Comorbidity of DSM-IV Pathological Gambling and Other Psychiatric Disorders: Results From the National Epidemiologic Survey on Alcohol and Related Conditions

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Objective: To present nationally representative data on lifetime prevalence and comorbidity of pathological gambling with other psychiatric disorders and to evaluate sex differences in the strength of the comorbid associations.

Method: Data were derived from a large national sample of the United States. Some 43,093 household and group quarters residents age 18 years and older participated in the 2001–2002 survey. Prevalence and associations of lifetime pathological gambling and other lifetime psychiatric disorders are presented. The diagnostic interview was the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version. Fifteen symptom items operationalized the 10 pathological gambling criteria.

Results: The lifetime prevalence rate of pathological gambling was 0.42%. Almost three quarters (73.2%) of pathological gamblers had an alcohol use disorder, 38.1% had a drug use disorder, 60.4% had nicotine dependence, 49.6% had a mood disorder, 41.3% had an anxiety disorder, and 60.8% had a personality disorder. A large majority of the associations between pathological gambling and substance use, mood, anxiety, and personality disorders were overwhelmingly positive and significant ($p < .05$), even after controlling for sociodemographic and socioeconomic characteristics. Male sex, black race, divorced/separated/widowed marital status, middle age, and living in the West and Midwest were associated with increased risk for pathological gambling. Further, associations between alcohol dependence, any drug use disorder, drug abuse, nicotine dependence, major depressive episode, and generalized anxiety disorder and pathological gambling were stronger among women than men ($p > .05$).

Conclusion: Pathological gambling is highly comorbid with substance use, mood, anxiety, and personality disorders, suggesting that treatment for one condition should involve assessment and possible concomitant treatment for comorbid conditions.

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Pathological gambling is classified as a disorder of impulse control and is characterized by gambling to excess.[1] Most pathological gamblers attempt to cover up the extent of their gambling, many jeopardize relationships or employment, and some even commit illegal acts to support gambling.[2] Pathological gambling is associated with substantial costs not only for those who have the disorder, but also for their families and society. Recently, the annual cost of pathological gambling in the United States was estimated to be $5 billion, including costs to job loss and wages, debt and bankruptcy, and arrests and incarceration.[3] Studies have also documented the association between pathological gambling and high rates of suicide ideation and attempts, divorce, and spousal abuse.[4,5]

Prevalence rates of pathological gambling usually range between 0.4% and 2.0% in surveys conducted throughout the United States and Canada.[6–11] Similarly, surveys from Australia,[12] New Zealand,[13] and European

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countries[14–17] find prevalence rates of pathological gambling of 0.2% to 2.1%. Surveys in Asian countries likewise report rates between 1% and 2%.[18,19] Although prevalence rates are generally under 2%, some of the discrepancies across studies may be related to the samples surveyed and the instruments used to assess pathological gambling. Few nationally based surveys have been conducted, and most relied on telephone surveys that suffered from high refusal rates (over 35% in the U.S. studies[7,8,11]). Further, many prevalence studies[9–14,16,17] utilized the South Oaks Gambling Screen,[20] an instrument developed for clinical settings, rather than general population surveys. Although no instrument has undergone substantial psychometric testing in general populations, recent studies[7,11,15,16,19] have begun administering instruments based upon the *Diagnostic and Statistical Manual for Mental Disorders*, Fourth Edition, Text Revision (DSM-IV-TR)[1] criteria for pathological gambling. DSM-based instruments yield more conservative prevalence estimates than the South Oaks Gambling Screen,[11,16] perhaps because the latter focuses more on sources from which individuals borrow gambling money rather than the broader array of negative impacts gambling may have on individuals' lives, as assessed by DSM-IV criteria.

Understanding prevalence rates of psychiatric disorders is clearly important for establishing intervention services for affected individuals. In addition, knowledge regarding the comorbidity of pathological gambling and other psychiatric conditions is necessary to generate hypotheses regarding the etiology of, and ultimately designing prevention strategies for, pathological gambling. Pathological gambling appears to be comorbid with other psychiatric disorders,[21,22] but a sophisticated understanding of these relationships is lacking. Most of the available data on comorbidities are derived from treatment-seeking samples. These estimates may be biased because individuals with more severe symptoms, or with multiple psychiatric disorders, may be more likely to present for treatment than those with a less severe, or only 1, disorder. General population surveys clearly are the gold standard in establishing associations between conditions. As noted above, few nationally based surveys of the prevalence of pathological gambling exist, and most did not concurrently assess other psychiatric conditions.

Two national surveys of pathological gambling conducted in the United States[7,11] evaluated alcohol use disorders, but not other psychiatric conditions. In the first, Gerstein et al.[7] conducted telephone interviews of 2417 randomly selected persons. Almost 10% of individuals with lifetime pathological gambling had alcohol dependence versus a very low 1.1% of nongamblers. In the second study, 2638 persons participated in another random-digit dialing survey.[11] Among individuals with current pathological gambling, 25% were currently alcohol dependent versus 1.4% of nonpathological gamblers.

