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Adolescent substance use screening in primary care: validity of computer self-administered vs. clinician-administered screening

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Abstract

Background—Computer self-administration may help busy pediatricians' offices increase adolescent substance use screening rates efficiently and effectively, if proven to yield valid responses. The CRAFFT screening protocol for adolescents has demonstrated validity as an interview, but a computer self-entry approach needs validity testing. The aim of this study was to

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AUTHOR CONTRIBUTIONS

Drs. Harris and Knight had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Drs. Harris, Knight, and Saitz, conceptualized and designed the study; obtained funding; oversaw study implementation; performed data analysis and interpretation; drafted the initial manuscript; revised the manuscript critically for important intellectual content; approved the final manuscript to be published; and agree to be accountable for all aspects of the work. Ms. Van Hook coordinated and supervised data collection across all sites; acquired study data; revised the manuscript critically for important intellectual content; approved the final manuscript to be published; and agrees to be accountable for all aspects of the work. Mr. Sherritt substantially contributed to the design of the study, developed the computerized screening and data collection programs; performed data analysis and interpretation; revised the manuscript critically for important intellectual content; approved the final manuscript to be published; and agrees to be accountable for all aspects of the work. Drs. Brooks, Kulig, and Nordt substantially contributed to the acquisition of study data; revised the manuscript critically for important intellectual content; approved the final manuscript to be published; and agree to be accountable for all aspects of the work.

evaluate the criterion validity and time efficiency of a computerized adolescent substance use screening protocol implemented by self-administration or clinician-administration.

Methods—12- to 17-year-old patients coming for routine care at three primary care clinics completed the computerized screen by both self-administration and clinician-administration during their visit. To account for order effects, we randomly assigned participants to self-administer the screen either before or after seeing their clinician. Both were conducted using a tablet computer and included identical items (any past-12-month use of tobacco, alcohol, drugs; past-3-months frequency of each; and six CRAFFT items). The criterion measure for substance *use* was the Timeline Follow-Back, and for alcohol/drug use *disorder*, the Adolescent Diagnostic Interview, both conducted by confidential research assistant-interview after the visit. Tobacco dependence risk was assessed with the self-administered Hooked on Nicotine Checklist (HONC). Analyses accounted for the multi-site cluster sampling design.

Results—Among 136 participants, mean age was 15.0±1.5 yrs, 54% were girls, 53% were Black or Hispanic, and 67% had ≥3 prior visits with their clinician. Twenty-seven percent reported any substance *use* (including tobacco) in the past 12 months, 7% met criteria for an alcohol or cannabis use disorder, and 4% were HONC-positive. Sensitivity/specificity of the screener were high for detecting past-12-month *use* or *disorder* and did not differ between computer and clinician. Mean completion time was 49 seconds (95%CI 44-54) for computer and 74 seconds (95%CI 68-87) for clinician (paired comparison $p<0.001$).

Conclusions—Substance use screening by computer self-entry is a valid and time-efficient alternative to clinician-administered screening.

Keywords

Adolescents; substance use; primary care; screening; validity (epidemiology); computers; alcohol; tobacco; cannabis; drugs

INTRODUCTION

Adolescent substance use is strongly linked to a spectrum of serious health risks and problems, making routine pediatric office visits a promising venue for screening and brief counseling.[1] Yet screening rates are low among pediatricians,[2,3] who must see patients quickly and have a growing list of recommended behavioral health assessments. One potential solution is to use a computer system that allows adolescent patients to complete the screen before the clinician visit and yields a report for the clinician to review with the patient during the visit. Adolescents may be more likely to disclose sensitive information if there is some distance between the screening and talking with their clinician, and it leaves more time during the visit for the clinician to conduct further assessment and offer counseling.[4] A computerized system also allows multiple health-risk behaviors (e.g., tobacco, alcohol, and drug use) to be combined into a single screener, and the use of automatic skip patterns increases item clarity and improves overall time efficiency. Computerization improves standardization of screening, and integration with electronic health records may boost screening and documentation rates.[4-8] Studies of computerized screening of adolescents in medical settings generally show strong acceptability and feasibility among both patients and providers.[4,7,9,10]

