PART III

APPLYING THE NEW ADAM METHOD

VII. Implementing the New ADAM Study Design at the Local Level

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When the National Institute of Justice (NIJ) decided to strengthen the Drug Use Forecasting (DUF) program, it envisioned a way to measure drug use and drug-related behavior among arrestees that could withstand methodological scrutiny and would be an even better tool for local policymakers than in the past. That meant developing a statistically sound method of data collection, improving the way the local sites collected data, enhancing the survey instrument (questionnaire), and increasing the number of sites. The premise underlying the change was straightforward: to build an infrastructure that ensured standard data collection protocols; an unbiased, probability-based sample of arrestees; and a data management system that generated standardized data for use by the sites.

The theoretical ideals underpinning the new program, ADAM, have now been applied in the practical world of the jail environment in 35 sites nationwide, and the program has had one full year of experience administering a new collection instrument and probability-based sampling in all the sites. That application of research in a real-world setting raised several questions, which are explored here. Among the questions are whether it is possible to develop data collection protocols applicable in all jurisdictions, whether the ADAM program can ensure adherence to these standardized protocols, whether methodologically sound sampling strategies can be imported into local jails and still retain their scientific rigor, what adaptations the methodology can tolerate before it no

longer meets ADAM's standards, and whether probability-based sampling can work in a jail environment.

Explaining the full the transition from DUF to ADAM requires discussing why standardization is important; the reasons for probability-based sampling; how the new, county-level and facility (jail)-level sampling designs were implemented; and what challenges are posed by the jail environment. Once the transition is complete and all sites operate with probability-based sampling for female arrestees as well as male arrestees, ADAM should have even greater potential for generating information that will assist local officials at the sites in making policy decisions affecting these at-risk populations.

From DUF to ADAM

Until ADAM was established, researchers had never before attempted to use the setting of the jail as the focus of ongoing, standardized data collection and application of rigorous sampling procedures. NIJ did so, creating a program at multiple sites nationwide that included the following components:

- Data collection procedures common to all sites

- Probability-based sampling that would allow the sites to place confidence intervals around their findings on drug abuse and related behavior

- Enhanced data collection capabilities, with questions about drug treatment and drug markets

- The ability to compare ADAM data to those from national surveys of drug use.[1]

The importance of standardization, or common data collection procedures, cannot be overstated. Regardless of the sophistication of the sampling process, the findings are not reliable unless procedures are the same and carried out the same way in all the sites. All interviewers must administer the survey questionnaire (instrument) in the same way in all the sites. No step in the data collection process can be omitted. The population from which the data are drawn must be identifiable and the same type in all sites. Sampling must always be conducted the same way.

The data collection instrument, or questionnaire, was expanded from its initial focus on drug use, and now covers treatment and the dynamics of drug markets. And with the greater methodological sophistication of probability-based sampling, the interview also needed to include information required for weighting cases so that they are generalizable to a larger population—the county. Thus, ADAM needed a mechanism for estimating such information as the number of arrestees in the county who used drugs and the number who needed treatment. And because ADAM data are a measure of drug use among a limited spectrum of Americans, NIJ decided to build into the new collection instrument the ability to compare findings to those of other, national surveys of drug use.

Achieving standardization

Creating standardized data collection procedures involved first making sure the "catchment areas," or regions from which arrestees are drawn at the sites, are defined the same way in all the sites. Because a representative mix of the types of offenses committed is needed for the sample, standardization also meant resolving varying ways in which the sites define and deal with crime.[2]

Redefining the catchment areas

Arrestees who participate in ADAM are selected from people brought to booking facilities—generally a jail. In DUF, the sites collected data from arrestees booked at one

or two jails, but they did not necessarily reflect all arrestees in the community. For example, in Philadelphia data were collected in one facility, but because there are seven, the data could not represent drug use among all people arrested citywide. In Los Angeles, data were collected at two booking facilities out of nearly 100 in the county. At the other extreme, in New Orleans Parish (equivalent to a county), the sheriff's department operates the sole holding facility, so it is possible to make assertions about the generalizability of the data to the county's arrestee population.

In fast-growing cities in the West, the number of facilities grew with the population, but data continued to be collected in only one. DUF began operations in 1988. Phoenix, whose population increased 40 percent in the past 10 years,[3] continued to collect data at one facility. In sprawling communities in Texas, California, and elsewhere in Arizona, as metropolitan areas grew and encompassed more and more localities, it became less clear which locality or localities the arrestees at the central jail represented.

ADAM defined the common catchment area as the county. County lines generally served as a reasonably common demarcation, though there were exceptions. Atlanta, for example, extends across two counties, but because the site felt the city should be covered as a single entity, ADAM included both Fulton and DeKalb counties in the definition of this catchment area. Because the city and county of Philadelphia are coterminous, the city limits define this catchment area. New York City consists of five boroughs, making it necessary to attempt data collection in all of them.[4]

Not all counties are the same. Sites in the West manage catchment areas that are considerably larger, geographically, than in the East, with local law enforcement practices, such as deployment of officers, sometimes contingent on the number of miles to cover or amount of time it takes to bring arrestees to holding facilities. The catchment areas also vary in the number of local, county, and State law enforcement

officials having arrest authority, with the result that procedures might differ by facility. There were also variations in the number of booking facilities capable of holding arrestees. The ADAM program aimed to ensure that each booked arrestee in a catchment area had some probability of being selected for participation, and these two variables affected that probability. In all sites, the first step for ADAM was to find out how many booking facilities there were in the defined area and where arresting officials took arrestees to be booked.

Variations in "arrest" and other terms

Every State and local jurisdiction in the country has its own laws and system of justice, and while there are commonalities, the system of legal requirements in each reflects local conditions. For example, what one jurisdiction calls "breaking and entering" another may call "burglary."

What one community may call an arrest another may call a citation; for some communities booking and arrest are synonymous. Cite and release in one community may mean a street release/field release and in another may mean coming to the station/facility for booking and release. In order to understand which arrestees constituted the sample in each site, ADAM

needed common definitions so that segments of the arrestee population were neither over nor underrepresented.

The goals of ADAM dictated that all booked arrestees—from low-level misdemeanants to serious felons—have some probability of being selected for inclusion in the sample interviewed. If arresting authorities in one community bring *all* arrestees to booking facilities, the result for ADAM's purposes would be a reasonable mix of types of offenses among the arrestees. However, if another community cites and then *releases* most arrestees who commit only misdemeanor and city ordinance offenses, the arrestee population that remained to be interviewed would overrepresent those booked for more serious offenses. Even "misdemeanor" and "felony" are not defined the same by all jurisdictions. In some, such a label refers solely to the potential length of a jail sentence, while in others it refers more generally to the seriousness of the offense.

Adopting probability-based sampling

The ADAM procedure was also redesigned to account for the variations in the structure and size of local criminal justice systems and processes. That involved designing

Setting and Ensuring Performance Standards

To promote standardization of ADAM data collection at the sites, NIJ established basic criteria for data collection procedures. At each site, the agency also implemented training in the procedures.

The contractor that administered the ADAM program (Abt Associates) developed the training materials that were used at all sites. It ensured the procedures for data collection were followed and observed data collection. Editing instructions for the questionnaires were provided to all sites as a tool for ensuring quality data.

Common performance standards were established for all sites. They included requirements for meeting data collection targets (number of arrestees), for training, for minimum error rates in conducting interviews, and for adherence to a specified fiscal standard. A sampling plan to be used by all sites was developed and implemented.

When data collected from the interviews at the sites were received at the ADAM Data Center, they were all subjected to the same data management procedures by means of automated editing and entry programs.

By establishing these quality controls, NIJ anticipated that comparison of findings from site to site would be more defensible than in the past and that ADAM data would be that much more useful in informing local and national discussions of substance abuse.

county-level sampling models and strategies for sampling arrestees in each selected facility.

