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# Substance Use Disorders Assessed Using the Kreek–McHugh–Schluger–Kellogg (KMSK) Scale in an Urban Low-Income and Predominantly African-American Sample of Primary Care Patients

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*The Kreek–McHugh–Schluger–Kellogg (KMSK) scale was developed to quantify self-exposure to opiates, cocaine, alcohol, and tobacco. The original study was limited by a relatively small sample that was not representative of general clinical populations, and did not include marijuana exposure. For the current study, participants were recruited from primary care outpatient clinics in an urban public hospital. The primary measure was the KMSK scale. The Structured Interview for Diagnosis for DSM-IV (SCID) was used as the “gold standard” for substance dependence diagnoses, and the results of KMSK assessments were evaluated using Receiver operator characteristic (ROC) analysis. The sample (n = 439) was predominantly African-American (90.6%), with mean age (±SD) of 43.1 ± 12.8 years. ROC analyses found that the optimal cutoff scores for alcohol dependence were the same as suggested previously (11), while they were lower for cocaine dependence (10 vs. 11) and opiate dependence (4 vs. 9). The analysis suggested a cutoff score of 8 for marijuana. The KMSK performed well in the current study as a brief tool for evaluating dependence on alcohol, cocaine, marijuana, and opiates in this nonpsychiatric clinic sample of predominantly poor urban African Americans. (Am J Addict 2011;00:1–8)*

bidities associated with nonsubstance-use psychiatric disorders,<sup>4–6</sup> and the seriousness of the medical and psychiatric consequences of SUD<sup>7</sup> all point to the need, in both research and clinical practice, for brief and easily implemented screening instruments for detecting and evaluating SUD. A number of SUD screening instruments have been developed, such as the Drug Abuse Screening Test (DAST-10)<sup>8,9</sup> and the Substance Dependence Screening Questionnaire (SDSQ),<sup>10</sup> which screen across SUD involving multiple substances, and for all SUD, and the CAGE,<sup>11</sup> Canterbury alcoholism screening test (CAST),<sup>12</sup> and Alcohol Use Disorders Identification Test (AUDIT)<sup>13</sup> for alcohol-use disorders. However, the foregoing instruments focus predominantly on the symptoms or outcomes associated with SUD, rather than exposure to substances. In addition, it is difficult or impossible to generate specific diagnoses from most of the existing screens.

The KMSK scale was developed by Kreek and colleagues<sup>14</sup> with the goal of creating a rapid screening instrument that can be used for the assessment of the extent of lifetime alcohol and drug use, and for the identification of dependence. The original instrument quantified self-exposure to opiates, cocaine, alcohol, and/or tobacco, and a subsequent revision added assessment of marijuana use (2004 e-mail from M.J. Kreek to JFC). Each section of the KMSK scale assesses the frequency, amount, and duration of use of a particular substance during the individual’s period of greatest consumption. It takes approximately 15–20 minutes to administer the entire instrument. Since its publication, this scale has been used in several genetic studies of drug abuse, mostly by the same group that developed the instrument.<sup>15–17</sup>

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## INTRODUCTION

The high prevalence of substance use disorders (SUD) themselves,<sup>1–3</sup> the substantial substance-related comor-

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1 The original study<sup>14</sup> showed the KMSK could assess  
2 lifetime use of tobacco, alcohol, cocaine, and opiates. How-  
3 ever, that study was limited by the relatively small sample  
4 size ( $n = 100$ ) and the small number of subjects in each  
5 diagnostic group. In addition, the sample evaluated was  
6 recruited to participate in studies of SUD, so might not  
7 have been representative of more general clinical popula-  
8 tions. Finally, the original version of the KMSK did not  
9 assess marijuana dependence. The aim of the current study  
10 was to validate the utility of the KMSK in a larger sample  
11 comprised of inner-city primary care patients. Specifically,  
12 we tested the hypothesis that the KMSK would show good  
13 sensitivity and specificity for diagnosing substance depen-  
14 dence in clinical research settings by comparing the screen-  
15 ing results to diagnoses established by structured interview  
16 using the Structured Interview for Diagnosis for DSM-IV  
17 Axis-I disorders (SCID-I/NP).<sup>18</sup> Finally, we examined the  
18 performance of a version of the KMSK revised by its origi-  
19 nators to include marijuana exposure, which the originally  
20 described instrument had not included.

