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Conducting Rapid Street Assessment of Drug Users in New York City Using Oral Fluid and Brief Interviews: A Feasibility Study

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Abstract

This study piloted the feasibility of rapidly collecting both self-reports of drug use and saliva specimens for drug toxicology in field settings. The use of oral fluid collection devices to supplement self-reports is unproven in street settings and may pose challenges for field research. Sixty adults who identified as recent illicit drug users were recruited in public settings in New York City and were asked to complete a brief drug screening inventory and provided saliva specimens. Descriptive findings are detailed along with critical best research practices and limitations that provide important directions for researchers looking to employ both toxicology and self-report in rapid field recruitment designs.

Keywords

Drug abuse screening; oral fluid; saliva; toxicology; street drug users; rapid assessment

Introduction

Although there are previous studies of illicit drug use by street-involved individuals,^{1–4} there is little systematic research with this population that includes newer drugs and non-prescribed medications which are subject to abuse, including buprenorphine (Suboxone[®]), methamphetamine (“Speed,” “Meth,” “Crystal”), prescription opioids (e.g., oxycodone [OxyContin[®]]), methamphetamine/MDMA (“Ecstasy” “Molly”), prescription stimulants (e.g., Adderall[®], Ritalin[®]), synthetic marijuana (“K2,” “Spice”), and synthetic cathinones (“Bath Salts”). In addition, previous research with this population has relied exclusively on self-reporting of both traditional illicit drugs (e.g., heroin, cocaine, marijuana) and non-prescribed medications,^{5–7} even though substantial under-reporting of illicit drug use in high-risk populations is common and long known, even under conditions of research confidentiality^{8–10}

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Urinalysis is an established method of verifying self-reports of drug use, but is not practical for individuals recruited “on the street.” The collection of urine specimens is intrusive and requires access to a private bathroom, making it unfeasible, or at least inconvenient, for most street data collection. The collection of saliva specimens, in contrast, can be readily accomplished in public settings. The collection process is relatively non-intrusive, the specimen collection and storage devices are small and portable, and no special facilities are needed. Additionally, researchers can directly observe the collection of saliva in the field in order to minimize tampering or other variables that may affect the validity of results.^{11,12}

There has been considerable work in developing improved saliva tests for drugs subject to abuse. However, the accuracy of saliva testing varies greatly by the type of substance, specimen collection device and testing method; this is an active area of research and development. Saliva analysis also has a shorter window of detection than urinalysis for most drugs, which among other limitations, makes it unclear whether saliva would be as sensitive as urine for detecting use in a population of active street-involved drug users.^{13,14}

Epidemiological studies of illicit substance use among street-involved populations are important for monitoring trends in the prevalence of illicit substance abuse in communities and especially for detecting emerging substances of abuse. Street-involved populations are susceptible to high rates of illicit substance use, homelessness, and co-occurring mental illness.¹⁵ Thus, conducting field research in public settings is an effective way to find and recruit this “at-risk” population. Furthermore, focusing on active drug users within such groups represents an important public health domain because it can detect emerging drug use trends (e.g., misuse of recently marketed prescription opioids) and associated risk behaviors.

Typical survey approaches based on self-reports of illicit drug use almost certainly result in underestimates of use.^{9,16–18} Previous studies that triangulate self-report and toxicology data have been conducted in controlled settings, including police booking facilities,¹⁹ drug treatment clinics,^{8,20} soup kitchens,¹⁷ and even mobile medical vans,²¹ but never in public settings. Saliva testing for street-involved populations could be useful, but there are no data on the feasibility or accuracy of this procedure for this population.