The goal of sampling in ADAM is to be able to estimate with a known probability, the likelihood that an arrestee will be selected for the ADAM interview and to be able to use that information to weight the sample data.[5] To avoid biasing the sample in favor of the types of arrest charges and types of arrestees represented at the facility during the times when interviewers are not collecting data, the sampling plan must reflect all days of the week and all times of the day. Further, the plans must represent all of the facilities in the county, whether large or small, or urban, suburban, or rural, in order to represent all types of offenders and offenses.

The "stock" and the "flow"

For each adult male arrestee booked in a 24-hour period,[6] ADAM had to determine the probability of his being selected for the sample. The approach had to be one that could be readily implemented in 35 sites in which there were in all more than 100 booking facilities. The easiest way—sampling and interviewing around the clock—would not be cost-effective. Another option would be to choose blocks of time randomly during the day and sample arrestees booked during those time periods. This was also too costly.

The sampling plan adopted covered the full 24-hour period by splitting the day into two parts: a "flow" and a "stock" period. In the flow period were the arrestees booked during each daily ADAM data collection shift—the 8-hour period when the flow of arrestees was highest. In the stock period were arrestees booked during the 16 hours when data collection did not occur. Using systematic selection procedures, interviewers sampled from both groups, with the result an arrestee sample that represented each 24-hour period of the one- to two-week ADAM data collection period.

The four sampling models

Variations among the catchment areas required developing a county-level sampling model that was flexible enough to be applied to the specific counties/sites. This in turn required that no matter the number of booking facilities in a county, each county would have a sampling plan that generated estimates that could be extrapolated to the entire arrestee population of the county. For counties with only a single booking facility, this was easily accomplished, but for those with multiple facilities, ADAM developed a procedure that would not bias the sample against certain facilities or certain types of offenses.

To accommodate the variations, four sampling models were developed. The simplest plan was the "single jail" design, in which collection took place at one jail only. Only slightly more complex was the "stratified" design, used for counties/sites with six or fewer facilities. This design called for data collection at all jails, with target numbers of arrestees selected proportionate to the number of arrestees processed at each jail.

For counties with more than six jails, a "stratified cluster" sample design was developed. In this type of design, every jail was assigned to one of a small number of strata, with one or two jails sampled from each stratum. This design generated estimates for all jails, even though only some jails were included in the sample. In a few sites, this model needed to be further refined into a "feeder" design. It was applied in counties where a large number of jails quickly transported arrestees to a central holding facility, which for ADAM reduced the probability of interviewing arrestees in the outlying jails to virtually zero. In counties where the feeder design was used, interviews took place at the central holding facility (which represented all jails in the county) as well as at the "feeder" jails, so that arrestees who were not transported to the central facility could be sampled.

To determine which model was appropriate where, the ADAM sites were asked to identify every booking facility in the county and furnish information about the number of adult males booked at each in the past year. These two pieces of information were used to select facilities and facility sample target numbers, proportionate to size.

In hindsight, it would have been helpful to have worked with each site to document the movement of arrestees through the various booking facilities in the county before developing county-level sampling plans. Had that been done, it would have been possible to adjust sampling plans to accommodate the county-specific variations, and thus implementing the plan would have been easier. However, that would have delayed implementation and would not have guaranteed immunity from other idiosyncracies.

Weighting the data to ensure representativeness

In order to demonstrate the extent to which numbers in a sample represent a larger population, they are weighted. In ADAM, this requires identifying the probability of each adult male arrestee's being included in the sample, based on information about that larger population. The ADAM data required a nontraditional approach to weighting. The main reason is that there is no way to know, before sampling takes place, who will be arrested and thus no way to assign a probability of any given arrestee's being included in the sampling frame (the list of cases of interest). The issue was resolved by using post-sampling stratification to identify the probability of inclusion in the sample of like groups of arrestees.

This required obtaining information about the total population arrested during each ADAM data collection period in each site (the "census"). In ADAM, all sites provided, as the census data, information about all adult males booked into the facility during the one- to two-week ADAM data collection period. These data include each arrestee's date of birth, race/ethnicity, date and time of booking, and description of the arrest charge and its severity. They are used to match the sample of arrestees interviewed with the larger population and to separate the population into strata based on these characteristics. The number of arrestees in each stratum was then counted, and the probability of their being included in the sample was determined in comparison to that of everyone else in that stratum. Essential to this approach was ensuring that bias could be minimized; that is, that for everyone in each stratum the probability of selection was the same.

Using "census" data

Several assumptions were used in weighting the data:

■ Arrestees charged with more serious crimes spend more time in the jail facility than those arrested on less serious charges.

■ Arrestees booked at the same time of day are processed similarly; that is, they all spend approximately the same amount of time in the jail before arraignment and/or transfer to another holding facility.

■ The stock and flow model (described above) may mean more serious offenders will be over-represented in the stock population, while the flow sample should represent the full range of charges. Thus, an assumption was made that for all people arrested on like charges and booked at about the same time (stock or flow), the probability of selection for the sample is similar.

■ Because the number of interviewers is static, the day of the week affects the probability of an arrestee's being selected. For arrestees booked on days when many people enter the system, the probability of their being selected is lower than for those booked on slow days.

In stratifying the population, time of booking is used to separate stock and flow, and charge severity and day of the week are used to further separate the population into strata having approximately equal probabilities of selection. For example, all felony "stock" booked on Friday and Saturday may be in one stratum, while misdemeanants booked Monday through Wednesday are in another.

The importance of census data to the weighting process makes accuracy and comprehensiveness of those data essential. Some sites find it more difficult than others to meet these requirements. Some facilities either do not store booking information electronically, or do not allow the jail database to be queried at the user end. For these sites, census data must be collected manually. Thus, on each day of ADAM data collection, in addition to orchestrating the sample selection and the interviewing, the ADAM site staff keeps a running census of all adult male arrestees booked into the jail. They then submit these data to the ADAM Data Center at the end of the one- or two-week collection period. Although this is typically the procedure in small or "low-flow" facilities, some jails where case flow is very high are not automated and require this manual approach.

For sites with only one facility or for those that use a stratified sampling design (because they have six or fewer facilities), all facilities are sampled, because there are so few. However, sites that use stratified cluster design (because they have more than six facilities) and feeder designs must submit census data for all booking facilities in the county. For a few sites, where the county maintains a countywide criminal database, this is not an arduous task. For other sites, collecting census data from all facilities in the county is difficult and the cost prohibitive. When it is not possible for them to collect census data, annual booking statistics for each facility or county-wide booking data are used to develop annualized countywide estimates.

Resolving census problems

Three problems that can adversely affect the weighting process often arise after the census data are transmitted to the Data Center. The data may include ineligibles, duplicates, and inconsistently recorded booking times.

Ineligibles and duplicates. Not everyone booked into jail is eligible to participate in ADAM. (Those ineligible include Federal holds, extradition holds, and court holds, all of which involve people detained in a local facility before trial). ADAM has to ensure that ineligibles are identified and removed from the sample so that they do not inflate the number of arrestees in the county. For example, an offender released on bond who arrives at court for arraignment may be remanded into custody and booked into the jail for holding pending transfer to another facility. This person would not be eligible for ADAM, but in most facilities would appear in the booking system. Some facilities track the type of booking and can include it as a variable in submitting their census data. In other cases, eligibility for the ADAM sample can be deciphered only by reviewing the charge and the information from the arresting agency and making educated guesses. It is the sites that confirm that ineligible populations are excluded from the census submission (and that there are no missing cases).

Duplicate cases also inflate the arrestee population. Cases are duplicated when more charges are added to a previous booking of an arrestee or an arrestee's use of an alias is discovered. The sites will need to learn to recognize the potential for duplicates and work with the ADAM Data Center to merge or delete duplicate records.

Inconsistent booking times. There can be variation in and confusion about the definition of "booking time" at the local level. This is a variable essential to the weighting process because in order to assign cases to the correct stratum, the time of the day

when arrestees are selected for data collection must match the time the census data indicate as booking time. However, in some cases, data submitted to the ADAM Data Center indicate booking times different from the times when the ADAM sample is selected. For example, many sites use the jail's intake log to identify stock and flow and select their sample by using intake time as a proxy for booking time. In the census data, the booking time indicated often reflects the time at which booking data were entered into the facility's computer system, rather than the intake time. This poses a problem for weighting because in some cases data are not entered into the booking system for several hours after intake, which means some stock might be weighted as flow and some flow as stock. In such situations, the sites will work with the Data Center to find a solution to the discrepancy.

