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Subtypes of Disordered Gamblers: Results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

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Abstract

Aims—To derive empirical subtypes of problem gamblers based on etiological and clinical characteristics described in the Pathways Model, using data from a nationally representative survey of U.S. adults.

Design & Measurement—Data were collected from structured diagnostic face-to-face interviews using the Alcohol Use Disorder and Associated Disabilities Interview Schedule DSM-IV version IV (AUDADIS-IV).

Setting—The study utilized data from U.S. National Epidemiologic Survey on Alcohol and Related Conditions (NESARC).

Participants—All disordered gambling participants (N = 581) from a nationally representative cross-sectional sample of civilian non-institutionalized adults aged 18 years or older.

Findings—Latent class analyses indicated the best-fitting model was a three-class solution. Those in the largest class (Class 1: 51%, n=295) reported the lowest overall levels of psychopathology including gambling problem severity and mood disorders. In contrast, respondents in Class 2 (20%, n=117) had a high probability of endorsing past-year substance use disorders, moderate probabilities of having parents with alcohol/drug problems and of having a personality disorder, and the highest probability for past-year mood disorders. Respondents in Class 3 (29%, n=169) had the highest probabilities of personality and prior-to-past year mood disorders, substance use disorders, separation/divorce, drinking-related physical fights, and parents with alcohol/drug problems and/or a history of ASPD.

Conclusions—Three subtypes of disordered gamblers can be identified, roughly corresponding to the sub-types of the Pathways Model, ranging from a subgroup with low levels of gambling severity and psychopathology to one with high levels of gambling problem severity and comorbid psychiatric disorders.

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Keywords

Gambling; DSM-IV; Epidemiology; Subtypes; Survey research; problem or pathological gambling; gambling disorder

The recent proliferation of legalized gambling opportunities have corresponded to increased rates of gambling participation and disordered gambling (i.e. pathological and sub-clinical problem gambling) [1-4]. Though rates in specific subgroups are higher, prevalence rates generally range from 1.1% to 1.6% for pathological gambling and from 2.8% to 3.8% for sub-clinical problem gambling for adults [2]. A number of diverse, theoretical approaches have attempted to explain the etiology of disordered gambling [5-11]. However, conceptually, many of these models fail to reflect the heterogeneous and complex nature of the disorder and to account for subtypes of disordered gamblers based on demographic factors, developmental history, or neurobiology.

In gambling research, Blaszczynski and Nower (2002) proposed subtyping disordered gamblers into etiological subgroups in their Pathways Model, which asserts that there are three subtypes of gamblers, distinguished by the presence or absence of specific pre-morbid psychopathology and biological vulnerabilities despite displaying similar phenomenological features [12]. All three groups have common exposure to related ecological factors (e.g., availability, accessibility, and acceptability), cognitive processes and distortions, and contingencies of reinforcement; however, they represent differential constellations of additive risk factors. The model proposes that *Pathway 1* “behaviourally conditioned” disordered gamblers, distinguished by the absence of specific pre-morbid features of psychopathology, gamble primarily as a result of the effects of conditioning, distorted cognitions surrounding the probability of winning, a disregard for the notion of independence of events, and/or a series of bad judgments or poor decision-making rather than because of impaired control [12]. Mood disorders and comorbid addictions in this group are theorized to follow rather than precede the development of gambling problems. *Pathway 2* “emotionally vulnerable” gamblers share similar ecological determinants, conditioning processes, and cognitive schemas; however, these individuals also present with mood disorders that precede disordered gambling, a history of poor coping and problem-solving skills, problematic family background experiences, and major traumatic life events; they gamble primarily to modulate affective states and/or meet specific psychological needs [12]. *Pathway 3* gamblers also possess psychosocial and biologically-based vulnerabilities similar to those in Pathway 2 but are primarily distinguished by features of impulsivity, antisocial personality traits and behaviors, and attention deficits, manifesting in severe multiple maladaptive behaviors including comorbid addictions [12].

