence for the co-occurrence of problem gambling and substance abuse, it is important to have current data to examine the co-occurrence of gambling and substance use behaviors because gambling opportunities and venues have increased markedly over the past decade (Horvath & Paap, 2012). Although exposure has been shown to be an important factor in problem gambling and co-occurrence with substance abuse (Welte, Wieczorek et al., 2004), it may be that gambling has become more commonplace and accepted as gambling opportunities have increased. Consequently, problem behavior theory (i.e., co-occurrence) may not be as strong an explanation for gambling and substance use as previously found in past general population studies. For instance, there are new competing explanations pertaining to co-occurrence, such as adaptation theory (LaPlante & Shafer, 2007). Adaptation theory posits that people and places adapt to the risks of gambling. If this explanation holds, the co-occurrence of gambling with substance abuse may not be as strong or significant as shown in past studies.

Furthermore, it is important to have representative samples with sufficient numbers of respondents from important population subgroups, including females, members of minority groups and young adults. Thus, national studies carried out over a decade ago and select non-representative clinical or regional samples are not sufficient to examine this issue of co-occurrence between gambling and substance use in the U.S.

Additionally, the present national U.S. survey assessed a continuum of gambling behaviors – from any gambling, to frequent gambling, to problem/pathological gambling. Previous surveys (noted below) which have focused on co-morbidity, analyzed the occurrence of only pathological gambling which is a diagnostic classification with very low occurrences (less than 1%) in the general population. Past studies also have shown very different rates of pathological gambling depending on the DSM-IV instrument used (as reviewed by Welte et al., 2014). It is important for public health policy to examine the broader relationships between overall gambling and frequent levels of gambling with the respective classifications of alcohol and other substance use in the general population.

Co-occurrence in previous general population surveys

The correlates of pathological gambling and other DSM-IV disorders were assessed in the U.S. National Comorbidity Survey Replication (NCS-R) in 2001–2003. Despite a low overall percentage of lifetime pathological gambling diagnosis in this study (0.6%), pathological gambling showed strong associations with substance use disorders with odds ratios ranging from 3.9 for nicotine dependence to 5.8 for alcohol or drug dependence (Kessler, Hwang, LaBrie, et al., 2008).

The U.S. National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) also assessed DSM-IV problem/pathological gambling and substance use disorders in a large representative sample (n=43,093) interviewed in 2001–2002. Although the lifetime prevalence rate of pathological gambling was found to be lower (0.42%) than in other national surveys (cf. Welte et al., 2001; Welte et al., 2014), nonetheless, 73% of the pathological gamblers had an alcohol disorder, 38% had a drug use disorder, and 60.4% had nicotine dependence (Petry et al., 2005). Also analyzing the NESARC data, French, Maclean and Ettner (2008) found that alcohol consumption was positively associated with

the likelihood of experiencing any gambling-related problems and with the number of problems experienced, taking into account geographic areas with more alcohol sales. Chou and Afifi (2011) used two waves of NESARC data and demonstrated a significant effect of disordered gambling (problem and pathological gambling together) on alcohol dependence after adjusting for demographic factors and other medical conditions. Nower and colleagues (2013) also used NESARC data to derive three subtypes of problem gamblers based on Blaszczynski and Nower's (2002) pathways model of problem and pathological gambling. The model classified the 591 disordered gamblers into three etiological subgroups distinguished by other psychopathology and biological factors. The most severe pathway-3 gamblers were characterized by impulsivity and antisocial personality traits, and this group had the highest probability (~78%) of comorbid substance use disorders.

In the first Survey of Gambling in the U.S. (SOGUS1), for which the current study is a follow-up a decade later, Welte et al. (2001), reported a strong comorbidity between current pathological gambling and current alcohol dependence with a very high odds ratio of 23.1.

In two separate large Canadian general population samples, there was consistent evidence for links between problem gambling and substance abuse. Martins et al. (2010), in an aggregated study of four independent province surveys of over 11,000 respondents, found that problem gamblers were significantly more likely than non-problem gamblers to report being drunk or high while gambling and to report having an alcohol or drug problem. In another large (n=14,934) sample of community respondents in Canada, persons with substance dependence or alcohol abuse had nearly three times the risk of being in the highest severity gambling category as compared with those who were not classified in the substance abuse group (El-Guebably, et al., 2006).

Griffiths et al. (2010) analyzed data from the 2007 British Gambling Prevalence Survey which included 9,003 adults aged 16 years and older. Their results showed that cigarette smokers were more likely to be problem gamblers than non-smokers and alcohol consumption on one's heaviest drinking day was significantly associated with problem gambling.