The county-level sampling plan design

In adopting probability-based sampling for ADAM, there are two stages in planning the sampling at the sites: the broad, county-level stage that determines a site's general sampling design, and a more specific, facility-level stage that specifies the actual mechanics of drawing the sample. To determine which of the four sampling strategies/models is to be used in a site, it was first necessary to identify the number of booking facilities in each site's catchment area. Once this number was known, each site was "labeled" with the type of county-level sampling plan to be used in that catchment area (single-jail design, stratified design, stratified cluster design, or feeder design).

Implementing the county-level sampling design involved setting target numbers of arrestees to be included in the sample; understanding who, on the basis of various characteristics, the population of arrestees in county facilities represent; and ensuring fiscal accountability. Each ADAM site needed its own unique sampling plan,

based on the number of people arrested and booked in the county and on the procedure each arresting agency follows after citing or arresting suspected offenders. And although the plans had to be unique, adherence to standardization required that variations among the sites did not compromise the overall sampling principles.

Setting target numbers for the sample

The basis of the sample size was the total number of bookings in the county and the number of facilities in the county, because this permits calculating a sample equivalent to the variance that results from sampling proportionate to size. In order to perform this calculation, the sites needed to provide information about the total number of arrestees booked in each facility in the catchment areas, or at least the total number of people booked in the county. However, this information was not always available to the site staff and, in sites where booking data were not available, the FBI's Uniform Crime Reports (UCR) were used to document the number of arrests in each county.

UCR data theoretically include all arrests nationwide, but they have well-known limitations that derive primarily from differences in reporting. Other limitations in the UCR data meant they could be used to identify arrest numbers in only some ADAM counties. First, the UCR includes arrests that do not result in bookings. This is principally the case for minor crimes in which the individual receives only a citation. Second, the UCR excludes some arrests that do result in bookings. Warrants and revocations are examples. Third, some arrests are double-counted in UCR data.

Despite these limitations, UCR data were used in some sites to develop county-level sampling plans. At the same time, ADAM worked with the sites to identify alternate sources of data to validate the preliminary target numbers. On the basis of these numbers, ADAM set initial targets for each site

in number of adult male arrestees who should be interviewed, although this was done with the understanding that more accurate data, provided later, might lead to changes in the sample sizes.

Defining the population to be sampled

Success in implementing the ADAM sampling designs requires understanding the movement of arrestees from one facility to another and the length of time they spend at each facility. Arresting authorities identified which facilities were those where arrestees were booked. They also provided in-depth information about booking and arrest procedures, including potential points of release in the field (that is, release where the arrest took place) and release from local booking facilities. ADAM needed to know about the extent of law enforcement's discretion in arrest and release decisions in each jurisdiction and have some understanding of the sites' transfer and hold procedures. It is important to know, for example, whether local booking facilities have holding capabilities and, if not, how soon and to what facility arrestees are transferred.

In general, law enforcement agencies in all counties can exercise some discretion in whether to release on citation people who violate city ordinances. They can do so either in the field or from local booking facilities. Whether an arrestee is processed in the field or is booked and released has implications for ADAM sampling, because it affects the size of the arrestee population available to participate in the program. Arrestees released on a field citation are not available to be interviewed. This makes it necessary to understand the categories of arrestees who have no probability of being selected and what proportion of the arrestee population is processed this way.

Just as important as understanding release on field citations is understanding the procedures used to book and release arrestees from the local booking/holding facilities or stations. This includes knowing how much

time the procedures take and where book and release occurs. Because the population of arrestees who are booked and released generally consists largely of misdemeanants, it must be included in the ADAM sample. Without it the representativeness of the sample would be called into question. Both options—field citations or book and release—are typically available for processing the misdemeanor population but not the felony population. Systematically excluding arrestees who are released would heavily bias the sample against people arrested for minor offenses and would thus potentially inflate the extent of drug use among ADAM respondents.

Ensuring fiscal accountability

Cost was a consideration in redesigning ADAM. At some ADAM sites, especially those where there are several facilities, expanding the catchment area to the entire county significantly increased the cost of data collection. Cost considerations necessitated a series of trade-offs between maintaining expenditures at a reasonable level and retaining the overall goals of the program.

The first trade-off involved setting the target numbers of interviewees. All DUF sites tried to obtain 250 interviews per quarter, a target goal that often took several weeks to achieve in some sites. Any increases or decreases in this target number under ADAM would have cost implications, favorable or unfavorable. The best justification of the cost of probability-based sampling was that it produced, at each site, a sample size large enough to ensure a reasonable level of confidence in using the data (in other words, a sample large enough that the level of variance would be acceptable). Logic dictated that the Los Angeles County sample would be larger than that of Webb County (the primary city is Laredo, Texas), for example, but the question was: how much larger? The decision to base sample size on total number of bookings in the county and the number of facilities in the county (based on a sample equivalent to the variance resulting from sampling proportionate to size) met two needs. It

generated a sufficient number of cases from which to estimate the number of people in a county who have certain characteristics and to distribute the cases equitably among the sites.

Some smaller sites, understanding that their target numbers needed to be smaller than those of larger sites, were at the same time concerned that it might be difficult to make credible statements about drug use and related behavior on the basis of the numbers. A target of 75 cases, for example, might be large enough for sampling purposes, but local officials might be reluctant to use it to shape policy. Here the trade-off was meeting local needs while developing standard errors (such as those for confidence intervals) that were reasonable in relation to those of other sites.

Cost considerations also affected the number of interviewers working in each jail. In order to contain costs, it became necessary for NIJ to set the number of interviewers per shift per facility. In doing so, NIJ also created a built-in mechanism for ensuring that sites adhered to their own specific sampling plans. The plans emphasized selecting the sample of arrestees to be interviewed rather than the total number of interviews completed. However, staff at the sites continued to focus on completing the prescribed number of interviews. The conceptual shift from quantity to quality was difficult for many sites.

Practical issues in implementing the county-level design

Conceptually, the new approach to creating county-level sampling designs was relatively straightforward: identify the number of booking facilities, establish the general design, find out how many arrestees move through each facility each day, and set sample targets for the county and each facility within the county. In practical terms, the new approach was not so straightforward. Except in a few sites, the UCR data were not useful in identifying the number of arrestees booked at each facility or the number of booking facilities in a county.

The sites found it difficult to obtain information about the flow of cases through each facility and to gain access to the facilities selected.

Identifying facilities

Although seemingly a straightforward task, finding out how many facilities there were in a catchment area was not easy. The Uniform Crime Reports do not contain this information. Counts by county law enforcement authorities varied with the definition of a booking facility. Further complicating the task of counting facilities was that arrestees are often booked many times, first in the local jail and again in the county facility. Thus, although county facility staff might be correct in their assessment that all arrestees in the county are booked in the county facility, arrestees may be booked in local facilities as well.

These approaches failing, the one that succeeded was to contact the source; that is, the arresting agency authorities in each county. Each ADAM site thus systematically contacted all arresting agencies in its catchment area to determine where arrestees are booked.

Gaining access

In the past, jurisdictions wishing to participate in the DUF or ADAM program submitted to NIJ letters of agreement from local jail facilities that ensured access to those facilities to conduct ADAM interviews. These letters generally applied only to the primary county facility but did not guarantee the site would be permitted to collect data in all facilities selected in the sampling plan.

To gain access to all facilities selected, local ADAM staff contacted facility administrators, explaining the program and the reasons for including their facility. In general, jail administrators' initial reaction was to question the program or deny access because it would delay the booking process, interfere with operations, and raise security concerns. Often, NIJ or NIJ's ADAM contractor intervened. When jail

administrators understood that the program had been in existence for more than 10 years and that numerous facilities nationwide permitted data collection without adverse effects, they were more amenable to working out an arrangement. In a very few cases, access was still denied, and higher law enforcement officials or other city/county officials were contacted. In rare circumstances, despite all efforts, the request was denied.

