Frequency of 5+/4+ Drinks as a Screener for Drug Use and Drug-Use Disorders*

DEBORAH A. DAWSON, PH.D.,† WILSON M. COMPTON, M.D., M.P.E.,† AND BRIDGET F. GRANT, PH.D., PH.D.

Laboratory of Epidemiology and Biometry, National Institute on Alcohol Abuse and Alcoholism, 5635 Fishers Lane, MSC 9304, Bethesda, Maryland 20892-9304

ABSTRACT. Objective: The objective of this study was to test the ability of a question on frequency of drinking 5+ (for men) or 4+ (for women) drinks to screen for drug use and drug-use disorders (DUDs) in a general population sample. **Method:** Using data collected in 2001-2002 from a representative U.S. adult population sample (N = 43,093), including a subsample of those with past-year emergency-department use (n = 8,525), past-year frequency of drinking 5+/4+ drinks was evaluated as a screener for drug use and DUDs for four categories of illicit drugs. **Results:** Sensitivities and specificities of the 5+/4+ drinks screener were 72.4% and 76.6% for any drug dependence, 71.9% and 77.3% for any DUD, and 63.3% and 78.9% for any drug use in the general population. Sensitivities and specificities were higher for marijuana and cocaine/crack and lowest for illicit prescription drugs. Optimal screening cutpoints were once a month or more for cocaine/crack dependence, either once or more a month or seven or more times a year for cocaine/crack DUDs, seven or more times a year for cocaine/crack use, and once or more a year for the other drug use and DUD measures. Sensitivity and specificity were similar among adults who had visited an emergency department in the past year, and the optimal screening cutpoints were identical. **Conclusions:** Past-year frequency of drinking 5+/4+ drinks was quite accurate as a screener for past-year marijuana and cocaine/crack use and DUDs, but it was less accurate for illicit prescription drug use and DUDs. Its drug-screening potential can be thought of as "added value" from an item already likely to be asked in the interest of detecting problem drinking. Future work may consider using the alcohol consumption screener as a starting point, with follow-up questions to assess illicit drug use among those who screen positive. (*J. Stud. Alcohol Drugs, 71,* 751-760, 2010)

ILLICIT DRUG USE IS COMMON in the United States. Recent data indicate that approximately 20 million individuals 12 years of age and older used at least one illicit drug in the past month, and 2.8% had a past-year illicit drug-use disorder (DUD; Substance Abuse and Mental Health Services Administration, 2009). Use of illicit drugs is associated with numerous adverse health consequences affecting multiple organs and body systems (Khalsa et al., 2002, 2008) and accounts for 0.5% of deaths and 1.8% of the burden of disease in developed regions of the world (Rehm et al., 2006). Drug use and DUDs are also associated with significant social, mental, and emotional impairment (Compton et al., 2007) and staggering economic costs (Cartwright, 1999; Office of National Drug Policy, 2004).

Because of their severe consequences, it is a crucial public health concern to identify and offer interventions for illicit drug use and DUDs. Although illicit drug use and DUDs are not uncommon, most persons with these behaviors do not automatically request treatment; in fact, most individuals with diagnosable DUDs do not seek care (Compton et al., 2007; Substance Abuse and Mental Health Services Administration, 2009). One way to address this issue is to provide assertive outreach in settings where drug users and persons with DUDs are likely to be identified. Primary care, emergency department (ED), and similar health care settings, especially those that have a large number of adolescent or young-adult patients, are examples of such logical venues for drug screening. Recent data from a nationally representative sample of U.S. adults indicated that rates of using illicit drugs at least monthly were similar among those who did and did not report any past-year primary care use, 3.2% and 3.6%, respectively, but were higher among those who reported ED use than those who did not, 6.6% versus 3.2% (Cherpitel and Ye, 2008). These survey results of drug-use prevalence among primary care patients are broadly comparable to rates from actual samples of primary care and ED patients (e.g., rates of 3.2%-5.2% in primary care samples; Manwell et al., 1998; Mertens et al., 2005). The prevalence of drug use in ED samples has varied as a function of the population being served by the ED and the type of screening,

Received: November 30, 2009. Revision: March 15, 2010.

*The study on which this article is based, the National Epidemiologic Survey on Alcohol and Related Conditions, is sponsored by the National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, U.S. Department of Health and Human Services, with supplemental support from the National Institute on Drug Abuse. This research was supported by the Intramural Program of the National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism. All authors are federal government employees, and none of the authors has any financial conflict of interest to report. The views and opinions expressed in this article are those of the authors and should not be construed to represent the views of any of the sponsoring organizations, agencies, or the U.S. government. All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

†Correspondence may be sent to Deborah A. Dawson at the above address or via email at: ddawson@mail.nih.gov. Wilson M. Compton is with the Division of Epidemiology, Services and Prevention Research, National Institute on Drug Abuse, Bethesda, MD.

but testing of physical specimens in a sample of Tennessee ED patients found that the proportion of positive screens of physical specimens ranged from 15% for marijuana to 3.1% for barbiturates (Rockett et al., 2003). A study of 2,366 inner-city Canadian ED patients found that approximately 18% had used street drugs (Cummings et al., 2006), whereas a Swiss ED study of 2,304 women and 2,688 men reported rates of past-year marijuana and other illicit drug use of 5.0% and 1.4% for women and 13.2% and 3.8% for men (Fleming et al., 2007).

Psychiatric and general health care clinicians have been encouraged to screen patients routinely for alcohol and illicit drug problems to identify and intervene with those who have clinically significant levels of symptoms and to provide early intervention for those at risk for adverse conditions. Whereas some primary and specialty care physicians routinely ask new patients about alcohol and illicit drug use, this does not always entail quantification or use of a standard screening instrument (Friedmann et al., 2001; Gunderson et al., 2005; Maheux et al., 1999; Schermer et al., 2003). Questioning about illicit drug use is more common in specialty areas such as psychiatry and obstetrics/gynecology than in family medicine practices (Friedmann et al., 2001), but even in specialty settings, accurate and efficient assessment is often lacking. To receive the highest level of accreditation from the American College of Surgeons, trauma centers already are required to identify alcohol problems (Gentilello, 2007), and there have been proposals to extend this requirement to include identification of drug problems (Martins et al., 2007). However, a recent study of emergency physicians showed that only a minority routinely ask about illicit drug use, far fewer than ask about tobacco or alcohol use (Williams et al., 2000). Studies of primary and emergency physician attitudes toward substance-misuse screening indicate concerns about the sensitivity of the questions, inadequate training, and the time required and lack of reimbursement for this effort (Friedmann et al., 2001; Gentilello, 2005; Schermer et al., 2003; Yoast et al., 2008). Concerns regarding asking about or documenting an illegal practice also may deter physicians from asking about drug use, whereas similar concerns would not exist for questions about alcohol use, at least among adults age 21 and older.

Although a number of brief substance use screeners exist, the trend under the time constraints of clinical care is toward ever-shorter screening instruments. A number of recent studies have examined a single-item screener asking about the frequency of drinking five or more (5+) drinks in a single day for men or four or more (4+) drinks in a single day for women. This single question has performed almost on a par with longer instruments in screening for alcohol-use disorders (AUDs) and hazardous drinking in general population, ED, and patient samples (Dawson et al., 2010; Smith et al., 2009; Stewart et al., 2008; Williams and Vinson, 2001). This screener also showed surprisingly high levels of sensitivity in screening for illicit drug use in a recent study of patients in four trauma centers in Los Angeles County. Specifically, at a cutpoint of drinking 5+/4+ drinks once or more in the past 30 days, this question had a sensitivity and specificity of 74% and 57%, respectively, for past-year marijuana use; 67% and 67%, respectively, for past-year cocaine/crack use; and 63% and 53%, respectively, for past-year illicit prescription drug use. The overall percentage of cases screened correctly varied from 62% to 68%, and it generally did a better job of identifying drug users than nonusers (i.e., its sensitivity exceeded its specificity; Ramchand et al., 2009).