Co-occurrence in treatment samples

Studies in treatment samples of pathological gamblers also have shown comorbid substance use disorders. For example, in an Australian treatment study, DSM-IV pathological gamblers (n=75) were found to have rates of substance-use problems which were higher than found in the general Australian population (Maccallum & Blaszczynski, 2002). A Canadian sample (n=101) of pathological gamblers who recently quit gambling were followed prospectively for a year (with 41% achieving a three-month period of abstinence from gambling during the followup year). Although 73% and 48% of this group had lifetime alcohol use and drug use disorders, respectively, at follow-up, 7% had current alcohol and drug use disorders (Hodgins, Peden & Cassidy, 2005). The age of onset for substance use disorders was earlier than age of gambling disorders. The authors underscore the importance of comorbid substance use disorders in the recovery process from gambling problems.

Studies have also examined pathological gambling among those being treated for substance abuse. For example, Langenbucher & Merrill (2001) analyzed data from 372 participants at eight addiction treatment centers in five northeastern U.S. states. The researchers found that 14% of male participants and 10% of female participants were identified as pathological gamblers. Furthermore, the participants who were comorbid for both substance abuse and pathological gambling showed more severe substance abuse patterns and significant increased rates of impulsivity and antisocial personality symptoms than non-pathological gamblers.

The present study is the latest large, representative U.S. study of gambling and problem gambling in over a decade. The patterns of co-occurrence between gambling and problem gambling and alcohol, tobacco and marijuana use and abuse (as defined in DSM-IV) will be examined in the overall population and among important sociodemographic subgroups in the U.S. population. Further, we examine the relationships between gambling – along a continuum from any gambling to problem gambling – and alcohol, tobacco and marijuana use/abuse and dependence. Important demographic subgroups were considered based on gender, age, race/ethnicity and socioeconomic status. In this national U.S. survey, the co-occurrence of gambling and specific substances of abuse was examined while taking into account a broad range of sociodemographic factors in the U.S. population.

Methods

Sample and Procedures

The Survey of Gambling in the U.S. (SOGUS2) was conducted in 2011–2013 at the Research Institute on Addictions' Computer-Assisted Telephone Interviewing (CATI) facility. This survey of gambling behaviors and problems consisted of 2,963 completed interviews conducted in all 50 states and the District of Columbia. The sample for SOGUS2 included both a landline sample and a cell phone sample of adults aged 18 years or older. The response rate (defined as the number of interviews divided by the number of eligible respondents located) for the SOGUS2 landline sample (1,748 respondents) was 54.0% and for the cell phone sample (1,215 respondents) was 62.7%.

The telephone samples were purchased from Survey Sampling, Inc. Every landline phone number in the U. S. had an equal probability of being included in the sample, and every cell phone number likewise had the same probability as every other cell phone number. The samples were stratified by county and by telephone block within county. These procedures resulted in a sample that was spread across the U.S. according to population distribution. Telephone numbers in both cell and landline samples were called at least seven times to determine if that number was assigned to an eligible respondent. Once designated as eligible, the number was called until an interview was obtained or refusal conversion had failed. The median length of the interview was 40 minutes. Respondents were paid \$30 for their time.

The weights for SOGUS2 were computed in accordance with current guidance from experts in the telephone sampling field (American Association of Public Opinion Research, 2010). The weights were constructed in four steps. The first step accounted for the probability of

selection. Respondents were classified into three non-overlapping groups: landline only, cell phone only and both landline and cell phone. The probability of the respondent being selected was computed separately in each phone service group. For landline-only respondents, the probability of respondent selection was the ratio of the landline sample size to the landline frame size, adjusted for the number of eligible respondents in the household. For cell-phone-only respondents, the probability of selection was the ratio of the cell phone sample size to the cell phone frame size. For dual users, the probability of selection was the sum of the probabilities for cell and landline users. This method of calculating weights for dual frame overlap is also called the single frame approach (Kennedy & Kolenikov 2012; Lohr 2009). Frame size figures were supplied by Survey Sampling, Inc. The second step adjusts for differential response rates by telephone usage group. Information on the prevalence of different telephone usage groups came from the National Health Interview Survey (NHIS) (Blumberg & Luke 2012). The percentages of the five telephone usage groups based on the NHIS are: wireless mostly, 18%; dual, 25%; landline mostly, 15%; landline only, 10%; and wireless only, 32%. To account for the differing response rates by telephone usage group, weights were rescaled in each of the five telephone usage groups so that the percentages in each usage group, based on the re-scaled weights, were equal to the NHIS percentages above. The third step further adjusted the weights for the gender, age and race distribution of the U.S. population. Data from the U.S. Census 2010 for the United States population 18 years and over was obtained from the U.S. Census Bureau's American Factfinder web site. At the fourth step, the weight variable was divided by its own mean, giving it a mean of one, so the weighted N equaled the true N. Weighted analyses are reported in this paper. Additional details about the samples and procedures have been reported elsewhere (Welte et al., 2014).