The CRAFFT is a substance use screening protocol specifically designed for adolescents, and is brief enough for busy clinicians to use.[11] It is the screener most thoroughly studied among adolescents[12], and the most widely recommended in the U.S. and abroad. [13-15] The CRAFFT, as originally developed, included six yes/no questions referred to by the mnemonic CRAFFT (Car, Relax, Alone, Forget, Family/friends, and Trouble). A score of 2 or more "yes" responses to these six items was found to have the best combination of sensitivity (80%) and specificity (86%) for detecting a substance use disorder in a primary care population.[12,16] The CRAFFT screen has since been expanded to begin with a set of opening questions that ask about *any* past-12-month alcohol, cannabis or other drug use, followed by the six original items (for current version, see http://www.ceasar-boston.org/CRAFFT/pdf/CRAFFT_English.pdf). These opening questions give clinicians important information on usage, facilitate early intervention, and allow a skip-pattern for non-users that minimizes confusion and improves time-efficiency. More recently, we further expanded the CRAFFT screening protocol to include items on tobacco use, since tobacco is the leading cause of mortality in the US[17], and on the past-3-month frequency of use of each substance (i.e., recent consumption pattern).

While the original six-item CRAFFT screen has demonstrated criterion validity for identifying adolescents with a substance use disorder[16], the added questions on substance *use* and *frequency* need validation. Moreover, the original CRAFFT was tested as an *interview*, and a computerized self-entry version also needs validation. To that end, we developed a computerized screening program, based on user feedback and revision, that is optimized to run on an iPad or similar tablet device, and can be used before the clinician encounter (i.e., teens read the questions and directly enter their responses), or during the visit (i.e., clinicians read the questions aloud and enter the teen's responses, hereafter referred to as "clinician-administration" [CA]). The objective of this study was to evaluate the criterion validity of this updated CRAFFT screening protocol in computer self-administered and clinician-administered modes. Specifically, we evaluated validity of the two screening modes to identify substance *use* and *disorders* among 12- to 17-year-old primary care patients. We also examined the time required by patients to complete the screening in each mode.

METHODS

We conducted this multi-site study during 2012-2013 at three large urban, teaching hospital-affiliated primary care offices located in Massachusetts (two adolescent clinics and one general pediatric practice), with 9 clinicians (8 attending physicians, 1 nurse practitioner) participating.

The recruitment procedure was identical at all sites. Patients aged 12- to 17-years arriving for well-visits, who were medically and emotionally stable on the day of the visit, and able to read and understand English were eligible. Minimum participant age was 13 at the adolescent clinics, and 12 at the general pediatric practice. Research assistants (RAs) worked with clinic staff to identify eligible patients with upcoming well-visit appointments whom they then recruited either through phone contact before the visit or upon arrival at the clinic. Recruitment was limited to patients of participating clinicians, and was guided by an

age- and gender-stratified recruitment table to ensure equal numbers of participants across the age-gender groups in the sample. At the time of visit check-in, RAs explained the study purpose, procedures, and confidentiality protections, answered questions, and obtained written adolescent assent. Assenting patients then immediately completed a short six-item computerized demographics questionnaire which assessed gender, age, grade in school, two socioeconomic status indicators (number of parents/guardians living at patient's primary home, highest education level completed by any parents/guardians living at home), and race/Hispanic ethnicity. All participants were screened by both computer tablet-based self-administration (SA) and clinician-administration (CA). RAs provided participants with a brief orientation on how to complete the tablet screening program, and clinicians received training on the screening protocol and tablet computer program during one of their weekly staff meetings. To account for possible order effects, we randomly assigned participants to complete the SA screen either before or after the visit and CA screening. When SA occurred first, clinicians were "blinded" to the results of the SA screen.

