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## Crosswalk between DSM-IV Dependence and DSM-5 Substance Use Disorders for Opioids, Cannabis, Cocaine and Alcohol

Wilson M. Compton<sup>a</sup>, Deborah A. Dawson<sup>b,c</sup>, Risë B. Goldstein<sup>b</sup>, and Bridget F. Grant<sup>b</sup>

<sup>a</sup>Division of Epidemiology, Services and Prevention Research, National Institute on Drug Abuse, National Institutes of Health, Bethesda, MD, USA

<sup>b</sup>Laboratory of Epidemiology and Biometry, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, MD, USA

<sup>c</sup>Kelly Government Services, Bethesda, MD USA

### Abstract

**Background**—Ascertaining agreement between DSM-IV and DSM-5 is important to determine the applicability of treatments for DSM-IV conditions to persons diagnosed according to the proposed DSM-5.

**Methods**—Data from a nationally representative sample of US adults were used to compare concordance of past-year DSM-IV Opioid, Cannabis, Cocaine and Alcohol Dependence with past-year DSM-5 disorders at thresholds of 3+, 4+ 5+ and 6+ positive DSM-5 criteria among past-year users of opioids (n=264), cannabis (n=1,622), cocaine (n=271) and alcohol (n=23,013). Substance-specific 2×2 tables yielded overall concordance (kappa), sensitivity, specificity, positive predictive values (PPV) and negative predictive values (NPV).

**Results**—For DSM-IV Alcohol, Cocaine and Opioid Dependence, optimal concordance occurred when 4+ DSM-5 criteria were endorsed, corresponding to the threshold for moderate DSM-5 Alcohol, Cocaine and Opioid Use Disorders. Maximal concordance of DSM-IV Cannabis Dependence and DSM-5 Cannabis Use Disorder occurred when 6+ criteria were endorsed, corresponding to the threshold for severe DSM-5 Cannabis Use Disorder. At these optimal thresholds, sensitivity, specificity, PPV and NPV generally exceeded 85% (>75% for cannabis).

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Send all correspondence to: Wilson M. Compton, 6001 Executive Boulevard, MSC 9589, Bethesda, MD 20892-9589, Telephone: 301-443-6504, Fax: 301-443-2363, wcompton@nida.nih.gov.

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Dr. Deborah Dawson: NONE

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Dr. Bridget Grant: NONE

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Dr. Compton conceptualized the study, wrote the primary manuscript with Dr. Dawson, and finalized edits of the manuscript for submission. Dr. Dawson designed and implemented data analysis including statistical analysis, wrote the primary draft, and edited all subsequent drafts. Dr. Goldstein provided critical interpretation of the results and edited the manuscript. Dr. Grant obtained the data, supervised all data analysis and edited the manuscript. All authors approved the final manuscript.

**Conclusions**—Overall, excellent correspondence of DSM-IV Dependence with DSM-5 Substance Use Disorders was documented in this general population sample of alcohol, cannabis, cocaine and opioid users. Applicability of treatments tested for DSM-IV Dependence is supported by these results for those with a DSM-5 Alcohol, Cocaine or Opioid Use Disorder of at least moderate severity or Severe Cannabis Use Disorder. Further research is needed to provide evidence for applicability of treatments for persons with milder substance use disorders.

### Keywords

DSM-IV; DSM-5; substance use disorder; concordance; kappa; diagnosis

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## 1. INTRODUCTION

The Diagnostic and Statistical Manual of Mental Disorders – 4<sup>th</sup> Revision (DSM-IV; American Psychiatric Association, 1994) conceptualized two discrete substance use disorders (SUD), abuse and dependence, defined by mutually exclusive sets of diagnostic criteria. Abuse required endorsement of one or more (1+) of four abuse criteria, and dependence required endorsement of three or more (3+) of seven dependence criteria. In contrast, the proposed Diagnostic and Statistical Manual of Mental Disorders – 5<sup>th</sup> Revision (DSM-5; <http://www.dsm5.org>) conceptualizes a unitary SUD construct, varying only in terms of severity. The 11 DSM-5 SUD criteria comprise a new craving criterion plus all the former DSM-IV abuse and dependence criteria except substance-related recurrent legal problems. Mild DSM-5 SUD requires endorsement of 2–3 of these criteria, moderate SUD requires 4–5, and severe SUD requires 6+ criteria. A recent paper based on a general population sample of U.S. adults reported that 80.5% of individuals positive for DSM-IV alcohol dependence met criteria for DSM-5 moderate-to-severe alcohol use disorder (AUD); individuals with the two disorders showed no statistically significant differences in sociodemographic characteristics, health, psychiatric comorbidity, alcohol consumption or alcohol treatment utilization (Dawson et al., 2013). When AUDIT-C, a popular brief screener for AUD, was tested in the same sample, identical screening cutpoints optimized identification of DSM-IV alcohol dependence and DSM-5 moderate-to-severe AUD (Dawson et al., 2012).