Q2

## 21 METHODS

### 22 Subjects and Assessments

23 Subjects in this study were ascertained as part of the  
24 Grady Trauma Project, which is an ongoing molecular ge-  
25 netic study with a primary focus on posttraumatic stress  
26 disorder.<sup>19–21</sup> Potential participants were approached by re-  
27 search staff in the primary care and obstetrics-gynecology  
28 waiting rooms of the Grady Memorial Hospital General  
29 Medical Clinic, in Atlanta, GA. The inclusion criteria were:  
30 (1) 18 to 65 years old, male or female; (2) able to give in-  
31 formed consent and willing to participate in interviews and  
32 collection of biological materials (saliva and/or blood) for  
33 DNA extraction. All enrolled participants gave written in-  
34 formed consent, and the study was approved by the In-  
35 stitutional Review Boards of Emory University and Grady  
36 Healthcare System. Subjects were reimbursed for their time  
37 and effort in the study.

38 Subjects who completed a brief screening interview (as  
39 described in Gillespie et al., 2009)<sup>21</sup> were invited to par-  
40 ticipate in a more extensive evaluation. As described in  
41 full detail previously,<sup>21</sup> subjects who agreed to participate  
42 in the more extensive evaluation underwent additional as-  
43 sessments, which included the SCID-I.<sup>18</sup> At that visit, the  
44 participants also completed the KMSK. To address varia-  
45 tion in literacy in the study population, the KMSK was read  
46 aloud to all participants, and answers recorded by staff. The  
47 sections on alcohol, tobacco, cocaine, and heroin/opiates  
48 of the KMSK used in this study were identical to that  
49 described by Kellogg et al.<sup>14</sup> An additional section on mar-  
50 ijuana, added by the authors of the original instrument  
51 (2004 e-mail from M.J. Kreek to JFC), was also included  
52 in the current version of the instrument.

## Statistical Analysis

All analyses were performed using SPSS17.0 software.  
Descriptive statistics on demographics were calculated and  
expressed in terms of the total number of subjects and  
percentages of the sample as a function of a particular  
characteristic.

Based on the original report,<sup>14</sup> a receiver operating char-  
acteristics (ROC) analysis<sup>22–24</sup> was done to determine both  
the concurrent validity of the KMSK scales as compared  
to the SCID and to find the best cutoff score for alcohol,  
cocaine, opiates, and marijuana dependence diagnoses (to-  
bacco was not analyzed because there is no SCID scale for  
nicotine dependence). From the ROC graph, the levels of  
sensitivity and specificity for each possible cutoff score and  
an index of accuracy of discrimination provided by the scale  
can be determined. In this study, the goal was to find the  
KMSK cutoff score that best predicted which participants  
received a dependence diagnosis for the above four types of  
substances.

As an alternative method for determining diagnostic cut-  
off scores for dependence diagnoses, we used chi-square  
analysis to determine the best cutoff score. Presence or ab-  
sence of dependence was assigned according to each possi-  
ble KMSK score, for each of the four scales, and these as-  
signments were compared to those determined by SCID in-  
terview in a two-by-two contingency table. While the choice  
of a cutoff score may be influenced by the specific intent of  
the scale and/or the characteristics of a given population,  
if those things are not an issue, the cutoff score with the  
highest chi-square value may well be the best choice.<sup>25,26</sup>

Several aspects of the ROC analysis can be used to ex-  
plain the relationship between a scale and a criterion mea-  
sure. The one most commonly used is the area under the  
ROC curve (AUROC curve),<sup>27</sup> which is an overall measure  
of the relationship between the scale and the criterion. A  
score of .5 means a chance relationship, and 1.0 represents  
a perfect relationship. Scores lower than .5 signify a predic-  
tive ability worse than chance.

We recoded the SCID scores based on the DSM-IV cri-  
teria as described by Kellogg et al.<sup>14</sup> Briefly, the SCID  
requires the endorsement of at least three DSM-IV symp-  
toms in order to receive a diagnosis of alcohol or substance  
dependence. So, patients who had SCID-I score of three or  
greater for alcohol, cocaine, opiate, and marijuana depen-  
dence were given the criterion score of “1”; and those who  
received scores of 0, 1, or 2 were recoded as “0” (absent)  
for that substance. The patients who received an abuse but  
not a dependence diagnosis for a specific substance also  
received a “0” score for that dependence diagnosis.