Participants received a $25 merchandise certificate for study completion. The institutional review boards of the lead coordinating institution and each recruitment site approved the study design and protocol and authorized a waiver of the requirement for parental consent for adolescents under 18 years of age in accordance with published guidelines for adolescent health research.[18]

Computerized Screening Program

The SA and CA modes used the same computer program and thus included identical items in the same order and format. The opening questions on any past-12-month use of tobacco, alcohol, cannabis, and other drugs (e.g., "During the past 12 months, did you ever drink any alcohol? Don't count one or two sips taken during religious or family events.") were presented in a grid on the first page. The opening questions were followed by a past-3-month *frequency* item for each substance used (e.g., "During the past 3 months, about how often did you …?"; response scale "Never," "Once or Twice," "Monthly," "Weekly," "Almost Daily," "Daily" derived from the Alcohol, Smoking and Substance Involvement Screening Test [ASSIST])[19,20]; and then by the six original CRAFFT[11,16] questions. The "Car" question (driving while impaired/riding with an impaired driver) was asked of all patients, and the RAFFT questions only of those reporting past-12-month use of substances other than tobacco.

In the CA mode, the primary clinician read the questions aloud from the iPad and entered the patient's responses. The computer screening program allowed items to be skipped, but an automated reminder message highlighted the skipped item before going to the next screen. The program automatically recorded the user-elapsed times for each click and each page which were summed to determine the total screening completion time.

Validation Measures

Our criterion measure for past-12-month and past-90-day substance use was an adapted Timeline Follow-Back (TLFB) interview.[21,22] The TLFB is a reliable and valid method used extensively in substance use studies of both adults and adolescents to measure self-reported

frequency and quantity of substance use during a defined time period. By utilizing a calendar and specific memory aids to enhance recall, it has been shown to yield more precise estimates of use than simple quantity and frequency questions[23-25]. The TLFB has also been shown to have good validity compared to biomarkers such as salivary cotinine in the assessment of smoking.[26]

To assess sensitivity/specificity of the screening items to detect substance use *disorders*, we used the Adolescent Diagnostic Interview (ADI)[27-29], a structured interview for identifying a substance abuse or dependence disorder based on DSM-IV criteria. We chose the ADI to allow direct comparison of validity statistics between this study and a prior CRAFFT validation study[16] in which the ADI and screening were conducted by RA interview. In a prior validation study, ADI sensitivity/specificity for detecting alcohol abuse was .87/.87, alcohol dependence .90/.95, cannabis abuse .85/.92, and cannabis dependence .92/.92.[27]

Both the TLFB and ADI were administered by a trained research assistant in a confidential interview immediately after the visit and completion of both screening modes. Research assistants were blind to the results of both the self-administered and clinician-interview screening. To identify risk for tobacco dependence, we administered the Hooked on Nicotine Checklist, a 10-item nicotine dependence screen previously shown to be sensitive to loss of autonomy over tobacco use, even at the early stages, and to be valid for use with adolescents ages 12 and older.[30-32]

Post-Visit Ratings of Care

Because the patient-provider relationship could affect the likelihood of patient disclosure of sensitive information such as substance use, participants also completed a brief post-visit questionnaire consisting of items assessing the number of prior visits with the clinician and how connected they felt to that clinician, which was assessed using the Youth Connectedness to Provider scale,[33], consisting of 7 items (e.g., “How much do you feel that this doctor cares about you?”) and a five-point response scale ranging from “1=Not at all” to “5=Very much.” Item scores were summed to form a total score which ranged from 7 to 35.

