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## Concordance between gambling disorder diagnoses in the DSM-IV and DSM-5; Results from the National Epidemiological Survey of Alcohol and Related Disorders

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### Abstract

The fifth edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM-5) eliminates the committing illegal acts criterion and reduces the threshold for a diagnosis of gambling disorder to four of nine criteria. This study compared the DSM-5 “4 of 9” classification system to the “5 of 10” DSM-IV system, as well as other permutations (i.e., just lowering the threshold to four criteria or just eliminating the illegal acts criterion) in 43,093 respondents to the National Epidemiological Survey of Alcohol and Related Conditions. Subgroups were analyzed to ascertain if changes will impact differentially diagnoses based on gender, age or race/ethnicity. In the full sample and each subpopulation, prevalence rates were higher when the DSM-5 classification system was employed relative to the DSM-IV system, but the hit rate between the two systems ranged from 99.80% to 99.96%. Across all gender, age and racial/ethnic subgroups, specificity was greater than 99% when the DSM-5 system was employed relative to the DSM-IV system, and sensitivity was 100%. Results from this study suggest that eliminating the illegal acts criterion has little impact on diagnosis of gambling disorder, but lowering the threshold for diagnosis does increase the base rate in the general population and each subgroup, even though overall rates remain low and sensitivity and specificity are high.

### Keywords

pathological gambling; gambling; diagnoses; DSM-5

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The Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 1994) is the primary classification system for diagnosing gambling disorder in the United States (US) and in many countries throughout the world. The fifth edition of the DSM (DSM-5) was published in 2013, and it contains changes in the name of and diagnostic criteria for gambling disorder. The name was changed from “pathological gambling,” which was used in DSM-III, DSM-III-R and DSM-IV to “gambling disorder,” and it is included in the chapter with substance use and addictive disorders. Additionally, the committing illegal

acts criterion was removed as a stand-alone criterion, and the threshold for diagnosis was decreased from five of ten criteria to four of nine.

The committing illegal acts criterion was eliminated because it was endorsed only in individuals with the most severe form of the disorder and it did not appear to add substantially to diagnosis (Strong & Kahler, 2007). Nationally-based epidemiological surveys from the US as well as other countries (McBride, Adamson, & Shevlin, 2010; Orford, Sposton, & Erens, 2003; Strong & Kahler, 2007; Toce-Gerstein, Gerstein, & Volberg, 2003) revealed that this criterion was the least prevalent of all diagnostic criteria for the disorder, and individuals rarely met this criterion without also reporting multiple other criteria (Zimmerman, Chelminski, & Young, 2006). Because assessment burden is increased when redundant criteria are included, this criterion was removed from the diagnosis of gambling disorder in DSM-5.

This change has been met with skepticism. Some clinicians and researchers consider the illegal acts criterion to be essential to diagnosis, reflective of the desperation that can occur in the context of the disorder (e.g., Mitzner, Whelan, & Meyers, 2011). Others have expressed concern that its elimination may impact prevalence rates or treatment access (Shaffer & Martin, 2011). It is not uncommon for pathological gamblers to be involved in the legal system, and up to 40% of treatment-seeking pathological gamblers report that illegal acts have supported their gambling activities (Blaszczynski, McConaghy, & Frankova, 1989; Meyer & Fabian, 1992; Petry, Blanco, Stinchfield, & Volberg, 2013). One purpose of this study was to investigate whether the elimination of this criterion impacts diagnosis of gambling disorder in a large nationally representative sample.

The other major change for gambling diagnosis in DSM-5 involved decreasing the threshold for diagnosis to four criteria. This recommendation was derived from studies of US and Spanish samples (Jimenez-Murcia, Stinchfield, Alvarez-Moya, Jaurieta, Bueno, Granero, ... & Vajello, 2009; Stinchfield, 2003; Stinchfield, Govoni, & Frisch, 2005), each of which found that endorsement of four or more criteria improved diagnostic accuracy relative to a cut point of five when seeking treatment was used as the criterion. Development of the National Opinion Research Center DSM-IV Screen for Gambling Problems (NODS; Gerstein, Volberg, Toce, Harwood, Johnson, Buie, ... & Tucker, 1999) also supported a threshold of four criteria.

