

**Does the Calendar Method Enhance Illegal Drug Use
Reporting among Arrestees?¹**

**George S. Yacoubian, Jr., Ph.D.²
Ronald J. Peters, Dr.Ph.**

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² George S. Yacoubian, Jr. is the Director of Research at McFarland & Associates, Inc. Ronald J. Peters, Jr., is an assistant professor of Behavioral Sciences at the University of Texas Health Science Center at Houston, School of Public Health. Address correspondence to: Dr. George S. Yacoubian, Jr., McFarland & Associates, Inc., 8601 Georgia Avenue, Suite 601, Silver Spring, MD 20910, (301) 562-5332, or gyacoubian@mcfarlandassociate.com. The opinions reflected in this paper are those of the authors and do not necessarily reflect those of McFarland & Associates, Inc. or the University of Texas Health Science Center at Houston

Abstract

While a plethora of research has determined that respondents underreport their recent use of illicit drugs, few studies have attempted to improve the validity of self-reported drug use. The Arrestee Drug Abuse Monitoring (ADAM) Program is a federally funded drug surveillance system that has been collecting data from arrestees since 1987. In 2000, the ADAM Program fielded a new data collection instrument that uses a calendar method to enhance the reporting of personal drug use. To date, however, no research has assessed the degree to which this calendar method has improved drug use reporting among ADAM arrestees. To address this limitation, urinalysis results and 30-day self-report measures for marijuana, cocaine (crack and powder), and heroin use collected in Houston in 1999 are compared to identical drug use measures collected in Houston in 2000. In addition, kappa statistics for marijuana, cocaine, and heroin use are generated for each of the two time frames. Results indicate that, despite virtually identical drug-positive rates within the two samples of arrestees, the introduction of the calendar method in 2000 had no significant effect on the reporting of recent marijuana, cocaine, and heroin use. Implications for survey methodology are discussed.

Introduction

One major problem of self-report drug surveys is that researchers must rely on respondents to disclose their personal use of illicit drugs. To measure recent drug use and to assess the validity of self-reported drug use information, researchers often collect an objective, biological measure of recent drug use, such as urine or oral fluid. The collection of two measures of recent drug use – self-reports and biological specimens – permits an exploration of validity, whereby the more unreliable measure (self-report) is measured against the criterion measure (biological specimen). Validity studies can determine, therefore, the extent to which arrestees are being truthful about their recent drug-using behaviors.

Previous studies have established that arrestees underreport their recent use of illegal drugs, particularly cocaine (Yacoubian, 2000a; Lu et al., 2000; Hser, 1997; Harrison, 1995; Fendrich and Xu, 1994; Rosenfeld and Decker, 1993; Mieczkowski et al., 1991; Wish and Gropper, 1990). Mieczkowski et al. (1991), for example, compared self-reports of cocaine use with urinalysis results from a sample of adult arrestees in Florida. Of the cocaine-positive arrestees, only 24% reported cocaine use in the previous 48 hours (Mieczkowski et al., 1991). Harrison (1995) explored the validity of self-reported drug use with data from 21,991 Drug Use Forecasting (DUF) arrestees interviewed in 1989. For those arrestees who tested positive for marijuana, cocaine, and opiates, only half reported using the drugs within the past three days (Harrison, 1995). Most recently, Yacoubian (2000a) compared arrestee urinalysis results to self-reported drug use over eight annual intervals for each Arrestee Drug Abuse Monitoring (ADAM) Program site. Temporal correlation estimates between urinalysis results and three-day

self-reports were low for both cocaine and opiates across all jurisdictions (Yacoubian, 2000a).

