Telling the Truth About Drug Use: How Much Does It Matter?

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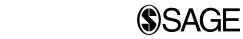

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Abstract

The gap between what people admit about their behavior and what is actually true has plagued social scientists and survey methodologists for decades. This gap would not matter if it did not play an important role in estimation of the extent of the consumption of illegal drugs and/or changing trends in illegal use, both data critical for developing public policy and determining the effects of intervention programming and policy changes. The Arrestee Drug Abuse Monitoring (ADAM) survey matches anonymous self-reported interview information to a urine test for nine drugs in a probability-based sample of adult male arrestees conducted within 48 hr of their arrest. Using data from 2000-2003 and 2007-2011 collected in 10 U.S. counties, this article looks at how the gap between the truth and reality in self-report varies by the drug reported, by the region of the country, over time, and by characteristics of the user, and discusses the relevance of these findings to policy.

Keywords

drug use, self-report data, Arrestee Drug Abuse Monitoring survey

Introduction

Self-report of all kinds of behavior is the predominant way social science gathers information about everything from shopping preferences to how much people drink. The method is quick, relatively low cost and can provide representative data on large numbers of people by using phone and online surveys, in person interviews, self-administered questionnaires, and computer assisted interviews. But questions about the reliability and validity of self-reported responses have plagued social scientists and survey methodologists for decades, particularly when the questions involve reporting behaviors which threaten the respondent with exposure, embarrassment or both. Interest in the issue endures because accurate assessment of some behaviors is critical to policy makers as they form the basis of assessment of need for services or other official responses to public health and law enforcement problems. As a result, research has focused for years on the quality of self-report data and how to mitigate the impact of denials or obfuscation.

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A number of critical studies point to the factors that relate to variability in self-report validity—sensitivity of the information sought (e.g., demographics vs. health information), characteristics of the respondent (age, socioeconomic status, and social desirability needs), time frame of reporting (distant past vs. recent activity), degree of privacy of the interview/survey, anonymity and confidentiality, mode of administration, and perceptions of what is normative behavior (Brener, Billy, & Grady, 2003; Fendrich, Johnson, Wislar, Hubbell, & Spiehler, 2004; Harrison & Hughes, 1997; Midanik, 1988; Patton, 2005).

All these factors play a significant role when respondents are asked about highly stigmatized or illegal behaviors. Meta-analysis of research into factors that affect truth telling in adolescents reporting health risk behaviors (Brenner, Billy & Grady, 2003), found that both social desirability and the setting of interviews (perception of confidentiality) result in substantial underreporting of unfavorable behaviors. And the setting has been found to produce bias in both directions. For example, drug users who are entering treatment programs or attempting to qualify for diversion or research programming may be more likely to admit and even exaggerate their drug use than in other circumstances (Hser, 1999; Magura & Kang, 1996; Welp et al., 2003) to assure entry.

The question of the validity of self-reported drug use is neither simply academic nor trivial. The Nation's policy makers rely on changes seen in surveys of drug use to gauge the extent of the Nation's consumption of drugs (Office of National Drug Control Policy [ONDCP], 2012c), to determine resource allocation for programming, and to assess the effectiveness of policy changes or prevention campaigns (Magura, 2010). If those data represent substantial underreporting, or underreporting with an unknown bias in reporting by subgroups, data on the effectiveness of a policy, programs, or campaigns are uninterpretable at best. For example, while the Substance Abuse and Mental Health Services Administration's (SAMHSA) 2013 National Survey on Drug Use and Health (NSDUH) survey findings report that whereas the number of persons reporting current use of heroin (in the prior 30 days) has remained roughly the same from 2008 to 2012 and below 300,000 individuals in all years, data from emergency rooms, treatment entries, and drug seizures report substantial increases in heroin use and availability in that time period. Emergency room data from SAMHSA's Drug Abuse Warning Network (DAWN) reporting on emergency room episodes show a 37% increase nationwide in emergency department visits involving heroin from 2007 to 2011 (ONDCP, 2014a). SAMHSA's Treatment Episodes Data Set (TEDS), which tracks all entrants to government funded treatment centers, reports heroin admission rates were between 8% and 167% higher in 2008 than 10 years earlier in five of the nine Census divisions (SAMHSA, Center for Behavioral Health Statistics and Quality, 2010). The Drug Enforcement Administration finds that seizures of kilogram quantities of heroin increased from 1,893 kg in 2004 to 4,785 kg in 2011; and ONDCP estimates that Americans consumed 24 metric tons of heroin in 2010 in a US$27 billion industry (ONDCP, 2014a). This prompts the question as to who is using the supply, if general population surveys uncover only roughly 300,000 recent users (use in the past 30 days) and less than 500,000 past-year users (SAMHSA, 2014)? If we assume the estimate is correct and there are 400,000 past-year users, then every user would have had to spend US$67,000 each year for heroin or at the typical street unit prices of US$10/bag or US$20/bag from 9 to 19 bags each day—amounts that would kill off many of the users both financially and physically quickly. In addition, data on overdoses indicate that the new users of heroin are young, often White, and often beginning their use with prescription opioids (National Institute on Drug Abuse, 2015), all factors that make accurate data critical for making decisions regarding service needs and prevention approaches.

To address the issues of underreporting, we utilize data from the Arrestee Drug Abuse Monitoring (ADAM) survey. ADAM data provide a platform on which to examine the validity of self-reporting over time in a population that is likely to include a substantial number of users, male arrestees. These data have been used in past research looking at "truth telling" or congruence between positive urine tests and self-report in all annual ADAM reports (ONDCP, 2007-2014). We

expand those analyses here to look at whether the perennial problem of underreporting is dynamic. We stress that male arrestees are a special sample and not representative of the general population, but they provide a unique opportunity not available in other data sets: They are a probability-based sample of adult male arrestees who are newly arrested on any charge, not already incarcerated allowing time for drugs to have passed out of their system, and drug tested and interviewed within 48 hr of being at liberty; the interview and urine testing are anonymous and confidential (no identifying data are recoded, the researchers are not aware of the identity of the respondent, and all data are de-identified throughout); and respondents are able to refuse to participate or continue at any time. In addition respondents are told of the request for a specimen at the beginning of the consent process and have the ability to refuse the interview and/or or the specimen collection.