Recently, a number of studies have identified relationships among various predisposing factors for disordered gambling, identified in the Pathways Model: personality, mood, and/or substance use disorders [13-15]; impulsivity, sensation-seeking, and emotional vulnerability [16-19]; negative affect and distress tolerance [20]; and autonomic arousal [21]. Using principal components analysis, Turner et al. [22] identified four distinct components that accounted for the relationship of disordered gambling severity: emotional vulnerability, impulsivity, erroneous beliefs, and the experiences of wins, which the authors concluded corresponded to sub-types in the Pathways Model. Similarly, in a past-year population-based sample using Canadian data, Martins, Ghandour, and Storr [23] identified three latent classes of gamblers that varied by disordered gambling severity as well as by select etiological risk factors.

Other studies have expressly investigated the possibility of heterogeneous subtypes of disordered gamblers, the theoretical basis for the Pathways Model. Gonzalez-Ibáñez et al. [24] identified three distinct clusters, each exhibiting progressively more severe symptoms of psychopathology on variables measuring depression, psychoticism, somatization, impulsiveness, interpersonal sensitivity and phobic anxiety. Ledgerwood and Petry [25] identified three different subgroups of disordered gamblers, based on emotional state, dissociation, and attention-seeking; Stewart et al. [26] reported similar findings in a cluster analysis of positive and negative emotional factors. Exploring the Pathways subtypes, Ledgerwood and Petry [27] found less severe levels of psychopathology in the first subgroup; significantly higher levels of psychiatric severity in the second versus the first subgroup but fewer addiction-related and legal problems than the third subgroup; and, in the third group, high rates of ASPD and the most severe psychosocial problems [27]. These findings lend limited support to the Pathways Model and the existence of distinct etiological subgroups of disordered gamblers. However, the studies are limited by failing to fully examine the range of factors identified by the model and to measure the presence or absence of symptoms in relation to the development of gambling problems.

This study utilizes latent class analysis (LCA) to subtype empirically those who endorse criteria of disordered gambling based on a multivariate range of clinical indicators outlined in the Pathways Model, using data collected in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC). Similar to the model, we hypothesize that there will be three or more classes with increasing levels of comorbid psychopathology. In addition, we predict that classes representative of Pathways 2 and 3 in the model will share multiple features of psychopathology that differ in severity and that the class similar to Pathway 3 will present with additional features of disorder and the highest overall level of psychopathology, particularly substance use and personality disorders.

Methods

Sample

Data were drawn from the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative United States survey of civilian non-institutionalized participants aged 18 and older, using a cross-sectional design and in-person interviews. Details of the sampling frame [28,29] and of interviewing, training, and field quality control appear elsewhere [30]. Young adults, Hispanics, and African-Americans were oversampled, and rates were weighted to the 2000 decennial census in terms of age, race, sex, and ethnicity and were further weighted to adjust for sampling probabilities. The study achieved an overall response rate of 81%.

Measures

The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-IV) [31], a structured diagnostic interview, was administered to the NESARC participants using computer-assisted software with built-in skip, logic, and consistency checks.

Subclinical and DSM-IV pathological gambling—All respondents were asked if they had gambled (e.g., played cards for money, etc.) at least five times in any one year of their lives. Those who responded affirmatively were asked the DSM-IV pathological gambling questions. Consistent with DSM-IV, lifetime AUDADIS-IV diagnoses of pathological gambling required the respondent to meet at least five of the 10 DSM-IV criteria. Internal consistency reliability of the symptom items ($\alpha=0.92$) and criteria for pathological gambling ($\alpha=0.80$) were excellent [32]. For the purpose of this study and consistent with previous analyses of the NESARC [33,34], respondents who answered “yes” to the gatekeeping item

and met three or more DSM-IV criteria for pathological gambling were termed “disordered gamblers” (N = 581), and this group included both problem gamblers (three to four criteria; N = 386) and pathological gamblers (five to 10 criteria; N = 195). In addition, the Pathways Model [12], while originally conceptualized for pathological gamblers, is intended to identify etiological risk factors, applicable to the development of gambling problems across the spectrum of disorder. A pathological gambling sum criteria variable, indicative of gambling severity, was included as one of the latent class analyses (LCA) items.