Underreporting of recent drug use has also been identified in other high-risk populations (Morrall et al., 2000; Fendrich et al., 1999; Magura and Kang, 1997; U.S. Department of Health and Human Services, 1997; Wish et al., 1997; Hubbard et al., 1984). Fendrich et al. (1999) used the National Household Survey on Drug Abuse (NHSDA) methodology and collected self-report survey data and hair specimens from a high-risk sample of household respondents in Chicago. Results illustrated considerable underreporting of cocaine and heroin use within the past 30 days (Fendrich et al., 1999). Most recently, Morrall et al. (2000) explored the accuracy of self-reported drug use frequency among 701 methadone maintenance clients. Results indicated that use frequencies averaged 34% higher for opiates and 20% higher for cocaine than were self-reported (Morrall et al., 2000). Taken collectively, these studies illustrate that the validity of recent drug use survey data are often low for both criminal and non-criminal populations.

Improving the validity of self-reported drug use

A number of studies have attempted to improve the validity of self-reported drug use, with a variety of methods (Yacoubian and Wish, 2001; Wish et al., 2000a,b; Tourangeau et al., 1997; Wagenaar et al., 1993; Campanelli et al., 1987; Akers et al., 1983). Campanelli et al. (1987) used a bogus pipeline procedure with 291 students to attempt to increase the validity of self-reported alcohol use. Before completing the surveys, experimental respondents were told that a saliva specimen would be collected to

check the accuracy of their self-reports. In reality, no objective drug use results were generated. No significant differences between the experimental (n=173) and control (n=118) groups were discerned (Campanelli et al., 1987). However, Tourangeau et al. (1997) surveyed 120 randomly selected adults on issues related to smoking, alcohol consumption, illicit drug use, and sexual activity. Respondents were assigned to either a bogus pipeline condition, in which they were told that untruthful answers could be detected by a recording device, or a control condition, in which face-to-face interviews were conducted without the “verifactor” machine. Respondents in the experimental group were significantly more likely than control respondents to report sensitive or potentially embarrassing behaviors, including drug use and sexual activity (Tourangeau et al., 1997).

Wish et al. (2000a) undertook an experiment to determine whether modifying the ADAM collection protocol could enhance the self-reporting of drug use without adversely affecting study response rates. A 2x2 factorial design was used to assess the effects of two manipulations. The first experimental condition involved administering either the standard ADAM informed consent or an enhanced consent that told the arrestees more about the confidential nature of the research and the capabilities of urinalysis (Wish et al., 2000a). The second condition involved collecting the urine specimen either before or after the interview was administered (Wish et al., 2000a). Data were collected in three ADAM sites – Cleveland, Detroit, and Houston. Analyses determined that, first, the type of informed consent did not affect self-reported drug use, and second, that increased self-reporting with the urine-first condition was not found in more than one site (Wish et al., 2000a).

Using a modified bogus pipeline procedure, Wish et al. (2000b) exposed adult arrestees surveyed through the Substance Abuse Need for Treatment among Arrestees (SANTA) Program – an ADAM-like study – to two manipulations. The standard collection procedure involved requesting a urine specimen after subjects had completed a survey about illicit drug use. The specimen was subsequently shipped to a laboratory for analysis. The second condition employed the Test First Technique (TFT), which required that an instant urine test be administered on site and its results shared with the arrestee prior to survey administration. Wish et al. (2000b) hypothesized that arrestees surveyed with the TFT would be more likely to self-report recent illegal drug-using behaviors than respondents surveyed with the standard procedure. Their hypothesis was confirmed for cocaine and marijuana. Cocaine-positive arrestees surveyed under the TFT ($n=26$) were significantly more likely (81% v. 44%, $p<0.001$) to report cocaine use in the past three days than arrestees surveyed under the standard condition ($n=25$) (Wish et al., 2000b). Marijuana-positive arrestees surveyed under the TFT ($n=53$) were significantly more likely (94% v. 75%, $p<0.001$) to report marijuana use within the past 30 days (the detection period for marijuana by urinalysis) than arrestees surveyed under the standard condition ($n=51$) (Wish et al., 2000b).