Dependent Measures

Gambling—Respondents were asked the frequency of past-year gambling on 15 types of gambling, including 1) office pools, and charitable small stakes gambling; 2) lottery; 3) pulltabs; 4) internet gambling; 5) casino, riverboat or cruise ship; 6) horse or dog track; 7) horses or dogs, off track; 8) gambling machines, not in a casino; 9) cards, not in a casino; 10) games of skill, e.g., bowling, pool, golf; 11) lottery video-keno; 12) bingo; 13) dice, not in a casino; 14) sporting events; and 15) other gambling. An overall gambling frequency variable was produced by summing the frequency of these types of gambling. The variable, *any gambling*, was a dichotomous measure defined as gambling at least once in the past year on any of the 15 types of gambling. A frequent gambling variable (104+ times) was a dichotomous variable which is approximately equivalent to gambling twice a week or more often (Welte et al., 2014).

Gambling problems—The measure of problem gambling is based on the DIS-IV for pathological gambling (Robins et al. 1996). The DIS-IV contains 13 items that map into the 10 DSM-IV criteria (American Psychiatric Association, 1994), such as preoccupation with gambling and needing to gamble with increasing amounts of money to get the same excitement (“tolerance”). Five or more criteria are considered indicative of pathological gambling. Endorsement of three or more criteria as used in the present work is considered indicative of problem/pathological gambling.

Independent Measures (Logistic Regressions)

Any Alcohol Use, Frequent Drinking, and Alcohol Abuse/Dependence—Alcohol consumption was assessed by a series of quantity and frequency questions for various alcoholic beverages. Beverages included: beer, malt liquor, wine, fortified wine, wine cooler and liquor. Responses to these questions, along with the alcohol content of each beverage, were used to calculate the respondent's average alcohol consumption in ounces of ethanol per day. This average consumption variable was recoded to create the dichotomous variables indicating any alcohol use in the past year and frequent drinking (defined as consuming two or more drinks per day or, stated differently, consuming an average of 1 or more ounces of ethanol per day in the past year) (Welte et al., 2001). The current alcohol abuse/dependence measure was based on DSM-IV criteria (Diagnostic Interview Schedule, Robins et al. 1996) during the past year. The alcohol abuse questions cover 12 negative consequences (fights while drinking, traffic accident while drinking, etc.). The respondent was asked if there was ever a 12-month period in which the consequences occurred more than once (lifetime abuse), and also whether they occurred more than once in the past 12 months (current abuse). The alcohol/drug dependence questions cover 30 symptoms of dependence which map onto the 9 DSM criteria. Respondents were then asked if they had 3 or more criteria in the past 12 months (current dependence).

Any Tobacco Use, Frequent Tobacco Use, and Tobacco Dependence—Tobacco use was measured by two questions - frequency ("In the past 12 months, how often did you smoke cigarettes") and quantity ("On a typical day when you smoke, how many cigarettes ..."). These questions were used to calculate average tobacco consumption. Frequent tobacco use was defined as smoking 10 or more cigarettes a day. Nicotine dependence was assessed by six questions which were used in the NIDA National Household Survey (Kandel and Chen, 2000). They are based on DSM criteria, and apply to all tobacco use, including smoking and smokeless tobacco. They cover 1) use of more than intended, 2) inability to cut down, 3) getting less work done because of tobacco use, 4) health problems, 5) tolerance, and 6) withdrawal. Three or more symptoms designated tobacco dependence in the present study.

Marijuana Use, Frequent Marijuana Use, and Marijuana Abuse/Dependence—Respondents were asked their frequency of marijuana or hashish use in the past twelve months. Dichotomous variables were created for any marijuana use and frequent use (i.e., 52+ times) in the past year. Abuse and dependence were assessed for marijuana consistent with the DSM-IV classification scheme reported above for alcohol abuse/dependence. More specifically, current marijuana abuse was defined as having one or more of four problems in the past year. These problems were: continued use after it caused fights or problems with people, police stopped or arrested you more than once for using it, caused problems for you at work, home or school more than once, and there were several times when you were high or feeling its after-effects in a situation where it increased your chances of getting hurt. Dependence in the past year was defined as having three or more of seven DSM-IV criteria, e.g., used more than intended, tried to cut down, needed more for an effect, used despite a health problem.