Data Analyses

To validate the opening questions, we collapsed TLFB data into a dichotomous variable for any/no past-12-month use of each substance, and examined sensitivity (% of true positives identified by the screen as positive) and specificity (% of true negatives that screen negative) of each opening question compared to these dichotomous variables. To validate the past-3-month frequency items, we collapsed TLFB data for the most recent 3-month period into five categories so as to match the frequency response scale on the screening tool (i.e., “None”=0 days, “Once or twice”=1-2 days, “Monthly” =3-12 days, “Weekly”=13-60 days, “Almost daily/Daily”=≥61 days). We then conducted a paired comparison of the screening responses and the TLFB variables using the Wilcoxon signed-ranks test.

To evaluate validity for identifying a substance use *disorder*, we computed dichotomous variables derived from the ADI for any/no alcohol or cannabis abuse or dependence according to DSM-IV criteria. Loss of autonomy over tobacco use (dependence risk) was

defined as a score≥1 on the Hooked on Nicotine Checklist[30]. We calculated sensitivity, specificity, positive likelihood ratios (sensitivity/1-specificity, or ratio of the true positive rate over false positive rate), and negative likelihood ratios (1-sensitivity/specificity, or ratio of the false negative rate over true negative rate). We calculated 95% confidence intervals (95%CI) for each validity statistic using SUDAAN® v.10.0 to account for correlated error arising from our multi-site cluster-sampling design.

To determine whether screening times differed between self-administered and clinician-interview modes, we conducted generalized linear mixed modeling with site and participant as random effects and screening mode as the predictor variable.

RESULTS

Sample Characteristics

Of 141 eligible invited patients, 139 agreed (98.6% participation rate), and 136 (97.8% of agreed) had complete data for analysis. Sixty-nine patients completed the SA screening first, while 67 patients received the CA first. The overall sample was slightly more than half girls, had a mean ± standard deviation age of 15.0 ± 1.5 years, and was racially and socioeconomically diverse (Table 1). Nearly equal numbers of patients saw an adolescent medicine specialist vs. a general pediatrician. Over two-thirds of participants had ≥3 prior visits with their clinician, and scores tended to be high on the Youth Connectedness to Provider scale. There were no differences in demographic characteristics or visit ratings between the SA-first and CA-first groups.

Overall, 27% reported use of any substance (including tobacco) in the past 12 months according to Timeline Follow-back data. Alcohol was the most prevalent, followed by cannabis (Table 1). Only four participants reported use of drugs other than cannabis; three had non-medical use of prescribed or over-the-counter medications and one used an illicit drug other than cannabis. Because of these small numbers, we were unable to evaluate validity for specific drugs other than cannabis. On the six CRAFFT items, 15 (11%) participants had a score ≥2 on the SA screen, and 13 (10%) on the CA. Interestingly, for the “Car” item, youth disclosed this sensitive behavior more often on the SA screen (n=26) than on the CA (n=19). On the ADI, 9 participants (7%) met DSM-IV criteria for a substance use disorder (i.e., abuse or dependence), while an additional 16 (11%) reported experiencing at least one substance-related problem but did not meet full criteria for a disorder. Six participants (4%) screened positive on the Hooked on Nicotine Checklist.

Screening Time

Screening completion time differed significantly between the two modes with SA taking, on average, 49 seconds (95%CI 44-54) compared to 74 seconds (95%CI 68-87) for CA (corrected F-statistic=140.5, p<0.001). For participants reporting *no* past-12-month substance use, average SA and CA screening times were 40 (95%CI 36-44) and 62 (95%CI 52-73) seconds, respectively, while for those reporting *any* past-12-month use, the times were about twice as long (73 [95%CI 63-83] and 116 [95%CI 99-133] seconds).

Criterion Validity for Past-12-Month Use

Disclosure of any past-12-month substance use was highest on the confidential TLFB interview (35 reported any use compared to 30 for SA and 33 for CA). Sensitivity and specificity for the opening questions did not differ significantly between SA and CA, but varied by substance, with the alcohol and cannabis items having lower sensitivities compared to tobacco (Table 2). Among the 35 participants reporting past-12-month use on the TLFB, 11 were missed by either the SA or CA screening. Five of the 11 were missed by both and all had no more than two days of use in the past year. Among the remaining six that were detected by only one of the screening modes, five disclosed on the *second* screen (4 disclosed alcohol use, 2 cannabis use), suggesting a possible order effect. Among the original 11 missed, only three had >6 days of use in the past 12 months, and all three were identified in the CA mode.