New York City (NYC) represents an environmental extreme in that it is the most densely populated urban area in the United States and historically has the largest number of heroin users,² but also high numbers of cocaine,²² marijuana,²³ and, more recently, prescription opioid users.^{2,24,25} A NYC Street Research Unit was operated by the New York State Division of Substance Abuse Services (DSAS; later renamed as the Office of Alcoholism and Substance Abuse Services, or OASAS) for over 20 years and served a “vital and indispensable part of the research capacity of the agency.”²⁶ This unit relied on ethnographic techniques to investigate street drug markets and drug use trends in NYC and to also collect a variety of artifacts used to prepare, administer, and conceal drugs, from which researchers concluded that “there is no better way to gather current information on drug activity on the streets of NYC.”²⁶

In the spirit of this early important ethnographic drug research with street-involved populations, and in order to pilot the feasibility of saliva testing for street-involved populations, the aims of the current study are

1. to determine the feasibility of obtaining saliva specimens for drug testing from street-involved individuals congregating in venues known to be frequented by illicit drug users;
2. to determine the sensitivity of a typical, commercially available saliva screening test for detecting the *admitted use* of illicit drugs or non-prescribed medications in street-involved populations; and
3. to determine the potential utility of saliva screening to help estimate prevalence rates of illicit drug or non-prescribed medication use in street-involved populations.

Field research with street-involved populations of drug users^{27,28} often carries its own challenges and ethical dilemmas, including issues related to obtaining informed consent, maintaining confidentiality, safety, and risks of participant or research staff arrest.²⁹ Accordingly, an additional aim of this article is to discuss many of the salient challenges encountered by the research team in the field in order to help advance the development of practical guidelines for researchers looking to employ both toxicology and self-report in rapid field recruitment designs.

Methods

Overview of Procedures

Between April and December of 2013, a convenience sample of 60 participants in NYC was recruited from accessible outdoor locations where drug users were likely to be found. For the purposes of this study, “street-involved” individuals were defined as those who could be readily observed “hanging out” in public locations (e.g., parks, homeless shelters, outside drug treatment facilities, etc.). This recruitment method was intended to yield a high proportion of homeless/unstably housed individuals and drug treatment patients, among others who were likely to meet eligibility criteria.

Eligible participants had to be at least 18 years of age, speak English, and self-report use of at least one illegal drug or non-medical use of at least one psychoactive prescription medication within the past 30 days. Drug use “within the past 30 days” is a common survey and measurement standard in national health and other drug use research studies to represent recent substance use.^{30,31} After staff confirmed eligibility and participants provided verbal informed consent, members of the research team conducted a brief structured interview and collected participants' saliva in sterile devices. The data collection procedures were designed to be completed in 10–15 minutes and participants were remunerated US\$15. Saliva specimens were mailed to the laboratory within 24 hours of collection. All procedures were approved by the Institutional Review Boards (IRBs) of National Development and Research Institutes and Western Michigan University. Due to the condition of participant anonymity, the provision of written informed consent was waived and only verbal consent was required. The data were analyzed with SPSS v. 20.0 (SPSS, Chicago, IL).

Research Team

Members of the research team had all been previously trained in human subject research and received additional training by the project's principal investigator to familiarize them with safe recruitment and remuneration procedures, the administration and handling of saliva collection devices, and the safe accessing of locales frequented by the target population. Finally, researchers were given a list of drug classes and prescription drug brand names for both their own and participants' reference, as well as a list of local shelters, drug treatment programs, and social service organizations to provide to participants upon request or as needed.

Recruitment and Data Collection Sites

Recruitment took place in parks and street corners that were known to be frequented by street-involved drug users, in areas including Flatbush; Bedford-Stuyvesant; East New York; Brooklyn; Ridgewood; Queens; downtown, midtown, and uptown (Harlem); Manhattan; and the South Bronx. Researchers were instructed to recruit participants from a diverse range of locations to avoid oversampling from any single location or type of venue. The average number of interviews conducted per day at any single site was three. Researchers entered the field alone, and interviews were mostly conducted during daylight hours for logistical and safety reasons. Recruitment and interviewing typically took place in parks, on sidewalks, and other public spaces. Interviews were usually conducted in seated locations in these venues (e.g., park benches, walkway handrails, or a private room at a harm reduction organization). Researchers always took the participants "aside" so that the interviews would not be overheard. Saliva collection was often visible, however.