When access is denied

When access is denied, replacing the site or a specific facility is easily accomplished within the parameters of the sampling design. Increasingly, however, replacements are required repeatedly where there are several small facilities in the stratum. One cause may be lack of security at the facility. ADAM requires that to ensure safety and security, law enforcement officers observe the interviewers and arrestees during the interview process. Often, small facilities could not participate because of a shortage of officers. When a department is short-staffed and the jail or booking area is not sufficiently staffed to provide adequate security for civilians (ADAM interviewers), the program cannot continue at that facility. Even if an overtime incentive is offered, there may not be enough officers to work the additional hours.

The other reason repeated replacements may be necessary is low case flow, which can make the cost of data collection prohibitive. Interviewers may be at the facility for several hours or even an entire shift without conducting a single interview, because no arrestees have been booked. In Bexar County (San Antonio), Texas, for example, there are approximately 25 booking facilities, but most book fewer than one arrestee per day. Again, the issue was resolved by trade-offs. The sampling plan was adjusted to eliminate facilities that produced fewer than three cases a day. In making all such trade-offs, the balance is between cost and risk to the integrity of the overall sampling plan.

"Specialty" facilities

Some jurisdictions have facilities where people arrested for only certain types of crimes are booked. For example, there may be a facility dedicated to booking people arrested on domestic violence charges. If ADAM interviews do not take place at these facilities, people charged with these types of offenses will not be included in the arrestee populations for sampling purposes. On the other hand, if ADAM uses its resources to interview at these facilities, only those specific types of arrestees will be interviewed. The challenge is to reach these arrestees before they are brought to the specialty facility, but this is not feasible in all jurisdictions. For now, the sites having specialty facilities must adapt by limiting the representative nature of their sample through adding written caveats to their findings; for example, by making it clear in their reports that their sample does not include domestic violence cases.

Defining the arrestee population

Counts of arrestees, essential to sampling, were difficult to ascertain. Arresting agencies maintain numbers for operational reasons, not for research purposes. ADAM had to use the operational numbers as the basis for constructing a mechanism to create a representative sample.

One reason it is difficult to count arrestees is that their movement throughout a county is considerable. They are often transferred throughout the criminal justice system, sometimes very quickly. Many factors contribute to this movement, including geographic imperatives, municipal requirements, and overlapping jurisdictions. Additionally, the criminal justice process has several stages, with each one at a different location. The possibility of double-counting when arrestees move is inevitable because a given facility may not be aware that the arrestee has already been counted for ADAM's purposes. These factors affect all counties, but become more problematic as the number of law enforcement agencies and booking facilities in the county increases.

Movement also means an arrestee who should be counted may not be. In most facilities, an arrestee's booking sheet follows him or her to each succeeding stage of the criminal justice process. Therefore, if an arrestee has left the intake area or been transferred to another facility, no record of demographic data and offense characteristics may be available. The booking log may indicate that the arrestee was booked into the facility, but if that arrestee (with his records) has gone to court or another facility, it would be difficult to include him in the sampling plan.

In some ADAM sites, the individual idiosyncrasies either in the facility populations, the movement of arrestees within and among facilities, and the booking processes can only be documented. These sites must satisfy themselves that their sample has limitations and must make it clear they exist. In some sites, such documentation will lead to adaptations that enable their samples to be consistent with the overall sampling plans.

The facility-level sampling plan design

Before data collection began at the facilities, a facility-level sampling plan was established for each one. The plans had several steps: setting the targeted number of interviews, determining what time of day the interviews take place, and identifying the number of interviewers needed on each shift.

Setting a targeted number of interviews

The number of interviews to be conducted quarterly was identified for each site. This was the site's target number. Then, to identify the number of interviews to be conducted at each facility in the site, the target was simply divided by the number of sampled facilities, proportionate to size. For sites having stratified and stratified cluster designs (those with, respectively, 6 or fewer and more than 6 facilities), the county

sample target was divided among the strata and/or facilities, proportionate to the number of bookings each contributed to the whole. A site with a city jail and two suburban jails, for example, might have a site sample target of 168 completed interviews. Annual booking statistics there might indicate that 50 percent of the county's arrestee population is booked at the city jail and the other 50 percent at the two suburban facilities (25 percent at each). For the city jail the sample target would be 84 completed interviews and for each suburban jail the target would be 42.

Once the total sample per facility was determined, the number of days required for data collection was set. Collection must take place every day of the week in order to account for variations, by day of the week, in the type of crimes for which arrestees are charged. The length of time data are collected is based on the average number of bookings per day. Using the example cited above, and assuming the daily flow in the city jail is significant, a 7-day collection period, with a daily sample target of 12 completed interviews, will meet the targeted 84 interviews. (ADAM assumes each week in a given calendar a quarter is generally like any other, so the sites do not collect data on holidays or during days when special local events take place, such as Independence Day, and Mardi Gras in New Orleans.)

What time of day should data be collected?

When the optimal time of the day for interviewing is determined, that becomes the data collection shift. In the probability-based design, an 8-hour shift represents a 24-hour period, and all arrestees booked during that period have a known probability of being selected for the sample.

The "stock and flow" design of the sampling plan (described above) increases the likelihood that the sites will sample and interview arrestees charged with lesser offenses, whose numbers are typically larger

in a county arrestee population. Because of the less serious nature of their charges, these arrestees will be released more quickly than the more serious offenders and therefore the window of availability for interviewing them is smaller. The data collected from the "flow" cases are weighted to represent lower-level offenders booked during the "stock" period who were released before collection began. The success of this process relies on a site's ability to maximize data collection from arrestees charged with all types of offenses by collecting during the busiest 8-hour period of the day.

The "flow" period, which begins the moment the data collection team enters the facility, represents the period of the day when the number of bookings is highest. After an interview is completed, the interviewer then selects the arrestee whose booking time was closest to the time of that interview. This procedure ensures the interviewer works throughout the shift, regardless of the number of interviews completed. For "stock" (which comprises arrestees who were booked and whose numbers accumulated during the time when data were not collected at the site), interviewers work with the facility to develop a list of all arrestees booking during the stock period, organizing it chronologically by the time each arrestee was brought to the facility. Arrestees to be interviewed are selected at intervals determined by the stock sample target.

Number of interviewers

Once the interview time (shift) is identified, the sample targets for stock and flow are calculated. The basis is the number of daily bookings estimated during each of these periods. For example, if 50 percent of the daily bookings occur during the flow timeframe, a site with a daily sample target of 12 completed interviews would have flow and stock sample targets of 6. These targets are the basis for determining the number of interviewers. In calculating this number, the assumption is that one interviewer can complete approximately one interview per hour. In most cases, one

interviewer is assigned to stock and another to flow. The difference is that the flow interviewer works the entire 8-hour shift, regardless of whether the target is met or surpassed, and the stock interviewer works to meet the daily stock quota and then ends the shift.

This means the number of resources or interviewers in a given facility will be constant, regardless of whether, on a given day, the flow of arrestees is high or low. Additionally, because an interviewer is always needed throughout the flow shift, the probability is high that arrestees booked in low-flow facilities will be interviewed. The interviewer can usually interview all of the remaining stock and each flow as they are booked. The requirement that the number of interviewers be kept constant made implementation easier. Predicting daily flow activity in a jail and modifying the number of interviewers accordingly would have been difficult. Having the number of interviewers remain constant also is important in weighting the data because otherwise it would affect assumptions about the probability of selection in a way that could not be predicted.

Practical issues in implementing the facility-level design

In implementing the facility-level design, there are a number of factors essential to the success of the sampling. These include gaining access to booking data, identifying arrestees ineligible for the sample, determining when and where arrestees are to be interviewed, tracking arrestees' whereabouts as they are processed, ensuring the interview space is secure and, in general, adapting to the jail environment.

Access to the booking data

A site's ability to implement its sampling plan is directly related to the facilities' ability to provide the necessary materials with which to select stock and to establish an efficient process for identifying and interviewing flow. Access to booking and census information is essential if the facility is to participate in ADAM.