DSM-IV assessment of other psychiatric disorders—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 classes of drugs. The DSM-IV mood and anxiety diagnoses in the AUDADIS-IV were major depressive disorder (MDD), dysthymia, bipolar I & II, specific phobia, and panic, social anxiety and generalized anxiety disorders that are not caused by bereavement, substance use or a general medical condition. Data on age of onset of alcohol and drug abuse/dependence, whichever occurred first, as well as of the first onset of MDD/dysthymia was also collected. Lifetime diagnosis of attention-deficit/hyperactivity disorder (ADHD) were assessed in the Wave 2 NESARC [35]. Test–retest reliability [28,36–38] and validity [28,29,38,39] of the AUDADIS-IV measures are well documented in psychometric studies, conducted in clinical and general population samples. Reliability and validity of AUDADIS substance use disorders are excellent [40–44]. Personality disorders were assessed on a lifetime basis and included DSM-IV avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic, and antisocial personality disorders. Diagnoses required long-term patterns of social and occupational impairment and exclusion of substance-induced cases [45–48]. Convergent validity of personality disorders assessed was good to excellent and is reported in detail elsewhere [46–48].

Disability and Current Health and Emotional Problems—The NESARC interview used the Short Form Health Survey 12 version 2 (SF-12v2), a reliable and valid measure of disability, often used in epidemiological surveys. This study used the general health, physical functioning, bodily pain, and mental health scores of the SF12v2 (lower scores mean more disability). Reliability coefficients of SF-12v2 rating scales ranged from 0.73–0.87 in the general population and content, concurrent and predictive, and construct validity was shown to be good across a wide variety of populations and purposes [49,50].

Family History—The AUDADIS-IV collects extensive data on family history of alcohol and drug problems. For these analyses, we combined the variables that asked whether father/mother had drinking problems and whether father/mother had drug problems into a single LCA item and also used the variables that recorded whether the parents had a history of ASPD. The AUDADIS-IV also records information on parental death and divorce.

Current Events—The AUDADIS-IV includes questions on whether, in the past 12 months, respondents had separated, divorced or broken off a steady relationship or had experienced the death of a family member or close friend, and whether respondents or their family members had experienced trouble with police.

Demographics—Age, sex and race/ethnicity were compared between identified latent classes. To be parsimonious, we combined several items into single LCA variables (see Table 1 for all variables, including combined).

Analytic Plan

Latent Class Analysis (LCA) was used to empirically derive groups of disordered gamblers based on the selected variables, 17 categorical and five continuous indicators (see Table 1). All analyses were done in Mplus version 5.21 to accounting for the complex sampling design of the NESARC [51]. Mplus estimates latent class models using full information maximum likelihood estimation. Lifetime disordered gamblers were classified into the different latent classes, based on the probability of their responses in the selected indicators. In order to determine the model with the optimal number of classes, models with between 1 and 5 classes were evaluated. Fit indices and theory were used to identify the best-fitting and most parsimonious model. The model with the number of classes associated with minimum values of fit statistics including, Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC) and Sample Size Adjusted BIC (ABIC) was chosen [52]. The BIC was given priority over other fit statistics given its optimal performance in simulation studies [53]. The optimal latent class model was checked for model fit and model assumptions including conditional independence [52].

Results

Overall, 581 of 43,093 participants (1.36%) were classified as disordered gamblers (SE=0.07%). Derivation of different classes proceeded sequentially from the most parsimonious one-class model (past-year disordered gamblers are not different on any of the correlates) to a more differentiated five-class model. Based on fit statistics, there was an improvement with increasing number of classes, peaking at around three classes, our chosen best-fitting model (see Table 2). While BIC showed that a four-class model could have a slightly better fit as compared to a three-class model, the four-class model was unstable (in this model the variable 'emotional problems' could not be estimated in some classes), suggesting that the three class- model was the best-fitting model.