Upon approaching potential participants or upon being approached, researchers identified themselves, briefly outlined the goals and procedures of the study and screened interested individuals. If eligible, participants were asked to provide verbal consent and were informed about the participation incentive. Participants were asked to not provide any identifying information, and they were informed of their right to decline to answer any question without penalty.

Interview Protocol

The interview protocol consisted of 30 main questions which elicited information on: demographic characteristics (e.g., age, gender, race, ethnicity, etc.); substance use within the past 30 days; routes of drug administration; and injection-related risk behavior. Questions related to injection risk behavior were adapted from the Risk Behavior Survey³² (RBS); all other items were constructed by the investigators. About halfway through the study it was observed that the saliva test's sensitivity to detecting admitted drug use was low for some drugs; thus questions were added asking about substance use in the past three days, to better accord with the detection window for saliva screening. Although firm data are difficult to come by, specialists in saliva drug screening believe most drugs remain detectable for up to 2–3 days after administration.³³ Specific drugs and drug classes queried about were: marijuana/hashish, heroin, cocaine/crack, phencyclidine (PCP), methamphetamine, hallucinogens, Ecstasy (MDMA), "synthetic" marijuana (K2, Spice), bath salts, prescription opioids (buprenorphine, codeine, fentanyl, hydrocodone, hydromorphone, meperidine,

methadone, morphine, oxycodone, tapentadol, tramadol, and “other” prescription opioids), non-opioid prescription drugs (benzodiazepines, stimulants [e.g., Ritalin, Adderall], anti-depressants, muscle relaxants, and sleep medicines). The instrument distinguished between medical and non-medical prescription drug use.

The interview also asked participants to identify their first and second most frequently used drugs including routes of administration (e.g., injected, chewed and swallowed, swallowed without chewing, dissolved sublingually sniffed/snorted, smoked, etc.), reasons for use (e.g., to get high, to control withdrawal, to manage physical pain, to help sleep, etc.), and means by which they obtained the drug (dealer, friend or relative, forged prescription, stole it, internet, etc.). The final section of the protocol contained items about injection drug-related behaviors that can transmit HIV and hepatitis C and substance use treatment history, if applicable.

Oral Fluid (OF) Collection and Laboratory Protocol

Two laboratories were used for the present study, although not by original research design. Approximately halfway through planned recruitment, the original laboratory contracted for this study to screen and provide results of saliva toxicology, Bendiner & Schleisinger Medical Laboratories was sold and arrangements could not be made with the acquiring company to continue the study. Data collection was temporarily suspended until a new laboratory (Alere Toxicology) was obtained. A total of 35 samples were processed by Bendiner & Schlesinger and 25 by Alere. Bendiner & Schlesinger screened for methadone, opiates (non-specific), fentanyl, buprenorphine (Suboxone^R), oxycodone, cocaine, benzodiazepines, methamphetamine, marijuana (THC), and PCP. Alere Labs screened for all but two of the same drugs (oxycodone and fentanyl were excluded), with the addition of a unique metabolite of heroin (6-monoacetylmorphine [6-MAM]). The change of laboratories coincided with the aforementioned addition of past 3-day drug use questions to the interview protocol.

The two laboratories used different OF collection devices. Bendiner & Schlesinger supplied the *Intercept[®] Oral Specimen Collection Device*; Alere Toxicology supplied the *Quantisal[™] Saliva Collection Device*. Enzyme immunoassay was the screening technique in both cases, with presumptive positive results confirmed by gas chromatography-mass spectrometry (GC/MS) or liquid chromatography-mass spectrometry (LC/MS) methodology.

The sealed collection wand was given to participants, who were instructed to peel the outer wrapper off the wand and place the cotton swab end against the inside of their cheek. Saliva collection with *Intercept* took place after the interview. Since *Quantisal* required a longer collection period (at least 5 minutes), the procedure was amended to begin saliva collection prior to the interview. In either case participants knew before the interview that saliva would be requested. For both devices, following OF collection, participants inserted the wands swab-side-down into plastic tubes containing the preservative liquid. The devices were then sealed and labeled by the researcher and the specimens were express-mailed to the laboratory within 24-hours of collection. The specimens did not require refrigeration.