Yacoubian and Wish (2001) replicated their earlier study with a different sample of adult arrestees using an instant oral fluid test in lieu of the instant urine test. Again, cocaine-positive arrestees surveyed under the TFT ($n=22$) were significantly more likely (86% v. 49%, $p<0.001$) to report cocaine use in the past three days than arrestees surveyed under the standard condition ($n=133$) (Yacoubian and Wish, 2001). Opiate-positive arrestees surveyed under the TFT ($n=20$) were significantly more likely (90% v.

66%, $p < 0.001$) to report opiate use in the past three days than arrestees surveyed under the standard condition ($n=128$) (Yacoubian and Wish, 2001). The studies by Wish et al. (2000b) and Yacoubian and Wish (2001) produced the highest levels of concordance between urinalysis and self-reported recent drug use ever documented in research studies of arrestees.

Calendar Method

Another technique used to improve self-reported drug use is the calendar method. The calendar method is based on the assumption that recall can be drastically improved by visually and mentally anchoring memories of these events (Rubin, 1986). For the ADAM Program, the assumption is that the reporting of personal drug use, treatment history, and criminal justice involvement will be enhanced when recalled in conjunction with more personal events (e.g., birthdays, anniversaries, and holidays). The calendar method is based on a body of work (Breslin et al., 1996; Ehrman and Robbins, 1994; Anglin et al., 1993; Sobell and Sobell, 1992; Freedman et al., 1988; Sobell et al., 1988; Nurco et al., 1975) that has illustrated increased reporting of a host of sensitive behaviors, including the use of alcohol and other drugs. In contrast, one study (Midanik et al., 1998) found lower estimates of self-reported 30-day drug use after implementation of the calendar method.

The ADAM Program first used the calendar method in 2000. To date, however, no studies have evaluated the efficacy of the calendar method among ADAM arrestees. To address this methodological limitation, 30-day drug use data collected in Houston in 1999 are compared to identical data collected in Houston in 2000. It is important to note,

however, that the current analysis involves two separate cohorts of arrestees. That is, arrestees were not randomly assigned to one condition or the other. As such, our ability to draw strong inferences about the impact of the calendar method on the results is limited. This caveat aside, we hypothesize that arrestees surveyed in Houston in 2000 will report significantly more 30-day use of marijuana, cocaine, and heroin than arrestees surveyed in Houston in 1999. With this preliminary hypothesis, project methods are described below.

Methods

The National Institute of Justice (NIJ) established the ADAM Program – formerly the DUF Program – in 1987 (Yacoubian, 2000b; Wish, 1995). The six primary goals of ADAM are: identifying the levels of drug use among arrestees; tracking changing drug-use patterns; determining what drugs are being used in specific jurisdictions; alerting local officials to trends in drug use and the availability of new drugs; providing data to help understand the drug-crime connection; and serving as a research platform upon which a wide variety of drug-related initiatives can be based (Yacoubian, 2000b). Data are currently collected in 35 jurisdictions across the United States (NIJ, 2000).

Each quarter, locally trained ADAM researchers enter booking facilities and approach persons shortly after their arrest. The introduction by the interview staff includes the purpose and sponsorship of the study and informed consent provisions. Arrestees are asked to participate in a confidential, in-person interview and to provide a urine specimen after the interview is completed. Arrestees are assured that their participation is voluntary, that their responses are confidential, and that they will receive

a candy bar as an incentive for participation. Subjects are interviewed in private or semi-private rooms that are out of hearing range of correctional officers or other arrestees. Interview time is approximately 30 minutes, depending on the amount and degree of drug use disclosure.

Between 1987 and 1999, the type of data collected by ADAM was relatively limited. Arrestees were first asked several demographic questions, including education level, marital and employment status, and income level. Participants were then asked to report whether they had *ever* used a panel of specific drugs. For those drugs the arrestees reported having *ever* tried, they were asked to indicate age of first use, whether they had used the drug within the past 12 months, the number of days used within the past 30 days, and whether they had used the drug within the past three days. Participants who admitted to drug use were also asked whether or not they considered themselves drug-dependent, and whether they were under the influence or in need of drugs at the time of arrest (Yacoubian, 2000b). Several questions also focused on treatment – whether the person had ever received treatment, was currently in a treatment program, or perceived a need for treatment.