Some general population surveys note a relationship between gambling and drug use disorders, but these studies are limited to specific geographic regions. Cunningham-Williams et al.[23] analyzed data from 2954 respondents in the St. Louis, Mo., site of the Epidemiologic Catchment Area Study. Almost 40% of individuals with pathological gambling or subclinical problem gambling had a drug use disorder, compared to 26.0% and 23.8% of social and nongamblers, respectively. These rates were derived from only individuals who reported sampling illicit drugs 6 or more times and did not differ significantly. A survey of a larger sample of 7214 adults from Edmonton, Alberta, Canada, found that prevalence of illicit drug abuse or dependence was about 4 times higher among pathological gamblers than nongamblers (23.2% vs. 6.3%), and the difference was statistically significant.[6]

These 2 surveys[6,23] are the only known general population studies evaluating comorbidities of pathological gambling and affective disorders. Bland et al.[6] found a significant increase in affective disorders among pathological gamblers (33.3%) compared to nongamblers (14.2%), but no differences in major depression. Cunningham-Williams et al.[23] found major depression was significantly more prevalent in problem gamblers (8.8%) than nongamblers (5.2%). Rates of dysthymia also were significantly elevated in those with gambling problems in the Bland et al.[6] study (20.0% vs. 4.9%), but not the Cunningham-Williams et al.[23] study (4.2% vs. 3.4%). Neither study found significant increases in rates of manic episodes among those with gambling problems compared to those without gambling problems.[6,23]

Thus, pathological gambling may share overlap with some mood disorders, but these data are limited by low prevalence rates of both disorders and relatively small samples surveyed. These studies also used older classification systems (e.g., DSM-III) than are available presently. Importantly, past studies compared problem and/or pathological gamblers to nongamblers. As the vast majority of adults gamble occasionally,[3,7,10,24] comparing pathological gamblers to all others may be more appropriate.

Data are sparse regarding comorbidity of pathological gambling and anxiety disorders. Cunningham-Williams et al.[23] found that problem/pathological gamblers were significantly more likely to have phobias (14.6% vs. 9.5%), but not other anxiety disorders, relative to nongamblers. Bland et al.[6] found that pathological gamblers were significantly more likely than nongamblers to have any anxiety disorder (26.7% vs. 9.2%) and agoraphobia (13.3% vs. 2.4%). Anxiety and mood disorders may predispose one to develop a gambling problem, or pathological gambling may lead to anxiety disorders.

In terms of personality disorders, the most evidence exists for an association between pathological gambling and antisocial personality disorder. A survey of over 7000 male veteran twin pairs[25] found antisocial personality disorder

occurred in 24.1% of pathological gamblers compared to 2.0% of those without a gambling problem. Both community surveys[6,23] also found high rates of antisocial personality disorder in pathological gamblers, but these associations may be related to their overlap with substance use disorders. Further, none of these studies evaluated other personality disorders. The only published data on comorbidity of other personality disorders with pathological gambling come from treatment-seeking samples, with rates of personality disorders ranging from 25% to 93%.[26–29]

In sum, pathological gambling appears to be highly comorbid with some psychiatric disorders. Evidence is unequivocal for the relationship between substance use and gambling disorders. Whether samples are drawn from the general population or persons seeking treatment for either gambling or substance use disorders, high rates of comorbidity are found, and virtually no negative findings are noted.[7,10,11,21,22] For other psychiatric disorders, much less information is available. Data are strong regarding an association between any affective disorder and pathological gambling, but mixed for specific mood and anxiety disorders. Evidence is fairly convincing that treatment-seeking gamblers have high rates of personality disorders, but whether these associations hold up in community samples is unclear.

Further, few data are available with respect to sex differences in comorbidities. Most prevalence studies find men develop pathological gambling at higher rates than women,[6,11,13–16] and some data suggest that men may gamble for different reasons than women. Among men, gambling may be more likely to occur for excitement or thrill-seeking, while for women, gambling may be related to modulation of adverse moods.[30–32] These patterns may be reflected in differential comorbidities between sexes, which may be important for understanding etiology and treatment. Previous epidemiologic studies were too small to address these issues in multivariate analyses.

This study sought to investigate the relationship between pathological gambling and psychiatric conditions using data from a major national survey. The National Institute on Alcohol Abuse and Alcoholism's (NIAAA's) National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)[30–32] is the largest comorbidity survey ever conducted; it assessed DSM-IV substance use disorders and 9 independent mood and anxiety disorders in a nationally representative sample of 43,093 adults. It also included a DSM-IV–based assessment of pathological gambling and 7 personality disorders. This sample size allows for an accurate estimation of the prevalence and comorbidity of even relatively rare conditions, such as pathological gambling. It provides a unique opportunity to evaluate sex differences in the associations between pathological gambling and other psychiatric disorders and to identify other risk factors of pathological gambling using multivariate analyses.

METHOD

NESARC Sample

The 2001–2002 NESARC is a survey of a representative sample of the United States conducted by the NIAAA that has been described in detail elsewhere.[33,34] The target population was individuals age 18 years and older in the civilian noninstitutional population residing in households and group quarters. The survey included those residing in all 50 states and District of Columbia. Face-to-face personal interviews were conducted with 43,093 respondents. Response rate was 81%, and blacks, Hispanics, and young adults (ages 18–24) were oversampled.