Results

Characteristics of Respondents

The sample consists of 60 participants (15 women, 45 men), ranging from 19 to 67 years old with a mean age of 47 years ($SD = 12$); 62% identified as African American, 27% as Hispanic or Latino, and 13% as Caucasian. The majority of the sample were residentially unstable (55% were either homeless or stayed in shelters); 35% were currently in substance abuse treatment (e.g., methadone maintenance, residential treatment, outpatient treatment), and an additional 35% stated that they had been in substance use treatment in the past.

Self-Reported Drug Use

Substance use reported within the sample is shown in Table 1 and should be interpreted cautiously in the context of the eligibility criteria (street-involved populations who were pre-screened for past month illicit drug or non-medical prescription drug use) and the relatively small sample size. Marijuana and prescription opioids were the most frequently reported drugs used within the past 30 days, followed by benzodiazepines. The most frequently self-reported opioids used within the past 30 days were methadone,^a oxycodone, codeine hydrocodone, buprenorphine, and morphine. Past month use of tramadol, mepedrine, and hydromorphone were each reported once.

Routes of drug administration were recorded for the substances that participants identified as either their primary or secondary drugs of choice. The majority of primary or secondary heroin users reported intranasal use (13/17 = 76.5%) as opposed to injection use of heroin (4/17 = 23.5%). Participants also reported insufflating (e.g., “snorting”) prescription drugs, including buprenorphine, oxycodone, and benzodiazepines. Participants who reported any lifetime injection drug use were asked about injection risk behaviors (e.g., sharing needles, cookers, cottons, rinse water, water containers, or splitting the drug solution using front-loading or back-loading), and one of the four injection drug users reported engaging in each of these behaviors within the past month.

Saliva Test Results

Toxicologies in comparison with self-reported past 30- and 3-day use are shown in Tables 2 and 3, respectively. The sensitivity of the saliva test is defined as the percentage of tests that are positive when the individual reports using the drug. Sensitivities reported in Table 2 were not expected to be high because the window of detection for OF is only up to three days for drugs, whereas the main analysis is based on past 30 day reports. Nevertheless, saliva-positive results should be more likely when the individual reports drug use than when the individual does not, which would be reflected in a statistically significant association.

Saliva test results were significantly associated with 30-day self-reports for cocaine/crack, opiates, and methadone. Significance for heroin alone was marginal, but this was a smaller

^aAn estimated 7 out of 25 past 30-day self-reported methadone users/patients were illicit methadone users, according to survey responses and field notes. One of these participants refused to provide a saliva specimen, and of the remaining six, two screened positive for methadone. This relative proportion of illicit methadone users is not high, noting, however, the procedures and non-probability sample employed. Illicit or “street” methadone is often diverted from patients for multiple and complex reasons worthy of further investigation beyond the aims of this pilot study.

sample size. Associations with marijuana and benzodiazepines were not significant. None of the 11 self-reports of oxycodone were detected by saliva. The range of sensitivities for different drugs was large, between 0% (oxycodone) and 75% (methadone; Table 2).

Limiting self-reports to the past three days increased the sensitivities of saliva testing for cocaine/crack, methadone, marijuana, and benzodiazepines, but not opiates generally or heroin specifically. The range of sensitivities for different drugs was again large, between 25% (opiates, heroin, and benzodiazepines) and 100% (methadone; Table 3). Not shown in Tables 2 and 3 are positive tests/3- and 30-day self-reports for methamphetamine (0/1), PCP (1/4), and buprenorphine (0/4). There were very few instances where a respondent denied the use of a drug or medication, but the saliva test was positive.

Challenges and Best Practices in Fieldwork

Respondents were typically recruited in sets of three to six in a single recruitment episode, and were generally quite willing to participate— remuneration was helpful and necessary. “Impression management”³⁴ was important in gaining trust and building rapport, which entailed intentional choices by the research staff regarding attire, demeanor, and speaking characteristics in the field.^{34,35} Self-presentation bias can have a significant effect on the quality of interactions between research ethnographers and drug using populations,³⁶ and field researchers found the self-presentation strategies employed to be effective. These strategic choices included wearing minimalist casual clothing (as opposed to more formal attire found in academic or clinical settings), and investing considerable time happily and patiently observing a setting before deliberately making polite eye contact and engaging in conversational banter with as many passersby as possible. The overall impression to bring into field settings should ultimately be one of approachability and humanization for both the participant and process.