In 2000, a new data collection instrument was fielded (NIJ, 2000). The seven primary sections of the instrument are: face sheet, demographics, criminal justice involvement, personal drug use, treatment history, dependence and abuse, and market and use (NIJ, 2000). Face sheets are completed on all eligible arrestees with information collected from official records. These data include arrest and booking dates, arrest location, date of birth, gender, primary criminal charges, race, and residence zip code. If respondents consent to the interview, demographic data – ethnicity, citizenship,

education, employment, health insurance, marital status, and living arrangements – are collected via self-report. The collection of demographic information is followed by questions on criminal justice activity, personal drug use, and treatment history. The dependence and abuse section allows for the clinical diagnosis of drug abuse and/or dependency. The abuse and dependence section is based on the Substance Use Disorders Diagnostic Schedule (SUDDS). Respondents are asked, for example, if their use of alcohol or drug use has caused them to neglect their usual responsibilities and whether they used alcohol or drugs more than they intended. The market and use section inquires cash vs. non-cash drug transaction, location of purchase, quantity purchased, amount paid, frequency of purchases, and market availability.

In addition to the survey, a urine sample is obtained as an objective measure of recent drug use and to validate the self-report data. The Enzyme Multiplied Immunoassay Test (EMIT) screens for 10 drugs: amphetamines, barbiturates (e.g., Phenobarbital), benzodiazepines, marijuana, metabolite (crack and powder) cocaine, methadone, methaqualone, opiates, PCP, and propoxyphene (Darvon). All positive results for amphetamines are confirmed by gas chromatography (GC) to eliminate any over-the-counter medications.

The calendar method is introduced prior to administration of the personal drug use questions. Respondents are first asked if they have *ever* used marijuana, crack cocaine, powder cocaine, heroin, and methamphetamine. For those drugs respondents report having ever tried, they are asked to report age of first use and whether they have used the drugs within the past 12 months. If 12-month use is indicated, the calendar is initiated. After noting major holidays (e.g., Thanksgiving) on the calendar, interviewers ask

respondents to recall personal events that occurred during the previous 12 months (e.g., birthdays, anniversaries, and arrests). These events are designed to serve as anchors for recalling specific events related to alcohol and other drug (AOD) use. Following the completion of the calendar, arrestees are asked to report the number of days a drug has been used within the past 30 days. Given that the calendar method is not introduced until *after* the 12-month use question is asked, the variables of interest are self-reported 30-day use of marijuana, crack cocaine, powder cocaine, and heroin.³ With this framework, data analysis and findings are presented below.

Data Analysis and Findings

For each year, data analysis was accomplished in four phases. First, participation rates were calculated. Second, descriptive statistics were generated. Third, rates of self-reported 30-day marijuana, cocaine (crack or powder), and heroin use were calculated. Fourth, 30-day self-reports of marijuana, cocaine (crack or powder), and heroin use were compared to their respective urinalysis results for each year.⁴ Kappa statistics were generated and the validity of self-reported recent marijuana, crack cocaine, powder cocaine, and heroin use was examined.

Participation rates

As shown in Table 1, 2,683 adult arrestees were approached for interviewing in 1999. Of these, 71% completed the interview. Of those who completed the interview, 83% provided a urine specimen, for an overall participation rate of 59%. Rates of

³ The low levels of methamphetamine precluded their inclusion in the current analysis.

⁴ That is, the self-report and urine data are matched for each arrestee and are thus treated as paired data.

participation were slightly lower in 2000.⁵ A total of 1,446 arrestees were approached for interviewing in Houston in 2000. Of these, 57% completed the interview. Of those who completed the interview, 88% provided a urine specimen, for an overall participation rate of 50%. The analysis for the current study is based on the 1,572 arrestees who completed the interview *and* provided a urine specimen in 1999 and the 728 arrestees who completed the interview *and* provided a urine specimen in 2000.