We offer these analyses as a contribution to the ongoing literature on estimating trends in drug use and the role that self-report data may play. We feel this contribution is important, in that

- There are gaps in the accuracy of self-reported drug use that result in a serious underreporting of that use.
- Those gaps are not consistent across drugs, across geographic regions, and over time.
- The ADAM data, which represents a large sample of adult males using illegal drugs who are often missed in general population surveys, provide an opportunity to compare recent self-reported use of a number of drugs with a bioassay (urinalysis) verifying use to address that gap across areas of the county, across drugs, and over time.

We address the following research questions:

Research Question 1: Does the willingness to report drug use among arrestees vary by the drug used? By the region of the country?

Even if we can make adjustments to self-reported drug use to reflect actual use, differences in the willingness to report by drug or across the country suggest that those adjustments need to factor in drug type and geography.

Research Question 2: Does the willingness to report recent drug use among arrestees vary over time?

Trends in self-reported drug use may be due to underlying trends in actual drug use or may be due to trends in the willingness to report use affected by the social norms surrounding the drug.

Research Question 3: Does the willingness to report recent drug use by users vary by any characteristics of the user?

As with drug type and geography, making adjustments to self-reported drug use may need to account for personal characteristics.

Background

It is logical that individuals will deny or underreport their drug use in circumstances where that use is embarrassing and/or stigmatized. In its evaluation of the youth anti-drug public service campaign the U.S. Government Accountability Office (GAO, 2006) argued that it is possible (and unknowable) if informational campaigns about drug use change the stigma associated with the behavior among youth (rather than the behavior itself) and, consequently, alter a respondent's willingness to report the behavior in either direction.

Motivation to admit illicit behaviors is also influenced by the perception of very real negative consequences that may come from telling the truth—expulsion from school, loss of employment, arrest. For example, an increase in self-reported marijuana use over the last few years may be due to a true increase or to the perception of a lessening of negative consequences of its use. Research has also found that there are also differences in underreporting of illicit drug use by race and age of the respondent as well as by the drug used (Fendrich et al., 2004; Johnson & Bowman, 2003).

While there have been important advances in improving the accuracy of responses to sensitive questions (Gfroerer, Eyerman, & Chromy, 2002), such as the use of self-administered, computerized, and/or audio assisted answering devices, data on denial and the effect of presentation of self- (Goffman, 1959) or image management in answering questions about personal drug use point overwhelmingly to a problem: Illegal drug use is underreported, more in some settings than others, by some people more than others, and more for some drugs than others (DeJong & Wish, 2000; Fendrich et al., 2004; Harrison, 1995; Magura, 2010; Patton, 2005; Williams & Nowatzki, 2005).

In recognition of questions about underreporting in the Nation's premier general population study of drug use, the NSDUH, the SAMHSA commissioned an extensive validation study in 2000 and 2001 (Harrison, Martin, Enev, & Harrington, 2007) to compare self-report answers obtained as part of the NSDUH annual survey to matched samples of hair and urine collected from the same sample of respondents. These studies found that the overall agreement between urinalysis results and self-report was remarkably high in the general population: 90% for marijuana and 99% for cocaine use. These numbers can, however, be somewhat confusing as validation of use (Magura, 2010); that is, we can conclude that self-report is not a consequential problem among the overwhelming number of *non-users* in the sample. *But the issue is not if those who do* not use *readily admit their abstinence, but whether those who* are proven users *(by a positive drug test) admit to use*. And the SAMHSA validation study found that for marijuana, whereas 90% of the validation sample had a negative test result and reported that they did not use, 39% had a positive test result, but denied use. The results for cocaine were even more dramatic: Of the few people in the sample who used cocaine (tested positive), 79% did not admit it. Logically, the fact that there were few users of cocaine in the study improves the overall congruence data and legitimately indicates a relatively low number of users in this general population sample. Each year the weighted numbers of users in NSDUH is still quite small: In 2013, 0.1% or 289,000 persons admitted to current heroin use and 0.6% or 1.5 million persons admitted to current cocaine use (SAMHSA, 2014).

The answer may lie in both denial of use and the possibility that users—particularly regular or heavy users—of these drugs may simply not be captured in general household samples. For example, in the general population in 2011, less than 1% of respondents admit to any use of cocaine in the past 30 days compared with 4% to 10% of arrestees in 2011 (depending on the site) admitted to use in the prior 30 days and averaging from 4 to 10 days of use in that prior month. NSDUH samples do include persons who report they were on some form of community supervision (3% of the 2011 adult male sample had been on probation at some time in the last 12 months and 1% had been on parole) 3% of those on parole and 8% of those adult males on probation reported that they had used some illegal drug use in the prior 30 days (SAMHSA, 2011). However, data from the 2011 ADAM arrestees indicate that among the 5,000 arrestees interviewed, in 2011, almost 3 times that proportion (71%) tested positive for some illegal substance in their system. In addition, of those testing positive many would not have been eligible for the NSDUH: An average of 17% had no stable housing in the prior 30 days; 16% had changed residence 3 or more times in the prior year; and 12% were homeless or lived in a shelter at the time of arrest (ONDCP, 2012c). These individuals, as temporary residents (<3 months in or anticipated in the current residence) or without a residence, would not be included in household samples (Riggsbee & Chen, 2009). This factor, added to a substantial denial factor, both help explain lower than

expected numbers of users in NSDUH given availability and points to the need to look at other areas or populations from which information to inform the extent the Nation's use and trends in use might also be examined. Not accounting for a number of these often heavy consumers of illegal drugs is an important omission for understanding drug use, drug trends, market demands, and treatment needs.