In a sample of individuals seeking treatment for one or more addictive disorders in France, Denis, Fatséas, and Auriacombe, (2012) estimated the impact of simultaneously eliminating the illegal acts criterion and reducing the threshold for a diagnosis to four criteria. Using the DSM-IV system of five of ten criteria, the prevalence rate for gambling disorder was 20.5% in this sample, and it increased to 25.5% in this high-risk sample using the four of nine criteria planned for DSM-5.

In five independent samples ranging from epidemiological to treatment seeking, Petry et al. (2013) found that eliminating the illegal acts criterion had modest effects on prevalence rates. In the full sample of 3,710 individuals in this study, the overall prevalence rate for gambling disorder was 16.2% when five of ten criteria were used for diagnosis and 17.9%

when four of nine criteria were used. Sensitivity, specificity, and hit rates were high between the DSM-IV and DSM-5 classification systems as well.

The Petry et al. (2013) study used the NODS to assess gambling criteria, and classification accuracy may vary based on the instrument used. In particular, the item related to committing illegal acts in the NODS includes a low threshold specifier, "Have you ever written a bad check, or taken something that didn't belong to you from family members or anyone else in order to pay for your gambling?" Theoretically, this specifier ought to increase endorsement of the item, thereby making it more likely that individuals with relatively moderate degrees of gambling pathology will meet diagnostic criteria. Although over 40% of respondents with gambling disorder endorsed this item, removal of the item had little impact on diagnostic accuracy, especially when the threshold for diagnosis was reduced to four criteria (Petry et al., 2013). If similar effects are noted in the context of another gambling assessment instrument, greater confidence would be placed in the generalization of these findings.

Additionally, the Petry et al. (2013) study did not address the impact of the DSM-5 classification system in subpopulations. Because women develop and express gambling disorder differently than men (Blanco, Hasin, Petry, Stinson, & Grant, 2006; Ibáñez, Blanco, Moreryra, & Sáiz-Ruiz, 2003; Tavares, Martins, Lobo, Silveira, Gentil, & Hodgins, 2003), classifications systems may differentially impact the genders. Similarly, much controversy exists over the assessment and diagnosis of gambling disorder in youth and young adults, with vast differences in prevalence rates noted across surveys (Forrest & McHale, 2012; Volberg, Gupta, Griffiths, Olason, & Delfabbro, 2010; Welte, Barnes, Tidwell, & Hoffman, 2008). Racial and ethnic groups may also interpret criteria in different manners or express different symptoms associated with gambling disorder (Alegria, Petry, Hasin, Liu, Grant, & Blanco, 2009; Barry, Stefanovics, Desai, & Potenza, 2011a b). Thus, it is important to assess the impact of the DSM-5 changes across genders, ages, and racial and ethnic groups (Sacco et al., 2011).

The purpose of this study was to compare a range of diagnostic classification systems for gambling disorder in a large community-based sample using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version-IV (AUDADIS-IV). We examined past year prevalence rates in the full sample as well as subsets based on gender, age group and race/ethnicity. Using the DSM-IV system as the standard (meeting five of ten criteria), we evaluated three other alternative classifications: four of ten criteria (i.e., maintaining the illegal activities criterion but reducing the threshold for diagnosis to four criteria), five of nine criteria (i.e., using the same threshold as DSM-IV but eliminating the illegal acts criterion), and four of nine criteria (i.e., simultaneously reducing the threshold and eliminating the illegal acts criterion as will be applied in DSM-5). We derived prevalence rates across the four classification systems and assessed internal consistency using all ten criteria and just nine. Using DSM-IV as the standard, we evaluated sensitivity, specificity, and hit rates for each of the other three systems. Although classification accuracy was expected to be high because the standard to which other systems was compared employed identical items, these analyses nevertheless provide timely information related to gambling diagnosis with the publication of the DSM-5.

## Methods

The National Epidemiological Survey of Alcohol and Related Conditions (NESARC) is a face-to-face survey of a representative sample of US civilians sponsored by the National Institute of Alcohol Abuse and Alcoholism, which has been detailed previously (Grant, Dawson, & Hasin, 2001; Grant, Moore, Shepard, & Kaplan, 2003; Grant et al., 2004). It included non-institutionalized civilians aged 18 years and older residing in households and group quarters in all 50 US states and the District of Columbia. The 2001–2002 survey in which gambling was assessed included 43,093 respondents, with a response rate of 81%. The survey oversampled Blacks, Hispanics, and young adults (ages 18–24), and data were weighted to reflect study design characteristics and to account for oversampling and non-response so that weighted data were representative of the US population on socioeconomic variables including region, age, race-ethnicity and gender based on the 2000 Decennial Census.