Despite several studies comparing DSM-IV and DSM-5 AUD (see also Agrawal et al., 2011; Mewton et al., 2011), we are unaware of any that examine the concordance of DSM-IV and DSM-5 specific drug use disorders. This information is critical for clinicians to determine whether medications currently approved by the U.S. Food and Drug Administration (FDA) for the treatment of DSM-IV Alcohol Dependence, e.g., acamprosate, naltrexone and disulfiram (Litten et al., 2012), and DSM-IV Opioid Dependence, e.g., methadone, buprenorphine, and naltrexone (Tetrault and Fiellin, 2012), may be appropriate for treating DSM-5 SUD. The same is true for drugs currently being tested for treatment of cocaine (Dackis et al., 2012; Haile et al., 2012; Karila et al., 2011; Kennedy et al., 2012; Winhusen et al., 2012) and marijuana disorders (Cooper et al., 2012; Mason et al., 2012; van den Brink et al., 2012), if the selection criteria for those trials reflect DSM-IV dependence. Of particular interest is the specific number of positive DSM-5 criteria that maximizes concordance with DSM-IV dependence. Prior analyses have shown a good fit between alcohol dependence and 4+ positive DSM-5 criteria but have not investigated whether another threshold would improve concordance, nor have they examined concordance for illicit drugs. Accordingly, this paper uses data from a nationally representative sample of U.S. adults to compare concordance of past-year DSM-IV Opioid, Cannabis, Cocaine and Alcohol Dependence with past-year DSM-5 SUD thresholds of 3+, 4+, 5+ and 6+ positive criteria and investigate possible causes of variation across substances in optimal thresholds.

## 2. METHODS

### 2.1 Sample

This analysis uses data from the National Longitudinal Alcohol Epidemiologic Survey (NLAES), conducted in 1991–1992 by the National Institute on Alcohol Abuse and Alcoholism. The NLAES sample comprised adults 18 and older living in households (n=42,862, response rate=89%). Data were obtained in personal interviews from respondents who consented to participate after being informed about the survey content and confidential nature of the data. The NLAES is the most recent U.S. survey to operationalize the DSM-IV criteria for SUD and include questions on craving for all substances. The more recent National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) included questions on alcohol craving in its second wave, but did not ascertain craving for illicit drugs. This analysis was restricted to past-year users of opioids (n=264), cannabis (n=1,622), cocaine (n=271) and alcohol (n=23,013).

### 2.2 Measures

Past-year DSM-IV substance dependence was coded positive for individuals who endorsed 3+ of the seven DSM-IV dependence criteria: tolerance, withdrawal (not counted toward cannabis dependence), recurrent use in larger quantities or for longer than intended, persistent desire/attempts to stop or cut down on use, excessive time spent obtaining, using or recovering from use, continued use despite knowledge of substance-related physical/psychological problems, and important activities given up in favor of use. Past-year DSM-5 SUDs were based on 11 criteria: the seven dependence criteria described above, plus substance-related neglect of work, home or school responsibilities, recurrent use in hazardous situations, continued use despite substance-related interpersonal problems, and craving (“have a very strong desire or urge to [drink/use [drug]]”).

Symptoms of alcohol and drug use disorders were queried separately. Lifetime alcohol users were first asked whether a symptom had ever occurred, then whether and how often it had occurred in the past year. Lifetime drug users were first asked whether a given symptom had ever occurred, then the drugs and drug-specific frequencies with which it had occurred in the past year. Withdrawal required 2+ withdrawal symptoms or substance use to prevent/alleviate withdrawal symptoms. Most other criteria required 1+ positive past-year symptoms; however, those specifying persistent or recurrent occurrence required multiple symptoms or repeated occurrence of a single symptom. Test-retest reliability of the DSM-IV NLAES SUD diagnoses was good to excellent, with kappas of .79 for any drug, .78 for cannabis, .91 for cocaine and .76 for alcohol (Grant et al., 1995).