In short, a number of factors can play a part in underestimation: denial or obfuscation, absence of the individual of interest in the sample without accounting for that absence, and refusal to supply the specimen needed for the validation or match. Denial is the element that has been addressed in this and other studies through use of rapport building, assurance of confidentiality, and/or anonymity for the respondent. While we focus on truth telling in this article, there are other reasons why one might find a discrepancy between the test result and self-report that can also be considered—faulty recall of when exactly the drug was ingested, misinformation as to what drug was taken, inadequate amounts of the drug still detectable in the system of the user, contamination or dilution of the sample during the unobserved specimen collection.

As in all surveys, respondents may "select out" in ADAM, and in 2011, 16% of all those sampled from the listing of all arrested in each 24-hr period opted out. The absence of the individual of interest in the sample who either selected out or were not in the facility at the time of the interviewing (been released earlier, transferred, taken to court) is addressed in ADAM in the use of a census or complete panel of all persons arrested in each 24-hr data collection period as the sample frame and weighting each case in the sample based on known probability of selection into the frame of the individual interviewed. Refusal to supply the specimen about 10% to 12% of those agreeing to be interviewed each year, another source of potential bias is addressed and reported through the collection of reasons for refusal and a sophisticated imputation method described in the *ADAM Technical Documentation Report* (www.icpsr.umi.edu).

Why should researchers and policy makers care about variations in reporting? Accounting for the underreporting aspect of the issue might be addressed if a simple statistical correction for underreporting could be estimated and applied each year to results; that is, if denial of use were relatively static and did not vary regionally, by drug or over time by each of the former factors. If there are these variations over time, place, and populations, and they do not necessarily reflect variation in actual use, this presents a problem in understanding. This is the issue we examine in this article.

Data

We utilize data from the ADAM survey, a survey that includes a 20-min interview with a probability-based sample of adult male arrestees and urine testing in the active booking areas of agencies that are the initial processing locations for arrestees. The interview and sample collection include only those adult males who have been arrested within the prior 48 hr. ADAM is a probability-based sampling of facilities within counties and adult male arrestees within those facilities, creating the ability to develop accurate prevalence and trend estimates for each catchment area (the county). Although ADAM was originally conducted in 35 sites by the National Institute of Justice from 2000-2003, we focus on a subsample of 10 of those counties that were collected as ADAM II by the ONDCP in the years 2007-2013.[1] The interview covers a range of topics (drug use, treatment and arrest history, housing, employment, drug market activity) and collects a urine sample for testing for 10 substances. It also utilizes a calendar method of collection on many variables to cover activities by month over the year prior to this arrest. The questionnaire is available to download at www.icpsr.umi.edu, and technical sampling and weighting details may be found in the ADAM II technical report at the same site.

Questions are asked about specific drug use matched to the appropriate time window for detection through urinalysis (3 days, 7 days, and 30 days). Drugs are metabolized at different

Table 1. ADAM II Sites.

Primary city	County area
Atlanta, GA	Fulton County and City of Atlanta
Charlotte, NC	Mecklenburg County
Chicago, IL	Cook County
Denver, CO	Denver County
Indianapolis, IN	Marion County
Minneapolis, MN	Hennepin County
New York, NY	Borough of Manhattan
Portland, OR	Multnomah County
Sacramento, CA	Sacramento County
Washington, DC	District of Columbia

Note. ADAM = Arrestee Drug Abuse Monitoring.

rates so that the window of detection varies by drug. For most of the drugs of interest (opiates, cocaine, and methamphetamine) that window of accuracy is roughly 72 hr. For marijuana or sedatives, the window is longer, up to 30 days. Consequently, the survey asks when the drug was consumed over different time periods to match the expected detection in urinalysis.

Arrestees are told at the beginning of the interview process that they will be asked to provide a voluntary specimen and reminded again at the end of the interview of their consent choice. Individuals may assent to the interview and not to provision of the specimen and no identifying data are collected at any stage of the research. The data used here constitute a panel of data from those 10 ADAM II sites for the years 2000-2003 and 2007-2011. For this analysis, we elected to not include data from 2012 to 2013 as only 5 of the 10 sites collected data in those years.

Method

We draw on the 2000-2011 data in 10 ADAM II sites for this analysis. The "site" in ADAM and ADAM II is a county, though we refer to the site by the name of the large city in those counties often where central booking occurs. Table 1 indicates the ADAM II counties used in this analysis.

The 10 ADAM II sites selected in 2007 from the original 35 sites were chosen as *sentinel* sites, to represent geographical areas. Consequently, as with the original 35 National Institute of Justice funded sites, they do not represent a probability-based sample of U.S. counties. However, within each site, arrestees *are* a probability-based sample of those booked in the county for the two 14-day periods in which data are collected, and data are annualized to represent the year of arrests in those facilities.[2] ADAM II continues to execute the arrestee sampling plan first developed in 2000,[3] a plan that is both statistically sound and accommodates the reality of active booking facilities

Case Weighting

Although the sample is theoretically balanced, in reality, there are factors that change the probability that an arrestee is still in facility and available to be interviewed: time of day, charge, and day of the week. Persons with lesser charges and without outstanding warrants to be reviewed, those arrested earlier in the day when activity is light and booking processes faster, and persons arrested during slower days are likely to be processed faster and, when sampled, may not be in the facility to be interviewed; that is, they have already been arraigned and released or bailed out. Because all these factors create variation in the probability of being interviewed, the sample can be biased, for example, in favor of less serious offenses. To correct these known biases, each arrestee is weighted using

the inverse of the probabilities of that they would appear in the sample based on those variables that affect section probabilities (the propensity score) to accurately reflect the population sampled throughout the data collection period (each 24-hr period, each day), using propensity scores.