About 1,800 interviewers from the US Census Bureau, with an average of about 5 years experience, administered the NESARC using computer-assisted software that included built-in skip, logic and consistency checks. The National Institute of Alcohol Abuse and Alcoholism and Census Bureau Headquarters Staff provided standardized central training, and regional supervisors re-contacted a random 10% of respondents for quality control purposes and to verify accuracy of the interviewer's performance.

To minimize respondent burden, the NESARC asked the DSM-IV pathological gambling criteria contained in the AUDADIS-IV only to respondents who reported having gambled at least 5 times in any one year of their lives. Fifteen symptom items operationalized the ten DSM-IV pathological gambling criteria, and fourteen items when nine criteria were applied. The illegal acts criterion asked individuals if they ever “raised gambling money by writing a bad check, signing someone else's name to a check, stealing, cashing someone else's check, or in some other illegal way.”

## Data analysis

Analyses outlined below were initially conducted for the full sample and then for subgroups based on gender, age, and race/ethnicity. For age, individuals were categorized as younger adults if they were between the ages of 18 and 24, middle aged if they were between the ages of 25 and 54, and as older adults if they were 55 years or older. Race/ethnicity was assessed by self report, and analyses are presented for the three most common races/ethnicities in the US (White non-Hispanic, Hispanic/Latino, and Black/African American).

Internal consistency of the gambling disorder criteria was first evaluated using all ten criteria included in the AUDADIS. Similar analyses were then performed with the remaining nine items when the illegal acts criterion was removed.

Base rates of the disorder were estimated using each of the four classification systems under investigation: “5 of 10” criteria (DSM-IV), “4 of 10” criteria (reducing the threshold but retaining the illegal acts criterion), “5 of 9” criteria (maintaining the DSM-IV threshold but eliminating the illegal acts criterion), and “4 of 9” criteria (the DSM-5 system). Logistic

regressions evaluated differences in base rates across classification systems in the sample as a whole, within each subgroup, and using the interaction terms (classification by subgroup) to explore differences in changes in the proportion classified across classification systems by gender, age, and race/ethnicity.

Using the DSM-IV classification system as the standard, cross-tabulations were conducted with the other classification systems to determine sensitivity, specificity, and hit rates. Sensitivity is defined as the proportion of respondents classified by the DSM-IV system who were also classified by the alternate classification system, and specificity as the proportion not classified by the DSM-IV system who were also not classified by the alternate system. Hit rates refer to the proportions of respondents classified with or without a diagnosis by the DSM-IV and the alternate system.

To evaluate whether individuals who endorsed the illegal acts criterion differed from those who did not, the percentages in each group who endorsed each of the other nine gambling disorder criteria were compared using Chi-square analyses. These analyses were conducted for the sample as a whole as well as within each subgroup.

All results presented relate to past year gambling criteria. Analyses were also conducted using lifetime endorsement of symptoms, and results were similar to those shown for past-year (data not shown; available from authors). Percentages and standard errors were estimated on weighted data using SUDAAN to adjust for design characteristics of the NESARC.

## Results

When all ten diagnostic criteria were considered, Cronbach's internal consistency reliability was 0.73 for the full sample (Table 1), and it ranged from 0.66 to 0.78 in all subsamples investigated. When the illegal acts criterion was eliminated, internal consistencies were very similar and either identical to that reported with all 10 criteria or slightly higher.