Why might a question on heavy episodic drinking perform well as a screener for drug use and DUDs? The answer lies in the strong associations between alcohol and drug use and their associated disorders. Stinson et al. (2005) reported that 55.2% of individuals with a DUD had an AUD, compared with 7.5% of those without a DUD. Dawson et al. (2008) demonstrated that the odds of incident drug use and DUD increased in a linear manner with the frequency of drinking 5+/4+ drinks, even after adjusting for a host of other risk factors, and Miller et al. (2007) found a similar linear association between frequency of heavy episodic drinking and current marijuana, cocaine, and inhalant use among high school students. Likewise, heavy episodic drinking has been linked with the frequency of marijuana use among young women in a primary care sample (Rose et al., 2007) and with a threefold to sixfold increase in the prevalence of marijuana and other drug use in an ED sample (Fleming et al., 2007). Thus, whereas it might seem surprising to ask about alcohol use to screen for drug use and DUDs, the feasibility of such a screener is supported by the strength of the associations between alcohol and drug use.

The purpose of this study is to determine how well the single-item 5+/4+ drinks screener works to identify persons with illicit DUDs in a nationally representative sample of U.S. adults, thus extending the research of Ramchand et al. (2009), as well as in a subsample who reported having gone to an ED for care at least once in the preceding year (although not an ED sample per se). The study examines the performance of the screener in terms of its ability to identify past-year drug use, DUD (abuse or dependence), and drug dependence for any illicit drug and for three specific drugs: marijuana (cannabis), cocaine (including crack), and illicit prescription drugs. These illicit substances were chosen because marijuana and cocaine are the most prevalent specific drugs and because illicit prescription drugs are an emerging problem in the United States (Compton and Volkow, 2006).

Method

Sample

This analysis is based on data from the 2001-2002 Wave 1 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), designed by the National Institute

on Alcohol Abuse and Alcoholism (Grant et al., 2003a). The Wave 1 NESARC sample (N = 43,093, response rate = 81%) represented U.S. adults age 18 years or older residing in households and selected noninstitutional group quarters in all 50 states and the District of Columbia. The NESARC data were weighted to reflect design characteristics (including oversampling of Blacks, Hispanics, and young adults) and nonresponse. Weighted data were further adjusted to match the civilian, noninstitutionalized population on socioeconomic variables based on the 2000 U.S. census. Data were collected in personal interviews using a computer-assisted survey instrument administered by highly trained and experienced lay interviewers. All potential respondents were informed in writing about the nature of the survey, statistical uses of the survey data, voluntary aspect of their participation, and federal laws that rigorously provide for the confidentiality of identifiable survey information. Only respondents consenting to participate after receiving this information were interviewed. The research protocol, including informed consent procedures, received a full ethical review and approval from the U.S. Census Bureau and the U.S. Office of Management and Budget. The analyses for this study were conducted in 2009, using the total NESARC sample (N = 43,093) and a subsample of individuals who reported having visited an ED for care in the 12 months preceding the interview (n = 8,525).

Measures

The 5+/4+ drinking measure used in this analysis reflects past-year frequency of drinking 5+ drinks in a single day for men and 4+ drinks in a single day for women, based on all types of alcohol combined: "During the last 12 months, about how often did you drink (five or more/four or more) drinks in a single day?" Response categories were (a) every day, (b) nearly every day, (c) 3-4 times a week, (d) 2 times a week, (e) once a week, (f) 2-3 times a month, (g) once a month, (h) 7-11 times in the last year, (i) 3-6 times in the last year, (j) 1-2 times in the last year, and (k) never in the last year. These questions were asked only of current drinkers who in initial screening questions reported having consumed at least one alcoholic drink in the last 12 months, and among these it was directed only to those whose largest quantity of drinks consumed on any day was 5+/4+ or unknown, 5,596 men and 3,879 women. Frequency or 5+/4+ drinking was automatically set to "never" for 16,147 past-year abstainers, 7,471 men whose largest quantity of drinks was four or less, and 10,000 women whose largest quantity of drinks was three or less. The questions on 5+/4+ drinks were preceded by questions that asked for the overall frequency of drinking, the usual and largest number of drinks consumed in a single day, and the frequency of consuming the largest quantity. In addition, the whole sequence of questions on all types of alcohol combined was preceded by similar sets of questions specific to drinking coolers, beer, wine, and distilled spirits. In a random subsample of NESARC respondents reinterviewed approximately 10 weeks after the initial interview, the intraclass correlation coefficient for test-retest reliability was 0.69 for frequency of drinking 5+ drinks (Grant et al., 2003b).

Drug use and drug-use disorders

The NESARC asked respondents if they ever used 10 categories of illicit drugs: sedatives, tranquilizers, opioids, amphetamines, cannabis, cocaine including crack, hallucinogens, inhalants/solvents, heroin, and all other drugs combined. Illicit prescription drug use entailed use without or beyond the limits of a prescription. Individuals who ever used each drug type were asked: "Did you use (drug type) in the last 12 months only, before the last 2 months only, or during both time periods?" Past-year use comprised use in the last 12 months only or during both time periods. DUDs were defined in accordance with the criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), using the National Institute on Alcohol Abuse and Alcoholism's Alcohol Use Disorders and Associated Disabilities Interview Schedule—DSM-IV Version (Grant et al., 2001), a structured diagnostic interview designed to be administered by lay interviewers. A total of 33 symptom item indicators represented the seven dependence and four abuse criteria; past-year symptoms were asked only of past-year users. Respondents who endorsed a given past-year symptom were asked to identify the drug(s) associated with the endorsed symptom. To be classified with past-year drug dependence for any specific drug, respondents had to meet at least three dependence criteria for that drug in the 12 months preceding interview. To be classified with any DUD, respondents had to satisfy at least one abuse criterion *or* at least three dependence criteria (Compton et al., 2007; Grant et al., 2004). "Any-drug" measures (i.e., dependence, DUD, and use of any drug) required that the behavior or condition be positive for at least one of the 10 specific drug types; "any prescription drug" measures required a positive behavior/condition for at least one prescription drug type (sedatives, tranquilizers, opioids, amphetamines). Test-retest reliability of past-year DUDs ranged from κ = .79 for any DUD to .91 for cocaine-use disorder. The reliability of past-year drug use varied from κ = .86 for cocaine/crack and .77 for marijuana to .50-.82 for various types of illicit prescription drugs (Grant et al., 1995).

Analysis

Sensitivity, specificity, and positive predictive values were based on weighted data generated for various screener cut-points using SUDAAN (Research Triangle Institute, 2002),

TABLE 1. Past-year prevalence of illicit drug dependence, drug-use disorder, and drug use, by past-year frequency of drinking 5+/4+ drinks