Response Rates

All those sampled are considered part of the overall ADAM sample. Only those not physically in the facility at the time of interview, or those deemed by the facility too violent to be interviewed are not considered available to be included. Consequently, there are two response rates: one using the total sampled regardless of whether the individual is in the facility at the time of the interview and those sampled and available to be interviewed regardless of their assent. The response rate for interviews and urine sampling is remarkably high. The *overall response rate*, which includes those sampled, but not physically available for interview, was 54% in 2011. The *conditional response rate* or the ratio of the number of arrestees consenting to be interviewed to the total number of arrestees sampled and physically in the facility, was 86% in 2011. Of those interviewed, 88% supplied a urine sample for testing; for the 12% in 2011 who refused or could not provide a urine sample, an imputation method was developed.[4]

A total of 47,799 interviews and 41,704 urine samples were collected in these 10 sites from 2000 to 2011. The annual volume of arrests varies somewhat across the sites, although all are high volume jails. In 2011, for example, the average annual number of completed cases for each site was 505, ranging from 287 in Washington DC to 927 in New York City. When weighted, this represents 436,985 adult male arrests in these counties from 2000-2003 and 2007-2011. These almost half a million cases represent a unique subpopulation that is often missed or underrepresented in general population surveys due to transiency and/or denials, but is enriched in the proportion of users of illegal drugs.

Results

In our analyses, we first repeat the same steps as followed in the earlier SAMHSA validation study (Harrison et al., 2007), looking at the *overall* congruence between self-report and use, and also find reasonably high levels of congruence between arrestees' self-report of use and urine test results for the drug on which they were reporting; that is, *the total congruence between those who tested negative and reported no use plus those who tested positive and admitted it*.[5] In 2011, congruence across all 10 sites was 84% for marijuana, 88% for cocaine, 93% for opiates, and 97% for methamphetamine. This might lead us to applaud the relative veracity of heroin and meth users and suspect that of marijuana users.

This is far from reflecting the truth. Using the congruence among those who actually tested positive for the drug and told the truth—a measure of underreporting—we get a far different picture. Marijuana users (84% congruence between the urine test and admission of use) are far more likely to be telling the truth than users of cocaine (45% congruence), heroin (41%), or methamphetamine (61%). If we were to rely only on the self-report of these drugs in this population, we would underestimate by more than half for cocaine and heroin and by 40% for methamphetamine. Only marijuana users appear to be willing to admit use.

The ADAM results mirror some of the earlier findings of others on self-report when compared with a bioassay like urinalysis—congruence varies by drug, often dramatically. We might suspect that the differences by drug seen in the ADAM II data by drug might be related to the stigmatization of each drug (see Figure 1). For example, marijuana carries lower penalties (and in some sites no penalties) than the other drugs. It is also a drug more commonly used and perhaps more normative among users, and one that has become less stigmatized over the last 10 years as decriminalization and legalization have occurred in some states.

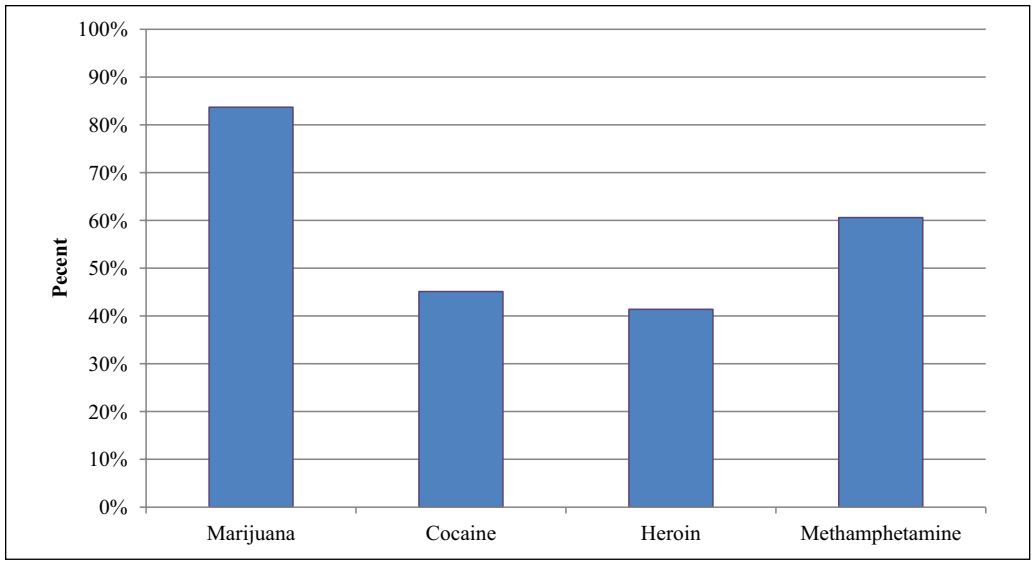

Figure 1. Percent admitting to use *when testing positive*, 10 ADAM II sites, 2011.
Note. ADAM = Arrestee Drug Abuse Monitoring.

This may not be a critical issue if we were able to estimate the bias of self-report data by drug and adjust prevalence estimates. It is a critical issue, however, if the willingness to tell the truth also varies over time, by area of the country and/or by characteristics of the respondent. We suggest the exploration of these factors because prevalence can differ by region of the country due to drug trafficking patterns and availability, by fads in use and by the age of users.