Gender—Gender was coded 0 for females and 1 for males.

Age—For the frequency distributions, age was classified into approximate decades resulting in six categories ranging from the youngest category of 18 to 30 years to the oldest category of 71+ years. For the logistic regressions, age was used as an interval variable, ranging from 18 to 90+ years.

Race/ethnicity—For descriptive purposes, race/ethnicity was classified as white (not Hispanic), black, Hispanic and other groups (designated as such due to the relatively small n).

Socio-economic Status—The measure of socioeconomic status was based on respondent's years of education, occupational prestige and family income. Occupational prestige was measured using the method of Duncan updated (Stricker 1988). For this method, the respondent's occupation was classified by our staff into predefined categories used by the U.S. Census, and these categories were subsequently recoded into scores based on the average prestige ratings given those categories by a U.S. general population sample. This prestige score and the respondent's years of education and the respondent's family income were scaled in the 0–10 range and then averaged. For the present report, socio-economic status is reported in five groups – lowest fifth to highest fifth.

Results

The frequency distributions for the respective gambling, alcohol, tobacco and marijuana variables according to sociodemographic factors are given in Table 1. Of the four variables considered in this article, any gambling is the most prevalent behavior in the U.S. population with three-quarters (76.9%) of the adult population gambling in the past year as compared with two-thirds (67.6%) of the population drinking any alcohol; over a quarter (28.7%) of the population smoked tobacco in the past year and about a tenth of population (11.2%) reported marijuana use in the past year. For all of the any gambling/any substance use variables, males report higher prevalence rates than females and people who are in the over 60 age categories have lower rates of all gambling/substance use behaviors than younger and middle-aged respondents. There are no notable differences in overall gambling according to race/ethnicity. However, whites have higher rates of overall alcohol use (71.9%) than blacks (54.2%) and Hispanics (58.3%). For overall smoking and marijuana use, the patterns are fairly similar across the race/ethnicity categories. Overall gambling does not show any clear variation according to socio-economic status (SES). In comparison, alcohol use is lowest among the lowest SES group (51.5%) and highest in the two upper SES groups (73.3% and 76.3%, respectively). Smoking and marijuana use show a different pattern according to SES than alcohol use, with the lowest SES group having the highest rate of smoking (45.5%) and marijuana use (15.6%) and the highest SES group shows the lowest rates for smoking (15.5%) and marijuana use (5.9%).

Examining the patterns of frequent gambling (104+ times in the past year) and problem gambling (3+ DIS criteria), males have twice the rate of frequent gambling (13.1%) and problem gambling (6.8%) as females (6.1% and 2.5%, respectively). For problem gambling,

the youngest age group (18–30 years) has the highest rate (6.3%) and the oldest age group (71+ years) has the lowest rate (1.2%). Whereas any gambling is virtually the same across racial/ethnic groups, frequent gambling and problem gambling are higher among blacks (14.3% and 8.8%, respectively) than among whites (9.5% and 3.7%) or Hispanics (8.1% and 5.8%). There is also a linear pattern with regard to problem gambling and socio-economic status with the highest rate of problem gambling occurring among the lowest fifth in SES (7.5%) and the lowest rate of problem gambling occurring among the highest fifth in SES (1.7%). As a point of comparison of problem gambling with alcohol abuse/dependence, the gender, age and socio-economic patterns are similar for both addictive behaviors. With regard to race comparisons, whites and blacks have virtually the same rates of frequent drinking and alcohol abuse/dependence. However, blacks have higher rates of frequent and problem gambling than whites.

For tobacco dependence, the gender pattern is reversed from gambling and alcohol with rates of dependence being somewhat higher for females (4.9%) than for males (3.8%); furthermore, rates of tobacco dependence do not drop until the 50 and over age categories which is different from the patterns for problem gambling and alcohol abuse. Whites show higher rates of tobacco dependence than other groups and tobacco dependence is highest in the lower SES groups. Marijuana abuse/dependence has a similar inverse relationship to SES as does problem gambling, alcohol abuse and tobacco dependence; and marijuana dependence shows the same gender and age relationships observed for alcohol and gambling with males and younger aged respondents having relatively high rates of frequent marijuana use and marijuana abuse/dependence.

Figure 1 shows the percent of problem gambling (3+ DIS criteria) among those with alcohol abuse/dependence, tobacco dependence and marijuana abuse/dependence. The graphs depict clear co-occurrence between problem gambling and the three other addictive behaviors. Whereas the overall rate of problem gambling in the population is 4.6%, the rate of problem gambling is 17% among those who have alcohol abuse or dependence, 14% among those with tobacco dependence and 33% among those with marijuana abuse or dependence.