Conducting recruitment only during the daytime and in public areas was another intentional consideration to maintain safety in the field both for participants and the research team. Recruiting from small networks was often helpful whereby the recruitment of a single participant often led to more. However, this sometimes led to a small queue of people waiting to participate, at which point the maintenance of privacy for those being interviewed became a concern that required active management by the research interviewer. The queuing and monetary incentive sometimes resulted in disappointed individuals who could not be enrolled due to ineligibility, a lack of OF kits, or saturation from a single recruitment site.

Some individuals who were approached refused participation and several prospective participants were turned away due to ineligibility (i.e., no illicit drug use within past 30 days) or due to researchers either running out of OF kits or limiting the number of participants who could be recruited at a single site. The setting of expectations was crucial to prevent disappointment from escalating to conflict. Because recruitment via peer referral frequently took place, researchers often found it important to disclose to enrolled participants the number of kits in their possession to convey a clear understanding of exactly how many interviews could be completed.

The OF devices and interview process were generally inconspicuous, but field researchers found that the brief procedure could provoke some curiosity in populated public places. Such intrigue came not only from onlookers and participants' acquaintances, but law enforcement officials as well. One interview, for example, was interrupted when police officers had to remove a participant from a public park for consuming alcohol and possessing a weapon (a hammer). Thus, the interview had to be momentarily postponed and continued outside of park grounds. Rare logistical inconveniences aside, the occasional presence of law enforcement or staff of local social service organizations did not interfere with study procedures.

Participants were generally cooperative in providing the saliva specimens and the devices were relatively simple for both the researchers and participants to use without error or confusion in handling. In one instance a participant refused to give a specimen, for fear that her DNA would be traceable despite the researcher's assurances of anonymity and the fact that no identifying information was collected. Prior research has shown that a fear of genetic testing and mistrust of the medical establishment in general is especially pervasive among African Americans, Latin Americans, and groups of lower socioeconomic standing,^{37–39} thus perhaps accounting for this type of occasional reluctance from participants.

The transition of laboratory vendors provided added insight into the use of two different commercial devices. During the first half of the study, Bendiner & Schlesinger's *Intercept* OF collection devices were administered after completion of interview/survey, requiring 1–2 minutes to become sufficiently saturated.

Alere's *Quantisal* OF devices, however, had a blue chemical indicator that took up to 5 minutes to signal that a sample had been collected. Therefore, to expedite the process and minimize inconvenience to participants, researchers found it necessary to begin OF collection at the beginning of the interview. This meant that participants completed the interview with OF collection devices in their mouths, which, fortunately did not impede speech or provide any difficulty. Testing these devices among all members of the research team during training was an important step before beginning fieldwork and should be viewed as essential for similar research designs, no matter which devices are used.

Early in the study, some researchers found that participants requested information about housing or substance abuse treatment or mistook researchers for social workers or outreach workers. Therefore, the team began offering a two-page resource information sheet to the participants after they completed all research procedures. This resource list contained information about local syringe exchanges/harm reduction sites, substance abuse and mental health services, HIV/AIDS support, and crisis hotlines in all five NYC boroughs. Participants who requested or accepted this information were overwhelmingly grateful to receive it, with many remarking that it was of equal or greater value than the remuneration.