Variable	Cases[a] *n*	Frequency of drinking 5+/4+ drinks										χ^2 *p*
		Total	Never	1×-2×/yr.	3×-6×/yr.	7×-11×/yr.	1x/mo.	2×-3×/mo.	1×/wk.	2×/wk.	>2×/wk.	
U.S. adults 18 and older, cases,[a] *n*		42,923	33,684	1,633	1,395	708	989	1,115	1,076	912	1,411	
Drug dependence												
Any illicit drug	248	0.6 (0.1)	0.2 (0.0)	0.9 (0.2)	0.3 (0.2)	1.0 (0.4)	1.3 (0.4)	1.8 (0.5)	1.8 (0.7)	2.6 (0.7)	5.1 (0.7)	<.001
Marijuana	132	0.3 (0.0)	0.1 (0.0)	0.7 (0.2)	0.2 (0.2)	0.9 (0.4)	0.9 (0.3)	0.8 (0.3)	1.3 (0.7)	1.7 (0.5)	2.2 (0.5)	<.001
Cocaine/crack	49	0.1 (0.0)	<0.1 (0.0)	0.1 (0.0)	<0.1 (0.0)	0.0 (0.0)	0.4 (0.2)	0.4 (0.2)	0.3 (0.2)	0.7 (0.5)	1.5 (0.3)	.001
Any illicit rx drug	88	0.2 (0.0)	0.1 (0.0)	0.3 (0.1)	0.1 (0.1)	0.3 (0.2)	0.3 (0.2)	0.7 (0.4)	0.7 (0.3)	0.2 (0.1)	1.9 (0.4)	.004
Drug-use disorder												
Any illicit drug	775	2.0 (0.1)	0.7 (0.1)	2.6 (0.4)	2.9 (0.5)	5.1 (0.9)	3.9 (0.6)	6.9 (1.0)	5.9 (0.1)	9.9 (1.3)	12.2 (1.1)	<.001
Marijuana	558	1.5 (0.1)	0.4 (0.0)	2.2 (0.4)	2.3 (0.5)	4.0 (0.8)	3.3 (0.6)	5.2 (0.8)	4.6 (0.9)	7.6 (1.1)	9.1 (0.9)	<.001
Cocaine/crack	97	0.3 (0.0)	0.1 (0.0)	0.1 (0.1)	0.1 (0.0)	0.3 (0.2)	0.7 (0.3)	0.9 (0.3)	0.5 (0.3)	1.4 (0.5)	3.0 (0.5)	<.001
Any illicit rx drug	234	0.6 (0.1)	0.3 (0.0)	0.5 (0.2)	0.6 (0.2)	1.1 (0.4)	0.7 (0.3)	1.8 (0.6)	1.7 (0.4)	1.6 (0.7)	4.4 (0.7)	<.001
Drug use												
Any illicit drug	2,457	6.2 (0.2)	3.0 (0.1)	9.4 (0.9)	10.8 (1.1)	12.5 (1.4)	14.6 (1.4)	18.3 (1.2)	16.7 (1.4)	25.5 (2.0)	26.9 (1.6)	<.001
Marijuana	1,610	4.1 (0.2)	1.5 (0.1)	7.4 (0.8)	6.9 (0.8)	9.1 (1.2)	10.5 (1.3)	13.6 (1.0)	12.5 (1.3)	12.6 (1.3)	21.2 (1.5)	<.001
Cocaine/crack	217	0.6 (0.0)	0.1 (0.0)	0.3 (0.2)	0.3 (0.1)	1.0 (0.4)	1.4 (0.4)	1.7 (0.4)	1.8 (0.5)	3.4 (0.8)	5.6 (0.8)	<.001
Any illicit rx drug	1,228	3.2 (0.1)	1.8 (0.1)	3.5 (0.5)	4.3 (0.7)	5.9 (1.1)	6.8 (0.9)	8.9 (1.1)	8.0 (1.1)	10.6 (1.5)	13.9 (1.2)	<.001
U.S. adults 18 and older with past-year ED utilization, cases, *n*		8,511	6,599	351	246	147	194	207	234	198	335	
Drug dependence												
Any illicit drug	107	1.6 (0.2)	0.6 (0.0)	2.0 (0.9)	0.8 (0.7)	1.4 (1.1)	2.4 (1.1)	5.6 (2.4)	4.6 (2.4)	4.0 (1.8)	11.0 (2.1)	<.001
Marijuana	48	0.7 (0.2)	0.2 (0.1)	1.1 (0.7)	0.7 (0.6)	0.9 (0.9)	1.3 (0.9)	2.7 (1.4)	4.0 (2.3)	2.1 (0.9)	4.1 (1.2)	.006
Cocaine/crack	19	0.4 (0.1)	0.1 (0.1)	0.5 (0.5)	0.0 (0.0)	0.0 (0.0)	0.6 (0.6)	0.4 (0.4)	0.9 (0.9)	1.6 (1.6)	3.6 (1.2)	.088
Any illicit rx drug	51	0.8 (0.1)	0.4 (0.1)	0.9 (0.6)	0.1 (0.1)	1.4 (1.0)	1.4 (0.9)	2.6 (2.0)	1.5 (1.0)	0.3 (0.3)	4.4 (1.3)	.030
Drug-use disorder												
Any illicit drug	254	3.4 (0.3)	1.3 (0.2)	3.0 (1.0)	1.9 (0.9)	9.8 (3.0)	4.8 (1.6)	12.3 (3.0)	8.2 (2.6)	16.7 (3.6)	19.3 (2.6)	<.001
Marijuana	168	2.3 (0.2)	0.7 (0.1)	2.1 (0.9)	1.5 (0.8)	8.2 (3.0)	3.1 (1.2)	8.5 (2.3)	7.3 (2.5)	10.4 (2.6)	13.1 (2.1)	<.001
Cocaine/crack	35	0.6 (0.1)	0.2 (0.1)	0.6 (0.5)	0.0 (0.0)	0.6 (0.5)	0.6 (0.6)	0.4 (0.4)	1.0 (0.9)	2.8 (1.8)	5.9 (1.5)	.016
Any illicit rx drug	106	1.5 (0.2)	0.7 (0.2)	1.4 (0.7)	0.4 (0.3)	2.4 (1.2)	2.4 (1.2)	4.1 (2.2)	2.7 (1.2)	4.4 (2.5)	9.0 (2.0)	.001
Drug use												
Any illicit drug	680	8.9 (0.4)	4.2 (0.3)	12.9 (2.1)	9.8 (2.4)	19.6 (3.9)	23.6 (3.7)	23.6 (3.6)	21.3 (3.4)	32.0 (4.4)	37.6 (3.6)	<.001
Marijuana	434	5.9 (0.4)	2.1 (0.2)	9.8 (1.8)	5.7 (1.7)	17.3 (3.7)	14.5 (3.3)	16.4 (2.9)	16.0 (3.2)	28.1 (4.7)	27.8 (3.2)	<.001
Cocaine/crack	68	1.1 (0.2)	0.4 (0.1)	0.7 (0.5)	0.0 (0.0)	1.9 (0.9)	2.2 (1.2)	1.6 (0.9)	2.5 (1.3)	4.0 (2.0)	9.8 (2.0)	.001
Any illicit rx drug	377	5.1 (0.3)	2.7 (0.3)	6.8 (1.6)	3.6 (1.7)	8.8 (2.8)	13.0 (3.3)	12.7 (3.1)	9.1 (2.2)	15.1 (3.6)	22.5 (3.0)	<.001

Notes: Figures in parentheses are standard errors of estimates; standard errors of 0.0 denote <.05. Yr. = year; mo. = month; wk. = week; rx = prescription; ED = emergency department. [a]Numbers of cases reflect missing data on frequency of drinking 5+/4+ drinks for 170 cases (0.4%) in the total sample and 14 cases (0.2%) in the ED subsample.

a software package that uses Taylor series linearization to adjust variance estimates for complex, multistage sample designs. At any given cutpoint, sensitivity reflects the proportion of individuals actually positive for the condition of interest whose screener score was greater than or equal to the cutpoint, and specificity reflects the proportion of individuals actually negative for the condition whose screener score was lower than the cutpoint. The positive predictive value is the proportion of those with a positive screen who are positive for the condition of interest. As a measure of screening efficiency, the positive likelihood ratio, which is the ratio of true to false positives (sensitivity divided by 1 minus specificity), was calculated for each cutpoint. Areas under receiver-operator characteristic curves (AUCs) that plot sensitivity versus 1 minus specificity at each screener cutpoint were calculated as measures of overall performance (Swets and Pickett, 1982) using ROCKIT 0.9B (Metz, 2003) for maximum-likelihood estimates of semiparametric binormal curve AUC.

Results

As shown in Table 1, less than 1% (0.6%) of U.S. adults met the criteria for past-year drug dependence, 2.0% had a past-year DUD (dependence and/or abuse), and 6.2% were past-year illicit drug users. Prevalence rates for specific drugs were highest for marijuana, next highest for any illicit prescription drug, and lowest for cocaine/crack. In the subpopulation of adults who had used the services of an ED in the year preceding interview, rates of drug use and DUDs were slightly higher than in the general population. In both the general population and among those who had used an ED, the rates of drug use and DUDs increased as a function of past-year frequency of consuming 5+/4+ drinks, and these associations were highly significant as indicated by the p for chi-square tests of association, $p < .001$ in most cases and $p > .05$ only for cocaine/crack dependence in the ED subpopulation ($p = .088$).