Criterion Validity for Past-3-Month Frequency

One in five participants (n=28, 21%) reported using tobacco, alcohol, or cannabis at least once in the past 3 months on the TLFB (data not shown). Eighteen (13%) reported at least weekly use, and 10 (7%) near-daily or daily use. We found no differences between past-3-month frequency of tobacco and alcohol use on the SA and CA screens compared to the TLFB. For cannabis use, however, we found a tendency to under-report frequency on the screens compared to the TLFB. On the SA screen, 11 respondents reported a lower frequency of cannabis use than indicated in their TLFB data, while four reported higher frequency (Wilcoxon signed-rank test z-statistic= −2.15, p=0.03). Similarly, on the CA screen, eight reported lower frequency compared to their TLFB report, while three reported higher (z-statistic= −1.71, p=0.09).

Validity for Detecting a Substance Use Disorder

Test characteristics for detecting a substance use disorder were generally similar between SA and CA for all three components of the CRAFFT screening protocol (i.e., past-12-month use, past-3-month frequency, and score on the six original items) (Table 3). Because of the small numbers with ≥weekly use in this sample (n=9), we collapsed the “monthly,” “weekly” and “almost daily/daily” categories for these analyses. The discrepancy in sensitivities between SA and CA for ≥monthly use of alcohol is attributable to a difference of only two respondents, so this result should be viewed with caution. The past-12-month use items had the highest sensitivities (i.e., the fewest missed positives) across the screening variables compared (Table 3). Not surprisingly, more frequent use (≥monthly) was associated with the highest *specificities* (i.e., the fewest false positives) and positive likelihood ratios for identifying a disorder. A CRAFFT score≥2 had specificities that were as high as the past-3-month frequency variables, but had better sensitivities.

DISCUSSION

This study shows that computer self-administration and clinician-administration of the CRAFFT screening protocol are equally valid ways to screen adolescent primary care patients for substance use and disorders, but that computer self-administration (SA) is more time-efficient. Given the lengthy list of recommended health-risk screenings, pediatric

primary care clinicians typically have only 2- to 3-minutes total to spend on both substance use screening and brief counseling. Computer self-administered screening before the visit would allow them to devote all of this time to counseling, and further assessment as needed. We have previously shown that a computerized CRAFFT screen, coupled with informational feedback and 2- to 3-minutes of clinician counseling significantly reduced patients' substance use at 3- and 12-month follow-ups.[10]

The current study suggests that the opening questions on past-12-month alcohol and cannabis *use* may need to be improved because of their low sensitivity (<80%) relative to the TLFB criterion standard, particularly in the SA mode. One possible reason for this poor performance was our presentation of these items in a grid format on a single page. This type of formatting has been found to take less time to complete than one-question-at-a-time presentation.[34] However, this formatting has also been found to be associated with "straight-lining" or "non-differentiation" of responses, and therefore, increased measurement error.[34] This phenomenon has been found with grids containing as few as four items.[35,36] The use of yes/no questions may also have contributed to lower sensitivity. Prior studies suggest that yes/no questions have greater potential for "motivated underreporting" and social desirability bias, particularly regarding sensitive topics, than questions that ask "how many" or "how often" which implicitly convey an expectation of the behavior.[34]