Stock samples are drawn from a list of all arrestees booked during the stock period (the period after the data collection shift ended the previous evening). Obtaining this list can be particularly difficult for facilities that do not have an automated booking system. It often requires consulting one or more handwritten logs. For example, the interviewer would use the intake log, which identifies everyone booked during the stock period, and the inmate log, which identifies stock arrestees who are still in the jail. ADAM site staff merge these two lists to select the stock sample and the replacements for released arrestees.

It is typically easier to obtain stock samples in jails that have automated booking systems. In the many facilities where booking staff do not have the authority to query the system, ADAM staff rely on command-level staff or department programmers to generate a report that can be used to create a stock list. However, many of these departmental reports either exclude arrestees released from the facility or do not cover the full stock period, which often begins in the middle of the night.

In many sites, the stock selection process does not end at this stage. This is because the information used to identify and select stock often does not include such items as the arrest charge, the specific location of the arrestee in the jail, and other basic variables. Without this information, it is not possible to know whether an arrestee is available or eligible to participate in the ADAM program. Often, negotiations with facility staff are necessary to develop a procedure for obtaining information in a timely manner.

Because many facilities purge the booking information after an arrestee has been released, site staff often work with facility staff to manually look up charge and location information for each person before beginning the selection process. In other cases, site staff return later in their shift and refer to the booking slips and/or the jail management system to fill in the information needed for the facesheet of the questionnaire for selected and replacement

stock. This process is particularly time-consuming in jails where the booking information physically accompanies the arrestee as he is transferred to various locations in the jail for various purposes (for example, intake, fingerprinting, booking, classification, housing).

Flow selection is often easier because it requires only access to arrestees as they are booked into the facility. In low-flow facilities, where arrestees are booked sporadically, this is often done by observation, but in most facilities it must be more systematized. In some cases, sites use an intake list or medical screening list to identify arrestees as they are booked or they use the booking slips, as they are generated, to select flow arrestees for interviewing. The major concern in flow selection is to ensure that certain types of cases that might be overlooked (for example, arrestees whose booking sheets/cards take a relatively long time to generate) are not.

The method used to develop the stock list should also drive the flow selection process, because the time of day when stock and flow are selected must be the same for both groups. In most ADAM sites, this is the time when the arrestee comes into the facility (the intake/booking time) or the time when arrest and booking information is entered into the computer. Systematically recording time for all arrestees, no matter what charge or disposition, is essential. Using different times can affect the sample. Thus, for example, in some sites arrestees charged with minor offenses might not be screened for medical problems. If a site uses medical screening time as the time for selecting stock and flow, lower-level arrestees may be systematically excluded from the sample.

Identifying eligibles and ineligibles

When drawing the sample, the ineligibles must be excluded. In some facilities, it is particularly difficult to identify them. ADAM focuses on people arrested for crimes committed in the local jurisdiction—the county. Thus, arrestees held for crimes committed in other jurisdictions,

including other counties, as well as for Federal crimes (for example, arrestees taken into custody by the INS, DEA, FBI, or the U.S. Marshal's Service), or arrestees remanded into custody by the court, are not of interest to ADAM. In general, these ineligibles are not represented in local arrest statistics or do not reflect an arrest on a new charge.

Gaining access to the arrestees

To implement the facility-level plan successfully, sites must understand the booking process and the restrictions it imposes on ADAM's ability to access and interview arrestees. In some facilities, booking may take only 20 minutes, and in others it may take as long as 8 or 10 hours—decreasing or increasing the possibility of the person's being interviewed. The amount of time can be determined by the number of arrestees brought in at once: more arrestees means more time is needed. In some facilities, local ADAM staff are permitted to interview arrestees before the booking process is completed. When this happens, the ADAM arrestees are more likely to represent a broader range of offenses because those who may be released on bond or on their own recognizance (that is, those charged with minor offenses) can be interviewed. In some facilities, the intake areas are chaotic, making it unreasonable to expect ADAM staff to conduct interviews in them. However, to the extent that ADAM interviews are conducted after the original intake, the likelihood increases that arrestees charged with minor offenses have been released and thus not represented in the sample.

For stock and flow collection, ADAM interviewers need access to arrestees who are at various stages in the booking process, in order to sample a broad range of arrestees. In the past, many sites conducted DUF interviews at times and in locations convenient to facility staff, typically in the housing areas. Frequently, the result was a sample consisting only of arrestees in the general population of the jail or housing unit of the jail. Although acceptable for stock interviewing, this approach does not work for flow collection because arrestees may be released before they reach the housing cells.

Other sites experienced the opposite problem: obtaining interviews from arrestees not in the intake area. DUF interviews had been conducted in intake, because facility staff were particularly concerned for the security of civilians in the housing area, or they were reluctant to move housed arrestees back to the intake area for interviewing. In almost all cases, site staff have negotiated a reasonable solution, usually involving selecting an interview location for stock and another for flow, or bringing one population into another area to accommodate the interviewers.

In addition to negotiating with ADAM staff to determine when and where interviews take place, facility officials also determine the broad categories of arrestees who may be interviewed. In almost all cases, arrestees in medical units and psychological units do not participate in ADAM. Some arrestees are deemed too inebriated or are verbally abusive or violent and cannot be interviewed. Local site staff work with facility staff to expand the interview population as much as possible and to ensure that certain populations are not unintentionally eliminated. To eliminate unnecessary bias, sites complete "facesheets" (forms containing information) on unavailable selected arrestees whose behavior initially prevents their being interviewed, and attempt to interview them later in the shift.

Adjusting to arrestees' movements in the system

Arrestees may be released or transferred before they can be interviewed. Because the stock is selected as many as 16 hours after arrestees arrive in the facility, some may have been released before data collection begins. As a result, sites may find it difficult to meet their quota of stock interviews. When this happens, the sites must find out whether the arrestees are being

released into the community or transferred to another jail; whether certain groups of arrestees are missed when those released are not interviewed; whether arrestees are released, either after arraignment or through some other process; and whether there is a better time or location for conducting stock interviews.

Depending on the answers, collection procedures may change so that stock are interviewed before a possible transfer or selected stock are interviewed at the new location. If large numbers of arrestees are released after arraignment, procedures may be changed to interview before arraignment. One change would be to split the collection shift into two periods of the day. It is more difficult to address the situation if arrestees are released on a preset bond and therefore not arraigned.

Information about arrestees' movements is also important to ensure comparability from site to site. In one county, for example, close to half the arrestee population, regardless of arresting agency, receives citations in the field. The UCR data include these cases, which means they were also included in the statistics used to develop the ADAM sample targets. Because this made the site's sample targets too high, they had to be adjusted to account for the unique nature of the arrest process there, which generated a large proportion of arrestees who were not available for ADAM interviewing.

It may or may not be possible to solve the problem of arrestees released from stock. But if the release problem arises during the flow period, it must be resolved, because it means the flow selection process is not being implemented as designed. Ultimately, it may not be feasible to interview all these cases, because the facility strives to process them as quickly as possible and will not allow interviewing to interfere. In most instances, the problem can be solved by negotiating access to different intake lists or holding areas in the facility.

Security

Security plays a major role in the success of sampling at the site level. Interviewers need a safe and private environment in which to conduct the interviews, but they also must meet any conditions the facility sets. In some sites, this may mean there is a glass partition between interviewer and arrestee; in others it may mean there are cell bars. Security may also affect the site's ability to implement the sampling plan if there are limitations on the number of hours permitted for stock interviewing or if interview times must accommodate meal schedules or lights out hours. These conditions can usually be met, but they require planning on the part of site staff.

Security may play a major role in selecting arrestees to be interviewed because many jails do not allow civilians access to the information management systems needed to select stock or flow interviews or to complete facesheets (information forms). In these situations, it is essential that the facility officer understands what information is needed and does not unwittingly bias the sample in an attempt to assist in the research. This might happen, for example, if the officer excludes certain arrestees he or she deems unruly.