Tables 3 and 4 show the probabilities and means of the selected items among the three latent classes, as well as the demographic characteristics of each class. Differences among classes are more quantitative than qualitative. Class 1 (50.76% of the sample, n=295), corresponding to the Pathway 1 gamblers in the model, was characterized by moderate probabilities of prior to past-year experience of substance use disorders (~55%) and the death of a parent or other family member (~41%), and low probabilities in all other categorical indicators. Respondents in this class had the highest mean scores of the SF-12v2 mental component summary. Overall, those in Class 1 had the lowest probabilities of experiencing any of the categorical indicators and the lowest mean scores for mood disorders and pathological gambling problem severity. Compared to Class 2, they also reported the lowest age of onset of alcohol abuse/dependence.

Respondents in Class 2 (20.06%, n=117) had a high probability (0.74) of endorsing prior to past-year substance use disorders and moderate probabilities of endorsing the death of a parent or other family member in the past-year (~56%), physical fights due to drinking (~33%), parents with alcohol or drug problems (~47%), and any personality disorder (~61%). Respondents in this class had the highest mean age of onset of alcohol abuse or dependence. Though probabilities were in the lower range (<0.3), individuals in Class 2 were more likely than respondents in other classes to report (a) trouble with police in the past-year; (b) death of a family member or close friend; (c) mood disorders; and (d) onset of first depressive episode.

Individuals in Class 3 (29.18%, n=169) had high probabilities of endorsing a personality disorder (~88%) and prior to past-year substance use disorders (~78%). They had moderate

probabilities of reporting a history of ASPD (~49%), past-year substance use disorders (~43%), the death of a parent or family member in the past year (~51%), involvement in drinking-related physical fights (~40%), and parents who were divorced (~30%), and/or who had alcohol or drug problems (~55%) and/or a history of ASPD (~36%). They had the highest mean scores for gambling problem severity (statistically significant compared to Class 1). Overall, Class 3 had the highest probabilities of endorsing ASPD and any other personality disorder, past-year and prior to past-year substance use disorders, prior to past-year mood and anxiety disorders (even though in these cases probabilities were in the low range), experiencing separation or divorce, involvement in physical fights due to drink, and parents who were divorced and/or who had problems with alcohol or drugs and/or a history of ASPD.

Table 5 shows the model covariate estimates. Males were less likely than females to be in Class 2 versus Class 1 (OR: 0.36 [95% CI=0.22-0.58]). Blacks were more likely than Whites to be in Class 2 versus Class 1 (OR:1.83 [95% CI=1.02-3.28]). Older disordered gamblers were more likely to be in Class 2 versus Class 1 (OR: 1.02 [95% CI=1.01-1.02]). There were no significant associations between covariates and Class 3 versus Class 1.

Discussion

The current study is the first to test a comprehensive range of etiological variables identified in the Pathways Model [12] in a nationally representative sample using variables that assessed both past-year and prior to past-year data. Consistent with the model, this study identified three empirical subtypes of disordered gamblers, distinguished by the nature and severity of their risk factors as well as by the onset of comorbid symptoms.

Class 1 is consistent with Blaszczynski and Nower's Pathway 1 subtype, reporting the lowest overall levels of psychopathology, some evidence of past-year substance use disorders and death of a family member, and a higher proportion of white males as compared to Class 2 but not to Class 3. These findings are consistent with the hypothesis in the model [12] that Pathway 1 gamblers initiate gambling in response to some stressful life event and develop problems as a result of behavioral conditioning that occurs with repeated gambling. In this sample, white males comprised the largest proportion of Class 1. Historically, White males are more likely to initiate gambling at a younger age and to gamble on games of skill and sports [54]. One possibility, in need of further investigation, is that this sub-group is characterized by men with a long history of recreational gambling who increased the severity and frequency of their gambling behavior to cope with grief or stress. The current data did not provide information on age of disordered gambling onset nor on gambling preferences, however, so it is impossible to draw definitive conclusions absent further research.