## RESULTS

### Sample Characteristics

A total of 439 subjects had complete data on the de-  
mographic form, the KMSK, and the SCID and were  
included in the current analysis. Table 1 summarizes the

**TABLE 1.** Demographic characteristics of the samples

Demographic	Total sample (N = 439)	Male (N = 168)	Female (N = 271)
Age (mean ± S.D.)*	43.1 ± 12.8	46.6 ± 10.6	40.9 ± 13.5
Self-identified race/ethnicity (N = 439)		(N = 168)	(N = 271)
Black	398 (90.7)	150 (89.3)	248 (91.5)
Non-black	41 (9.3)	18 (10.7)	23 (8.5)
Education (N = 438)		(N = 168)	(N = 270)
Did not complete 12th grade	98 (22.4)	31 (18.5)	67 (24.8)
High school graduate	153 (34.9)	59 (35.1)	94 (34.8)
Graduate equivalency diploma	25 (5.7)	9 (5.4)	16 (5.9)
Some college/technical school	99 (22.6)	42 (25.0)	57 (21.1)
Technical school graduate	19 (4.3)	7 (4.2)	12 (4.4)
College graduate or higher	42 (10.0)	20 (11.9)	30 (8.8)
Relationship status** (N = 437)		(N = 167)	(N = 270)
Single or never married	241 (55.1)	80 (47.9)	161 (59.6)
Married	44 (10.1)	20 (12.0)	24 (8.9)
Divorced	88 (20.1)	50 (29.9)	38 (14.1)
Separated	37 (8.5)	15 (9.0)	22 (8.1)
Windowed	27 (6.2)	2 (1.2)	25 (9.3)
Currently unemployed	347/439 (79.0)	141/168 (83.9)	206/271 (76.0)
Currently receiving disability support	125/437 (28.6)	57/166 (34.3)	68/271 (25.1)
Ever been arrested**	274/438 (62.6)	139/168 (82.7)	135/270 (50.0)
Ever been in jail**	257/438 (58.7)	130/168 (77.4)	127/270 (47.0)
Ever been in prison**	68/435 (15.6)	50/167 (29.9)	18/268 (6.7)
Ever had psychiatric hospitalization	80/435 (18.4)	31/166 (18.7)	49/169 (18.2)

N (%) are shown for each demographic variable; \* $p < .001$  between males and females; \*\* $p < .001$  between males and females, after controlling for age and race.

demographic characteristics of our sample. The sample was predominantly African-American (AA, 90.6%). The mean age was 43.1 years ( $SD = 12.8$ ). The majority of subjects were female (271/439, 61.7%). There was a significant difference in mean ages of each sex, with males being older on average ( $p < 0.01$ ).

### Substance Dependence Related Diagnosis in Our Sample

Based on the SCID interview, approximately half (214/439, 48.7%) of the sample did not meet any lifetime substance dependence diagnosis. Alcohol dependence was the most common substance dependence in this sample (145/439, 33.0%), followed by cocaine dependence (90/401, 22.4%), marijuana dependence (16/396, 4.0%), and opiate dependence (12/432, 2.8%). A total of 3.4% of our samples met the diagnostic criteria for polydrug dependence, defined as meeting DSM-IV criteria for at least two classes of substance.

### Kreek–McHugh–Schluger–Kellogg Total Scores of Each Class of Substance

Table 2 shows the correlation analyses of the KMSK lifetime total scores and SCID-I assessments for different types of substances. There were significant correlations between

the total KMSK scores and the SCID scores in alcohol, cocaine, and opiates, but not marijuana.