The performance of the single item 5+/4+ drinks screener varied as a function of drug type (Table 2). Performance was best for cocaine (AUC = .887-.897) and marijuana (AUC = .839-.854), worst for the pooled category of any illicit prescription drug (AUC = .748-.766), and intermediate for the pooled category of any drug (AUC = .799-.833). Within each drug category, differences in performance according to the specific gold standard being considered were small and within sampling error (i.e., their standard errors indicated overlapping 95% confidence intervals) but suggested that the screener might be slightly more accurate in screening for DUDs rather than drug use. Positive predictive values were low, especially for cocaine/crack, reflecting the low prevalence of illicit drug use and DUDs in the general U.S. adult population, even among those engaging in heavy episodic drinking.

For the drug categories of any drug, marijuana, and any illicit prescription drug, the optimal screening cutpoint was drinking 5+/4+ drinks once or more a year. A cutpoint of drinking 5+/4+ drinks three or more times a year was a reasonable alternative for situations that favor specificity over sensitivity (e.g., when the costs of an increase of approximately 5% in false positives outweigh the value of identifying an additional 5%-10% of true positives). For the any-drug and marijuana measures, achieving a specificity of 80% or more generally required accepting a sensitivity of less than 70% (i.e., of identifying less than 70% of the individuals truly positive for the drug use or DUD in question), and positive likelihood ratios were generally in the range of 3 to 4 for the optimal cutpoints. That is, these cutpoints would identify three to four times as many true positives as false positives. For the any illicit prescription drug category, the positive likelihood ratios were less than 3 at the optimal cutpoints, indicating a low level of screening efficiency, and all specificities were associated with sensitivities of 60% or less. In other words, the screener was incapable of identifying more than 60% of the individuals with illicit prescription drug use or DUDs at any cutpoint.

For cocaine, the optimal screening cutpoint for dependence was drinking 5+/4+ drinks once or more a month. The cutpoints of once or more a month and seven or more times a year performed equally well in screening for any cocaine DUD, and a cutpoint of seven or more times a year was optimal for any cocaine use. At the cutpoint of once or more a month, sensitivity and specificity were 76.0% and 86.0%, respectively, for cocaine dependence and 73.9% and 86.1%, respectively, for any cocaine-use disorder. At a cutpoint of seven or more times a year, sensitivity and specificity for cocaine use were 77.6% and 84.5%, respectively.

Among individuals who went to an ED for care in the past year (Table 3), the single-item screener performed almost as accurately as in the general population and more so for some drugs and/or target conditions. All differences between the general population and ED subsample were small and lay within sampling error; moreover, the optimal screening cutpoints were the same in the two samples.

Discussion

Data from a nationally representative sample of U.S. adults revealed that a single question about past-year frequency of drinking 5+/4+ drinks performed well as a screener for past-year marijuana- and cocaine-use disorders, as well as for monthly or more frequent use of these drugs. It was considerably less accurate in screening for illicit prescription drug use or disorders. This may reflect the fact that alcohol use is contraindicated when using some types of prescription drugs, or perhaps it indicates that the prescription-drug-use phenotype has a different set of predictors than alcohol and the other DUDs (Colliver et al., 2006). The particularly strong performance of the single-item screener in predict-

TABLE 2. Performance of single-question screener for past-year drug-use disorder and drug use: U.S. adults 18 years of age and older

Freq. of drinking 5+/4+ drinks	Drug dependence				Drug-use disorder (abuse and/or dependence)				Drug use			