Adapting to the jail environment

Even if all processes specific to the facility are carried out in the sampling plan, the dynamic nature of the jail environment may adversely affect a site's ability to meet its daily target of interviews. For example, delays occasioned by lockdowns, meals, counts of arrestees, and fights among arrestees may in turn delay interviewing. In the case of regularly scheduled events, the data collection shift can be changed to limit the effects of the delays. But even regularly scheduled events are not always predictable. For example, the amount of time needed to count arrestees may vary significantly from one night to the next, lasting as long as two hours in some cases.

Conducting research in a jail environment is different from and often more challenging than conducting the same research in prisons. Jail administrators act as the gatekeeper of the local criminal justice system. They are responsible for intake, medical screening, classification, release, feeding, and moving to and from court and otherwise transporting people who have only recently been arrested and are often unruly, intoxicated, or violent. To protect the balance of power and order in the jail, local ADAM staff will invest whatever effort is necessary to build relationships with facility staff, understand the rules and restrictions, and adopt procedures that adhere to those rules without transgressing the ADAM protocols.

The result: more reliable and useful data

Standardized data collection protocols and probability-based sampling will increase the reliability of ADAM's data and subsequent findings. With the adoption of probability-based sampling and the expansion of the questionnaire, ADAM will be more useful than in the past as a platform on which researchers can conduct studies of various aspects of drug use and related behavior. The expanded questionnaire enables local communities to validly estimate the prevalence of a variety of measures, including the proportions of arrestees who test positive for drug use by urinalysis and the proportions who need treatment. And for the first time, the questionnaire enables the ADAM sites to develop prevalence estimates of drug use in the nonarrestee population.

NOTES

1. These national collection programs are the National Household Survey on Drug Abuse (NHSDA), the DEA's System to Retrieve Information from Drug Evidence (STRIDE), and the Treatment Episode Data Set (TEDS). Other surveys used by ADAM are those conducted by the Center for Substance Abuse Treatment and the U.S. Census Bureau.

2. Variations in the booking process are discussed in the section on implementing facility-level sampling plans.

3. U.S. Census Bureau, 2000 data.

4. Data were collected during the first quarter of 2000 from all five boroughs. Because of unresolved sampling issues and cost constraints, data were collected in the second, third, and fourth quarters only in Manhattan.

5. A more in-depth discussion of the sampling and weighting method is in *Methodology Guide for ADAM*, by Dana Hunt and William Rhodes, Washington, D.C.: U.S. Department of Justice, National Institute of Justice, May 2001. The *Guide* can be downloaded from the ADAM Web page (http://www.adam-nij.net) on the NIJ Web site (http://www.ojp.usdoj.gov/nij).

6. Cost constraints and other practical limitations led ADAM to adopt probability-based sampling for adult male arrestees only.

VIII. "Calendaring" in ADAM: Examining Annual Patterns of Drug Use and Related Behavior

by Dana E. Hunt, Sarah Kuck, and Patrick Johnston*

Among the unique features of the ADAM survey instrument (question-naire) fielded in 2000 is a technique called "calendaring." It is designed to examine drug use and related behavior over the period of an entire year and month to month within a year. To measure drug use only in the recent past (30 days) does not convey the complexity of the behavior. To measure drug use over a year addresses the complexity issue, but events that took place as long ago as a year may be difficult to remember. Calendaring helps solve the problem of recall by prompting the arrestee, during the interview, with questions about events that took place at about the same time during each period of time. The prompts include questions that can be used to "crosswalk" ADAM data with data in other surveys.

Calendaring promotes recall

Research designs often relinquish any attempt at long-term recall, instead asking people about events that took place in a single, relatively brief period of time (the past month, for example). Drug use, though a chronic behavior, changes over time. Thus, the recent past is not likely to be representative or typical, either of use or treatment history. In ADAM, it may be that at the time the arrestee was interviewed, he or she was in a period of escalated drug use (one that resulted in the arrest). Moreover, because drug use is a socially stigmatized behavior, people may be reluctant to respond to questions about recent use.

Alternatively, research designs may focus on drug use over a longer period, presumed to be more typical of use patterns. The added advantage is that people more readily admit to drug use in the more distant past than to use in the past few days or weeks.[1] In this approach, arrestees might be asked to describe their annual consumption of drugs. But when frequency of drug use is very high or if it changes, recall can be compromised. It would not be difficult for a teetotaler to remember drinking no alcohol, but someone who has several drinks on certain days and fewer on others would find it difficult to come up with an accurate count of overall consumption. Asking people about an even longer period of time introduces significant chances of error and promotes guessing or mental averaging.

The calendar approach to collecting data was developed to deal with recall and related issues. It was used in early research on drug careers[2] as well as in other fields in which researchers are interested in recall of events over an extended period.[3] Calendaring has been shown to increase the accuracy of recall over even longer periods than 12 months (the period used in ADAM).[4] It promotes recall by dividing the year into units conceptually manageable by the arrestee and then "anchoring" his memory around interconnected, real-life events that occur in these units of time.

ADAM's calendar information consists of data covering events as they occur in one-month units of time in a 12-month period. For each unit of time, data on drug use,

drug treatment, mental health treatment, number of arrests, and residency status of the arrestees are obtained during the interview. Each one-month "box" in effect contains sets of interrelated life events and behaviors. These events vary in duration (number of months) and intensity (level of drug use, for example) and may be correlated with or conditioned on each other. Thus, for example, the likelihood of using drugs at Time 1 is related to the likelihood of using drugs at Time 2. The relationship of one event to another can also be contemporaneous (occurs in the same month) or delayed (occurs in subsequent months).

The ADAM interviewer records the behavior or events throughout the time period of interest (one year, month by month). The connections among the behaviors and events are presented visually (in a calendar) and mentally through a series of interrelated questions about life events. The life events themselves serve as cues to recall of other events. For example, the arrestee is asked where he was living, whether he was in treatment, whether he was arrested, and the approximate extent of his drug use. These questions are asked for each of the 12 months of the past year. As each type of behavior is recalled, it becomes a further anchor for recalling the next set of events. The result is a grid of events/behaviors, related to each and occurring over a period of time.

Calendaring increases accuracy

With calendaring, information becomes more accurate because it reflects aided recall of patterns unfolding over relatively long periods. For example, to calculate the amount of cocaine consumed or purchased by arrestees in an area in a year, ADAM data on total annual consumption of cocaine among users involved in the criminal justice system could be examined. If data from a single point in time were used to extrapolate to the entire year, that estimate would likely be biased. An arrestee might say he used cocaine 15 days in the past 30. In the previous months, however, he might have used it only one or two days in some months and not at all in others. Using past 30-day patterns as typical of a year would seriously inflate calculations of annual consumption of cocaine.

Measuring "typical" drug use

That the commonly used 30-day recall period may not substitute for typical or modal behavior is evident from self-reported drug use by adult male arrestees in the ADAM sample. Data from 2000 for selected sites—New York, Phoenix, and Las Vegas[5]—show that past-30-day crack use patterns were not in all cases the same as longer-term patterns. Crack users among adult male arrestees in New York were far more consistent in their long-term use than were their Phoenix or Las Vegas counterparts. Ninety-five percent of crack users in New York said they used the drug in the 30 days before their arrest and a similarly high proportion—82 percent—reported using it at least once in each of the previous 12 months (only 9 percent reported using crack in fewer than six months of the previous year). (See Table 8–1.)

In Phoenix and Las Vegas, by contrast, the proportions who used crack throughout the year were far different from the proportions

Table 8-1	SELF-REPORTED CRACK USE, SELECTED SITES, BY CALENDAR PERIOD—ADULT MALE ARRESTEES, 2000*			
Primary City	**Percent Who Used Crack in 30 Days Before Arrest**	**Percent Who Used Crack in All 12 Months Before Arrest**	**Percent Who Used Crack in Fewer than 6 Months Before Arrest**	**Percent Who Used Crack in Only One Month of Year Before Arrest**
New York, NY	94.9%	81.8%	8.9%	1.6%
Phoenix, AZ	80.7	41.0	40.5	16.4
Las Vegas, NV	77.9	43.9	33.0	9.6

* Questions were asked of adult male arrestees who said they used crack cocaine at any time in the 12 months before their arrest.

who used it in the past month. The 81 percent of crack-using arrestees in Phoenix who said they used the drug in the past 30 days dropped to 41 percent for use in all 12 previous months (41 percent had used crack half the year or less and 16 percent in only one month of the year). In Las Vegas, where the proportion who used crack in the recent past 30 days was also relatively high (78 percent), the figure for use in all 12 months of the past year dropped to 44 percent, and to one-third for use in fewer than six months of the past year.