### Receiver Operating Characteristics Analysis of Alcohol, Cocaine, Heroin, and Marijuana

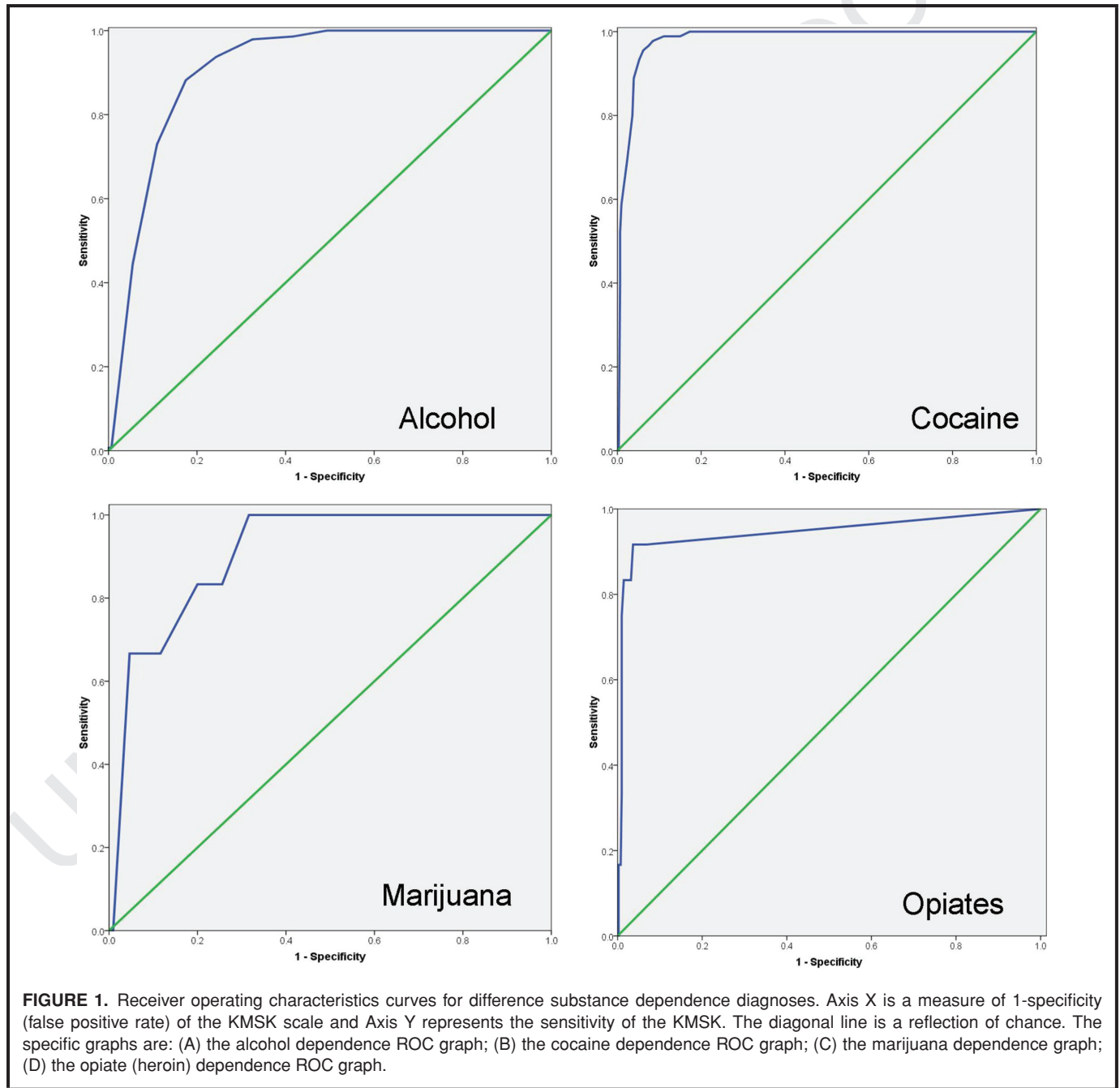
We performed a series of ROC analyses using the SCID diagnoses as the state variable (coded as 0 and 1, for presence or absence of the diagnosis, respectively), and the total score (lifetime) from each individual substance as the test variable. Figure 1 shows the ROC graphs for alcohol, cocaine, marijuana, and opiate dependence in our sample. We also calculated two other common measures that can show the diagnostic utility of an instrument: the positive predictive potential (PPP) and the negative predictive potential (NPP). The PPP is a measure of the proportion of subjects correctly classified as having the relevant dependence given a specific cutoff score and the NPP reflects how likely the test is to be correct if it categorizes a subject as not having a condition or diagnosis given a specific cutoff score.

### Cutoff Scores for Different Types of Substances

Table 3 shows different cutoff scores, the resultant sensitivity, specificity, chi-square value, PPP and NPP for alcohol, cocaine, marijuana, and opiates.