Discussion and Limitations

Some interesting substantive findings emerged from this pilot study with regard to polydrug use, new designer drugs, routes of administration, and HIV risk behaviors. One such finding is that about three times as many primary or secondary heroin users reported intranasal as

opposed to injection use, which corroborates patterns and trends typically seen in research samples of heroin users.⁴⁰ While the prevalence of heroin insufflation compared with injection has not been assessed for broad heroin-using populations nationally, longitudinal data collected from NYC treatment programs between 1989 and 1999 noted that injection use declined from 71% to 39%, while insufflation increased from 25% to 59% over that decade-long period.⁴⁰ Similarly, a rapid survey of NYC street drug users² (mean age = 42 years) found equal prevalences of intranasal and injection heroin use (22% each), and a recent study of methadone maintenance patients (primarily heroin users, mean age = 41 years) found that 51% reported injection as their primary route of administration while 45% reported insufflation as primary.^{2,41}

With regard to polydrug use, a methadone maintenance patient reported using blood pressure medication (clonidine/Catapres^R) in combination with benzodiazepines to create a stronger high. Although older respondents were more likely to report cocaine/crack, heroin, and methadone use, younger respondents more often reported “designer” synthetic drugs such as “Molly” (MDMA), “2C-I” (2,5-dimethoxy-4-iodophenethylamine), “25-I” (25I-NBOMe, a derivative of 2C-I), as well as “K2” (synthetic marijuana), and more traditional psychedelics such as mushrooms and LSD. Future designs should pay attention to the association of age with certain types of drug use across larger samples.

Cocaine/crack and methadone were detected by saliva with the highest sensitivities. This is consistent with previous research.^{42–45} In fact, using GC/MS, self-reported cocaine use up to 4 days ago can be very reliably detected with sensitivity = 91%.⁴² It should be noted that in the current study, almost all of the methadone use reported was by patients in methadone treatment, where daily doses are administered.

Previous studies have reported the low sensitivity of saliva screening tests for benzodiazepines^{44,46} and for marijuana^{43,46,47} in field settings. This was reflected in the findings of the current study. On the other hand, previous research reports good detectability of opiates in saliva screening tests,^{43–46} whereas the current study found low sensitivity to opiates generally and heroin specifically, whether compared with 30-day or 3-day self-reports. This may be attributable to the amount of opiates used; e.g., many respondents might be using just enough to avoid withdrawal symptoms, but not enough to achieve euphoria. To better understand the different sensitivities of saliva screening for different drugs, more detailed information on dosages and frequencies of use would need to be collected. The relatively low sensitivities of the saliva test for several drugs may also be influenced by limitations of self-reported drug use data. Participants were asked to report both 30-day (and later, past-3 day) drug use, which could be difficult for many to do accurately, especially in a population asked to recall psychoactive substances that can impair memory. Participants had to be lucid and cogent in order to enroll and were turned away if functionally impaired. Several participants, however, mentioned during interviews that they were under the influence of one or more substances.

In some cases, respondents remembered drugs they had used and researchers had to go back and amend their answers. As with any study involving a remuneration incentive, there may have been some instances of over-reporting. And given the vulnerability of this population,

under-reporting is also a possibility due to legal or stigma-related concerns. The extent of laboratory or specimen handling error is also unknown, and one sample was lost in the laboratory transition. To mitigate malinger or misreporting, researchers often went back over certain questions to double-check that they had all the information correct. The survey instrument provided multiple opportunities to report prescription drug use, but the various brand and chemical names for prescription drugs could be particularly confusing for respondents. The use of a reference sheet with prescription drug brands and chemical names was certainly helpful, but reporting accuracy could be further improved by including images of pills to improve recall.

Another reason for the lack of concordance between self-reports and toxicologies may derive from respondents' lack of specific drug knowledge, particularly relating to opioid formulations. In many cases, respondents were often not told explicitly what they were purchasing or taking, nor were they concerned about that at the time of acquisition or use. For example, several reported using "oxys" or "uppers" without any more detailed information about dosage, brand, or release formulation. One respondent, for example, reported taking "any other pill that was available" when heroin was unavailable.

There was no evidence that oxycodone can be detected by a saliva screening test in a field setting, which is a limitation since this is currently a major drug of abuse. However, this result could have been affected by respondents' possible inability to accurately distinguish the numerous opioids they were ingesting, as discussed.