### 2.3 Analysis

Substance-specific 2×2 tables were used to ascertain the concordance of past-year DSM-IV substance dependence with thresholds of 3+, 4+, 5+ and 6+ DSM-5 SUD criteria using kappa statistics (SAS Institute, 2008), a measure of chance-corrected agreement whose value generally varies from 0.000 (agreement no better than by chance) to 1.000 (perfect concordance). SUDAAN software (Research Triangle Institute, 2008), which adjusts for complex sample design characteristics, was used to determine the percentages of individuals positive and negative for DSM-IV dependence who were concordantly diagnosed at the various DSM-5 thresholds and the percentages of individuals positive and negative for the various DSM-5 thresholds who were concordantly diagnosed for DSM-IV dependence. The latter four measures are analogous to sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) in classic screening study design and are applied to the results of this study for the sake of brevity. Use of the DSM-IV diagnoses as the “gold

standard” against which DSM-5 thresholds are evaluated does not imply greater validity of the DSM-IV classifications; rather, it reflects testing the new revision against the status quo.

### 3. RESULTS

Overall concordance of DSM-IV Opioid Dependence and DSM-5 Opioid Use Disorder was highest at a DSM-5 threshold of 3+ criteria ( $\kappa=.856$ ), declining slightly at 4+ criteria ( $\kappa=.835$ ) and dropping sharply ( $\kappa=.727$  and  $.724$ ) at 5+ and 6+ positive criteria (Table 1). A threshold of 3+ criteria necessarily resulted in a sensitivity of 100% (because 3+ dependence criteria were required for DSM-IV Dependence) but yielded a PPV of just 77.1%. That is, only about three-quarters of individuals endorsing 3+ DSM-5 Opioid Use Disorder criteria were classified with DSM-IV Opioid Dependence; the remainder comprised diagnostic orphans who endorsed 1 or 2 DSM-IV dependence criteria (Hasin and Paykin, 1998) and cases of DSM-IV Opioid Abuse. A threshold of 4+ positive criteria resulted in a better balance of sensitivity (87.0%) and PPV (83.2%).

For cannabis, kappa values increased steadily with the required number of DSM-5 criteria, from .428 at 3+ criteria to .781 at 6+ criteria. A threshold of 6+ criteria also resulted in the most acceptable combination of sensitivity (78.6%) and PPV (79.7%). Thresholds of 4+ and 5+ DSM-5 Cocaine Use Disorder criteria yielded similar kappa values (.864 and .852) and equally good combinations of sensitivity and PPV. In terms of AUD, the value of kappa was significantly better at a threshold of 4+ DSM-5 criteria (.830) than at any other threshold; in addition, the threshold of 4+ DSM-5 AUD criteria resulted in the best balance of sensitivity (82.6%) and PPV (86.0%).

Table 2 illustrates one source of variation across substances in optimal thresholds for concordance between DSM-IV dependence and DSM-5 moderate-to-severe SUD, showing the rank ordering of DSM-5 SUD criteria by prevalence for the four substances. For opioids, three of the four most commonly endorsed criteria were DSM-IV dependence criteria, with little difference in prevalence among these four. Thus, few DSM-5 criteria were required to include the three DSM-IV dependence criteria required for DSM-IV dependence. In contrast, of the five most commonly endorsed criteria for cannabis, only one was a former dependence criterion. Seven DSM-5 cannabis disorder criteria were required to include the three most common DSM-IV dependence criteria. For cocaine, six positive criteria were required to include the three most common dependence criteria, but there were no significant differences in prevalence between the third dependence criterion and the two abuse criteria that preceded it in the ranking. In the case of alcohol, the top three DSM-5 criteria were all former dependence criteria, as was the fourth.

### 4. DISCUSSION

For three out of four disparate substances, a threshold of 4+ DSM-5 SUD criteria yielded the highest levels of concordance with DSM-IV substance dependence. Thus, for DSM-IV Alcohol, Cocaine and Opioid Dependence, optimal concordance corresponded to the thresholds for moderate DSM-5 Alcohol, Cocaine and Opioid Use Disorders. However, a threshold of 6+ criteria, corresponding to severe Cannabis Use Disorder, optimized concordance with DSM-IV Cannabis Dependence. This reflects a unique pattern of criterion endorsement for cannabis that favored DSM-IV abuse over dependence symptoms, and the fact that cannabis withdrawal was not recognized in DSM-IV and did not contribute to the 3+ dependence criteria required for a diagnosis of DSM-IV Cannabis Dependence. Because the DSM-5 criteria did include withdrawal for cannabis, it is not surprising that overall correspondence between the DSM-IV and DSM-5 diagnoses was lower for cannabis than other drugs, even at the optimal threshold.