Therefore, an alternative approach would be to begin the screen with past-12-month *frequency* items; i.e., "During the past 12 months, *on how many days* did you use [substance name]?" with either a write-in response text field, or a frequency response scale (e.g., Never, Less than monthly, Monthly, About weekly, etc.). Including the instruction "Please check 'Never' if you haven't used" would be important to convey that non-use is also normative. Past-12-month frequency items would also obviate the need to ask about past-3-month frequency, thus shortening the screen. The past 12 months is the preferred timeframe for these opening questions, having higher sensitivities for detecting a disorder than past-3-month frequency. For an initial screen, the highest sensitivity is preferred, even at the expense of lower specificity (i.e., more false-positive results), to avoid missing anyone who may be at risk. False-positive results can then be clarified by further assessment with questions that have high specificity. Interestingly, a CRAFFT score ≥2 had similar specificity, but better sensitivity, for detecting a disorder compared to any past-3-month use, thus making the past-3-month frequency items redundant.

One screening item for which the SA mode appears to have an advantage over the CA mode is the substance-related riding/driving risk ("Car") item. We found greater disclosure of this dangerous behavior in the SA mode, a finding consistent with previous studies that showed that less socially desirable behaviors were more often reported in response to self-administered questionnaires compared to face-to-face interviews.[37-39]

Strengths of our study include a racially and ethnically diverse sample; randomization to account for a possible order effect of screening modes; and completion of both self-entry and clinician-screening by all patients allowing for direct comparison. Our findings also provide additional evidence for the validity of the six CRAFFT items for detecting substance

use disorders, regardless of screening method, which is consistent with a growing body of research in a wide variety of adolescent populations[12] and languages.[40-43]

Some potential study limitations warrant consideration. We recruited from well-visits only (i.e., not from urgent care), the sample size was small, and the prevalence of use was low. In particular, the results for tobacco should be viewed with caution due to its low prevalence in this sample. The psychometric properties described here may not be generalizable to other modes of administration (e.g., paper self-administered), or other adolescent populations such as those with more severe substance use. Moreover, screening participants twice in the same study session may have altered screener performance, compared to being screened once. The clinicians participating in this study tended to be experienced pediatric clinicians who had long-standing relationships with many of their patients. Validity of clinician-administered screening might be different in general pediatric or family medicine practices.

Based on our study findings, we recommend computerized self-administered screening as a time-efficient, and similarly valid, alternative to clinician-administration. The enhanced, computerized CRAFFT screening protocol now assesses past-12-month *use*, *safety risk* (Car question), and *problematic use* (RAFFT items). Future studies should examine whether single-item questions on past-12-month use *frequency* improves sensitivity over the yes/no "any use" items in detecting use, as well as examine validity compared to DSM-V criteria. There is an urgent need for efficient, computerized office systems for screening, brief intervention, and referral to treatment in pediatric primary care settings. Substance addiction is a costly disease with a pediatric onset. A pediatrician screening and early intervention protocol that is effective and time-efficient could be widely applied, with substantial benefits to public health.

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Table 1

Characteristics of the sample (N=136).

	Total N (%)
Demographics	
Females	74 (54)
Age group	
12-13	27 (19)
14-15	55 (40)
16-17	54 (40)
Race/ethnicity	
White non-Hispanic	25 (18)
Black non-Hispanic	38 (28)
Hispanic	33 (25)
Asian	16 (12)
Other/Multi-race	24 (18)
College graduate parent(s)	68 (58)
Two parents at home	76 (56)
Visit Characteristics	
Clinician type	
Adolescent medicine specialist	66 (48)
General pediatrician	70 (52)
≥3 prior visits with clinician[a]	90 (67)
Youth Connectedness to Provider Scale score[a] (median, IQR; scale score range 7-35)	33 (31-35)
Substance Use Prevalence[b]	
Tobacco	
Any past-12-month use	7 (5)
Any past-3-month use	4 (3)
Monthly or more frequent[d]	2 (2)
Hooked on Nicotine Checklist-positive[c]	6 (4)
Alcohol	
Any past-12-month use	29 (21)
Any past-3-month use	21 (15)
Monthly or more frequent[d]	8 (7)
Disorder	4 (3)
Cannabis	
Any past-12-month use	25 (18)
Any past-3-month use	20 (15)
Monthly or more frequent[d]	15 (11)
Disorder	8 (6)

Abbreviations: IQR: interquartile range; SD: standard deviation

* Paired t-test, two-tailed $p<0.01$

[a] n=134 with completed post-visit questionnaires

[b] Based on Timeline Follow-Back and Adolescent Diagnostic Interview

[c] Hooked on Nicotine Checklist score ≥1 indicates tobacco dependence risk

[d] During past 3 months

Table 2

Detection of past-12-month substance *use:* criterion validity[a] of computer Self-administered vs. Clinician-administered screening.