	% Sens.	% Spec.	% PPV	PLR	% Sens.	% Spec.	% PPV	PLR	% Sens.	% Spec.	% PPV	PLR
Any illicit drug												
≥Once a year	72.4 (3.3)	76.6 (0.4)	1.9 (0.1)	3.1 (0.2)	71.9 (2.2)	77.3 (0.4)	6.1 (0.3)	3.2 (0.1)	63.3 (1.4)	78.9 (0.1)	16.5 (0.6)	3.0 (0.1)
≥3 times a year	65.9 (3.5)	80.9 (0.4)	2.1 (0.2)	3.5 (0.2)	66.3 (2.1)	81.5 (0.4)	6.8 (0.4)	3.6 (0.1)	56.8 (1.3)	83.1 (0.4)	18.2 (0.6)	3.4 (0.1)
≥7 times a year	64.2 (3.6)	84.4 (0.3)	2.5 (0.2)	4.1 (0.2)	61.2 (2.3)	85.0 (0.3)	7.7 (0.5)	4.1 (0.2)	50.7 (1.3)	86.4 (0.3)	19.8 (0.7)	3.7 (0.1)
≥Once a month	61.3 (3.7)	86.2 (0.3)	2.7 (0.3)	4.4 (0.3)	56.5 (2.4)	86.8 (0.3)	8.0 (0.5)	4.3 (0.2)	47.0 (1.3)	88.1 (0.3)	20.8 (0.8)	3.9 (0.1)
≥Twice a month	56.1 (3.7)	88.8 (0.3)	3.0 (0.3)	5.0 (0.4)	51.5 (2.3)	89.3 (0.2)	8.9 (0.6)	4.8 (0.2)	41.1 (1.3)	90.4 (0.2)	22.1 (0.9)	4.3 (0.2)
≥Once a week	47.8 (3.9)	91.5 (0.2)	3.4 (0.4)	5.6 (0.5)	42.0 (2.3)	91.9 (0.2)	9.6 (0.7)	5.2 (0.3)	33.0 (1.2)	92.8 (0.2)	23.4 (1.0)	4.6 (0.2)
Area under ROC curve (AUC)	MLE binormal AUC = .826, 95% CI [.795, .854]				MLE binormal AUC = .833, 95% CI [.818, .847]				MLE binormal AUC = .799, 95% CI [.789, 810]			
Marijuana												
≥Once a year	78.3 (3.9)	76.5 (0.4)	1.1 (0.1)	3.3 (0.2)	77.0 (2.4)	77.1 (0.4)	4.7 (0.3)	3.4 (0.1)	72.7 (1.5)	78.4 (0.4)	12.6 (0.5)	3.4 (0.1)
≥3 times a year	69.5 (4.3)	80.7 (0.4)	1.2 (0.2)	3.6 (0.2)	70.4 (2.4)	81.3 (0.4)	5.3 (0.3)	3.8 (0.2)	65.0 (1.4)	82.5 (0.4)	13.8 (0.5)	3.7 (0.1)
≥7 times a year	67.1 (4.6)	84.3 (0.3)	1.4 (0.2)	4.3 (0.3)	64.7 (2.5)	84.8 (0.3)	5.9 (0.4)	4.2 (0.2)	59.0 (1.6)	86.0 (0.3)	15.3 (0.6)	4.2 (0.1)
≥Once a month	62.1 (5.0)	86.1 (0.3)	1.4 (0.2)	4.5 (0.4)	59.7 (2.7)	86.6 (0.3)	6.2 (0.4)	4.3 (0.2)	55.0 (1.7)	87.7 (0.3)	16.1 (0.6)	4.5 (0.2)
≥Twice a month	55.2 (5.0)	88.6 (0.3)	1.5 (0.2)	4.8 (0.5)	53.9 (2.7)	89.1 (0.2)	6.8 (0.5)	4.9 (0.3)	48.5 (1.6)	90.1 (0.2)	17.3 (0.7)	4.9 (0.2)
≥Once a week	48.7 (5.3)	91.4 (0.2)	1.8 (0.3)	5.7 (0.6)	44.0 (2.7)	91.8 (0.2)	7.3 (0.6)	5.4 (0.4)	39.4 (1.5)	92.5 (0.2)	18.5 (0.9)	5.3 (0.2)
Area under ROC curve (AUC)	MLE binormal AUC = .851, 95% CI [.819, .880]				MLE binormal AUC = .854, 95% CI [.839, .867]				MLE binormal AUC = .839, 95% CI [.829, .848]			
Cocaine/crack												
≥Once a year	79.7 (7.8)	76.4 (0.5)	0.5 (0.1)	3.4 (0.3)	79.2 (5.7)	76.4 (0.4)	0.9 (0.1)	3.4 (0.2)	82.3 (3.5)	76.6 (0.4)	1.9 (0.2)	3.5 (0.2)
≥3 times a year	76.6 (8.1)	80.6 (0.4)	0.5 (0.1)	4.0 (0.4)	76.8 (5.8)	80.7 (0.4)	1.1 (0.1)	4.0 (0.3)	79.7 (3.6)	80.9 (0.4)	2.3 (0.2)	4.2 (0.2)
≥7 times a year	76.0 (8.1)	84.2 (0.3)	0.6 (0.1)	4.8 (0.5)	76.0 (5.8)	84.3 (0.3)	1.3 (0.2)	4.8 (0.4)	77.6 (3.7)	84.5 (0.3)	2.7 (0.3)	5.0 (0.3)
≥Once a month	76.0 (8.1)	86.0 (0.3)	0.7 (0.1)	5.4 (0.6)	73.9 (5.9)	86.1 (0.3)	1.4 (0.2)	5.3 (0.4)	74.5 (3.8)	86.3 (0.3)	3.0 (0.3)	5.4 (0.3)
≥Twice a month	68.3 (8.1)	88.5 (0.3)	0.8 (0.2)	5.9 (0.7)	67.6 (5.9)	88.6 (0.3)	1.6 (0.2)	5.9 (0.5)	68.2 (3.8)	88.8 (0.3)	3.3 (0.3)	6.1 (0.4)
≥Once a week	60.0 (7.9)	91.3 (0.2)	0.9 (0.2)	6.9 (0.9)	58.2 (6.0)	91.4 (0.2)	1.8 (0.3)	6.8 (0.7)	59.7 (4.0)	91.5 (0.2)	3.8 (0.4)	7.0 (0.5)
Area under ROC curve (AUC)	MLE binormal AUC = .887, 95% CI [.830, .929]				MLE binormal AUC = .897, 95% CI [.864, .923]				MLE binormal AUC = .893, 95% CI [.874, .910]			
Any illicit rx drug												
≥Once a year	60.3 (6.6)	76.4 (0.4)	0.6 (0.1)	2.6 (0.3)	60.1 (3.9)	76.5 (0.4)	1.6 (0.2)	2.6 (0.2)	56.5 (2.0)	77.4 (0.4)	7.6 (0.4)	2.5 (0.1)
≥3 times a year	55.1 (6.7)	80.7 (0.4)	0.7 (0.1)	2.9 (0.4)	56.7 (3.9)	80.8 (0.4)	1.8 (0.2)	3.0 (0.2)	51.8 (1.9)	81.6 (0.4)	8.5 (0.5)	2.8 (0.1)
≥7 times a year	54.0 (6.7)	84.2 (0.3)	0.8 (0.1)	3.4 (0.4)	53.5 (4.0)	84.4 (0.3)	2.1 (0.2)	3.4 (0.3)	47.0 (1.9)	85.1 (0.3)	9.5 (0.5)	3.2 (0.1)
≥Once a month	51.7 (6.5)	86.0 (0.3)	0.8 (0.2)	3.7 (0.5)	50.3 (4.0)	86.2 (0.3)	2.2 (0.2)	3.6 (0.3)	43.6 (2.0)	86.9 (0.3)	9.9 (0.6)	3.3 (0.2)
Twice a month	48.6 (6.5)	88.6 (0.3)	1.0 (0.2)	4.3 (0.6)	47.6 (4.1)	88.7 (0.3)	2.5 (0.3)	4.2 (0.4)	38.3 (1.9)	89.4 (0.3)	10.6 (0.7)	3.6 (0.2)
Once a week	40.0 (6.5)	91.3 (0.2)	1.0 (0.2)	4.6 (0.8)	39.6 (4.6)	91.4 (0.2)	2.8 (0.3)	4.6 (0.5)	30.5 (1.9)	92.0 (0.2)	11.2 (0.8)	3.8 (0.3)
Area under ROC curve (AUC)	MLE binormal AUC = .764, 95% CI [.690, .827]				MLE binormal AUC = .766, 95% CI [.724, .804]				MLE binormal AUC = .748, 95% CI [.729, .765]			