The Willingness to Admit Use Varies by Site

Table 2 indicates the congruence between a positive urine test for each drug and admission by the arrestee of use within the appropriate window of detection for each site, with standard errors indicated in parentheses. As this indicates, the willingness to admit use varies both by drug and by site. With the exception of marijuana, where more than 70% of arrestees who tested positive admitted use in all sites, there is far greater variation in admission rates for the other three drugs across sites. More than 50% of cocaine users (those testing positive) in five of the sites (Denver, Minneapolis, Portland, Sacramento, and Washington DC) also admitted use, while fewer than 40% tested positive and also admitted cocaine use in Charlotte, Chicago, and Indianapolis. While the underreporting as measured by congruence among arrestees is high, if we recall the results in the SAMHSA validation study (Harrison et al., 2007), among the few users in the general population survey, admission levels were even lower—39% of those with a positive marijuana test denied use and 70% of those testing positive for cocaine denied it.

As Table 2 indicates, the willingness to admit to opiate use among arrestees is even more varied—from 7% (Atlanta) to 65% (Chicago) and 71% (Portland) congruence rates across the sites. Both these latter sites are areas where there are more arrestees testing positives for opiates than in any other sites—19% of arrestees tested positive for opiates in Chicago and 14% tested positive in Portland in 2011. Methamphetamine use is rare in some of the sites—in New York, Charlotte, Chicago, and Washington DC. For example, 1% or less of the samples tested positive in 2011 and we do not rely on those small samples to assess congruence in these sites. By contrast, prevalence of methamphetamine use is the highest in Sacramento and Portland (43% of 731

Table 2. Proportion of Adult Male Arrestees Testing Positive and Self-Reporting Use by Site, 2011.

Primary city	Marijuana (%)	Cocaine (%)	Opiates (%)	Methamphetamines (%)
Atlanta	78.5	43.5	7.1	14.3
Charlotte	73.1	38.5	21.4	0
Chicago	79.5	36.8	65.2	0
Denver	92.4	55.1	25.0	66.7
Indianapolis	82.2	35.8	21.7	33.3
Minneapolis	86.2	52.3	29.8	50
New York	87.1	41.8	40	100
Portland	90.2	52.5	71.4	58.6
Sacramento	84.9	50.9	33.9	66.3
Washington DC	78.1	56.8	43.5	n/a
Overall congruence	83.7	45.1	41.4	60.6

and 23% of 1,050 male arrests, respectively, tested positive in 2011), and roughly a half to two thirds of users admitted their methamphetamine use in those sites.

The Willingness to Admit Use Varies Over Time

As availability and even fads in drug use change both the incidence and pattern of use over time (Hunt, 2004; Musto, 1999), these factors may change respondents' willingness to admit to use of different drugs at different points in time; that is, actual drug use can remain constant or change, but changing norms can affect the willingness to admit to that use. To examine trends, we estimate the probability of admitting drug use when testing positive over the course of that site's years of data collection.[6] We used a weighted linear probability least-squares regression model and computed robust standard errors. The tests of significance are based on the difference of the final year of data collection minus the first year of data collection. In other words, we are testing the end result of the probability in telling the truth, regardless of the pathway there. Although we could have tested whether there are trends in the path from the initial to final admission of use, we really wanted to check if the admission to use is different at the end than the beginning of the time periods.

The dependent variable is an indicator variable (1), if the arrestee admitted to using that drug within the appropriate window of detection for each drug (i.e., the prior 3 days or 30 days). It also includes other covariates: a set of indicator variables for charge (violent, property, and drug, with "other" excluded) and severity (felony) of the most serious arrest charge, age (age categories), race, Hispanic ethnicity, education, any full- or part-time employment, and a set of variables to capture potential cycles in admitting to drug use. The model specification estimates a linear and a squared trend term in each site estimates the time trend over the full-time period, then predicts the last year, the first year, and the differences between the two. The p value comes from testing whether the predicted differences are statistically different from zero.

Results show that there are statistically significant differences over time in the willingness to admit to drug use for some drugs in some ADAM II sites over time. Table 3 shows the estimated percentage point change in actual users (those testing positive) admitting drug use over the entire ADAM time period, holding all the other covariates in the ordinary least square (OLS) regression model constant. The first column reports the site, the second column the time period, and the third through seventh columns report the percentage point change, the standard errors associated with those estimates, and the statistical significance of the change in admission to use for

Table 3. Estimated Percentage Point Change in Admission to Drug Use, by Drug.

Site	Time period	Marijuana	Cocaine	Heroin	Meth
Atlanta	2002-2012	−15.4 (7.2)*	−36.9 (9.1)**	−65.0 (26.1)*	—
Charlotte	2000-2011	−12.4 (5.8)*	−22.5 (8.5)**	−19.9 (18.4)	—
Chicago	2000-2012	0.4 (7.0)	−3.8 (12.2)	−2.7 (13.8)	—
Denver	2000-2012	4.3 (2.9)	−3.9 (6.0)	−5.7 (11.4)	−15.2 (13.8)
Indianapolis	2000-2011	0.2 (4.2)	−8.5 (7.6)	4.3 (8.5)	−34.7 (38.1)
Minneapolis	2000-2011	−7.9 (3.8)*	−15.6 (8.8)	−12.3 (14.1)	−10.0 (19.3)
New York	2000-2012	6.9 (4.0)	1.1 (7.6)	−11 (9.9)	—
Portland	2000-2011	3.0 (3.4)	−4.4 (8.7)	31.3 (7.6)**	−0.4 (7.6)
Sacramento	2000-2012	2.9 (3.2)	−6.6 (9.5)	−20.8 (11.2)	2.7 (5.6)
Washington, DC	2000-2011	35.7 (12.6)**	76.2 (27.7)**	−77.3 (43.1)	—

*.01 < $p \leq .05$. **$p < .01$.

marijuana, cocaine, heroin, and methamphetamine from the beginning to the end of that site's observation period. The results are mixed across sites and drugs. Atlanta saw large, statistically significant reductions in the percentage of arrestees admitting to use when they had a positive drug test result for marijuana, cocaine, and heroin. Charlotte saw large, statistically significant reductions in the percentage of arrestees admitting to use when they had a positive drug test result for marijuana and cocaine. Minneapolis had a moderate reduction in the percentage of arrestees admitting to use when they had a positive drug test result for marijuana. Portland saw a large increase in the percentage of arrestees admitting use when they had a positive drug test result for cocaine. In short, holding other factors constant, the willingness to admit use among users changes over time, differently for different sites and for different drugs, making a global correction of bias covering all sites implausible. Again, when the number of users are too small (as for methamphetamine in some sites), we do not calculate the point change.