For clinicians, the most important results are those concerning alcohol and opioid use disorders, because these are the disorders for which pharmacotherapies have been approved by the FDA. Concordance of DSM-IV and DSM-5 disorders can help ascertain applicability of treatments originally developed for DSM-IV conditions to the new DSM-5 diagnoses. The excellent agreement and predictive values found between DSM-IV Alcohol and Opioid Dependence and their corresponding DSM-5 moderate SUD (a threshold of 4+criteria) suggest that medications indicated for the treatment of DSM-IV Alcohol or Opioid Dependence may be reasonably considered for patients with a DSM-5 Alcohol or Opioid Use Disorder of at least moderate severity.

For clinical researchers, development of medications for cocaine and cannabis disorders will need to take into account the new DSM-5 diagnostic system. Whereas DSM-IV Cocaine Dependence had a maximum correspondence with DSM-5 Cocaine Use Disorder of at least moderate severity (4+ criteria endorsed), DSM-IV Cannabis Dependence had a maximum correspondence with DSM-5 severe Cannabis Use Disorder (6+ criteria endorsed). Thus any testing of potential treatments for cannabis dependence currently underway among individuals with DSM-IV Cannabis Dependence would require replication among individuals of less than severe DSM-5 Cannabis Use Disorder in order to verify the applicability of those treatments to patients with lower severity disorders. Similarly, applicability of existing or prospective treatments for individuals with mild alcohol, cocaine or opioid disorders warrants examination in future research.

The major limitation of this analysis is the use of a general population sample. Whereas the question addressed in this study concerns the clinical appropriateness of DSM-IV based treatment medications to the proposed DSM-5 diagnoses, substance-specific treatment seeking was not addressed in the NLAES, and general population respondents may differ from treatment samples. Replication of this analysis among treated individuals with DSM-IV substance dependence might help address this concern. Also, replication with more recent data would ensure that changes since the 1990's in the array of opioids or chemical attributes of cannabis commonly available would not alter the findings.

In summary, applicability of treatments approved for DSM-IV Dependence is supported by these results for individuals with a moderate or severe DSM-5 Alcohol, Cocaine or Opioid Use Disorder, or a severe Cannabis Use Disorder. Further research is needed to provide evidence for applicability of treatments for persons with milder DSM-5 SUD.

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Table 1

Concordance of past-year DSM-IV dependence with selected thresholds<sup>a</sup> for DSM-5 past-year opioid, cannabis, cocaine and alcohol use disorders among past-year users of the specific substances; U.S. adults 18 years of age and older

DSM-5 SUD threshold	Kappa	% Concordant among individuals where DSM-IV dependence is:		% Concordant among individuals where DSM-5 SUD threshold is:	
		Positive (Sensitivity)	Negative (Specificity)	Positive (PPV)	Negative (NPV)
<b>Opioids:</b>					
3+ positive criteria	.856 (.026)	100.0 (0.0)	97.1 (1.1)	77.1 (7.3)	100.0 (0.0)
4+ positive criteria	.835 (.029)	87.0 (7.6)	98.3 (0.9)	83.2 (7.1)	98.7 (0.8)
5+ positive criteria	.727 (.039)	64.5 (10.4)	99.2 (0.6)	88.9 (7.5)	96.6 (1.2)
6+ positive criteria	.724 (.040)	59.0 (10.7)	100.0 (0.0)	100.0 (0.0)	96.1 (1.2)
<b>Cannabis:</b>					
3+ positive criteria	.428 (.016)	100.0 (0.0)	88.9 (1.0)	30.6 (3.5)	100.0 (0.0)
4+ positive criteria	.614 (.018)	99.3 (0.7)	94.5 (0.7)	47.0 (4.5)	100.0 (0.0)
5+ positive criteria	.757 (.017)	95.6 (2.1)	97.4 (0.5)	64.6 (5.5)	99.8 (0.1)
6+ positive criteria	.781 (.018)	78.6 (5.2)	99.0 (0.3)	79.7 (5.4)	98.9 (0.3)
<b>Cocaine:</b>					
3+ positive criteria	.734 (.022)	100.0 (0.0)	85.8 (2.9)	67.5 (5.8)	100.0 (0.0)
4+ positive criteria	.864 (.018)	96.2 (3.7)	94.6 (1.8)	84.1 (4.7)	98.8 (1.2)
5+ positive criteria	.852 (.019)	86.7 (5.5)	97.3 (1.4)	90.4 (4.7)	96.1 (1.7)
6+ positive criteria	.760 (.025)	69.8 (6.9)	99.0 (0.7)	95.3 (3.3)	91.7 (2.3)
<b>Alcohol:</b>					
3+ positive criteria	.802 (.003)	100.0 (0.0)	96.2 (0.2)	69.5 (1.1)	100.0 (0.0)
4+ positive criteria	.830 (.003)	82.6 (1.1)	98.8 (0.1)	86.0 (1.2)	98.5 (0.1)
5+ positive criteria	.720 (.005)	60.0 (1.4)	99.8 (0.1)	95.4 (1.2)	96.7 (0.2)
6+ positive criteria	.568 (.006)	41.8 (1.3)	100.0 (0.0)	99.6 (0.3)	95.3 (0.2)