Notes: Figures in parentheses represent standard errors of estimates. Shaded cells denote cutpoints that result in highest combined values of sensitivity (sens.) and specificity (spec.), with sens. constrained to be above 60% if possible. Freq. = frequency; PPV = positive predictive value; PLR = positive likelihood ratio; ROC = receiver operator characteristic; AUC = area under receiver-operator characteristic curve; MLE = maximum likelihood estimation; CI = confidence interval; rx = prescription.

TABLE 3. Performance of single-question screener for past-year drug-use disorder and drug use: U.S. adults 18 years and older with past-year ED utilization

Freq. of drinking 5+/4+ drinks	Drug dependence				Drug-use disorder (abuse and/or dependence)				Drug use			
	% Sens.	% Spec.	% PPV	PLR	% Sens.	% Spec.	% PPV	PLR	% Sens.	% Spec.	% PPV	PLR
Any illicit drug												
≥Once a year	70.4 (5.5)	74.9 (0.7)	4.3 (0.6)	2.8 (0.2)	71.5 (3.5)	75.8 (0.7)	9.5 (0.8)	3.0 (0.2)	65.4 (2.3)	78.1 (0.7)	22.6 (1.3)	3.0 (0.1)
≥3 times a year	64.4 (5.6)	79.6 (0.7)	4.9 (0.7)	3.2 (0.3)	67.4 (3.5)	80.6 (0.7)	10.9 (1.0)	3.5 (0.2)	58.5 (2.3)	82.6 (0.6)	24.8 (1.5)	3.4 (0.2)
≥7 times a year	62.7 (5.9)	83.0 (0.6)	5.6 (0.8)	3.7 (0.4)	65.6 (3.6)	83.9 (0.6)	12.6 (1.1)	4.1 (0.3)	54.9 (2.4)	85.9 (0.6)	27.6 (1.7)	3.9 (0.2)
≥Once a month	61.1 (5.8)	84.9 (0.5)	6.1 (0.9)	4.0 (0.4)	60.1 (3.7)	85.7 (0.5)	12.9 (1.2)	4.2 (0.3)	50.7 (2.4)	87.6 (0.5)	28.6 (1.8)	4.1 (0.3)
≥Twice a month	57.1 (5.8)	87.5 (0.5)	6.9 (1.1)	4.6 (0.5)	56.4 (3.8)	88.3 (0.5)	14.6 (1.4)	4.8 (0.4)	43.7 (2.3)	89.8 (0.5)	29.6 (2.0)	4.3 (0.3)
≥Once a week	47.8 (6.0)	90.1 (0.5)	7.2 (1.3)	4.8 (0.7)	46.8 (4.1)	90.7 (0.4)	15.1 (1.7)	5.0 (0.5)	36.7 (2.3)	92.0 (0.4)	31.1 (2.2)	4.6 (0.4)
Area under ROC curve (AUC)	MLE binormal AUC = .806, 95% CI [.752, .852]				MLE binormal AUC = .823, 95% CI [.793, .850]				MLE binormal AUC = .805, 95% CI [.784, .824]			
Marijuana												
≥Once a year	77.9 (6.8)	74.6 (0.7)	2.2 (0.5)	3.1 (0.3)	76.2 (4.0)	75.4 (0.7)	6.7 (0.7)	3.1 (0.2)	73.8 (2.5)	77.2 (0.7)	16.9 (1.2)	3.2 (0.1)
≥3 times a year	70.7 (7.0)	79.3 (0.7)	2.5 (0.5)	3.4 (0.4)	71.8 (3.9)	80.1 (0.7)	7.7 (0.8)	3.6 (0.2)	66.0 (2.60	81.7 (0.6)	18.5 (1.4)	3.6 (0.2)
≥7 times a year	67.7 (8.1)	82.6 (0.6)	2.8 (0.6)	3.9 (0.5)	69.6 (4.1)	83.4 (0.6)	8.9 (1.0)	4.2 (0.3)	62.8 (2.7)	85.1 (0.6)	20.9 (1.5)	4.2 (0.2)
≥Once a month	65.4 (8.2)	84.5 (0.5)	3.0 (0.7)	4.2 (0.5)	62.7 (4.4)	85.2 (0.5)	9.0 (1.0)	4.2 (0.3)	57.2 (2.8)	86.7 (0.5)	21.3 (1.7)	4.3 (0.3)
≥Twice a month	60.7 (8.2)	87.2 (0.5)	3.4 (0.8)	4.7 (0.7)	59.1 (4.6)	87.9 (0.5)	10.2 (1.2)	4.9 (0.4)	50.6 (2.8)	89.2 (0.5)	22.6 (1.8)	4.7 (0.3)
≥Once a week	51.1 (8.4)	89.8 (0.5)	3.5 (1.0)	5.0 (0.9)	49.2 (4.9)	90.4 (0.5)	10.6 (1.4)	5.1 (0.6)	43.2 (2.8)	91.5 (0.4)	24.2 (2.1)	5.1 (0.4)
Area under ROC curve (AUC)	MLE binormal AUC = .851, 95% CI [.800, .893]				MLE binormal AUC = .853, 95% CI [.825, .878]				MLE binormal AUC = .846, 95% CI [.827, .863]			
Cocaine/crack												
≥Once a year	80.8 (13.2)	74.4 (0.7)	1.1 (0.3)	3.2 (0.5)	73.7 (11.2)	74.5 (0.7)	1.7 (0.4)	2.9 (0.4)	74.8 (7.7)	74.7 (0.7)	3.1 (0.6)	3.0 (0.3)
≥3 times a year	74.7 (13.6)	79.1 (0.7)	1.2 (0.4)	3.6 (0.7)	68.7 (11.3)	79.2 (0.7)	2.0 (0.5)	3.3 (0.6)	71.6 (7.8)	79.5 (0.7)	3.7 (0.7)	3.5 (0.4)
≥7 times a year	74.7 (13.6)	82.4 (0.6)	1.5 (0.4)	4.2 (0.8)	68.7 (11.3)	82.5 (0.6)	2.3 (0.6)	3.9 (0.7)	71.6 (7.8)	82.8 (0.6)	4.3 (0.8)	4.2 (0.5)
≥Once a month	74.7 (13.6)	84.4 (0.5)	1.7 (0.5)	4.8 (0.9)	66.8 (11.2)	84.5 (0.5)	2.5 (0.6)	4.3 (0.7)	68.3 (7.9)	84.7 (0.5)	4.6 (0.9)	4.5 (0.5)
≥Twice a month	70.1 (13.7)	87.0 (0.5)	1.9 (0.6)	5.4 (1.1)	64.1 (11.2)	87.1 (0.5)	2.9 (0.7)	5.0 (0.9)	62.8 (7.6)	87.4 (0.5)	5.1 (1.0)	5.0 (0.6)
≥Once a week	67.4 (13.9)	89.7 (0.5)	2.2 (0.7)	6.5 (1.4)	62.5 (11.4)	89.8 (0.5)	3.6 (0.9)	6.1 (1.2)	58.9 (7.6)	90.0 (0.5)	6.0 (1.2)	5.9 (0.8)
Area under ROC curve (AUC)	MLE binormal AUC = .875, 95% CI [.762, .944]				MLE binormal AUC = .880, 95% CI [.812, .929]				MLE binormal AUC = .880, 95% CI [.840, .913]			
Any illicit rx drug												
≥Once a year	57.7 (9.1)	74.5 (0.7)	1.7 (0.4)	2.3 (0.4)	62.5 (6.0)	74.8 (0.7)	3.6 (0.5)	2.5 (0.2)	59.8 (3.1)	76.0 (0.7)	11.7 (0.9)	2.5 (0.1)
≥3 times a year	52.2 (9.0)	79.2 (0.7)	1.9 (0.4)	2.5 (0.4)	57.9 (6.0)	79.5 (0.7)	4.0 (0.6)	2.8 (0.3)	53.5 (3.1)	80.7 (0.6)	12.8 (1.1)	2.8 (0.2)
≥7 times a year	51.6 (9.0)	82.5 (0.6)	2.2 (0.5)	2.9 (0.5)	57.0 (6.0)	82.8 (0.6)	4.7 (0.7)	3.3 (0.4)	51.1 (3.2)	84.0 (0.6)	14.5 (1.2)	3.2 (0.2)
≥Once a month	48.1 (8.7)	84.4 (0.5)	2.2 (0.6)	3.1 (0.6)	53.9 (6.0)	84.7 (0.5)	5.0 (0.8)	3.5 (0.4)	47.8 (3.2)	85.8 (0.5)	15.2 (1.3)	3.4 (0.3)
≥Twice a month	43.1 (8.6)	87.0 (0.5)	2.5 (0.6)	3.3 (0.7)	49.5 (6.2)	87.4 (0.5)	5.5 (1.0)	3.9 (0.5)	40.9 (3.1)	88.3 (0.5)	15.7 (1.5)	3.5 (0.3)
≥Once a week	34.1 (8.1)	89.6 (0.5)	2.4 (0.6)	3.3 (0.8)	42.1 (6.4)	89.9 (0.5)	5.9 (1.1)	4.2 (0.7)	34.3 (3.2)	90.7 (0.4)	16.4 (1.7)	3.7 (0.4)
Area under ROC curve (AUC)	MLE binormal AUC = .746, 95% CI [.654, .829]				MLE binormal AUC = .765, 95% CI [.701, .821]				MLE binormal AUC = .753, 95% CI [.719, .785]			

Notes: Figures in parentheses represent standard errors of estimates. Shaded cells denote cutpoints that result in highest combined values of sensitivity (sens.) and specificity (spec.), with sens. constrained to be above 60% if possible. Freq. = frequency; PPV = positive predictive value; PLR = positive likelihood ratio; ROC = receiver operator characteristic; AUC = area under receiver-operator characteristic curve; MLE = maximum likelihood estimation; CI = confidence interval; rx = prescription.

ing cocaine-use disorder reflects the fact that cocaine is the DUD most strongly comorbid with AUD, with an odds ratio of 19.2 (Stinson et al., 2005). Given that almost 80% of individuals with a past-year cocaine-use disorder also had a past-year AUD (Stinson et al., 2005), it is not surprising that an AUD screener would also do a good job of screening for cocaine-use disorder. The findings are also supported by a recent ED study that found a threefold to sixfold increase in the risk of illicit drug use among men and women drinking at risk levels consistent with the 5+/4+ definition used in this study (Fleming et al., 2007).

The sensitivities and specificities found for the subsample of individuals with past-year ED utilization in this study exceeded those reported in a recent study of the 5+/4+ drinks screener in a sample of trauma center patients (Ramchand et al., 2009). The weaker performance in that study may reflect the use of a past-30-day reference period for frequency of drinking 5+/4+ drinks, which implies a screening cutpoint of once a month or more—more frequent than the optimal cutpoints for drugs other than cocaine in the current study. One would also expect a stronger degree of association when the time reference periods for the two are identical, as was the case in the current study.

Not surprisingly, the frequency of drinking 5+/4+ drinks performed less accurately in screening for DUDs than AUDs. A previous investigation of the NESARC survey data showed that drinking 5+/4+ drinks three or more times a year had a sensitivity and specificity of 89.5% and 83.3%, respectively, in relation to alcohol dependence (Dawson et al., 2010). The present study showed that at similar levels of specificity, the sensitivity of the screener for drug dependence varied from 54.0% for illicit prescription drugs to 76.0% for cocaine. The differential performance across substances suggests that shared genetic and environmental factors do not explain all of the variance in the alcohol and drug problem behaviors and disorders. Rather, some risk factors appear to be substance-specific and therefore might best be addressed by means of substance-specific screeners.