Class 1 was the largest group in the current study but the smallest in a study with a clinical sample [27], underscoring the need to identify through prevention and education efforts this significant proportion of individuals with less severe psychiatric problems who may not seek treatment for gambling problems but might, nevertheless, go on to develop severe and progressive problems with disordered gambling. This finding could also suggest that ecological factors, behavioral conditioning, and cognitive distortions are sufficiently powerful to drive the transition from social to disordered gambling, with or without underlying psychopathology, highlighting the importance of education and prevention for disordered gambling and the implementation of harm reduction strategies in the gambling environment.

Class 2 is also generally consistent with the Pathway 2 subgroup of problem gamblers, characterized by substance use disorders, personality disorders, depression and parents with alcohol problems or personality disorders. While the model hypothesizes this will be the largest group, Class 2 in this study was the smallest group of the three with the highest average age; it was overrepresented by female and Black participants. In contrast, the model suggests that Class 3 or the Pathway 3 subtype is a small subset of Pathway 2, distinguished by more males and more severe features and manifestations of impulsivity and anti-social tendencies. These variations from the model could be due, in part, to differences between clinical and epidemiological samples.

The features of Class 3 were generally consistent with the Pathway 3 subtype, characterized by the highest levels of personality, mood, and substance use disorders; alcohol-related fights; separation or divorce; and parental history of drug/alcohol problems or ASPD. In this study, Class 3 was larger than Class 2 and comprised nearly a third of the sample. These differences from the model could be an artefact of the analysis, which provides groupings based on a continuum of symptom severity. They could also suggest that, in contrast to the model, disordered gamblers are largely characterized by two overarching subgroups: those who are behaviorally-conditioned without significant psychopathology (Pathway 1) and those who have severe, biologically-based psychopathology (Pathway 3) with lesser degrees of severity (Pathway 2) as a variant. Alternatively, these findings may highlight differences between the proportion of gambling subtypes in the general population as compared to those in clinical samples, which served as the inspiration for the model.

It is important to consider the study's findings in light of two main limitations. First, though the NESARC data provides a fairly comprehensive group of variables for testing the model, as other general population studies [23], it does not accurately reflect all the variables in the model required for thorough testing, therefore conclusions regarding relationship of the results to the model rely on interpretative judgement. For example, the model suggests that pathways will differ based on the age of onset of gambling initiation. However, the NESARC data did not include information on age of gambling initiation; age of disordered gambling onset could not be used, as it was only assessed for gamblers who met clinical criteria for disorder (n=195), a number too small to obtain stable model estimates. Due to the limitations of the NESARC variables, additional research is needed to conduct a comprehensive validation of the model. Second, while the data does provide information on past-year and prior to past-year symptoms, it does not clearly differentiate those that preceded and followed the onset of gambling problems, necessary elements in the model to distinguish the pathways.

Despite these limitations, this study is the first to test the Pathways Model in a nationally-representative sample. The study suggests the existence of two or three distinct groups – those with and without significant, pre-existing and/or comorbid psychopathology. These groups likely develop gambling problems in different ways and for different reasons. The data suggests that subtypes have common as well as subtype-specific risk factors, which has implications for the study of the etiology of disordered gambling as well as potentially other addictive disorders. Replication studies with demographically diverse samples and, ideally, longitudinal investigations from adolescence to middle and older adulthood are needed to better understand the nature and relationship of risk and protective factors that characterize sub-groups of disordered gamblers and their relationship to other addictive disorders.

Identifying specific etiological factors by subtype holds practical implications for treatment. In alcohol studies, subtyping models have been used to develop targeted and more effective strategies for behavioral and pharmacological interventions [see 55 for a review]. Such models could prove equally efficacious for treating disordered gamblers, allowing clinicians

to address a comprehensive list of risk factors that could bear on the success and maintenance of recovery. This is particularly timely in light of proposed changes to psychiatric classification, in which gambling disorder will likely be the first behavioral addiction grouped with substance use disorders under ‘Substance Use and Addictive Disorders’ in DSM-V [56]. Results of this study also suggest that disordered gambling shares common antecedents and underlying etiology with other addictive behaviors [57]; left unidentified and untreated, comorbid addictive behaviors could serve as relapse triggers for gambling thereby limiting the long-term effectiveness of treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Characteristics of Disordered gamblers in the NESARC, Wave 1 (N=581).