The Willingness to Admit to Use Differs by Characteristics of the User

Our analysis indicates that the only characteristic of the arrestees that seems consistently associated with admission to drug use is age. Figures 2 through 4 report the estimated percentage of arrestees in 2011 admitting to drug use when testing positive by age group, for marijuana, cocaine, heroin, and methamphetamine. We estimated the percentage admitting to use from the parameters estimated in the weighted OLS regressions, setting the values of the covariates to (a) the overall site mean for all charge, severity, race, ethnicity, education, and employment; (b) zero for the variables associated with cycles; and (c) either 0 or 1 for the age groups, depending on the age group being estimated. For example, to estimate the 18 to 21 age groups, we set the variable indicating 18 to 21 equal to 1, and the variable associated with all other age groups equal to 0. All sites are reported on each figure, and we indicate statistically significant differences in admitting drug use across the age groups.

Why would difference in the age of users of different drugs matter? History tells us that large increases in the prevalence of the use of a drug at a point in time, that is, prior "epidemics" of use, create a rise in the number of users followed by a settling down of that number into the hard core and most often aging users. When, however, the average age of users drops and younger users appear in samples, it may be a signal of another overall rise in use. For this reason, it is important to pay close attention to shifts in the willingness of different ages of users of different drugs to admit that use.

Overall, for marijuana, there is a high level of willingness to admit use in all age groups in all sites, perhaps because compared with the other drugs tested, marijuana is less stigmatized and/or

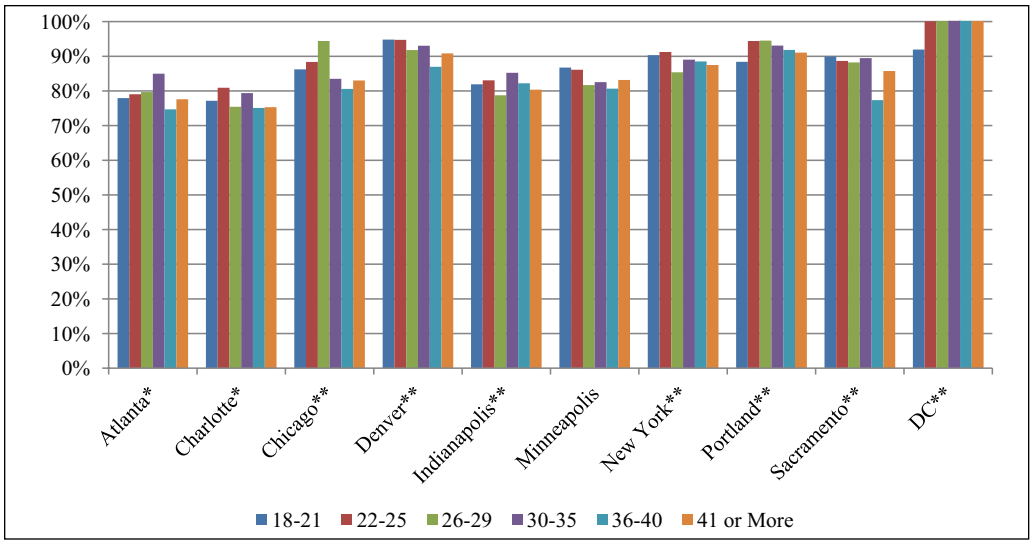

Figure 2. Predicted congruence for marijuana use, those testing positive, by age group.

more normative in all age groups (Figure 2). There are still some differences among arrestees testing positive and reporting use in 9 of the 10 sites in a user's willingness to admit to marijuana use based on their age, and the trends are not consistent across sites. In Atlanta, Chicago, Indianapolis, and Portland, middle-aged arrestees are most likely to admit to use of marijuana, while in Charlotte, Denver, and Sacramento the youngest arrestees are the most truthful with regard to marijuana. The relative truthfulness of those using marijuana at all ages seems to point to the norms surrounding the harm and the declining penalties associated with the drug.

By contrast, there are differences across age groups in the willingness to admit to cocaine use in all 10 sites. Admitting to cocaine use presents an interesting picture relative to age—younger users are less likely to admit, there is an increase in willingness among the 30 somethings, then a decline among the older users. Unlike marijuana, cocaine is a less normative, more stigmatized drug that involvement with carries far greater penalties than marijuana.

Age also differentiates the percentage admitting to heroin use in 6 of the 10 ADAM sites (Figure 3). Younger arrestees are less likely to admit use, followed by the oldest arrestees, though there is considerable variation in overall willingness across sites. What is most disturbing about the reticence of younger users to admit to use are data from ADAM showing that in 3 sites there is a significant increase in the proportion of arrestees 18 to 24 in three cohorts (2000-2003, 2007-2009, and 2010-2011) testing positive for opiate use, primarily heroin[7] over the time period. In some sites, like Minneapolis and Indianapolis, the proportion of 18- to 24-year-old arrestees testing positive for opiates went from 13% in the 2000-2003 cohort to 33% and 30%, respectively, in the 2010-2011 cohort (ONDCP, 2014b). The rise in the percentage of young users testing positive for opiates and the reticence to admit that use when asked points to a notable problem—we are likely not getting a good picture of a serious and increasing heroin and other opiates problem, relying only on self-report in this particularly vulnerable group of young users. The ADAM data would suggest that the rise in overdoses seen at the same time and later would not be surprising.