A series of logistic regressions is shown in Tables 2, 3 and 4 with different levels of gambling involvement in the past year as the dependent variables and with sociodemographic factors and varying levels of alcohol, tobacco and marijuana use as the independent variables. (Given the large dataset and the sizeable number of analyses performed, the lowest significance level was set at $p < .01$ rather than $p < .05$.) The first column in each logistic regression table shows the effects of the demographic variables on the respective level of gambling, frequent gambling or problem gambling. This is important because demographic factors are often among the most powerful predictors of gambling and other problem behaviors. Then in the second sets of logistic regressions, the effects of the respective substance use/abuse variables are shown, after taking into account all of the demographic factors. Thus, Table 2 shows the results of two logistic regressions with any gambling in the past year as the dependent variable and only demographic variables in the first column and demographic factors as well as substance use variables in the second column. Considering the analysis with only the demographic independent variables, males have one and a half times the odds of being a gambler as do females and younger age is

associated with increased likelihood of gambling. When both demographic and substance use variables are considered together, gender remains significant, but age is no longer significant. However, all three substance use variables – any alcohol, tobacco and marijuana use – are highly significant in predicting overall gambling. The substance use odds ratios range from 1.8 for tobacco to 2.35 for marijuana and 3.22 for alcohol; that is, drinkers as compared with nondrinkers have over 3 times the odds of being a gambler after controlling for all demographic factors as well as tobacco and marijuana use. The strength of this alcohol-gambling relationship is evidenced by a very large Wald statistic of 145.8.

The results predicting frequent gambling, that is, gambling an average of twice a week (104+ times) or more in the past year, show that males have over twice the odds of being a frequent gambler as do females (Table 3). For frequent gambling, the socioeconomic status (SES) effect is highly significant with lower SES individuals having a higher likelihood of being a frequent gambler than higher SES individuals. Frequent alcohol users (2+ drinks/day) and frequent tobacco users (10+ cigarettes/day) have over twice the odds of being a frequent gambler as compared with those who do not use alcohol and tobacco at these levels.

Table 4 shows the results of logistic regressions with current problem gambling (3+ DIS criteria) as the dependent variable. Examining the second column with all of the demographic and substance use variables considered, the male effect, observed in all earlier analyses, remains strong with males having nearly three times the odds of being a problem gambler as females. The age effect, observed when only the demographic factors were considered, is not significant with all of the variables in the analysis. For this problem gambling analysis, there is a significant race effect, not previously observed for the analyses of lower levels of gambling involvement. Blacks have over twice the odds of being a problem gambler as do whites. This effect is significant after SES is taken into account. This analysis, like the previous frequent gambling analysis, shows more problem gambling associated with lower SES over and above the race effect. Importantly, with all of the demographic factors taken into account, all three substance-specific dependence measures are highly significant in predicting problem gambling. Thus, individuals with alcohol abuse/dependence and tobacco dependence have nearly three times the odds of being problem gamblers as do those who are not dependent on alcohol or tobacco. Marijuana abuse/dependence results in five times the odds of being a problem gambler than those without marijuana abuse/dependence.

In summary, being male, black, having low SES, having alcohol abuse, tobacco dependence, and marijuana abuse are each highly significant risk factors for problem gambling among adults in the United States.

Discussion

Based on this current large general population survey of adults in the United States, it is evident that gambling is highly prevalent as is alcohol use; moreover, these behaviors co-occur such that the more an individual gambles, the more likely s/he is to drink alcohol more frequently. Although smoking tobacco and marijuana use are not as prevalent as gambling

and alcohol use, their co-occurrences with gambling are high. It is particularly noteworthy that among respondents who have current marijuana abuse/dependence, one-third of these individuals are also problem or pathological gamblers. These findings lend further empirical support to tests of problem behavior theory (Donovan & Jessor, 1985) which have shown that problem gambling co-occurs with substance abuse in general population surveys of adults (Welte et al., 2001) as well as adolescents (Barnes et al., 2011). Given the co-occurrence between gambling and substance use/abuse, it is likely that these behaviors share common antecedent factors from multiple domains including sociodemographic factors, individual/personality factors and biological factors (Barnes, Welte, Hoffman, & Dintcheff, 2005).

Despite the conceptualization of gambling within adaptation theory, the relationships between any gambling with any alcohol, any tobacco and any marijuana use remain strong. Thus, gambling does not appear to have become so commonplace that it no longer fits within the context of a problem behavior syndrome. Frequent use of substances and substance abuse appear to be strong respective risk factors for frequent gambling and problem gambling.