Data were weighted to reflect design characteristics of the NESARC survey and to account for oversampling. Adjustment for nonresponse across numerous variables, including age, race-ethnicity, sex, region, and place of residence, was performed at the household and person level. Weighted data were then adjusted to be representative of the civilian population of the United States on a variety of socioeconomic variables including region, age, race-ethnicity, and sex, based on the 2000 Decennial Census.

Interviewer Training Field Quality Control

About 1800 interviewers from the U.S. Census Bureau administered the NESARC using laptop computer-assisted software that included built-in skip, logic, and consistency checks. On average, interviewers had 5 years' experience. Training was standardized through centralized sessions under direction of NIAAA and Census headquarters staff.

Regional supervisors recontacted a random 10% of respondents for quality control purposes and to verify accuracy of the interviewer's performance. In addition, 2657 respondents were randomly selected for a reinterview after completion of their NESARC interview. Each respondent was readministered 1 to 3 sections of the NESARC survey interview as an additional check on data quality and for a test-retest reliability study.[35] Test-retest results are presented in each assessment section described below.

Sociodemographic and Socioeconomic Measures

Sociodemographic variables were age, sex, race-ethnicity, marital status, urban or rural residence, and region of the country. Socioeconomic variables were education and income.

DSM-IV Pathological Gambling Assessment

The diagnostic interview was the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV),[36] a state-of-the-art structured diagnostic interview designed for use by lay interviewers. Due to the relatively low prevalence rate of current pathological gambling and thus reduced power to gauge accurately comorbidities, only lifetime

diagnoses were analyzed. Lifetime AUDADIS-IV diagnoses of pathological gambling required the respondent to meet at least 5 of the 10 DSM-IV criteria in the 12-month period preceding the interview and/or before that 12-month period. Fifteen symptom items operationalized the 10 pathological gambling criteria.

Internal consistency reliability of the symptom items ($\alpha = 0.92$) and criteria for pathological gambling ($\alpha = 0.80$) were excellent. In order to determine if pathological gambling was associated with one of its most significant validators, we conducted a series of linear regression analyses to examine the associations between lifetime pathological gambling and 3 Short Form-12 Health Survey, version 2 (Short Form-12)[37] mental disability scores, controlling for age and other lifetime psychiatric disorders (substance use, mood, anxiety, and personality disorders). The focus was on 3 mental disability scores: mental component summary (MCS), social functioning (SF), and role emotional (RE) function. Pathological gambling was a significant ($p < .0354$ to $p < .0089$) predictor of MCS and RE scores, while the relationship approached significance ($p < .0631$) for the SF score. In general, respondents with pathological gambling had greater disability and social/occupational dysfunction than respondents without pathological gambling.

DSM-IV Alcohol and Drug Use Disorder Assessment

The AUDADIS-IV included an extensive list of symptom questions that operationalized DSM-IV criteria for nicotine dependence and alcohol and drug-specific abuse and dependence for 10 drug classes: sedatives, tranquilizers, opiates (other than heroin or methadone), stimulants, hallucinogens, cannabis, cocaine, inhalants/solvents, heroin, and other drugs.

Lifetime AUDADIS-IV diagnoses of alcohol abuse required a respondent to meet at least 1 of the 4 abuse criteria in the 12-month period preceding the interview and/or before that 12-month period. Lifetime AUDADIS-IV dependence diagnoses required the respondent to satisfy at least 3 of the 7 dependence criteria during the past year and/or prior to the past year. Prior to the past year diagnoses of dependence were required to satisfy the time-clustering criteria defined in the DSM-IV. That is, to meet prior to the past year criteria, at least 3 dependence symptoms must have occurred within the same 1-year period.

Test-retest reliability[38–42] and validity[43–58] of the AUDADIS-IV nicotine, alcohol, and drug diagnoses were good to excellent and are well documented in numerous psychometric studies conducted in clinical and general population samples. Psychometric properties of the alcohol and drug use disorders modules of the AUDADIS-IV also were excellent (exceeding $\kappa = 0.70$) in several countries that participated in the World Health Organization/National Institutes of Health's International Study on Reliability and Validity.[59–64]

DSM-IV Mood and Anxiety Disorder Assessment

The DSM-IV mood and anxiety diagnoses in the AUDADIS-IV were major depressive episode, dysthymic disorder, manic episode, hypomanic episode, panic disorder (with and without agoraphobia), social phobia, specific phobia, and generalized anxiety disorder. Due to time constraints of the interview, not all disorders (e.g., obsessive-compulsive disorder) were included. As discussed in detail elsewhere,[34] mood and anxiety diagnoses presented in this article are defined in the DSM-IV as "primary" or independent diagnoses. In the DSM-IV, the term *primary* "is used as a shorthand to indicate those mental disorders that are not substance induced and that are not due to a general medical condition."[1(p192)] Respondents classified with disorders that only were substance induced and/or due to a general medical condition (about 1.0% of all cases) were not included in the analyses presented here. According to the DSM-IV, depressive episodes entirely accounted for by bereavement also were excluded.