Table 1 also shows past-year base rates of gambling disorder according to each of the four classification systems under investigation. Base rates rose relative to the DSM-IV classification system when the threshold was reduced to four criteria but the illegal act criteria remained ("4 of 10"). Eliminating the illegal acts criterion alone (as shown in the "5 of 9" column) decreased prevalence rates only very slightly relative to DSM-IV ("5 of 10") when the number of criteria needed for diagnosis remained at five. When the DSM-5 classification system ("4 of 9") was applied, prevalence rates were higher than those derived from the DSM-IV system ("5 of 10") in the full sample. This increased prevalence rate with the DSM-5 classification system relative to DSM-IV was significant in the full sample and in each of the subgroups,  $ps < .01$  (data not shown; available from authors). However, no interaction effects between gender, age, or race/ethnicities and changes in prevalence rates between DSM-IV and DSM-5 classifications were significant,  $ps > .16$ , indicating no differential effects of the changes in classification by demographic group (data not shown; available from authors).

By definition, sensitivity is 100% when the threshold is reduced but all criteria remain (Table 2). Sensitivity was also 100% in the full sample and in each subgroup with the DSM-5 classification system, but sensitivity decreased slightly when 5 of 9 criteria were employed.

Specificity is always 100% when one criterion is eliminated but the threshold for diagnosis remains constant. Simultaneously reducing the threshold for diagnosis to four criteria while removing the illegal acts criterion resulted in high specificity in the full sample (99.88%) and each subsample (Table 2), with slightly higher specificity in some subsamples using “4 of 9” relative to “4 of 10” as a threshold. Further, hit rates were greater than 99.8% in the full sample and within each subsample when alternate classifications systems were applied.

Of those who endorsed committing illegal acts, rates of endorsement of all nine other criteria ranged from 39.7% for the criterion related to “jeopardized or lost a significant relationship...” to 90.5% for the criterion related to “pre-occupied with gambling”. Similarly, those who did not report committing illegal acts endorsed all other criteria at rates between 25.9% for “jeopardized or lost a significant relationship...” to 89.4% for “pre-occupied with gambling.” Rates of endorsement for the nine criteria did not differ between those who did and did not report illegal acts,  $ps > 0.15$  (data not shown; available from authors).

## Discussion

Results indicate that eliminating the illegal acts criterion had virtually no impact on diagnoses, but lowering the threshold to four criteria will increase the base rate of gambling disorder relative to the system in place with the DSM-IV in the general population. Petry et al. (2013) conducted similar analyses in samples ranging from the general population to treatment-seeking gamblers. In that study, 0.1% of the general population sample was classified with gambling disorder using the DSM-IV system, and rates rose to 0.2% using the DSM-5 system, representing a doubling of base rates. The base rate in the general population in the present sample was 0.16% using the DSM-IV system, and it increased, albeit not doubling, to 0.27% when the DSM-5 system was applied. In higher-risk samples included in the Petry et al. (2013) study, increases in base rates were proportionally more modest, rising from 5.3% to 8.0% in a gambling patron sample and from 99.4% to 100.0% in a gambling-treatment seeking sample. When all samples were combined, the overall change in base rates was relatively low, increasing from 16.2% to 17.9% across the two DSM systems. Similarly, base rates increased from 20.5% to 25.5% using the DSM-IV relative to DSM-5 system in a sample of patients seeking addictions treatment in France (Denis et al., 2012). Thus, base rates will increase with the DSM-5 system, and the proportional increases will be more pronounced in epidemiological (i.e., low-risk) samples than those with greater overall gambling problems. Nevertheless, others have argued that reducing the threshold for diagnosis to four criteria may more accurately classify individuals with gambling disorder (Jimenez-Murcia et al., 2009; Stinchfield, 2003; Stinchfield et al., 2005), so it is possible that the DSM-IV system under-estimates the true prevalence of the disorder and the DSM-5 system may more validly classify individuals. Future research should continue to address the optimal diagnostic threshold for gambling disorder.

The present study focused on evaluating the impact of reducing the threshold for diagnosis to four criteria, consistent with the DSM-5. A further reduction in the threshold to three, two or even one criteria could also be considered, and has been associated with impairment (Blanco et al., 2006; Toce-Gerstein et al., 2003). In this as well as other epidemiological samples (Gerstein et al., 1999), however, lowering the threshold results in even greater increases in the proportions of respondents classified with a gambling disorder. For example, in this NESARC sample, past-year diagnosis increases to 0.60% (SE = 0.05%) with three criteria as the threshold and to 1.22% (SE = 0.08%) with two criteria, and 2.95% (SE = 0.13%) with one criterion.