Finally, as this is a feasibility pilot study, the generalizability of findings are limited by non-probability sampling and the relatively small sample size. Because researchers relied on both convenience sampling in common drug-using locales and peer recruitment, there was the potential for participant selection bias. Recruiting participants from multiple sites in all NYC boroughs was helpful to diversify the sample, but recruitment could be made more systematic in future studies through the use of targeted sampling and ethnographic mapping of locations⁴⁸ or time-space sampling.⁴⁹

Conclusions and Implications for Practice

This pilot study suggests that the rapid dual collection of self-report and OF data in the field is logistically feasible. However, it is hard to imagine this target population participating in similar research without remuneration, the condition of anonymity and a waiver of written informed consent. In addition to not collecting identifiable information, researchers should pay attention to impression management to more expediently develop trust and rapport.

Administering OF collection devices at the beginning of the interview was helpful. Respondents could become impatient waiting for the swabs to saturate after the interview was over.

Street-involved individuals should be approached with care when in groups and for the sake of researcher safety, it is very important that expectations are clearly set when offering remuneration. Organization is especially important in street settings and it is strongly recommended that all of the various paperwork (interview protocols, lab cover sheets, drug

information cards, resource sheets, cash incentives, and incentive receipts) and OF devices (including hygienic envelopes for the sealed biological samples and postal mailers for the labs) be pre-sorted into individual field kits to expedite the process of moving between respondents in the field. In particular, field researchers should place cash or other remuneration incentives in envelopes to avoid showing cash in street settings. Any labeling or processing that can be properly done post-recruitment (e.g., completing lab forms and preparing collected samples to be mailed) should be done outside of the field in order to maximize peer recruitment opportunities at any given site.

Drug information/reference cards containing images of actual prescription drugs may help respondents' recall and aid the accuracy of self-report data. Furthermore, resource information sheets containing local shelter, social service, and substance abuse treatment locations should be mandatory for researchers to provide to respondents upon request. Provision of referral information and resource sheets need not be limited to respondents, because individuals who are either ineligible or decline to participate may still benefit from receiving such information upon request. These procedures help contribute to the beneficence of field research with street-involved substance users.

The low to moderate sensitivities of saliva screening for detecting the past 30-day or even the past 3-day drug use does not mean that the value of saliva testing is questionable. On the contrary, such testing can be employed to determine true prevalences of drug use by applying the back calculation technique recently described by Magura (2010).⁵⁰ For instance, 55% of those who admit cocaine use in the past 30 days tested positive in the current study. From this one could infer that, among a hypothetical set of individuals who deny cocaine use, but 10% of whom test positive, the true prevalence of cocaine use can be estimated as $10\% \times (100/55) = 18\%$. That is because only a little over half of those admitting cocaine use within the last 30 days test positive, then almost twice as many of who test positive but do not admit use, are estimated to be actual users within the last 30 days.

The back calculation technique cannot be applied to the current data, because the overall sample is small and importantly there were very few individuals who denied use of a drug, but tested positive for that drug. This of course is by design—the present study targeted those willing to admit illicit drug use so that “true” sensitivities of saliva drug screening could be estimated in a field setting. Moreover, individuals willing to admit some illicit drug use might be expected to admit all illicit drug use and also non-medical use of prescription medications—at least to the best of their ability. Thus the low number of positive tests when use of certain drugs was denied is understandable and likely reflects reality.

This current study is a “proof of concept” pilot and a larger sample would be required to determine stable and replicable sensitivities for saliva screening. Given that, then the back calculation technique could be used to establish accurate prevalence of illegal and unprescribed drug and medication use among groups of individuals not willing to admit such use in field settings. This will require further research using saliva testing in field settings. Prior research has shown that denial of illicit drug use is common among various at-risk populations.^{9,10} Consequently it can be recommended that saliva screening should be part of a rapid drug assessment protocol.