Reliability of AUDADIS-IV measures of DSM-IV mood and anxiety disorders is documented in test-retest studies among general population and clinical samples.[35,39–41] Reliabilities were fair to good, ranging from $\kappa = 0.42$ for specific phobia to $\kappa = 0.64$ for major depressive episode. Kappas with values between 0.40 and 0.70 indicate fair to good agreement according to standards established for psychiatric diagnoses.[65] The convergent validity of AUDADIS-IV mood and anxiety disorders was assessed using the same procedures as described for pathological gambling. With the exception of hypomanic episode, each mood and anxiety disorder was a significant ($p < .0429$ to $p < .0001$) predictor of MCS and SF mental disability scores of the Short Form-12, controlling for age, other mood disorders, and substance use, anxiety, and personality disorders. All mood and anxiety disorders except hypomania and the phobias were significant predictors ($p < .0001$) of the RE score. Thus, mood and anxiety disorders were highly associated with their most significant validators, disability and social/occupational dysfunction, as assessed independently on the Short Form-12.

Personality Disorder Assessment

The AUDADIS-IV included assessment of 7 of the 10 DSM-IV personality disorders: dependent, avoidant, histrionic, obsessive-compulsive, schizoid, paranoid, and antisocial personality disorders. Not all DSM-IV personality disorders were assessed due to time and space constraints, but schizotypal, borderline, and narcissistic personality disorders will be assessed in the second wave of the NESARC, which is currently in the field. The diagnosis of personality disorders requires an evaluation of long-term patterns of functioning.[1] Respondents were asked a series of personality symptom questions about how they felt or acted most of the time throughout their lives regardless

of the situation or whom they were with. They were instructed not to include times when they were depressed, manic, anxious, drinking heavily, physically ill, using medicines or drugs, or experiencing withdrawal symptoms. To receive a DSM-IV diagnosis, respondents needed to endorse the requisite number of DSM-IV symptom items for the particular personality disorder, and at least 1 positive symptom item must have caused social and/or occupational dysfunction.

The reliability of AUDADIS-IV categorical diagnoses of each personality disorder was assessed in a test-retest study conducted as part of the NESARC survey.[35] The reliability of personality disorder diagnoses ranged from fair to good, from $\kappa = 0.40$ for histrionic personality disorder to $\kappa = 0.67$ for antisocial personality disorder, comparable to reliabilities found for semistructured personality interviews and other fully structured diagnostic interviews conducted in treated samples of patients as reviewed elsewhere.[66]

Validity of personality disorders was assessed using the same procedures described for pathological gambling.[67] Avoidant, dependent, paranoid, schizoid, and antisocial personality disorder were each significant ($p < .0167$ to $p < .0001$) predictors of MCS, SF, and RE scores. Histrionic personality disorder was not associated with greater disability, and respondents with obsessive-compulsive personality disorder had greater disability on the MCS score ($p < .0001$) than respondents without obsessive-compulsive personality disorder.

Statistical Analysis

Cross-tabulations were used to derive conditional prevalences of pathological gambling and other psychiatric disorders (i.e., prevalences of pathological gambling among respondents with other psychiatric disorders and vice versa). Odds ratios (ORs), derived from a series of logistic regression analyses with and without controls for sociodemographic and/or socioeconomic variables, were used to study associations between pathological gambling and other psychiatric disorders. Other models were estimated separately for men and women, and sex differences in the associations between pathological gambling and each psychiatric disorder were examined in pooled models. Standard errors and 95% confidence intervals were estimated using SUDAAN,[68] a software package that uses Taylor series linearization to adjust for the design effects of complex sample surveys.

RESULTS

Sociodemographic and Socioeconomic Characteristics of Pathological Gamblers and NESARC Sample

The lifetime prevalence rate of pathological gambling was 0.42% in this sample. Rates for men and women were 0.64% and 0.23%, respectively. Demographic characteristics of respondents with pathological gambling and the remaining NESARC sample, excluding those with pathological gambling, are shown in Table 1. Respondents with pathological gambling were significantly more likely to be male (72.2% vs. 47.8%), black (22.1% vs. 11.0%), 45 to 64 years of age (39.4% vs. 31.0%), and widowed/separated/divorced (27.5% vs. 17.4%) and less likely to be married (46.0% vs. 61.7%) and to reside in the Northeast (14.0% vs. 19.7%) and South (28.8% vs. 35.2%) than the remaining NESARC sample.

Table 1. Demographic and Socioeconomic Characteristics of NESARC Sample (excluding pathological gamblers) and Pathological Gamblers

	NESARC Sample (N = 42,898)		Pathological Gamblers (N = 195)	
Characteristic	%	SE	%	SE
Sex				
Male	47.8	0.31	72.2	3.28
Female	52.2	0.31	27.8	3.28
Race-ethnicity				
White	70.9	1.59	62.2	4.43
Black	11.0	0.64	22.1	3.34
Native American	2.1	0.16	1.3	0.40
Asian	4.4	0.53	7.2	3.12
Hispanic	11.6	1.24	7.2	2.12
Age, y				
18–29	21.8	0.37	21.8	4.30
30–44	30.9	0.32	29.9	4.09
45–64	31.0	0.31	39.4	4.34
65+	16.3	0.33	8.9	2.88
Marital status				
Married/living as married	61.7	0.47	46.0	4.97
Widowed/ separated/ divorced	17.4	0.23	27.5	4.19
Never married	20.9	0.48	26.5	4.23
Education				
Less than high school	15.6	0.49	19.6	3.76
High school	29.3	0.55	34.3	4.58
Some college or higher	55.1	0.62	46.1	4.73
Income				
$0–19,999	47.3	0.58	48.4	4.52
$20,000–34,999	22.6	0.36	23.4	3.87
$35,000–69,999	22.0	0.38	19.5	3.57
$70,000+	8.1	0.37	8.7	3.34
Urbanicity				
Urban	80.3	1.61	85.3	3.72
Rural	19.7	1.61	14.7	3.72
Region				
Northeast	19.7	3.41	14.0	3.49
Midwest	23.1	3.18	25.1	5.11
South	35.2	3.25	28.8	4.76
West	21.9	3.51	32.1	6.03

Abbreviation: NESARC = National Epidemiologic Survey on Alcohol and Related Conditions.