**TABLE 2.** Analysis of KMSK lifetime total scores and SCID-I assessments for different types of substances

KMSK subscale	Mean KMSK scale score	Mean SCID score	KMSK-SCID correlation
Alcohol whole sample	8.0 ± 4.6	4.1 ± 2.1	r = .473, p < .0001
Alcohol dependence (N = 144)	12.0 ± 1.4	5.1 ± 1.3	r = .289, p < .0001
Cocaine subscale	5.4 ± 6.5	.2 ± .4	r = .792, p < .0001
Cocaine dependence (N = 90)	13.7 ± 2.7	5.4 ± 1.4	r = .235, p < .026
Marijuana whole sample	5.5 ± 5.0	2.2 ± 1.8	NS
Marijuana dependence (N = 16)	12.0 ± 2.4	4.0 ± 1.3	NS
Opiate subscale	5.1 ± 2.0	.9 ± 2.6	r = .741, p < .004
Opiate dependence (N = 12)	8.5 ± 3.6	5.5 ± 1.3	r = .584, p < .046



**FIGURE 1.** Receiver operating characteristics curves for difference substance dependence diagnoses. Axis X is a measure of 1-specificity (false positive rate) of the KMSK scale and Axis Y represents the sensitivity of the KMSK. The diagonal line is a reflection of chance. The specific graphs are: (A) the alcohol dependence ROC graph; (B) the cocaine dependence ROC graph; (C) the marijuana dependence graph; (D) the opiate (heroin) dependence ROC graph.

**TABLE 3.** Impact of KMSK cutoff score on sensitivity and specificity

Substance	Cutoff ( $\geq$ )	Sensitivity (%)	Specificity (%)	Sensitivity + specificity	$\chi^2$ value	<i>p</i> value	PPP	NPP
Alcohol	7	100.0	50.7	150.7	110.5	<.0001	.500	1.000
	8	98.6	58.2	156.8	130.4	<.0001	.538	.988
	9	97.7	67.5	165.2	166.0	<.0001	.597	.985
	10	93.8	75.7	169.5	186.5	<.0001	.655	.961
	11	88.2	82.5	170.7*	199.7*	<.0001	.713	.934
Cocaine	12	72.9	89.0	161.9	171.8	<.0001	.766	.870
	6	98.9	88.9	187.8	251.0	<.0001	.724	.996
	7	97.8	91.5	189.3	271.2	<.0001	.772	.993
	8	96.7	92.5	189.2	276.3	<.0001	.791	.990
	9	95.6	93.8	189.4*	285.7	<.0001	.819	.986
Marijuana	10	93.3	94.8	188.1	286.8*	<.0001	.840	.980
	11	88.9	96.1	185.0	282.3	<.0001	.870	.967
	12	80.0	96.4	176.4	245.8	<.0001	.867	.943
	5	100.0	52.1	152.1	6.34	<.05	.055	1.000
	6	100.0	54.9	154.9	7.07	<.01	.058	1.000
Opiates	7	100.0	61.9	161.9	9.32	<.01	.068	1.000
	8	100.0	68.4	168.4*	12.25	<.0001	.081	1.000
	9	83.3	74.4	157.7	9.84	<.01	.083	.994
	10	83.3	80.0	163.3	13.78	<.0001	.104	.994
	11	66.7	88.4	155.1	15.5	<.0001	.138	.990
	12	66.7	92.6	159.3	24.9	<.0001	.200	.990
	13	66.7	95.3	162.0	37.8*	<.0001	.286	.990
	14	33.3	97.2	130.5	15.6	<.0001	.250	.981
	2	91.7	93.4	185.1	103.3	<.0001	.289	.997
	3	91.7	94.6	186.3	120.8	<.0001	.333	.997
	4	91.7	96.4	188.1*	156.6	<.0001	.423	.997
	5	83.3	96.8	180.1	145.7	<.0001	.435	.995
	6	83.3	97.3	180.6	160.8	<.0001	.476	.995
7	83.3	98.5	181.8	214.8*	<.0001	.625	.995	
8	75.0	99.0	174.0	214.5	<.0001	.692	.993	
9	75.0	99.0	174.0	214.5	<.0001	.692	.993	

\*The highest value; PPP: Positive predictive potential; NPP: Negative predictive potential.