Age differentiates the percentage admitting to methamphetamine use in two of the five ADAM sites that had appreciable methamphetamine use in 2011 (Figure 5). In Minneapolis, the youngest arrestees admit methamphetamine use less frequently than older arrestees. In Sacramento, willingness to admit methamphetamine use generally increases until age 40, and after that users appear to become more wary of admission.

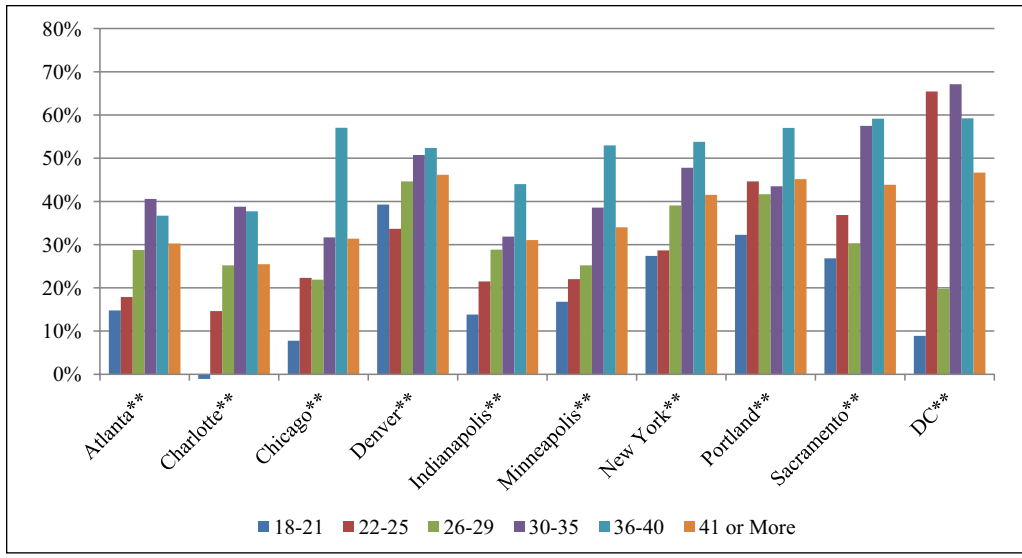

Figure 3. Predicted congruence for cocaine use, those testing positive, by age group.

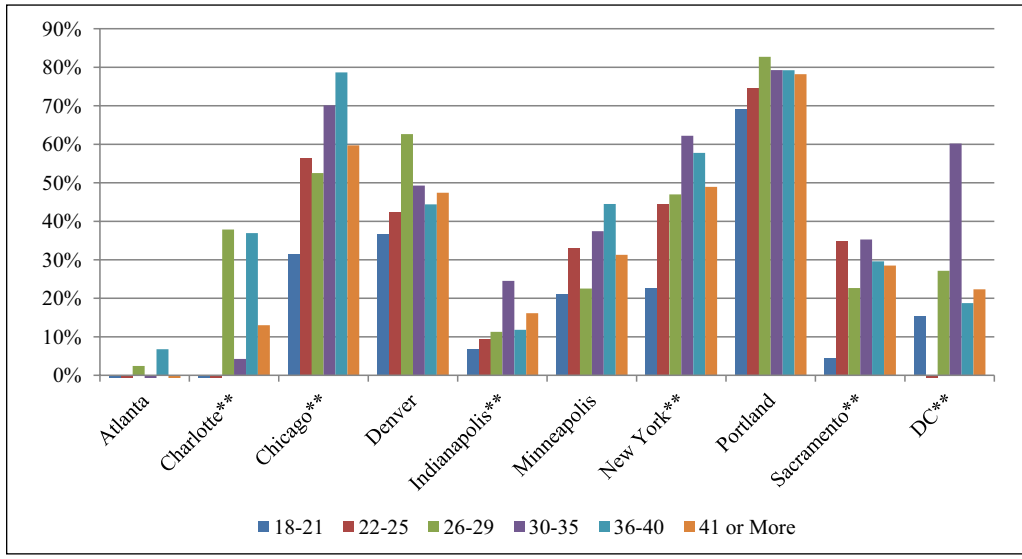

Figure 4. Predicted congruence for heroin use, those testing positive, by age group.

Summary

Getting respondents to tell the truth about illegal behaviors like drug use is difficult business and survey professionals have worked hard to eliminate as many obstacles to validity as possible—assurance of confidentiality, respondent controlled reply devices, online survey administration, careful development of rapport. All these undoubtedly help tackle the common problem that respondents are often not willing to tell the truth about behavior that is stigmatized or whose

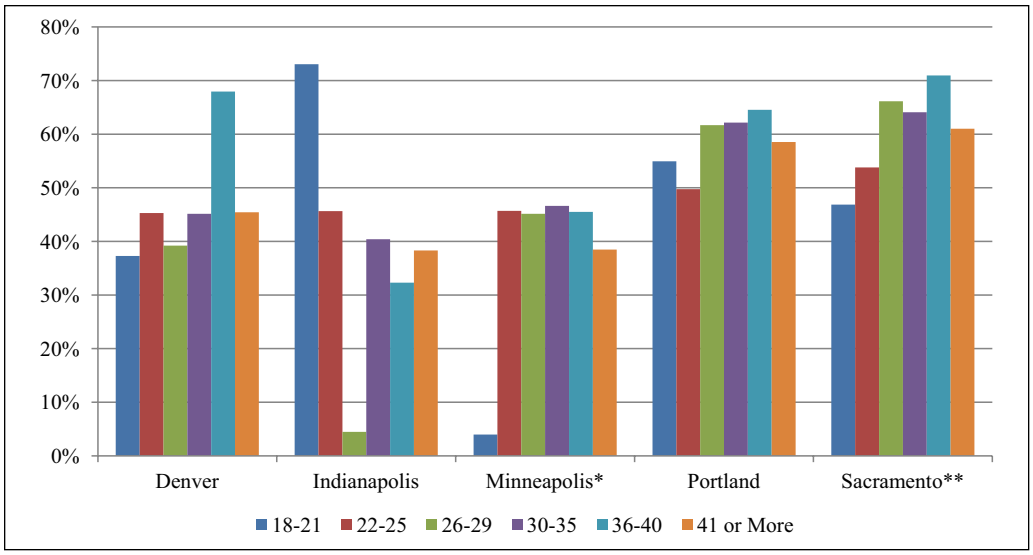

Figure 5. Predicted congruence for methamphetamine use, those testing positive, by age group.