Lifetime Prevalence of Pathological Gambling Among Respondents With Other Psychiatric Disorders

Lifetime prevalence rates of pathological gambling among individuals with other psychiatric disorders are

Table 2. Lifetime Prevalence Rates of Comorbid Psychiatric Disorders

	Prevalence of Pathological Gambling Among Respondents With Comorbid Disorder		Prevalence of Comorbid Disorder Among Respondents With Pathological Gambling	
Comorbid Disorder	%	SE	%	SE
Any alcohol use disorder	1.03	0.11	73.22	1.03
Alcohol abuse	0.61	0.11	25.42	4.16
Alcohol dependence	1.62	0.23	47.79	4.75
Any drug use disorder	1.56	0.23	38.10	4.71
Any drug abuse	1.48	0.28	26.92	4.44
Any drug dependence	1.83	0.38	11.18	2.40
Nicotine dependence	1.45	0.17	60.37	1.45
Any mood disorder	1.08	0.14	49.62	4.66
Major depressive episode	0.95	0.13	36.99	4.42
Dysthymic disorder	1.30	0.28	13.20	2.82
Manic episode	2.92	0.61	22.80	4.16
Hypomanic episode	0.85	0.26	4.66	1.45
Any anxiety disorder	1.02	0.14	41.30	4.55
Panic disorder with agoraphobia	5.01	0.61	5.09	1.53
Panic disorder without agoraphobia	1.39	0.36	13.13	3.17
Social phobia	0.90	0.25	10.55	2.73
Specific phobia	1.06	0.20	23.54	3.85
Generalized anxiety	1.14	0.29	11.15	2.67
Any personality disorder	1.74	0.21	60.82	4.67
Avoidant	2.51	0.71	13.96	3.51
Dependent	2.75	0.86	3.19	0.94
Obsessive-compulsive	1.53	0.24	28.45	3.95
Paranoid	2.31	0.42	24.08	3.84
Schizoid	2.03	0.47	14.97	3.20
Histrionic	3.02	0.63	13.10	2.62
Antisocial	2.72	0.54	23.31	4.25

shown in the first column of Table 2. Among respondents with a substance use disorder, rates of pathological gambling ranged from 0.61% to 1.83%. Rates of pathological gambling among individuals with a mood disorder ranged from 0.85% for hypomania to 2.92% for mania. Prevalence of pathological gambling among respondents with anxiety disorders ranged from a low of 0.90% for social phobia to a high of 5.01% for panic disorder with agoraphobia. Rates of pathological gambling among respondents with personality disorders (1.53%–3.02%) were similar to those of substance use, mood, and anxiety disorders.

Lifetime Prevalence of Psychiatric Disorders Among Respondents With Pathological Gambling

Lifetime prevalence rates of any alcohol and drug use disorder were 73.22% and 38.10%, respectively, among respondents with pathological gambling (Table 2, second column). Mood (49.62%) and anxiety (41.30%) disorders also were highly prevalent among respondents with pathological gambling. For personality disorders, prevalence rates ranged from 3.19% for dependent personality disorder to 28.45% for obsessive-compulsive personality disorder.

Associations Between Pathological Gambling and Other Psychiatric Disorders

Associations between pathological gambling and other psychiatric disorders are shown in Table 3 in the form of ORs. In the first model, which did not adjust for any sociodemographic or socioeconomic characteristics, the overall pattern of ORs was overwhelmingly positive, with 100% greater than 1.0 and statistically significant. Even after adjusting for sociodemographic characteristics (race-ethnicity, age, sex, marital status, region of the country, and urban/rural dichotomy; Model 2), and sociodemographic plus socioeconomic characteristics (adding education and income; Model 3), all but 1 of the ORs were significant. Alcohol abuse was the only disorder not significantly related to pathological gambling after adjusting for these variables.

Any alcohol use disorder and alcohol dependence were significantly related to pathological gambling, with ORs above 5 for both adjusted and nonadjusted analyses. Drug use disorders were significantly related to pathological gambling as well, although in these cases the ORs were slightly lower (ORs = 3.5–4.8). The OR for tobacco dependence was especially high, with a diagnosis of tobacco dependence increasing one's odds of pathological gambling by over 6-fold.

With the exception of hypomania, all mood and anxiety disorders were strongly and consistently related to pathological gambling. Even in the adjusted models, ORs ranged from 2.2 to 8.0. The mood disorder most strongly related to pathological gambling was mania, and panic disorder with agoraphobia was the anxiety disorder most strongly associated with pathological gambling. Similarly, personality disorders evidenced high ORs, with all of them above 4 in adjusted as well as unadjusted analyses.