## DISCUSSION

This study extends previously published data on the concurrent validity of the KMSK versus SCID diagnosis for substance dependence.<sup>14</sup> Based on a larger, more ethnically homogenous sample with higher rates of alcohol and substance dependence, we replicated most of the original findings and uncovered some new findings. We found in general that the KMSK is a useful assessment of alcohol, cocaine, marijuana, and opiate dependence. The scale performed well against the SCID for those substances. This finding supports the conclusion of Kellogg et al.<sup>14</sup> that the KMSK is a rapid screening instrument that can be used for the assessment of the extent of lifetime alcohol and drug use for the identification of dependence. The ROC analysis determined that the cutoff score that best discriminates between the presence and absence of a DSM-IV diagnosis of alcohol, cocaine, and marijuana dependence were 11, 9,

8, respectively, in our study sample, while the cutoff scores reported by Kellogg et al.<sup>14</sup> for alcohol and cocaine dependence were both 11. The score for opiate dependence, however, was inconsistent with the original findings, with our study suggesting a score of 4 or 7, depending on the approach to determining the cutoff, and the Kreek et al. study suggesting a cutoff of 9.

While this study showed that KMSK is a suitable, brief tool to characterize an individual's dependent status on alcohol, cocaine, and opiate, further study is necessary to determine its usefulness in assessing marijuana dependence.

In practice, there are two common ways of determining a cutoff score for a screening scale. One way is to maximize both sensitivity and specificity, which means the cutoff score has to have the best trade-off between sensitivity and specificity;<sup>28</sup> another way is to choose a score that can best discriminate between the presence and absence of a diagnosis made by the "gold standard" method, that is,

1 choosing the score with the highest chi-square value in a  
2  $2 \times 2$  goodness-of-fit test. The latter one was used by the  
3 original validation study by Kellogg et al.<sup>14</sup>

### 4 5 **Receiver Operating Characteristics Analysis for** 6 **Different Dependence Diagnoses**

7 The AUROC curve is commonly used as a summary  
8 measure of diagnostic accuracy and it can be interpreted  
9 as the probability that a randomly selected diseased case  
10 will be regarded with greater suspicion (in terms of its rat-  
11 ing or continuous measurement) than a randomly selected  
12 nondiseased case. So, based on our data, an AUROC of .981  
13 for cocaine dependence implies that there is 98.1% likeli-  
14 hood that a randomly selected diseased case will receive a  
15 more suspicious (higher) rating than a randomly selected  
16 nondiseased case. Based on this measure, the KMSK did  
17 very well on cocaine, alcohol, marijuana, and opiate de-  
18 pendence.

### 19 20 **Cutoff Score for Marijuana Dependence**

21 Based on the ROC analysis, a cutoff score of eight would  
22 have a sensitivity of 100% and a specificity of 68.4%, yield-  
23 ing the highest sum of sensitivity and specificity. The origi-  
24 nal report did not report a cutoff score on marijuana,  
25 probably due to the small number of subjects who met  
26 the criteria of marijuana dependence in their samples (One  
27 case qualified for a marijuana dependence diagnosis while  
28 another met the criteria for marijuana abuse). Despite the  
29 limited number of positive cases, we calculated cutoff scores  
30 for marijuana dependence because this is the first study to  
31 report a cutoff score for marijuana dependence (Marijuana  
32 was not included in the original version of the instrument).  
33 Validation of marijuana dependence cutoffs in additional  
34 samples is clearly necessary, especially since the correla-  
35 tions between the KMSK and SCID scores for marijuana  
36 were the only ones that were not statistically significant.  
37 Though the actual reasons for the lack of significance are  
38 unclear, the relatively small number of positive cases with  
39 marijuana dependence limited our power to detect such a  
40 relationship. In addition, it could also mean that the KMSK  
41 and SCID capture different aspects of marijuana use. This  
42 again shows that further study is needed.

### 43 44 **Cutoff Score for Opiate Dependence**

45 In contrast to other substances, the cutoff scores for opi-  
46 ate dependence determined by different approaches were  
47 widely disparate. As shown in Table 3, a cutoff score of  
48 four was best if we chose it based on maximizing sensitiv-  
49 ity (91.7%) and specificity (96.4%). However, if we chose  
50 the cutoff score with the highest chi-square value, it would  
51 be seven, which had substantially lower sensitivity (83.3%)  
52 but only marginally improved the specificity (98.5%). Ac-  
53 cordingly, the PPP and NPP changed from .423 and .997  
54 when the cutoff was 4 to .625 and .995, respectively, when  
55 the cutoff was 7. The authors would recommend using 4 as