Variables (Single and Combined Items)	N	%	SE
Parental History:			
Parent or family member death	298	46.82	2.62
Parents divorced	116	19.51	1.98
Parents with drinking or drug problem	225	37.02	2.39
Parents with a history of ASPD	116	18.58	2.08
Lifetime Psychopathology:			
ADHD*	31	6.99	1.43
ASPD	106	19.71	2.53
Any personality disorder (combined)	286	47.36	2.87
Past Year Psychopathology:			
Alcohol abuse or dependence, Drug abuse or dependence, or Drank to increase mood**	162	30.00	2.36
MDD or Dysthymia**	62	8.32	1.18
Panic Disorder or GAD**	59	10.66	1.59
Onset of first episode of MDD or Dysthymia**	26	10.22	2.39
Past Year Significant Life Events:			
Separation or divorce	59	10.26	1.49
Trouble with police	80	12.44	1.76
Prior to Past Year Psychopathology:			
Alcohol abuse or dependence, Drug abuse or dependence, or Drank to increase mood**	376	65.93	2.49
MDD or Dysthymia**	127	18.20	1.87
Panic Disorder or GAD**	110	18.38	2.17
Prior to Past Year Significant Life Events:			
Physical fights due to drinking	145	27.89	2.37
Gender			
Male	363	69.47	2.21
Female	218	30.53	2.21
Ethnicity			
White	288	62.53	2.64
Black	168	17.59	1.79
Native American	16	3.84	1.22
Asian	25	7.11	1.70
Hispanics	84	8.93	1.47
	Mean	SE	
Control Variables			
Pathological gambling sum criteria	4.26	0.09	
Mental disability (NBMCS)	49.65	0.55	
Emotional problems	1.67	0.05	

Variables (Single and Combined Items)	N	%	SE
Age of onset, alcohol dependence or abuse ***	24.20	0.52	
Age of onset, first episode of MDD or Dysthymia ***	29.65	2.42	
Age	41.52	0.80	

Gender, ethnicity and age were not included in the LCA for model building.

* Wave 2 variable, N=470.

** A dichotomous variable indicates if any of the listed conditions or items occurred.

*** A continuous variable shows the age of onset of the listed conditions or items occurred.

TABLE 2

Selected Fit Indices for 1- to 5-Class Latent Class Models of Disorders gamblers in NESARC, wave 1(N=581).

Number of Classes	Loglikelihood	AIC	BIC
1-class	-10650.936	21355.872	21473.720
2-class	-10165.052	20430.103	20648.341
3-class	-9962.480	20070.959	20389.586
4-class *	-9687.536	19567.073	19986.089
5-class **	-9526.169	19290.339	19809.744

AIC=Akaike Information Criterion; BIC=Bayesian Information Criterion; Selected model is bolded.

* Emotional problems could not be estimated in some of the classes

** The best likelihood is not replicated in this model.

TABLE 3
Predicted probability of categorical indicators between groups of Disordered gamblers in NESARC, wave 1 (PG, n=195; 3 to 4 criteria only, n=386; Total, n=581)