[INSERT TABLE 1 ABOUT HERE]

Demographic characteristics

As shown in Table 2, arrestees surveyed in 2000 were significantly more likely to be male (92% v. 57%, $p < 0.01$) and significantly less likely to have earned a high school diploma or General Equivalency Degree (GED) (37% v. 61%, $p < 0.01$) than arrestees surveyed in 1999. The racial, age, and primary charge distributions between the two samples were similar. With the exception of gender and education, the results suggest comparability between the two samples. Because a respondent's sex has been shown to effect willingness to participate, there may not be enough data to assess the efficacy of the calendar method with female arrestees.

[INSERT TABLE 2 ABOUT HERE]

⁵ A new sampling plan in 2000 reduced the number of completed interviews Houston was required to collect.

Personal drug use

Table 3 presents 30-day self-reports and urinalysis results for marijuana, cocaine, and heroin. In 1999, 31% of the arrestees tested positive for marijuana, while 35% reported using marijuana in the 30 days preceding the interview. Thirty percent tested positive for cocaine, while 16% self-reported 30-day crack or powder cocaine use. Also in 1999, 7% tested positive for heroin, while only 1% reported heroin use in the 30 days preceding the interview. In 2000, 35% of the arrestees were marijuana-positive, with 34% reporting 30-day marijuana use. Thirty-one percent of the sample was cocaine-positive, with 15% reported 30-day crack or powder cocaine use. Also in 2000, 7% of the sample tested positive for heroin, while 1% reported using heroin in the 30 days preceding the interview.

[INSERT TABLE 3 ABOUT HERE]

Kappa, which measures the agreement between the evaluations of two raters (self-reports and urinalysis) when both are rating the same object (recent drug use), is considered an appropriate measure of agreement when the time periods covered by both are similar (Magura and Kang, 1996). As shown in Table 3, 1999 kappa statistics were moderate for marijuana (.64), but low for cocaine (.48) and heroin (.08), suggesting poor agreement between the two raters (Magura and Kang, 1996). The 2000 kappa statistics were comparable to those from 1999 – .59 for marijuana, .47 for cocaine, and .06 for heroin. These findings indicate that, despite virtually identical drug-positive rates within the two samples of arrestees, the introduction of the calendar method in 2000 had no

significant effect on the reporting of recent marijuana, cocaine, and heroin use or on the agreement between the two raters.

Discussion

The calendar method has been shown in previous research to enhance self-reported recent AOD-using behaviors (Breslin et al., 1996; Anglin et al., 1993; Sobell and Sobell, 1992; Freedman et al., 1988; Sobell et al., 1988; Nurco et al., 1975). In 2000, the ADAM Program fielded a new data collection instrument that uses a calendar method to enhance the reporting of personal drug use. If 12-month drug use is indicated during the interview, the calendar is initiated. Arrestees are subsequently asked to report the number of days a drug has been used within the past 30 days. Given that the calendar method is not introduced until *after* the 12-month use question is asked, the variables of interest in the current study were self-reported 30-day use of marijuana, cocaine (crack or powder), and heroin. We compared urinalysis results and 30-day self-report measures for marijuana, cocaine, and heroin use collected in Houston in 1999 to identical drug use measures collected in Houston in 2000. Results indicated that the calendar method had no significant effect on the reporting of recent marijuana, cocaine, and heroin use.

Several methodological limitations should be noted. First, while the calendar is introduced after arrestees indicate 12-month drug use, the 30-day drug use questions in the ADAM interview are *not* asked immediately after completion of the calendar. A host of drug market questions are posed to the arrestees prior to the questions about recent drug use. It is difficult to ascertain, therefore, the direct effect of the calendar method on self-reported recent drug use. Rather, the current analysis was based on a spillover effect

between the calendar and questions about recent drug use. Second, given the detection capabilities of urinalysis, generating kappa statistics with *three*-day self-reported drug use measures would have been more appropriate than the 30-day drug use measures.