a cutoff score for screening purposes (ie, if the KMSK is  
to be followed with more detailed assessment), when sen-  
sitivity should probably be regarded as more important in  
order to decrease the risk of false negatives. However, in  
situations where the KMSK is the only instrument used  
for assessment of SUD, the higher cutoff of 7 is likely to  
be better, as a substantial improvement in PPP is achieved  
with only a slight decrement of NPP. Review of the data  
reported by Kellogg et al.<sup>14</sup> shows that sensitivity (100%)  
and specificity (95%) based on cutoff score 4 were both ex-  
cellent, the change of cutoff score from 4 to 9 only yielded  
minimal change in specificity (from 95% to 99%), but the  
authors chose 9 (determined by the chi-square value).

Detailed structured diagnostic instruments such as the  
SCID, or semi-structured instruments such as the Semi-  
structured Interview for the Assessment of Genetics of Al-  
coholism (SSAGA)<sup>29</sup> or the Semi-structured Assessment  
for Drug Dependence and Alcoholism (SSADDA)<sup>30</sup> can  
provide substantially more detailed information than the  
KMSK about the patterns of drug use and drug-related  
problems that underlie dependence. However, for the pur-  
pose of identifying people that are likely to qualify for a  
diagnosis of alcohol and drug dependence, the KMSK is  
a valid and viable adjunct to the SCID or other more de-  
tailed structured interviews, especially in clinical settings. In  
addition, in some research settings, such as large epidemi-  
ological studies or studies where the assessment burden  
regarding nonsubstance use phenotypes is already high, it  
can be advantageous to use a briefer instrument. In such  
settings, the KMSK is a good candidate for assessing life-  
time SUD. The issue of trading brevity and simplicity for  
detail may become a very important one in genetic epidemi-  
ological studies, as the magnitude of sample sizes required  
to detect associations of genome-wide significance is very  
large.

Of note, we here only report the data on lifetime expo-  
sure and this paper does not include current exposure as-  
sessment. With the help of the original authors (2004 e-mail  
from M.J. Kreek to JFC), our team is currently collecting  
data on current (past 30-day) alcohol and drug exposure  
and we hope that in the future we could expand the utility  
of the KMSK to include current dependence diagnoses.

Although the results of the current study are gener-  
ally encouraging, caution is recommended because of the  
study's limitations. (1) The results are sample dependent  
because the measurement properties of the KMSK vary  
according to patient populations. Results may differ for  
samples from different populations, and the optimal cutoff  
scores for the KMSK could change. Therefore, it is impor-  
tant to replicate the findings in other samples, including  
large community samples. (2) The generalizability of the  
findings may be limited by the recruitment methodology  
given that participants were selected for an ongoing molec-  
ular genetic study of posttraumatic stress disorder; however,  
it is important to note that all subjects were approached  
in a randomized fashion from general medical clinic

waiting rooms, regardless of traumatic, psychiatric, medical, or substance use histories. (3) Furthermore, although we did investigate the differences in KMSK cutoff scores between male and female subjects, differences associated with other subgroups, such as age groups or subjects with different education levels, were not conducted given that the sample size was not large enough for such analyses.

In conclusion, this study has demonstrated that the KMSK is a suitable, brief tool that can be used to characterize an individual's dependence on alcohol, cocaine, marijuana, and opiates, at least in the primarily African American, low socioeconomic status, urban population examined in this study. Compared with the original report, we found a diagnostic cutoff score for alcohol identical to that suggested by the original study, but lower cutoffs for cocaine dependence (9 vs. 11 recommended previously) and opiate dependence (4 vs. 9). In the meantime, we also determined a cutoff score for marijuana dependence (8) based on our data, which is a new finding. Since this was the first study to report a cutoff score for marijuana, further validation is clearly necessary. Optimal diagnostic cutoff scores for the KMSK may vary depending on sample demographics, but our results suggest the potential utility of the KMSK for evaluating SUD in diverse populations. Additional studies, seeking to validate the KMSK in other clinical samples, as well as in representative community samples, would greatly enhance the utility of the KMSK as a general research and clinical tool. The instrument might be particularly useful in situations in which brevity and simplicity of administration are necessary, such as large epidemiological studies, or as in the case of the present parent study, where the scientific focus is not substance use, but where SUD comorbidity is expected to be substantial, so that data on substance use are very important.

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#### Declaration of Interests

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

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