New York's 30-day figures could reasonably be used as the basis of an assessment of crack use at that site, because the level of use was consistent over time. In the other two sites, the picture was different. What difference do these differences make? If past-30-days data (when the proportions who used crack were high) were used to assess the amount of crack consumed in these sites, the result might be serious overestimation. While it might be safe to assume that the most recent month's use of crack in New York was like any other month's use, it would not be so for Phoenix and Las Vegas. At those two sites, crack use appeared more variable or episodic. A user might, for example, use crack one month, skip a month, return to use, and so forth.

Calculating repeated arrests

Calendaring also increases accuracy in calculating the rate at which people in the ADAM sample are arrested.[6] DUF and ADAM have always reported number of arrests rather than number of arrestees.[7] When number of arrestees rather than number of arrests are reported, this conceals repeat offending. In fact, law enforcement has long noted that repeat offenders are overrepresented in arrestee statistics. With calendaring, the new ADAM survey instrument makes it possible to examine the number of repeat arrests of a single arrestee in the sample.

Many variables affect rates of arrest. ADAM measures some of them, including age and previous arrest history. Data from selected ADAM sites also show that the number of times someone in the ADAM sample has been arrested varies with type of drug used.[8] (See Exhibit 8–1.) In the cities where

methamphetamine use was detected among adult male arrestees—San Diego, Oklahoma City, and Sacramento—the rate at which users were arrested was higher than the rate for users of any other drug. Oklahoma City's methamphetamine users were arrested almost three times more often than heroin users; in Sacramento, methamphetamine users were arrested more than twice as often as heroin users. In sites where no methamphetamine use was found among arrestees (New York, New Orleans, Atlanta), cocaine users were arrested most often, though the difference between users is not as dramatic as for methamphetamine.

ADAM data support the law enforcement observation that many arrestees come back to the criminal justice system again and again. Nevertheless, about half the adult males in the sample in these selected sites indicated that their current arrest was their only arrest in the past 12 months. (See Table 8–2.) In New York, for example, almost half the adult male arrestees said the current arrest was their only arrest in the past year. By contrast, slightly more than half the arrestees in New York were arrested between one and five times in the past year and 1 percent said they were arrested 10 or more times in the past 12 months.

Exhibit 8-1: Annual rates of arrest, by selected drugs, by selected sites–adult male arrestees, 2000

Heroin   Cocaine   Marijuana   Methamphetamine
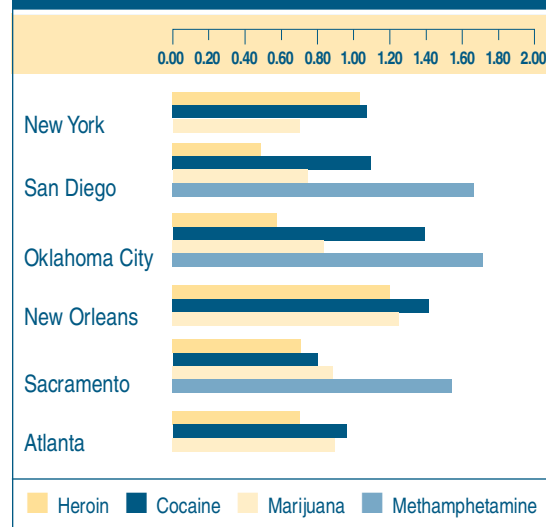
Note: Use of drugs was detected by urinalysis. Numbers are mean number of arrests.

"Calendaring" in ADAM

How ADAM data can be used with other measures of drug use

Calendaring also offers the opportunity to use ADAM data in conjunction with other measures of drug use and related behavior to find out whether arrestees are covered in these counts. Among these are the National Household Survey on Drug Abuse (NHSDA), the Treatment Episode Data Set (TEDS), and the State Treatment Needs Assessment Program (STNAP).[9] In developing the new survey instrument, the ADAM program made certain that the variables were defined in a way that would enable the resultant data to be "crosswalked" with (directly compared to) data in these and other relevant surveys and data sets.

Crosswalking makes it possible, for example, to identify people not counted by NHSDA but included in ADAM. The NHSDA examines drug use by all people in the general population age 12 and older who are members of a household. It excludes people who are homeless, living in a temporary shelter, confined in jail, or in like circumstances. In ADAM, the questions about residence, whose answers are recorded on the month-by-month "calendar," were designed to match those in NHSDA.

Comparing NHSDA and ADAM data reveals that in most of the selected sites examined, large percentages of arrestees who used drugs in the year before their arrest would not have been included in the Household Survey. They were excluded because they were transient or lived in unstable housing at least some part of that time.[10] (See Table 8–3.) The range among these sites was 4 percent (Birmingham) to 32 percent (Honolulu). While the NHSDA is the country's premier survey of drug use in the general population, it may miss some people who are the heaviest consumers of illegal drugs.

Crosswalking ADAM with TEDS reveals a similar pattern. The Treatment Episode Data Set contains information about extent of drug and alcohol treatment. ADAM mirrors the TEDS definition of an "episode" of treatment, with questions about treatment received by drug users month by month in the past year.[11] In the sites selected for examination, the proportions of adult male arrestees who used drugs in the year before their arrest and did not receive any inpatient or outpatient treatment were high.[12] In New York, 81 percent of them did not participate in treatment; in New Orleans and Birmingham, the figures were 90 percent or higher. Thus, the TEDS data do not reflect large proportions of drug users in the arrestee population.

The State Treatment Needs Assessment Program (STNAP) is a CSAT program that collects information about drug abuse and uses it to estimate the need for substance abuse services. ADAM crosswalked STNAP data to identify the proportions of drug-using arrestees who might be excluded from STNAP. Because the STNAP survey is conducted by phone, anyone who does not have a phone cannot be contacted. Having a phone is a proxy for inclusion in STNAP, so the redesigned ADAM survey instrument included a question about the number of noncommercial phone

Table 8-2	ARREST RATES IN PAST 12 MONTHS, SELECTED SITES— ADULT MALE ARRESTEES, 2000			
Primary City	**Percent Who Reported Current Arrest as Sole Arrest**	**Percent Who Reported 1–5 Previous Arrests**	**Percent Who Reported 6–9 Previous Arrests**	**Percent Who Reported 10 or More Previous Arrests**
Atlanta, GA	48%	48%	2%	3%
New Orleans, LA	41	55	3	1
New York, NY	47	51	1	1
Oklahoma City, OK	48	51	1	0
Sacramento, CA	44	55	1	0
San Diego, CA	56	42	2	0

lines where the arrestee was living. By this measure, the proportions of arrestees[13] who were not counted in the assessment of treatment needs were high in the selected sites examined.

The way in which these other national surveys of drug use are designed tends to exclude certain subpopulations. Analysis of the 2000 ADAM data revealed the extent to which this was so. ADAM provides the "missing" data on some of these drug users. Because DUF and ADAM have over the years consistently shown drug use among this at-risk population to be high, the ADAM findings are an important basis for State and Federal assessment of need and resource allocation.

Using calendaring to examine patterns of drug use

Much of the research literature on substance abuse describes it as a chronic and relapsing condition that involves cycles of moderate use, abuse, and abstinence. By permitting analysis of drug use and related behavior over time, calendaring affords insights into patterns of use, whether consistent or episodic. Setting these patterns against the backdrop of concurrent events in the lives of the arrestees can illuminate

the dynamics of substance abuse. (For other ways in which calendaring is being explored by ADAM, see "Further Potential of ADAM Calendaring.")