	Sensitivity % (95% CI)		Specificity % (95% CI)	
	Self	**Clinician**	**Self**	**Clinician**
Tobacco	86 (41-98)	86 (41-98)	98 (93-99)	98 (93-99)
Alcohol	62 (44-78)	69 (50-83)	98 (93-100)	96 (90-99)
Cannabis	72 (52-86)	79 (58-91)	100	99 (94-100)

[a]Criterion measure: research assistant-administered Timeline Follow-Back Calendar interview

Table 3

Detection of a substance use *disorder:* sensitivity, specificity, and likelihood ratios of computer Self-administered vs. Clinician-administered screening.

	Sensitivity %		Specificity %		Likelihood Ratio-Positive		Likelihood Ratio-Negative	
	Self	**Clinician**	**Self**	**Clinician**	**Self**	**Clinician**	**Self**	**Clinician**
Tobacco[a]								
Any past-12-month use	83 (36-98)	83 (36-98)	97 (92-99)	98 (93-99)	27 (10-76)	36 (11-117)	0.2 (0.0-1.0)	0.2 (0.0-1.0)
Any past-3-month use	83 (36-98)	83 (36-98)	99 (94-100)	99 (94-100)	54 (13-224)	54 (13-226)	0.2 (0.0-1.0)	0.2 (0.0-1.0)
Monthly or more frequent[c]	67 (26-92)	50 (16-84)	99 (95-100)	100	87 (11-662)	--	0.3 (0.1-1.0)	0.5 (0.2-1.1)
Alcohol[b]								
Any past-12-month use	100	100	88 (81-93)	85 (78-90)	8 (4-12)	7 (4-10)	0.0 (0.0-1.6)	0.0 (0.0-1.6)
Any past-3-month use	100	100	92 (85-95)	89 (83-94)	12 (6-19)	9 (5-15)	0.0 (0.0-1.5)	0.0 (0.0-1.6)
Monthly or more frequent[c]	100	75 (23-97)	95 (89-97)	94 (88-97)	19 (8-34)	12 (5-30)	0.0 (0.0-1.5)	0.3 (0.1-1.5)
CRAFFT ≥2	100	100	92 (85-95)	93 (87-96)	12 (6-19)	15 (6-25)	0.0 (0.0-1.5)	0.0 (0.0-1.5)
Cannabis[b]								
Any past-12-month use	100	100	92 (86-96)	90 (83-94)	13 (6-21)	10 (5-15)	0.0 (0.0-0.9)	0.0 (0.0-1.0)
Any past-3-month use	88 (46-98)	86 (41-98)	93 (86-96)	91 (85-95)	11 (6-21)	10 (5-19)	0.1 (0.0-0.9)	0.2 (0.0-1.0)
Monthly or more frequent[c]	63 (28-88)	57 (23-86)	97 (92-99)	95 (90-98)	20 (7-60)	12 (4-33)	0.4 (0.2-1.0)	0.5 (0.2-1.1)
CRAFFT ≥2	88 (46-98)	88 (46-98)	94 (88-97)	95 (90-98)	14 (7-29)	19 (8-42)	0.1 (0.0-0.8)	0.1 (0.0-0.8)

[a] Criterion measure: Hooked on Nicotine Checklist.

[b] Criterion measure: Adolescent Diagnostic Interview.

[c] During the past 3 months.