This general population study clearly demonstrates that males, younger adults and those in lower socio-economic groups have a higher risk for problem gambling, alcohol and marijuana abuse than their female, older and higher socio-economic status counterparts. The exception to these patterns across the substance abuse variables is that males and females do not significantly differ in their rates of tobacco dependence. In addition, the rate of tobacco dependence does not decrease until after 50 years old which is a different age-related patterns than the other addictive behaviors.

With regard to race/ethnicity, whites have higher rates of overall alcohol use than blacks; yet blacks have higher rates of frequent and problem gambling than whites, and blacks are at a significantly higher risk of problem gambling than other racial/ethnic groups, even after controlling for all other demographic factors as well as alcohol abuse, tobacco dependence and marijuana abuse. These findings are consistent with those from the large U.S. National Comorbidity Survey Replication (Kessler et al., 2008) which found that problem gambling was significantly associated with being young, male, and Non-Hispanic Black. These findings are also consistent with a large Canadian general population survey of gambling behavior which showed strong co-occurrence between problem gambling and having an alcohol or drug problem (Martins et al., 2010). Furthermore, this same Canadian study found that lower family income was associated with gambling severity and the authors concluded that those most in financial need are the ones who have more gambling problems (Martins et al., 2010). In a 2000 precursor to the present U.S. survey, our group also found that lower socio-economic status individuals and members of minority groups had higher levels of pathological gambling than other groups after all other factors, e.g. alcohol and other substance abuse and other demographic factors were considered (Welte, Barnes, Wiczorek, Tidwell & Parker, 2004).

Key findings from this study are that current problem gambling (as measured by 3+ DIS criteria) is predicted by male gender, black race, low socioeconomic status and alcohol

abuse/dependence, tobacco dependence and marijuana abuse/dependence. Each of these variables is highly significant after all of the variables have been taken into account. Strikingly, persons with substance abuse/dependence have three to five times the odds of being a problem gambler as those without a substance abuse classification.

The strong co-occurrence of problem gambling with the three substance abuse variables lends support to the newly developed DSM-5 classification of “pathological gambling” to “gambling disorder.” Gambling disorders and substance use disorders will now both be classified as addictive disorders in the new American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders (DSM-5)(2013). Whereas pathological gambling was previously included in the Impulse-Control Disorders Not Elsewhere Classified section, gambling disorder is now part of the section related to alcohol and other drug use disorders. (See excellent summary of this issue by Petry et al., 2014.)

The findings from the present study are also consistent with those of Lorains, Cowlishaw and Thomas (2011), from the Problem Gambling Research and Treatment Centre in Victoria, Australia. These investigators conducted a systematic search of general population surveys around the world, using randomized sampling methods and standardized measurement tools. Results of the meta-analysis of 11 qualifying surveys showed high prevalence estimates of nicotine dependence and substance use disorders with co-occurring problem/pathological gambling. These authors note that problem/pathological gambling as well as nicotine dependence and other substance use disorders are all co-occurring addictive disorders; furthermore, evidence from these studies is consistent with problem/pathological gambling being classified as a ‘behavioral addiction.’

The treatment implications of problem gambling co-occurring with alcohol and other substance use disorders are especially noteworthy. Lorains et al. (2011) concluded that treatment providers for problem/pathological gambling should assess comorbid addictive disorders. Similarly, other gambling experts (e.g., Petry, 2007; Grant et al., 2002) have suggested that substance abuse treatment programs introduce screening and interventions for problem gambling. Those substance abuse treatment programs which attempt to incorporate interventions for problem gambling may not only reduce gambling problems but they may also have benefits on substance abuse outcomes. Furthermore, given that problem/pathological gambling may share common antecedents and etiology with substance abuse, Nower and colleagues have noted that left unidentified, comorbid addictive behaviors could serve as “relapse triggers” for gambling, thus diminishing the long-term effectiveness of treatment interventions.

Acknowledgments

This work was funded by grant R01AA018097 to John W. Welte, from the National Institute on Alcohol Abuse and Alcoholism.

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Biographies

Dr. Grace Barnes is a sociologist by training and a Senior Research Scientist at the Research Institute on Addictions, University at Buffalo. She has worked in the field of addictive behaviors (alcohol, other substance abuse and gambling) among adolescents and adults for over thirty-five years. She has served as PI and Co-PI of a number of large-scale survey

research projects. She received the Distinguished Career Award for the Practice of Sociology by the American Sociological Association.

Dr. John Welte, a psychologist, is a Senior Research Scientist at the Research Institute on Addictions. Dr. Welte is a leading expert in the study of gambling and substance use. He has published widely on the epidemiology of problem gambling and substance abuse in the general population. Dr. Welte has been the principal investigator on three national U.S. surveys of gambling among adults and adolescents. He has been active in survey research and statistical analyses for over thirty-five years.