Other significant demographic predictors of pathological gambling were also identified (data not shown). For each of the models that examined the associations between specific substance use, mood, anxiety, and personality disorders and pathological gambling, men were at greater risk (ORs = 2.1–3.9) of pathological gambling than women, and blacks were at greater risk (ORs = 2.0–2.8) compared to whites. Respondents who were widowed/separated/divorced also were at significantly greater risk (ORs = 2.0–2.8) compared to those who were married or cohabiting. Further, respondents residing in the Northeast and South (but not Midwest) were at significantly lower risk (ORs = 0.4–0.5) relative to those residing in the West. Interestingly, the odds of pathological gambling were consistently and significantly greater (ORs = 2.1–2.8) for 45- to 64-year-olds compared to respondents 65 years and older for all models examined, except those associated with nicotine dependence and any personality disorder. The 30- to-44-year-old age group also demonstrated a 2-fold increase in the risk of pathological gambling relative to the oldest age group in the

Table 3. Odds Ratios (ORs) of DSM-IV Lifetime Pathological Gambling and Other Psychiatric Disorders

	Unadjusted OR (Model 1)		Adjusted OR Controlling for Sociodemographic Characteristics (Model 2)		Adjusted OR Controlling for Sociodemographic and Socioeconomic Characteristics (Model 3)	
Comorbid Disorder	OR	95% CI	OR	95% CI	OR	95% CI
Any alcohol use disorder	6.3	4.0 to 10.1	6.1	3.8 to 9.8	6.0	3.8 to 9.7
Alcohol abuse	1.6	1.0 to 2.5	1.3	0.9 to 2.1	1.4	0.9 to 2.1
Alcohol dependence	6.5	4.4 to 9.6	5.8	3.8 to 8.9	5.6	3.7 to 8.5
Any drug use disorder	5.4	3.6 to 8.1	4.7	3.2 to 7.0	4.4	2.9 to 6.6
Any drug abuse	4.4	2.8 to 7.0	3.7	2.3 to 5.9	3.5	2.2 to 5.6
Any drug dependence	4.8	3.0 to 7.7	4.0	2.4 to 6.7	3.5	2.1 to 5.8
Nicotine dependence	7.2	5.0 to 10.3	6.9	4.8 to 10.0	6.7	4.6 to 9.9
Any mood disorder	4.1	2.8 to 5.9	4.6	3.0 to 6.9	4.4	2.9 to 6.6
Major depressive episode	3.0	2.0 to 4.3	3.5	2.4 to 5.1	3.3	2.3 to 4.9
Dysthymic disorder	3.4	2.1 to 5.6	3.5	2.1 to 5.9	3.3	1.9 to 5.6
Manic episode	8.9	5.5 to 14.3	8.6	5.1 to 14.7	8.0	4.7 to 13.7
Hypomanic episode	2.1	1.1 to 3.9	1.9	1.0 to 3.7	1.8	1.0 to 3.6
Any anxiety disorder	3.4	2.4 to 5.0	4.1	2.7 to 6.1	3.9	2.6 to 5.9
Panic disorder with agoraphobia	5.0	2.6 to 9.6	5.8	3.0 to 11.3	5.2	2.6 to 10.5
Panic disorder without agoraphobia	3.7	2.1 to 6.4	4.4	2.5 to 7.8	4.2	2.4 to 7.5
Social phobia	2.3	1.3 to 4.1	2.4	1.3 to 4.5	2.2	1.2 to 4.1
Specific phobia	3.0	1.9 to 4.6	3.6	2.3 to 5.8	3.5	2.2 to 5.5
Generalized anxiety	2.9	1.7 to 5.0	3.3	1.9 to 5.6	3.1	1.8 to 5.3
Any personality disorder	9.1	6.2 to 13.3	8.7	5.8 to 13.1	8.3	5.6 to 12.3
Avoidant	6.9	3.8 to 12.4	7.1	3.8 to 13.2	6.5	3.5 to 11.8
Dependent	6.8	3.5 to 13.2	7.0	3.4 to 14.6	5.5	2.6 to 12.0
Obsessive-compulsive	4.7	3.2 to 7.0	4.7	3.2 to 7.1	4.6	3.0 to 7.1
Paranoid	7.0	4.6 to 10.6	6.7	4.2 to 10.6	6.1	3.8 to 9.8
Schizoid	5.5	3.4 to 9.1	5.2	3.1 to 8.8	5.0	3.0 to 8.4
Histrionic	8.3	5.2 to 13.2	7.4	4.6 to 11.9	6.9	4.2 to 11.2
Antisocial	8.3	5.1 to 13.3	6.7	4.2 to 10.8	6.0	3.7 to 9.7

risk of pathological gambling relative to the oldest age group in those models that examined the associations between alcohol abuse, hypomania, panic disorder with agoraphobia, social phobia, and dependent personality disorder and pathological gambling.

Associations Between Pathological Gambling and Other Psychiatric Disorders by Sex

Similar to the pattern observed in the total sample, the associations between pathological gambling and other psychiatric disorders were overwhelmingly significant and positive for men and women. The only exceptions were that the relationships between pathological gambling and alcohol abuse were not significant for either men or women, for generalized anxiety disorder among men, and for hypomania and social phobia among women (Table 4). In general, the relative strengths of the associations between pathological gambling, alcohol use and drug use disorders, and mood, anxiety, and personality disorders among men and women mirrored those observed in the entire sample.