Unfortunately, ADAM data collected in 1999 queried past *three*-day drug use, while data collected in 2000 asked about *two*-day drug use. The only appropriate alternative, therefore, was generating kappa statistics by comparing the self-reported *30-day* drug use measures to the urinalysis results – the only recent time frame for which comparable data were available in both 1999 and 2000. Third, while the ADAM protocol required the collection of a urine specimen, urinalysis did not distinguish between the types of cocaine for which self-reported data were collected. Because urinalysis can now distinguish between crack and powder cocaine (Riley et al., 2001; Lu et al., 2000), future research should replicate the current analysis and distinguish between cocaine urinalysis results rather than combining the self-reported crack and powder cocaine use variables. Fourth, the current study focused on *arrestees from one ADAM site*. The extent to which these findings are comparable across ADAM sites, and other populations, is an empirical question that can only be addressed with future research. We recommend, therefore, that the calendar method be introduced to other populations to assess its utility. Fifth, interviews conducted with ADAM arrestees are conducted by trained interviews and are thus not self-administered. Previous research has suggested that underreporting may be more problematic when responses are not provided in complete privacy.

These caveats aside, the current study has illustrated that the calendar method did not enhance self-reported recent marijuana, cocaine, or heroin use among Houston arrestees. These findings thus call into question the efficacy of the calendar method, or,

at the very least, the process why which the calendar is utilized under the ADAM system. Given that the purpose of the calendar method is to assist in recall, and, ultimately, to enhance self-reported drug use, questions on recent (30-day) drug use should be posed immediately after the calendar. Moreover, the calendar should be used *during* the 30-day drug use questions to confirm the accuracy of arrestee self-reports.

While the current analysis cannot definitively state that the calendar method was ineffective in enhancing self-reported drug use within these two samples of arrestees, the results suggest that this might be the case. Future work should consider a cross-sectional experimental design in which arrestees are randomly assigned to a control condition, in which no calendar is utilized, and an experiment condition that uses the calendar method. This design would be more appropriate for detecting the effects of the experimental stimulus and would demonstrate concretely whether the calendar method is yielding its desired effect with ADAM arrestees.

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Table 1. Participation Rates, 1999 and 2000

	1999	2000
Total number of eligible arrestees	2,683	1,446
Of eligible, completed interview	71% (n=1,905)	57% (n=829)
Of completed interview, provided urine specimen	83% (n=1,572)	88% (n=728)
Overall participation rate	59%	50%

Table 2. Demographic Characteristics, by Year

Characteristic	1999 (n=1,572)	2000 (n=728)
Gender		
Male	57%*	92%*
Race		
Black	56%	49%
White	20%	23%
Hispanic	23%	27%
Other	1%	1%
Age		
20 and under	23%	22%
21-25	22%	24%
26-30	17%	16%
31-35	13%	11%
36 and over	25%	27%
Mean age (in years)	29.4	29.5
Education		
High school graduate/GED	61%*	37%*
Primary charge		
Property offense	17%	17%
Personal offense	14%	12%
Drug or alcohol offense	16%	29%
Miscellaneous offense	53%	42%

*Chi-square significant at the $p < 0.01$ level.

Note: Personal offenses include assault and robbery. Drug or alcohol offenses include drug possession and sale. Property offenses include theft and receiving stolen property. Miscellaneous offenses include loitering and unspecified parole/probation violations.

Table 3. Estimates of Drug Use from Self-Reports and Urinalysis and Kappa Statistics*, By Year

	1999	2000
Marijuana		
30-day	35%	34%
Urinalysis	31%	35%
Kappa	.64	.59
Cocaine (Crack or Powder)		
30-day	16%	15%
Urinalysis	30%	31%
Kappa	.48	.47
Heroin		
30-day	1%	1%
Urinalysis	7%	7%
Kappa	.08	.06

*Comparison between urinalysis and 30-day self-reports.