<sup>a</sup>Number of SUD criteria endorsed

Table 2

Ranking of past-year DSM-5 SUD criteria by prevalence of endorsement among past-year users of specific substances: U.S. adults 18 years of age and older

Rank	Opioids		Cannabis		Cocaine		Alcohol	
	Criterion	Prev. (SE)	Criterion	Prev. (SE)	Criterion	Prev. (SE)	Criterion	Prev. (SE)
1	Tolerance (D)	14.3 (2.4)	Hazardous use (A)	24.8 (1.2)	Try stop (D)	33.0 (3.3)	Larger/longer (D)	14.9 (0.4)
2	Try stop (D)	13.5 (2.3)	Try stop (D)	15.9 (1.0)	Withdrawal (D)	30.9 (3.3)	Tolerance (D)	13.3 (0.3)
3	Hazardous use (A)	12.3 (2.5)	Craving (New)	13.9 (1.1)	Craving (New)	27.0 (3.1)	Withdrawal (D)	10.7 (0.3)
4	Withdrawal (D)	10.5 (2.1)	Social (A)	10.7 (0.9)	Social (A)	24.6 (2.9)	Try stop (D)	10.2 (0.3)
5	Craving (New)	7.8 (1.9)	Neglect role (A)	10.4 (1.0)	Hazardous use (A)	22.3 (2.8)	Hazardous use (A)	8.4 (0.3)
6	Phys/psych (D)	6.7 (1.8)	Phys/psych (D)	8.6 (0.9)	Phys/psych (D)	20.6 (2.7)	Craving	7.0 (0.2)
7	Social (A)	6.7 (1.7)	Tolerance (D)	8.4 (0.8)	Larger/longer (D)	18.1 (2.8)	Social (A)	3.9 (0.2)
8	Neglect role (A)	6.7 (1.8)	Withdrawal (D) <sup>a</sup>	7.4 (0.7)	Neglect role (A)	17.3 (2.7)	Neglect role (D)	3.7 (0.2)
9	Larger/longer (D)	6.1 (1.8)	Larger/longer (D)	4.0 (0.5)	Tolerance (D)	14.3 (2.4)	Phys/psych (D)	3.6 (0.2)
10	Time spent (D)	6.0 (1.6)	Time spent (D)	3.8 (0.5)	Give up (D)	12.0 (2.2)	Time spent (D)	2.7 (0.1)
11	Give up (D)	3.9 (1.3)	Give up (D)	3.4 (0.5)	Time spent (D)	8.3 (1.8)	Give up (D)	1.3 (0.1)

Note: (D) connotes DSM-IV dependence criteria whereas (A) connotes DSM-IV abuse criteria. "Try stop" = Persistent desire/attempt to stop/cut down on use; "Phys/psych" = continued use despite recurrent/persistent substance-related physical or psychological problems; "Social" = continued use despite recurrent/persistent substance-related interpersonal problems; "Neglect role" = recurrent substance-related neglect of work/school/home responsibilities; "Larger longer" = Recurrent use in larger quantities or for longer than intended; "Time spent" = excessive time spent in obtaining/using/recovering from substance; "Give up" = Important activities given up in favor of substance use.

<sup>a</sup>Cannabis withdrawal was not recognized in the DSM-IV and did not contribute to the 3+ requisite dependence required for DSM-IV Cannabis Dependence.