Probability	Class 1 n=295, 50.76%	Class 2 n=117, 20.06%	Class 3 n=169, 29.18%	Marginal probability under fitted model
<i>Parental History:</i>				
Parent or family member death	0.407	0.559	0.507	0.467
Parents divorced	0.124	0.204	0.303	0.192
Parents with drinking or drug problem	0.219	0.468	0.549	0.365
Parents with a history of ASPD	0.048	0.258	0.359	0.181
<i>Lifetime Psychopathology:</i>				
ADHD	0.046	0.090	0.094	0.069
ASPD	0.000	0.233	0.489	0.189
Any personality disorder	0.168	0.606	0.877	0.463
<i>Past Year Psychopathology:</i>				
Alcohol abuse or dependence, Drug abuse or dependence, or Drank to increase mood	0.226	0.279	0.432	0.297
MDD or Dysthymia	0.003	0.179	0.149	0.081
Panic Disorder or GAD	0.026	0.224	0.159	0.105
Onset of first episode of depression	0.039	0.224	0.037	0.076
<i>Past Year Significant Life Events:</i>				
Separation or divorce	0.057	0.144	0.150	0.102
Trouble with police	0.078	0.174	0.166	0.123
<i>Prior to Past Year Psychopathology:</i>				
Alcohol abuse or dependence, Drug abuse or dependence, or Drank to increase mood	0.554	0.736	0.778	0.656
MDD or Dysthymia	0.093	0.257	0.275	0.179
Panic Disorder or GAD	0.084	0.278	0.283	0.181
<i>Prior to Past Year Significant Life Events:</i>				
Physical fights due to drinking	0.185	0.326	0.399	0.276
<i>Gender*</i>				
Male	0.767	0.497	0.705	
Female	0.233	0.503	0.296	
<i>Ethnicity*</i>				
White	0.637	0.584	0.632	
Black	0.132	0.264	0.191	
Native American	0.027	0.060	0.044	
Asian	0.100	0.017	0.057	
Hispanics	0.103	0.074	0.076	

* Based on observed data not estimated from the model.

TABLE 4

Predicted means of continuous indicators between groups of Disordered gamblers in NESARC, wave 1 (n=581).

Status	Class 1 n=295, 50.76%	Class 2 n=117, 20.06%	Class 3 n=169, 29.18%
Pathological Gambling sum criteria	3.89 ^{2,3}	4.56 ¹	4.65 ¹
Mental disability (NBMCS)	54.78 ^{2,3}	33.96 ^{1,3}	51.60 ^{1,2}
Emotional problems	1.13 ²	3.66 ^{1,3}	1.25 ²
Age of onset, alcohol dependence or abuse	23.00 ²	28.31 ^{1,3}	23.08 ²
Age of onset, first episode of MDD or Dysthymia	24.22	30.94	31.57
Age*	41.17	46.81	38.49

1,2,3 Significantly different as compared to class 1, 2 or 3, respectively. $\alpha=0.05/3$.

* Based on observed data not estimated from the model

TABLE 5

Two-Tailed Tests of Categorical Latent Variable Multinomial Logistic Regressions Using Posterior Probability-Based Multiple Imputation (Pseudo-Class Draws)* between groups of Disordered gamblers in NESARC, wave 1 (n=581).

	Estimate	S.E.	Est./S.E.	P-Value	OR†	CI (95%)
<u>Class 2</u>						
Male	-1.022	0.24	-4.190	<0.001	0.36	0.22-0.58
Black	0.605	0.30	2.034	0.042	1.83	1.02-3.28
Native American	0.784	0.56	1.394	0.163	2.19	0.73-6.60
Asian	-1.584	0.77	-2.070	0.038	0.21	0.05-0.92
Hispanic	-0.139	0.43	-0.325	0.745	0.87	0.38-2.01
Age	0.019	0.01	2.574	0.010	1.02	1.01-1.03
<u>Class 3</u>						
Male	-0.262	0.24	-1.077	0.282	0.77	0.48-1.24
Black	0.152	0.31	0.497	0.619	1.16	0.64-2.12
Native American	0.373	0.57	0.651	0.515	1.45	0.47-4.46
Asian	-0.501	0.46	-1.096	0.273	0.61	0.25-1.48
Hispanic	-0.476	0.44	-1.094	0.274	0.62	0.26-1.46
Age	-0.012	0.01	-1.520	0.129	0.99	0.97-1.00

† Reference groups are Class 1, female (gender), white (ethnicity). Age is a continuous variable.