No “gold standard” or objective index exists for classifying gambling or most other psychiatric disorders, and it is unclear if even a lower threshold, or different criteria, would more accurately classify individuals with a gambling disorder. Some have argued that symptoms more closely aligned to the substance use disorder criteria (as was the case in DSM-III-R; Petry, 2006) are appropriate for diagnosing gambling disorder (Denis et al., 2012). The use of parallel criteria could ease assessment burden, especially now that gambling disorder is listed alongside substance use disorders in the DSM-5. However, little data exist regarding changes to the criteria themselves, and future research is needed to assess whether other criteria validly assess gambling disorder.

Although base rates will increase in epidemiological samples when the DSM-5 system is in place relative to the DSM-IV, internal consistency was virtually identical whether ten or nine criteria were applied, and sensitivity, specificity and hit rates were high when comparing the two systems. In part, sensitivity, specificity, and hit rates were all very high because the same criteria were used as the test and standard, with only cut points and number of criteria varying.

Results were similar whether the full sample was considered or subgroups based on gender, age or race/ethnicity. The number of persons diagnosed with gambling disorder was too small to investigate changes for Native Americans, Asian Americans, and other racial/ethnic groups. Further, adolescents under 18 were not interviewed in NESARC, so the impact of the DSM-5 changes could not be addressed for youth. Nevertheless, the similar patterns noted across the subgroups studied suggest generalization of these effects at least in US samples of adults.

One limitation of these findings is that a small number of persons, even in the full sample of over 43,000 respondents, met criteria for a gambling disorder regardless of the classification system applied. Although the change in base rates between the DSM-IV and DSM-5 classification systems may appear high, proportional increases are always higher when the overall base rates are low, as is the case with gambling disorder. Even with the DSM-5 system, rates of gambling disorder remain well under 0.5% in the general population. Another limitation to this study is that individuals who did not report gambling five or more times in a year were not asked the AUDADIS gambling items; for the purposes of analyses, their responses were assumed negative. It is possible that some individuals who did not meet this minimum gambling frequency may have endorsed the gambling criteria, although most

likely individuals gambling less than five times per year would not have a gambling disorder.

In sum, results from this study and others (Denis et al., 2012; Petry et al., 2013; Zimmerman et al., 2006) suggests that removal of the illegal acts criterion has relatively little impact on diagnoses, but reducing the threshold for diagnosis to four criteria will increase base rates of gambling disorder. Future studies attempting to compare base rates across samples will need to account for changes in classification systems between DSM-IV and DSM-5, especially in low-risk epidemiological samples.

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**Table 1**

Cronbach's alpha ( $\alpha$ ) and base rates of gambling disorder across classification criteria

Sample	n	Cronbach $\alpha$ internal consistency			Base rates			
		10 items	9 items	5 of 10 criteria	4 of 10 criteria	5 of 9 Criteria	4 of 9 criteria	
Full sample	43,093	0.73	0.73	0.16 (0.02) 79	0.28 (0.03) 138	0.15 (0.02) 77	0.27 (0.03) 137	
Males	18,518	0.72	0.72	0.21 (0.03) 45	0.37 (0.04) 79	0.20 (0.03) 44	0.36 (0.04) 78	
Females	24,575	0.74	0.74	0.12 (0.03) 34	0.19 (0.03) 59	0.11 (0.03) 33	0.19 (0.03) 59	
Younger adults (18–24)	5,199	0.75	0.76	0.30 (0.09) 15	0.42 (0.10) 24	0.28 (0.09) 14	0.42 (0.10) 24	
Middle age adults (25–54)	24,474	0.74	0.74	0.17 (0.03) 50	0.29 (0.04) 86	0.16 (0.03) 49	0.29 (0.04) 86	
Older adults (55+)	13,420	0.66	0.67	0.08 (0.03) 14	0.18 (0.04) 28	0.08 (0.03) 14	0.17 (0.04) 27	
Caucasian	24,507	0.71	0.71	0.15 (0.03) 38	0.23 (0.03) 61	0.14 (0.03) 36	0.23 (0.03) 60	
Black	8,245	0.78	0.79	0.31 (0.07) 25	0.52 (0.09) 45	0.31 (0.07) 25	0.52 (0.09) 45	
Hispanic	8,308	0.74	0.74	0.12 (0.04) 13	0.25 (0.05) 23	0.12 (0.04) 13	0.25 (0.05) 23	

Base rate values represent percentages with standard errors in parentheses. Values in the second row indicate number of participants who were classified with the disorder, and the denominator is the *n* for the sample listed in the second column to the left. The values represent weighted percentages and therefore may not equal the *n*s in the second row divided by the denominators in the second column.