disclosure can have negative consequences. This would be less of an issue for researchers and policy makers if the bias that denial introduces was not substantial and variable. In the case of reporting illicit drug use, we have found in the ADAM samples that falsification is variable—by the drug, by the place in which the information is taken, by the age of the respondent, and over time. This assessment is only made possible by the fact that the ADAM survey has developed over a 13-year period estimates that reflect different sites, uses a bioassay matched to self-report to validate answers, and includes a large number of users of the four illegal drugs most often asked about in surveys—marijuana, cocaine, opiates, and methamphetamine.

One of the advantages of the ADAM sample is that, unlike studies done post-arraignment (i.e., jail or inmate populations), the specimen used for testing is taken on all the individuals who have been arrested in an area regardless of charge or ultimate disposition when they are "just off the street"—within 48 hr of arrest—leaving little time for drugs that are quickly metabolized like heroin, cocaine, and methamphetamine to escape detection. Second, ADAM interviews are anonymous, unlike circumstances where the identity of the respondent is known, as is necessitated in household-based surveys or treatment admission surveys. In addition, in the ADAM population, there are adequate numbers of drug users, both with test results and appropriately time-delineated self-reports, to examine in relationship between the two. Although there were persons who used illegal drugs in the SAMHSA validation study, they were far fewer in number than found in ADAM, due in part to the transiency of the heavy using population.

But the limitations of the ADAM sample are not inconsequential. All respondents are male and all have just been arrested; perhaps, despite anonymity of the interview, this also affects their willingness to be forthcoming in a way we do not yet know. And one strength of the ADAM samples—the ability to reflect county differences in drug use across different areas of the country that can be masked in national samples—is also one of its weaknesses. While the arrestees are a representative sample of adult male arrestees booked into facilities in just those 10 *counties*, it does not represent a larger group of arrestees across the country[8] or even across a larger region. Nonetheless, local or regional variation in the use of different drugs is of vital importance to treatment providers and law enforcement agencies where often a national estimate alone has less limited value.

But these analyses do point to a serious potential issue with underestimation of the extent of illegal use in the country both from denial and from exclusion of what may be the Nation's heaviest drug users. These discrepancies would make no real difference were accurate data not critical for estimates in use and analysis of trends. Estimates of marijuana use from self-report are likely reasonably accurate, given the general willingness of users to admit that use. But accurate estimates of heroin and cocaine consumption may be double what users are willing to report and methamphetamine off by a third. If accurate reporting differs by region, national estimates of prevalence or burgeoning trends in use may be uninformative to policy makers in regions hit hardest by specific drugs. In addition, if truthful reporting varies by age and by drug, for example, the rise of serious drug use by a new, younger cohort of users, as appears to be the case with heroin, is further underestimated.

When trying to assess the extent of the Nation's drug consumption and resulting problems being off by a significant margin is not inconsequential. What is the answer? Much self-report data are fine. However, when asking about stigmatized and/or illegal behavior, there should be an expectation of substantial underreporting. In the case of drug use that error can be addressed and the self-report validated, even if only periodically in large surveys or in samples of those survey populations, through the use of a bioassay. Only then can we be confident that the trends we see are real. In addition, our analyses tell us that some of the Nation's heaviest drug users may be missing from our national estimates of use due to the nature of heavy use itself that often places them at risk of residential transiency but may make it more likely that they interface with the criminal justice system.

Authors' Note

The views expressed in this article are solely those of the authors and do not reflect those of the Office of National Drug Control Policy (ONDCP).

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Notes

1. From 2007 to 2011, the Arrestee Drug Abuse Monitoring (ADAM) program continued the data collection procedures initiated in 2000 in 10 of the original 35 ADAM sites. In 2012 and 2013, data were collected from only 5 of those 10 sites due to budget cuts. Both programs use the same instrumentation and sampling protocols across years; only the number of sites continuing in 2007 is different.
2. For a complete explanation of these methods, see *ADAM 2013 Technical Documentation Report* 2014 available through http://www.icpsr.umich.edu.
3. For a full discussion of the sampling strategies used, see *ADAM 2013 Technical Documentation Report* 2013 available through http://www.icpsr.umich.edu.
4. A full discussion of the imputation method can be found in the *ADAM 2013 Technical Documentation Report* 2013, available through http://www.icpsr.umich.edu.
5. Other factors that may affect congruence include the inaccurate recall of when drugs were used when compared with the test window detection (He states, "I used a week ago but not three days ago," but tests positive) and the level of the drug currently in the users' system. Low levels of marijuana use, for example, may be below the threshold of testing and a user may admit to use but test negative. We match reported time of use with test detection window to determine congruence.
6. For those sites continuing past 2011, we included those data.

7. The ADAM II test protocol tests both for all opiates and for synthetic opiates such as oxycodone. The questions asked also cover both heroin and prescription opiates. Lesser than 3% of all respondents in any site tested positive for oxycodone in 2011.
8. When ADAM was operating in what was ultimately 39 sites, Rhodes, Kling, and Johnson (2007) developed an estimation procedure that provided an estimate of the number of heavy drug users in the country.

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