However, some sex differences in the associations between pathological gambling and other psychiatric disorders were noted. Relationships between pathological gambling and alcohol dependence, any drug use disorder, drug abuse, nicotine dependence, major depression, and generalized anxiety disorders were significantly greater for women than men.

COMMENT

This is the largest study of prevalence and comorbidity of pathological gambling conducted to date. The overall prevalence rate of pathological gambling was 0.42%, within the range, albeit the low end, found in other general population surveys that used DSM-based instruments for diagnoses.[6,7,11,15,16] Extrapolating from the results of this study to the population of the United States, we can estimate that of the 881,751 adult Americans with pathological gambling, an estimated 645,581 (73.2%), 335,909 (38.1%), and 431,439 (48.9%) have a lifetime alcohol use disorder, drug use disorder, and nicotine dependence, respectively. The prevalences of mood, anxiety, and personality disorders among pathological gamblers were also high. Of pathological gamblers, 437,494 (49.6%), 364,159 (41.3%), and 536,276 (60.8%) have a lifetime mood, anxiety, and personality disorder, respectively.

Results from this study confirm and expand upon prior studies showing an association between substance use disorders and pathological gambling. Associations between any alcohol use disorder and alcohol dependence were especially strong. Interestingly, ORs for alcohol use disorders were higher than those for drug use disorders, while the reverse pattern is noted for psychiatric disorders other than pathological gambling in most epidemiologic surveys.[69–71] This stronger association between alcohol use disorders and pathological gambling suggests that similar

Table 4. Odds Ratios (ORs)[a] of DSM-IV Lifetime Pathological Gambling and Other Psychiatric Disorders by Sex

	Pathological Gambling			
	Male		Female	
Disorder	OR	95% CI	OR	95% CI
Any alcohol use disorder	4.7	2.6 to 8.3	10.0	4.8 to 20.7
Alcohol abuse	1.2	0.7 to 2.0	2.2	0.9 to 5.2
Alcohol dependence	4.6	2.8 to 7.6	9.5	4.7 to 19.2[b]
Any drug use disorder	3.5	2.1 to 5.7	8.4	4.4 to 16.2[b]
Any drug abuse	2.8	1.6 to 4.8	6.9	3.1 to 15.6[b]
Any drug dependence	3.1	1.6 to 5.9	5.0	2.4 to 10.2
Tobacco dependence	5.0	3.1 to 8.2	14.7	7.5 to 28.7[b]
Any mood disorder	4.0	2.3 to 6.8	6.1	3.3 to 11.4
Major depressive episode	2.6	1.6 to 4.5	5.6	3.1 to 10.0[b]
Dysthymic disorder	2.8	1.3 to 6.0	4.0	2.0 to 8.3
Manic episode	7.7	3.9 to 15.0	8.3	3.8 to 17.7
Hypomanic episode	1.6	0.6 to 3.8	2.6	0.9 to 7.1
Any anxiety disorder	3.4	2.0 to 5.8	5.5	3.0 to 10.0
Panic disorder with agoraphobia	4.4	1.5 to 12.9	5.8	2.2 to 14.8
Panic disorder without agoraphobia	3.0	1.3 to 6.8	6.3	2.8 to 14.0
Social phobia	2.4	1.1 to 5.5	1.8	0.8 to 4.1
Specific phobia	3.2	1.6 to 6.3	3.8	1.9 to 7.4
Generalized anxiety	1.7	0.8 to 3.6	5.2	2.4 to 11.3[b]
Any personality disorder	8.3	5.1 to 13.5	8.0	4.3 to 14.8
Avoidant	6.3	2.6 to 15.0	6.5	3.2 to 13.3
Dependent	3.7	1.1 to 11.7	8.9	3.9 to 20.4
Obsessive-compulsive	4.0	2.3 to 7.0	6.1	3.5 to 10.8
Paranoid	7.2	3.9 to 13.1	4.2	2.4 to 7.5
Schizoid	5.5	2.8 to 10.7	3.7	1.8 to 7.4
Histrionic	7.3	4.0 to 13.6	5.5	2.1 to 14.3
Antisocial	5.5	3.2 to 9.6	8.3	4.0 to 17.3

[a]Sex-specific odds ratios adjusted for age, race-ethnicity, marital status, urbanicity, region, education, and income.
[b]OR significantly ($p < .05$) greater among females than males.

environmental, social, and/or genetic factors may be associated with both of these disorders.[22,72]

Findings from this first nationally representative study of comorbidity of pathological gambling also found strong associations between pathological gambling and mood, anxiety, and personality disorders. The mood disorder most strongly related to pathological gambling was mania, suggesting that the exclusionary criteria of the DSM-IV (i.e., a diagnosis of pathological gambling is not given if it occurs during a manic episode), if invoked, may serve to obscure the relationship between these 2 disorders. Associations between pathological gambling and major depression and dysthymia also were significant, but somewhat lower. With respect to the anxiety disorders, panic disorder with and without agoraphobia were most strongly related to pathological gambling, whereas relationships between phobias and generalized anxiety disorder were significant, but weaker. Further, strong associations exist between all the personality disorders and pathological gambling, especially antisocial, histrionic, paranoid, and dependent personality disorder. Etiologic factors may be more similar for disorders sharing higher rates of comorbidity. These data may also suggest the need to more closely evaluate those psychiatric disorders with higher co-occurrence among treatment-seeking individuals, as presence of another disorder may impact treatment outcomes.