Dr. Marie Tidwell, a psychologist, has been working in the field of addictions research for nearly twenty years. She has been the Project Director for four national U.S. telephone surveys. She is an expert in computer-assisted telephone interviewing and in survey interviewing and data collection.

Mr. Joseph Hoffman is a statistician with over 25 years of experience in statistical analysis, scientific computer programming, mathematical modeling, and data management. He has worked in the addictions field for 20 years, working on a number of projects dealing with substance abuse and gambling.

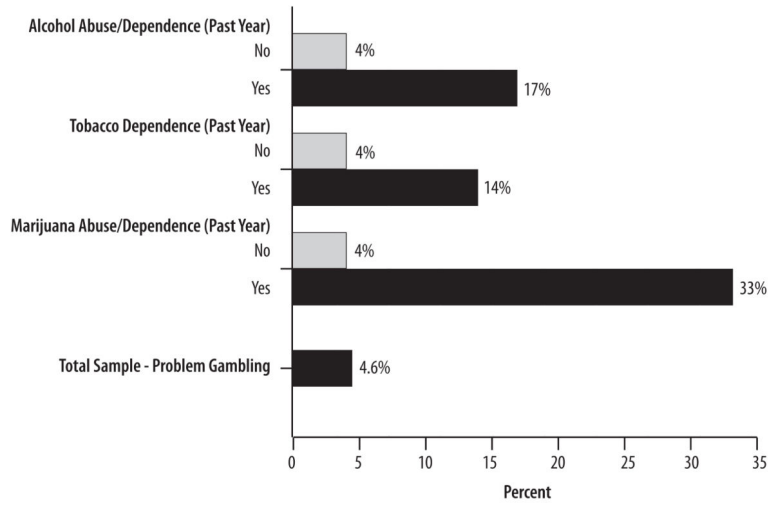


Figure 1.

Table 1

Percent Gambling, Alcohol, Tobacco, and Marijuana Use; Percent Frequent Gambling/Substance Use; and Percent Abuse/Dependence (Past Year) (n = 2,963).

Sociodemographic Group (n ^f)	Any Gambling	Gambled 104+ times	3+ DIS criteria	Any Alcohol	2+ drinks per day	Alcohol Abuse or Dependence
Total Sample	76.9	9.5	4.6	67.6	10.1	4.2
Female (1522)	73.2***	6.1***	2.5***	64.4***	5.6***	3.1***
Male (1442)	80.7	13.1	6.8	71.0	14.9	5.5
18 – 30 yrs. (850)	78.1***	6.7***	6.3**	71.2***	12.2***	8.3***
31 – 40 yrs. (431)	81.2	15.3	5.2	73.4	14.4	5.0
41 – 50 yrs. (481)	81.4	8.6	4.5	75.8	8.8	4.3
51 – 60 yrs. (591)	77.9	11.3	4.6	65.0	8.0	1.3
61 – 70 yrs. (373)	71.9	7.9	2.2	60.7	8.0	1.0
71+ yrs. (236)	60.5	8.9	1.2	45.0	6.3	0.6
White (1983)	77.3 NS	9.5***	3.7***	71.9***	10.7 NS	3.6**
Black (341)	75.7	14.3	8.8	54.2	10.8	3.3
Hispanic (424)	78.0	8.1	5.8	58.3	8.2	6.8
SES						
Lowest fifth (573)	73.4 NS	12.3***	7.5***	51.5***	10.1***	8.3***
2 nd fifth (523)	80.7	14.4	5.6	66.7	14.6	5.2
3 rd fifth (571)	77.4	10.2	5.0	68.4	11.3	3.6
4 th fifth (638)	77.1	6.4	3.7	73.3	7.8	3.7
Highest fifth (658)	76.1	5.5	1.7	76.3	7.9	1.0

Sociodemographic Group (n ^f)	Any Smoking	Smoked 10+ cigarettes day	3+ tobacco dependence symptoms	Any Marijuana	Used marijuana 52+ times	Marijuana Abuse or Dependence
Total Sample	28.7	13.8	4.4	11.2	4.6	1.3
Female (1522)	24.3***	13.0 NS	4.9 NS	7.6***	2.5***	0.8*
Male (1442)	33.3	14.6	3.8	15.1	6.8	1.8
18 – 30 yrs. (850)	38.2***	11.8**	5.9***	19.7***	9.6***	3.4***