There are, however, many challenges in trying to compare this study with evaluations of other screeners designed specifically to detect drug use and DUDs. These challenges include different populations, different and often less rigorous gold standards, different approaches to estimating AUC statistics (e.g., nonparametric versus semiparametric) that might yield slightly different values, and the fact that some studies have used measures that combined AUDs and DUDs. Although the World Health Organization's Alcohol, Smoking and Substance Involvement Screening Test (ASSIST; Humeniuk et al., 2008) has shown promise in populations of primary care and drug treatment patients (Henrique et al., 2004; Hides et al., 2009; Humeniuk et al., 2008; Newcombe et al., 2005), most of the published studies have examined the distinctions between use and abuse and between abuse and dependence, measures not directly addressed in the present study. The few studies that are more directly comparable generally suggest that longer, drug-specific screeners yield only slightly higher values of sensitivity and specificity than those for the 5+/4+ drinks single-item screener. In a review of studies examining the five-item Severity of Dependence Scale (Gossop et al., 1995) and the Problematic Use of Marijuana Scale (Okulicz-Kozaryn, 2007) for screening cannabis dependence in the general population, Piontek et al. (2008) reported AUC values of .85 to .92, compared with .851 in the current study. However, screening for marijuana use using the 10-item Cannabis Use Disorders Identification Test (Adamson and Sellman, 2003) in a clinical sample of alcoholics resulted in AUC values of .63 to .76 (Annaheim et al., 2008), lower than the AUC of .835 for use in the current study. At a cutpoint of 2 or more, a cocaine-specific version of the Severity of Dependence Scale resulted in a sensitivity and specificity of 73% and 82%, respectively, in screening for cocaine dependence in a cross-sectional survey of past-6-month cocaine users (Kaye and Darke, 2002), compared with 76.0% and 86.0%, respectively, for drinking 5+/4+ drinks once or more a month. However, at specificities greater than 90%, the Severity of Dependence Scale screener had higher levels of sensitivity than the single-item 5+/4+ drinks screener. Although most published studies have not provided standard errors for their screening measures, the fairly broad standard errors for the ED subsample in this study—a sample larger than those used in most prior studies—suggest that few, if any, of the differences across screening instruments would be statistically significant.

The primary limitation of this study is the fact that both the screening and gold standard measures were based on respondents' self-reports. Any broad tendency to withhold or fully provide requested information might tend to upwardly bias estimates of screening performance. Moreover, the questions on which the single-item screener was based were embedded in a long sequence of questions on past-year alcohol consumption, which may have increased the accuracy of reporting relative to what would be obtained by actually asking a single question on 5+/4+ drinking. Moreover, the 5+/4+ questions were not asked of all respondents but were filled on the basis of responses to prior questions for the majority of respondents. In addition, reporting of both 5+/4+ drinking and illicit drug use might be more honest in a confidential survey interview setting than in a medical setting where the responses could be linked with individuals' medical records, thus creating a bias toward better reporting than what might be expected in a nonconfidential medical setting. Another limitation is that the gold standard conditions against which the screener was tested did not include drug use with consequences that failed to meet the criteria for a DUD. In addition, although the drug-use and DUD measures showed generally good to excellent test-retest reliability, they were not externally validated. Finally, whereas the NESARC

identified past-year ED users, it did not identify past-year primary care patients; thus, we were unable to test the single-item screener in one of the subpopulations where it would most likely be used. These limitations indicate the need for caution in interpreting the results of this study and for replication in relevant subpopulations.

In summary, a single-item screener comprising the frequency of drinking 5+/4+ drinks shows strong promise for detecting marijuana and cocaine use and problems in general population samples. Although not optimal as a screener for illicit prescription drug use, it does a fairly good job of screening for any drug use or DUD, suggesting that it may also perform well for specific drugs not examined in this study, including hallucinogens and inhalants. The virtues of the screener include its brevity and its applicability across drug types without the need for drug-specific wording. Arguably, it is also less embarrassing to ask about a legal than an illegal practice, and individuals may be more likely to accurately report (and physicians to query) an activity for which they are not at risk of legal penalties. Most importantly, its demonstrated ability to accurately screen for AUDs and hazardous drinking (Dawson et al., 2010) means that drug screening can be thought of as "added value" from an item already likely to be asked in the interest of detecting problem drinking. These findings remind us of the interrelated nature of all substance-use disorders. The highest comorbidities for AUDs are typically with respect to other substance-use disorders (Hasin et al., 2007), and AUDs are very common among individuals with illicit DUDs (Compton et al., 2007).

Future investigation of the 5+/4+ drinks screener in primary care and ED samples should help to clarify its utility in those settings. Future work might consider a simple two-stage screening process for both alcohol and illicit drugs to help busy clinicians rule out the large number of negative cases while simultaneously identifying persons with problematic use. Using the alcohol consumption screener as a starting point, follow-up questions for patients who screen positive should include assessment of illicit and prescription drug use as well as AUDs. The additional screening questions may be very brief but are required to ascertain related diagnoses and the degree of severity of involvement with all substances. By ruling out the majority of patients on the basis of the initial 5+/4+ drinks screen, incorporation of additional second-stage screening questions would still represent a reduction of the aggregate patient burden relative to asking brief drug screeners such as the ASSIST or Drug Abuse Screening Test–10 (DAST-10) of the total patient population, and the performance of the two approaches in detecting drug use and DUDs could be compared. If the promising performance of the 5+/4+ drinks screener is thus borne out in practical application, this single-item screener should be incorporated as a standard intake item for patients seeking routine or emergency medical care.

References

Adamson, S. J., & Sellman, J. D. (2003). A prototype screening instrument for cannabis use disorder: The Cannabis Use Disorders Identification Test (CUDIT) in an alcohol-dependent clinical sample. *Drug and Alcohol Review, 22,* 309-315.

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: Author.

Annaheim, B., Rehm, J., & Gmel, G. (2008). How to screen for problematic cannabis use in population surveys: An evaluation of the Cannabis Use Disorders Identification Test (CUDIT) in a Swiss sample of adolescents and young adults. *European Addiction Research, 14,* 190-197.

Cartwright, W. S. (1999). Costs of drug abuse to society. *Journal of Mental Health Policy and Economics, 2,* 133-134.

Cherpitel, C. J., & Ye, Y. (2008). Drug use and problem drinking associated with primary care and emergency room utilization in the US general population: Data from the 2005 national alcohol survey. *Drug and Alcohol Dependence, 97,* 226-230.

Colliver, J. D., Compton, W. M., Gfroerer, J. C., & Condon, T. (2006). Projecting drug use among aging baby boomers in 2020. *Annals of Epidemiology, 16,* 257-265.

Compton, W. M., Thomas, Y. F., Stinson, F. S., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV drug abuse and dependence in the United States. *Archives of General Psychiatry, 64,* 566-576.

Compton, W. M., & Volkow, N. D. (2006). Abuse of prescription drugs and the risk of addiction. *Drug and Alcohol Dependence, 83* (Suppl. 1), S4-S7.

Cummings, G. E., Francescutti, L. H., Predy, G., & Cummings, G. (2006). Health promotion and disease prevention in the emergency department: A feasibility study. *Canadian Journal of Emergency Medicine, 8,* 100-105.

Dawson, D. A., Pulay, A. J., & Grant, B. F. (2010). A comparison of two single-item screeners for alcohol use disorder. *Alcoholism: Clinical and Experimental Research, 34,* 364-374.

Dawson, D. A., Li, T.-K., & Grant, B. F. (2008). A prospective study of risk drinking: At risk for what? *Drug and Alcohol Dependence, 95,* 62-72.

Fleming, E. A., Gmel, G., Bady, P., Yersin, B., Givel, J. C., Brown, D., & Daeppen, J.-B. (2007). At-risk drinking and drug use among patients seeking care in an emergency department. *Journal of Studies on Alcohol and Drugs, 68,* 28-35.

Friedmann, P. D., McCullough, D., & Saitz, R. (2001). Screening and intervention for illicit drug use: A national survey of primary care physicians and psychiatrists. *Archives of Internal Medicine, 161,* 248-251.

Gentilello, L. M. (2005). Confronting the obstacles to screening and interventions for alcohol problems in trauma centers. *The Journal of Trauma-Injury, Infection, and Critical Care, 59* (Suppl. 3), S137-S143.

Gentilello, L. M. (2007). Alcohol and injury: American College of Surgeons Committee on trauma requirements for trauma center intervention. *The Journal of Trauma-Injury, Infection, and Critical Care, 62* (Suppl. 6), S44-S45.