The degree of diagnostic overlap between substance use disorders; mood, anxiety, and personality disorders; and pathological gambling is often not entirely recognized and may, in part, be responsible for the strong associations in this study. For example, substance use disorders are phenomenologically quite similar to pathological gambling and share compulsivity, impaired control, tolerance, interpersonal problems, and neglect of role obligations criteria. Another pathological gambling criterion, gambling as a means of escape from problems or of relieving a dysphoric mood resembles some essential features of mood and anxiety disorders. Further, "lies to family members, therapists, or others to conceal the extent of involvement in gambling"[1(p618)] and "committing illegal acts such as forgery, fraud, theft or embezzlement to finance gambling"[1(p618)] criteria of pathological gambling also would qualify as criteria for antisocial personality disorder. Although multivariate studies[73–75] have been conducted at the criteria level of DSM-IV personality disorders to identify a factor structure underlying personality disorder diagnoses, findings from this study perhaps suggest that this search may be expanded to include criteria of Axis I disorders, including pathological gambling and substance use, mood, and anxiety disorders. Ultimately, results from such studies may refine classifications of disorders and increase our understanding of processes underlying comorbidities.

A number of DSM-IV psychiatric disorders examined in this study were more strongly related to pathological gambling among women than men, including most of the substance use disorders, major depressive episode, and generalized anxiety disorder. A complete explanation for these sex differences remains unclear. Because women have lower rates of substance use disorders and pathological gambling in general, women with these disorders may be a more deviant subgroup of the population and thus more highly comorbid for recurrent maladaptive behaviors characteristic of addictive disorders. In contrast, the stronger association between major depressive episode and generalized anxiety disorder and pathological gambling among women suggests that women may be more likely to develop pathological gambling in an attempt to alleviate anxious and depressed mood than men.

This study also consistently identified sociodemographic characteristics as risk factors for pathological gambling. Males, blacks, widowed/separated/divorced individuals, and those residing in the West and Midwest have significantly greater risks of pathological gambling. Many of these factors have been reported previously.[7,10–13,17,18,22,24] Lower socioeconomic status has been associated with pathological gambling in some studies.[7,10,11,16,17,19,76] However, income and education did not

emerge as significant predictors in this study, perhaps because other characteristics were controlled for in the analyses.

Although young age has been shown to be a risk factor for pathological gambling in some,[7,10,12–17] but not all[11,18] previous research, this study found the risk of pathological gambling was consistently greater among 45- to 64-year-olds than those 65 years of age and older. The 30- to 44-year-old age group demonstrated increased risk of pathological gambling, but this relationship was not as consistent. Importantly, in no case did the youngest age group (18–29 years old) show increased risk of pathological gambling in conjunction with other psychiatric comorbidities. These data seem to parallel trends in treatment-seeking pathological gamblers, few of whom are young.[77]

In sum, these data provide much-needed information regarding the comorbidity of pathological gambling with psychiatric disorders and identification of other risk factors for this disorder. Strengths of this study include the extraordinarily large randomly selected sample, a very high response rate, oversampling of young adults and minorities, administration of in-person interviews, and use of reliable and valid diagnostic instruments. In addition, mood and anxiety disorders were required to occur independently of substance use for a diagnosis to be made. Thus, comorbidity noted between mood and anxiety disorders and pathological gambling cannot be attributed directly to their association with substance use disorders.

Limitations to these findings are also noted. First, there were too few pathological gamblers to examine current prevalence rates, and therefore only lifetime prevalence rates are detailed. Second, not all psychiatric disorders were assessed. Wave 2 of the NESARC will include modules assessing posttraumatic stress disorder, attention-deficit/hyperactivity disorder, and narcissistic, borderline, and schizotypal personality disorders, all of which can be examined in association with pathological gambling. Finally, information on the patterning of the disorders was not assessed, so whether substance use, mood, and anxiety disorders preceded or occurred subsequent to the development of pathological gambling cannot be determined from this study. However, further analyses of NESARC data will begin to address the temporal relationships between these disorders using survival analytic procedures.

In terms of clinical implications, these results provide persuasive evidence that gambling treatment providers should assess substance, mood, anxiety, and personality disorders in their patients, and that screening for pathological gambling could be considered for individuals seeking treatment for other psychiatric disorders as rates of comorbidities are high. These data also underscore the need for further development of treatments for individuals comorbid for pathological gambling and other psychiatric disorders. Very few data are available to guide treatments for pathological gamblers in general, and almost no data exist regarding the natural course or responsivity to treatment among pathological gamblers with comorbid disorders in particular.[22,78] That is, individuals with any, or certain, comorbid disorders may respond better to different types of therapies, be they pharmacologic or psychological in nature; comorbidity may also impact the recommended durations or intensity of treatments. Given the personal and social costs associated with pathological gambling, along with this now clear evidence of comorbidity, further evaluation of how comorbidity impacts treatment types and outcomes is critical.

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, no investigational information about pharmaceutical agents that is outside U.S. Food and Drug Administration–approved labeling has been presented in this article.

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