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Sociodemographic Group (n ^f)	Any Smoking	Smoked 10+ cigarettes day	3+ tobacco dependence symptoms	Any Marijuana	Used marijuana 52+ times	Marijuana Abuse or Dependence
31 – 40 yrs. (431)	35.9	19.0	5.4	19.3	6.9	0.7
41 – 50 yrs. (481)	27.5	17.1	6.0	7.4	1.9	0.4
51 – 60 yrs. (591)	26.5	16.4	3.7	6.1	2.1	0.6
61 – 70 yrs. (373)	17.6	10.4	1.7	2.4	0.6	0
71+ yrs. (236)	6.4	3.7	0	0.5	0.2	0
White (1983)	29.0 NS	16.4***	4.6 NS	11.0 NS	3.9**	0.9**
Black (341)	27.0	9.6	3.3	12.4	7.6	2.2
Hispanic (424)	30.7	8.5	3.6	13.4	5.7	2.8
SES						
Lowest fifth (573)	45.5***	28.7***	8.7***	15.6***	9.3***	2.4***
2 nd fifth (523)	37.6	17.4	7.0	15.4	6.8	3.6
3 rd fifth (571)	25.0	13.4	3.0	9.3	3.2	0.4
4 th fifth (638)	23.1	8.6	3.5	11.0	4.0	0.1
Highest fifth (658)	15.5	3.3	0.5	5.9	0.5	0.1

^fNumbers vary slightly from the sample of 2,963 due to rounding associated with weighting. For race/ethnicity breakdowns, 215 cases were classified as “Other groups” and are omitted from these distributions because frequencies would have no substantive meaning.

* .05

** .01

*** .001

NS = Not significant

Table 2

Logistic regression with any gambling in the past year as the dependent variable and demographic factors, any alcohol use, any tobacco use, and any marijuana use in the past year as independent variables (n = 2,963).

Predictor	Demographic Factors Only (Odds ratio, Significance, and Wald in parenthesis)	Demographic Factors and Substance Predictors (Odds ratio, Significance, and Wald in parenthesis)
Gender (M=1; F=0)		
Female = reference	1.51 ^{***} (21.1)	1.35 ^{**} (9.9)
Age (18 – 90+ years)	.985 ^{***} (32.0)	NS
Race (White = reference)		
Black	NS	NS
Hispanic	NS	NS
Other Groups	.61 ^{**} (8.9)	NS
Socio-economic Status	NS	NS
Any alcohol past year	--	3.22 ^{***} (145.8)
Any tobacco past year	--	1.80 ^{***} (22.2)
Any marijuana past year	--	2.35 ^{***} (14.1)

**
p .01

p .001

Table 3

Logistic regression with frequent gambling (104+ times in the past year) as the dependent variable and demographic factors, frequent alcohol use (2+ drinks/day), frequent tobacco use (10+ cigarettes per day), and frequent marijuana use (52 times) in the past year as independent variables (n = 2,963).

Predictor	Demographic Factors Only (Odds ratio, Significance, and Wald in parenthesis)	Demographic Factors and Substance Predictors (Odds ratio, Significance, and Wald in parenthesis)
Gender (M=1; F=0)		
Female = reference	2.52*** (46.5)	2.17*** (31.0)
Age (18 – 90+ years)	NS	NS
Race (White = reference)		
Black	NS	NS
Hispanic	NS	NS
Other Groups	NS	NS
Socio-economic Status	.78*** (32.4)	.83*** (15.8)
Frequent alcohol use	--	2.49*** (29.3)
Frequent tobacco use	--	2.12*** (22.2)
Frequent marijuana use	--	NS

**
p .01

p .001

Table 4

Logistic regression with DIS current problem gambling (3+ criteria) as the dependent variable and demographic factors, alcohol abuse/dependence, 3+ tobacco dependence symptoms, and marijuana abuse/dependence in the past year as independent variables (n = 2,963).

Predictor	Demographic Factors Only (Odds ratio, Significance, and Wald in parenthesis)	Demographic Factors and Substance Predictors (Odds ratio, Significance, and Wald in parenthesis)
Gender (M=1; F=0)		
Female = reference	2.90 ^{***} (28.6)	2.89 ^{***} (27.6)
Age (18 – 90+ years)	.98 ^{**} (8.7)	NS
Race (White = reference)		
Black	1.99 ^{**} (8.5)	2.24 ^{***} (10.9)
Hispanic	NS	NS
Other Groups	NS	NS
Socio-economic Status	.77 ^{***} (15.7)	.83 ^{**} (7.3)
Alcohol abuse/dependence	--	2.80 ^{***} (13.3)
Tobacco dependence	--	2.77 ^{***} (11.3)
Marijuana abuse/dependence	--	5.01 ^{***} (16.9)

**
p .01

p .001