Gossop, M., Darke, S., Griffiths, P., Hando, J., Powis, B., Hall, W., & Strang, J. (1995). The Severity of Dependence Scale (SDS): Psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction, 90,* 607-614.

Grant, B. F., Dawson, D. A., & Hasin, D. S. (2001). *The Alcohol Use Disorder and Associated Disabilities Interview Schedule—DSM-IV Version.* Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, S. P., Dufour, M. C., & Pickering, R. P. (2004). The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991-1992 and 2001-2002. *Drug and Alcohol Dependence, 74,* 223-234.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, S. P., Kay, W., & Pickering, R. P. (2003b) The Alcohol Use Disorder and Associated Dis-

abilities Interview Schedule-IV (AUDADIS-IV): Reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug and Alcohol Dependence, 71,* 7-16.

Grant, B. F., Harford, T. C., Dawson, D. A., Chou, P. S., & Pickering, R. P. (1995). The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): Reliability of alcohol and drug modules in a general population sample. *Drug and Alcohol Dependence, 39,* 37-44.

Grant, B. F., Kaplan, K., Shepard, J., & Moore, T. (2003a). *Source and accuracy statement for Wave 1 of the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions.* Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

Gunderson, E. W., Levin, F. R., & Smith, L. (2005). Screening and intervention for alcohol and illicit drug abuse: A survey of internal medicine housestaff. *Journal of Addictive Disease, 24* (2), 1-18.

Hasin, D. S., Stinson, F. S., Ogburn, E., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry, 64,* 830-842.

Henrique, I. F., De Micheli, D., Lacerda, R. B., Lacerda, L. A., & Formigoni, M. L. (2004). Validation of the Brazilian version of Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). *Revista da Associacao Medica Brasileira, 50,* 199-206.

Hides, L., Cotton, S. M., Berger, G., Gleeson, J., O'Donnell, C., Proffitt, T., . . . Lubman, D. I. (2009). The reliability and validity of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) in first-episode psychosis. *Addictive Behaviors, 34,* 821-825.

Humeniuk, R., Ali, R., Babor, T. F., Farrell, M., Formigoni, M. L., Jittiwutikarn, J., . . . & Simon, S. (2008). Validation of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). *Addiction, 103,* 1039-1047.

Kaye, S., & Darke, S. (2002). Determining a diagnostic cut-off on the Severity of Dependence Scale (SDS) for cocaine dependence. *Addiction, 97,* 727-731.

Khalsa, J. H., Treisman, G., McCance-Katz, E., & Tedaldi, E. (2008). Medical consequences of drug abuse and co-occurring infections. *Substance Abuse, 29,* 5-16.

Khalsa, J. H., Genser, S., Francis, H., & Martin, B. (2002). Clinical consequences of marijuana. *Journal of Clinical Pharmacology, 42* (11 Suppl.) 7S-10S.

Maheux, B., Haley, N., Rivard, M., & Gervais, A. (1999). Do physicians assess lifestyle health risks during general medical examinations? A survey of general practitioners and obstetrician-gynecologists in Quebec. *Canadian Medical Association Journal, 160,* 1830-1834.

Manwell, L. B., Fleming, M. F., Johnson, K., & Berry, K. L. (1998). Tobacco, alcohol, and drug use in a primary care sample: 90-day prevalence and associated factors. *Journal of Addictive Diseases, 17,* 67-81.

Martins, S. S., Copersino, M. L., Soderstrom, C. A., Smith, G. S., Dischinger, P. C., McDuff, D. R., . . . Gorelick, D. A. (2007). Sociodemographic characteristics associated with substance use status in a trauma center inpatient population. *Journal of Addictive Diseases, 26,* 53-62.

Mertens, J. R., Weisner, C., Ray, G. T., Fireman, B., & Walsh, K. (2005). Hazardous drinkers and drug users in HMO primary care: Prevalence, medical conditions and costs. *Alcoholism: Clinical and Experimental Research, 29,* 989-998.

Metz, C. E. (2003). *ROCKIT 0.9B* (Beta Version). Chicago, IL: University of Chicago Press.

Miller, J. W., Naimi, T. S., Brewer, R. D., & Jones, S. E. (2007). Binge drinking and associated health risk behaviors among high school students. *Pediatrics, 119,* 76-85.

Newcombe, D. A., Humeniuk, R. E., & Ali, R. (2005). Validation of the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): Report of results from the Australian site. *Drug and Alcohol Review, 24,* 217-226.

Office of National Drug Policy. (2004). *The economic costs of drug abuse in the United States: 1992-2002* (Publication No. 207303). Washington, DC: Executive Office of the President.

Okulicz-Kozaryn, K. (2007). Ocena psychometryczynch wlasciwoski test "Problemowe uzywanie marihuany" (PUMP dia dorastajacych). *Postepy Psychiatrii Neurologii, 16,* 105-111.

Piontek, D., Kraus, L., & Klempova, D. (2008). Short scales to assess cannabis-related problems: A review of psychometric properties. *Substance Abuse Treatment, Prevention, and Policy, 3,* 25-34.

Ramchand, R., Marshall, G. N., Schell, T. L., Jaycox, L. H., Hambarsoomians, K., Shetty, V., . . . Belzberg, H. (2009). Alcohol abuse and illegal drug use among Los Angeles County trauma patients: Prevalence and evaluation of single item screener. *The Journal of Trauma-Injury, Infection, and Critical Care, 66,* 1461-1467.

Rehm, J., Taylor, B., & Room, R. (2006). Global burden of disease from alcohol, illicit drugs and tobacco. *Drug and Alcohol Review, 25,* 503-513.

Research Triangle Institute. (2002). *Software for survey data analysis (SUDAAN)* (Version 8.0). Research Triangle Park, NC: Research Triangle Institute.

Rockett, I. R. H., Putnam, S. L., Jia, H., & Smith, G. S. (2003). Assessing substance abuse treatment need: A statewide hospital emergency department study. *Annals of Emergency Medicine, 41,* 802-813.

Rose, J. S., Herman, D. S., Hagerty, C., Phipps, M. G., Peipert, J. F., & Stein, M. D. (2007). Marijuana use among young women in a primary care setting. *Journal of General Internal Medicine, 22,* 826-829.

Schermer, C. R., Gentilello, L. M., Hoyt, D. B., Moore, E. E., Rozycki, G. S., & Feliciano, D. V. (2003). National survey of trauma surgeons' use of alcohol screening and brief intervention. *The Journal of Trauma-Injury, Infection, and Critical Care, 55,* 849-856.

Smith, P. C., Schmidt, S. M., Allensworth-Davies, D., & Saitz, R. (2009). Primary care validation of a single-question alcohol screening test. *Journal of General Internal Medicine, 24,* 783-788.

Stewart, S. H., Borg, K. T., & Miller, P. M. (2008). Prevalence of problem drinking and characteristics of a single-question screen. *Journal of Emergency Medicine,* E-pub June 6 ahead of print.

Stinson, F. S., Grant, B. F., Dawson, D. A., Ruan, W. J., Huang, B., & Saha, T. (2005). Comorbidity between DSM-IV alcohol and specific drug use disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence, 80,* 105-116.

Substance Abuse and Mental Health Services Administration. (2009). *Results from the 2008 National Survey on Drug Use and Health: National Findings.* (Office of Applied Studies, NSDUH Series H-36, HHS Publication No. SMA 09-4434). Rockville, MD.

Swets, J. A., & Pickett, R. M. (1982). *Evaluation of diagnostic systems: Methods from Signal Detection Theory.* San Diego, CA: Academic Press.

Williams, J. M., Chinnis, A. C., & Gutman, D. (2000). Health promotion practices of emergency physicians. *American Journal of Emergency Medicine, 18,* 17-21.

Williams, R., & Vinson, D. C. (2001). Validation of a single screening question for problem drinking. *Journal of Family Practice, 50,* 307-312.

Yoast, R. A., Wilford, B. B., & Hayashi, S. W. (2008). Encouraging physicians to screen for and intervene in substance use disorders: Obstacles and strategies for change. *Journal of Addictive Diseases, 27,* 77-97.