**Table 2**

Sensitivity, specificity, and hit rates using different classification systems relative to the Diagnostic and Statistical Manual for Mental Disorders (DSM), edition IV (5 of 10 criteria)

Sample	n	Sensitivity		Specificity		Hit rate			
		4 of 10	5 of 9	4 of 10	5 of 9	4 of 10	5 of 9		
Full sample	43,093	100.0 (0.00) 79/79	97.11 (2.23) 77/79	100.0 (0.00) 79/79	100.0 (0.0) 43,014/43,014	99.88 (0.02) 42,955/43,014	99.88 (0.02) 42,956/43,014	100.0 (0.00) 43,091/43,093	99.89 (0.02) 43,035/43,093
Males	18,518	100.0 (0.00) 45/45	96.58 (3.36) 44/45	100.0 (0.00) 45/45	100.0 (0.00) 18,473/18,473	99.84 (0.03) 18,439/18,473	99.84 (0.03) 18,440/18,473	99.99 (0.01) 18,517/18,518	99.84 (0.03) 18,485/18,518
Females	24,575	100.0 (0.00) 34/34	97.97 (2.01) 33/34	100.0 (0.00) 34/34	100.0 (0.00) 24,541/24,541	99.92 (0.02) 24,516/24,541	99.92 (0.02) 24,516/24,541	100.0 (0.00) 24,574/24,575	99.92 (0.02) 24,550/24,575
Younger adults (18–24)	5,199	100.0 (0.00) 15/15	91.47 (8.20) 14/15	100.0 (0.00) 15/15	100.0 (0.00) 5,184/5,184	99.88 (0.04) 5,175/5,184	99.88 (0.04) 5,175/5,184	99.97 (0.03) 5,198/5,199	99.88 (0.04) 5,190/5,199
Middle age adults (25–54)	24,474	100.0 (0.00) 50/50	98.73 (1.27) 49/50	100.0 (0.00) 50/50	100.0 (0.00) 24,424/24,424	99.87 (0.02) 24,388/24,424	99.87 (0.02) 24,388/24,424	100.0 (0.00) 24,473/24,474	99.87 (0.02) 24,438/24,474
Older adults (55+)	13,420	100.0 (0.00) 14/14	100.0 (0.00) 14/14	100.0 (0.00) 14/14	100.0 (0.00) 13,406/13,406	99.90 (0.03) 13,392/13,406	99.91 (0.03) 13,393/13,406	100.0 (0.00) 13,420/13,420	99.91 (0.03) 13,407/13,420
White	24,507	100.0 (0.00) 38/38	95.51 (3.45) 36/38	100.0 (0.00) 38/38	100.0 (0.00) 24,469/24,469	99.91 (0.02) 24,446/24,469	99.92 (0.02) 24,447/24,469	99.99 (0.01) 24,505/24,507	99.92 (0.02) 24,485/24,507
Black	8,245	100.0 (0.00) 25/25	100.0 (0.00) 25/25	100.0 (0.00) 25/25	100.0 (0.00) 8,220/8,220	99.80 (0.05) 8,200/8,220	99.80 (0.05) 8,200/8,220	100.0 (0.00) 8,245/8,245	99.80 (0.05) 8,225/8,245
Hispanic	8,308	100.0 (0.00) 13/13	100.0 (0.00) 13/13	100.0 (0.00) 13/13	100.0 (0.00) 8,295/8,295	99.87 (0.04) 8,285/8,295	99.87 (0.04) 8,285/8,295	100.0 (0.00) 8,308/8,308	99.87 (0.04) 8,298/8,308

Values represent weighted percentages with standard errors in parentheses. Values in the second row with numerators and denominators indicate actual number (n) of participants who either met (sensitivity) or did not meet (specificity) criteria in the alternative classification system relative to the DSM-IV system. These ns are not weighted, but the percentages presented are weighted.