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Table 1**Self-Reported Past 30-Day Use**

Substance	Self-Reported “Yes” Past 30-Day Use	
	<i>n</i> (60)	%
Marijuana	33	55.0
Methadone	25	41.7
Benzodiazepine	25	41.7
Cocaine (not crack)	24	40.0
Heroin	21	35.0
Crack cocaine	20	33.3
Oxycodone	20	33.3
Codeine	13	21.7
Hydrocodone	12	20.0
Hallucinogen/MDMA	5	8.3
Phencyclidine	4	6.7
Buprenorphine	4	6.7
Morphine	4	6.7
Synthetics	3	5.0
Stimulant medications	3	5.0
Methamphetamine	1	1.7
Hydromorphone	1	1.7
Meperidine	1	1.7
Tramadol	1	1.7
Opana	1	1.7
Fentanyl	0	0.0
Tapentadol	0	0.0

Table 2
Self-Reported Past 30-Day Use Versus Saliva Toxicology

	Self-Reported Past 30 Day Use		
	No (%)	Yes (%)	Total (n)
Saliva test—cocaine/crack			
Negative	24 (96)	15 (45)	39
Positive	1 (4)	18 (55)	19
Total	25 (100)	33 (100)	58
(Fisher's exact test = .00; sensitivity = 55%)			
Saliva test—opiates			
Negative	28 (100)	22 (73)	50
Positive	0 (0)	8 (27)	8
Total	28 (100)	30 (100)	58
(Fisher's exact test = .01; sensitivity = 27%)			
Saliva test—methadone			
Negative	33 (97)	6 (25)	39
Positive	1 (3)	18 (75)	19
Total	34 (100)	24 (100)	58
(Fisher's exact test = .00; sensitivity = 75%)			
Saliva test—marijuana			
Negative	22 (85)	25 (78)	47
Positive	4 (15)	7 (22)	11
Total	26 (100)	32 (100)	58
(Fisher's exact test = .74; sensitivity = 22%)			
Saliva test—benzodiazepines			
Negative	32 (97)	22 (88)	54
Positive	1 (3)	3 (12)	4
Total	26 (100)	25 (100)	58
(Fisher's exact test = .31; sensitivity = 12%)			
Saliva test—oxycodone			
Negative	21 (100)	11 (100)	32
Positive	0 (0)	0 (100)	0
Total	21 (100)	11 (100)	32
(Sensitivity = 0%)			
Saliva test—heroin (6-MAM)			
Negative	18 (100)	6 (75)	24
Positive	0 (0)	2 (25)	2
Total	18 (100)	8 (100)	26
(Fisher's exact test = .09; sensitivity = 25%)			

Table 3
Self-Reported Past Three-Day Use Versus Saliva Toxicology

	Self-Reported Past 3 Day Use		Total (n)
	No (%)	Yes (%)	
Saliva test—crack/cocaine			
Negative	13 (93)	3 (27)	16
Positive	1 (7)	8 (73)	9
Total	14 (100)	11 (100)	25
(Fisher's exact test = .00; sensitivity = 73%)			
Saliva test—opiates *			
Negative	20 (95)	3 (75)	23
Positive	1 (5)	1 (25)	2
Total	21 (100)	4 (100)	25
(Fisher's exact test = .30; sensitivity = 25%)			
Saliva test—methadone			
Negative	15 (94)	0 (0)	15
Positive	1 (6)	9 (100)	10
Total	16 (100)	9 (100)	25
(Fisher's exact test = .00; sensitivity = 100%)			
Saliva test—marijuana			
Negative	13 (81)	5 (56)	18
Positive	3 (19)	4 (44)	7
Total	16 (100)	9 (100)	25
(Fisher's exact test = .21; sensitivity = 44%)			
Saliva test—benzodiazepine			
Negative	16 (94)	6 (75)	22
Positive	1 (6)	2 (25)	3
Total	17 (100)	8 (100)	25
(Fisher's exact test = .23; sensitivity = 25%)			
Saliva test—heroin (6-MAM)			
Negative	20 (95)	6 (75)	23
Positive	1 (5)	2 (25)	2
Total	21 (100)	8 (100)	25
(Fisher exact test = .30, sensitivity = 25%)			

* The only opiate reported in the last three days was heroin; thus the data were the same as for the heroin tabulation.