Patterns of heroin and cocaine use

Data on self-reported past-year use of heroin and cocaine by adult male arrestees in New York reveal different levels or intensities of use. The percentages of arrestees who used these drugs most heavily were higher than the percentages who used them less frequently. Less than 20 percent of both heroin and cocaine users were involved with these drugs 1 to 7 days in each month of the past year, and similarly small proportions were involved 8 to 14 days per month. By contrast, fully 55 percent of heroin users and more than 40 percent of cocaine users were involved 15 to 30 days in each month of the year. (See Exhibit 8–2.)

Information from three heroin users among the adult male arrestees in New York reveals one of many patterns, in this case escalating use in the months before arrest. (See Exhibit 8–3.) "User A" began the year using heroin fairly heavily, became abstinent, and escalated to a higher level of use in the months before his arrest. "User B" also escalated to a higher level before he

Table 8-3	ADULT MALE ARRESTEES NOT INCLUDED IN OTHER MEASURES OF DRUG USE AND RELATED BEHAVIOR, SELECTED SITES, 2000		
Primary City	**Percent of Drug Users in Unstable Residence in Past Year—Not Reflected in NHSDA[a]**	**Percent of Drug Users Not in Treatment in Past Year—Not Reflected in TEDS[b]**	**Percent of Arrestees Having No Phone in Past Month—Not Reflected in STNAP[c]**
Albuquerque, NM	10.1%	82.3%	25.0%
Birmingham, AL	4.3	90.0	13.2
Honolulu, HI	32.3	80.3	34.3
New Orleans, LA	5.7	94.2	18.3
New York, NY	11.7	80.5	33.5
Phoenix, AZ	14.5	85.6	27.1
Portland, OR	23.5	77.2	26.1
San Antonio, TX	10.1	87.8	20.4
San Diego, CA	21.6	82.5	24.2

a. NHSDA is the National Household Survey on Drug Abuse.

b. TEDS is the Treatment Episode Data Set.

c. STNAP is the State Treatment Needs Assessment Program.

Note all adult male arrestees, not just those who used drugs, were included in this analysis.

was arrested, although his use over the 12-month period was more consistent—there was no period of abstinence. "User C" was a heavy user who nonetheless managed to abstain for three months but returned to heavy use in the two months before being arrested.

Calendaring can document events in the lives of the arrestees that might affect their drug use. These include other arrests, jail confinements, and treatment experience. For "User B" (from Exhibit 8–3), time in jail affected the level of heroin use. The period in which this user reported reduced drug use corresponds to his arrest and jail time in month 7 of the 12-month period. (See Exhibit 8–4.) It is worth noting that this user said he was being treated for drug use (on an outpatient basis) during the entire 12-month period.

Exhibit 8-2: Percentages of adult male arrestees who used heroin or cocaine in past year, by level of use, New York–adult male arrestees, 2000
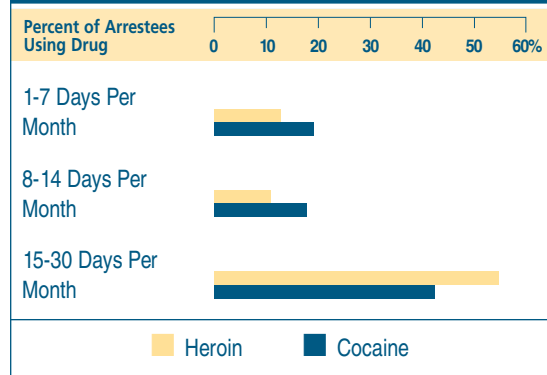
Note: Questions were asked of adult male arrestees who said they used heroin or cocaine in the year before they were arrested. Because recall is particularly difficult when an event occurs frequently, they were asked to state the number of days of involvement with the drug (that is, any amount of use on a given day) rather than the number of times the drug was used.

# Further Potential of ADAM Calendaring

The ADAM program is exploring the potential for using calendaring to build predictive models. How would calendaring be different from simple regression analysis in studying the effect of one variable—such as treatment—on another? The difference lies in the nature of the data available to use in developing the model. A simple regression model might look at the impact of drug treatment on subsequent drug abuse, examining data on level of use before and after treatment and amount of treatment received. In "real life," however, the effects of treatment are conditioned on many variables, including the patterns of use the person brings to treatment, not simply the level of use at entry. Calendaring in ADAM makes available more dynamic information about these patterns.

Calendaring in ADAM does have limitations that need to be taken into account in developing a predictive model. First, the ADAM data cover only a 12-month period, which is a relatively small window into the number of fluctuations or events in the career of the drug user. Second, the 12-month period is not likely to be "typical" in that in ADAM it always terminates with an arrest. In addition, the data are "left-censored"; that is, projections or predictions would be made about behavior with no information about them before the time frame studied.

Clinicians often say that users have to "hit bottom" in drug use and other life crises before their treatment experience will be successful. One way to use a predictive model based on calendaring would be to try to measure "hit bottom." It may mean a series of experiences before treatment—escalating arrests, increasing drug use, increasing transience. These variables (number of arrests, level of drug use, residence status) are all measured in the ADAM calendar in each month before the event of interest (in this example, entry into treatment).

The more traditional approach is to summarize these "events" without regard to either when they happened or to their interrelationship. By using the calendar data, it is possible to build models that can account for previous experiences and concurrent events and activities. For a given arrestee, the level of heroin use in June might be directly related to whether he was in treatment or in jail in March, April, or May, as well as conditioned on the amount of heroin he was consuming in those months. Level of use might also be correlated with arrests in those months. The effects of some interrelated events (being jailed, for example) might be immediate in reducing the amount of heroin consumed, while the effects of others (treatment, for example) might lag or be delayed by a month or two.

"Calendaring" in ADAM

Exhibit 8-3: Patterns of heroin use for 3 adult male arrestees in year before arrest, New York–2000
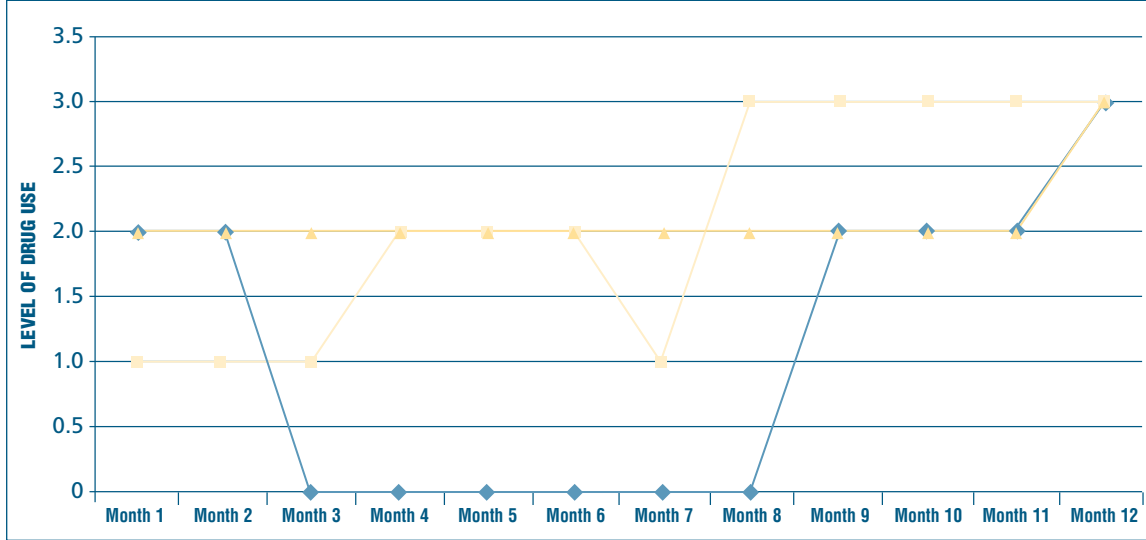
Note: On the y axis, "0" = no drug use; "1" = 1 day/week or 1–7 days/month; "2" = 2–3 days week or 8–12 days/month; "3" = more than 3 days/week or 13–30 days/month.

User A   User B   User C

Exhibit 8-4: Heroin use by "User B" in context of treatment and involvement in criminal justice system, New York–ADAM data, 2000
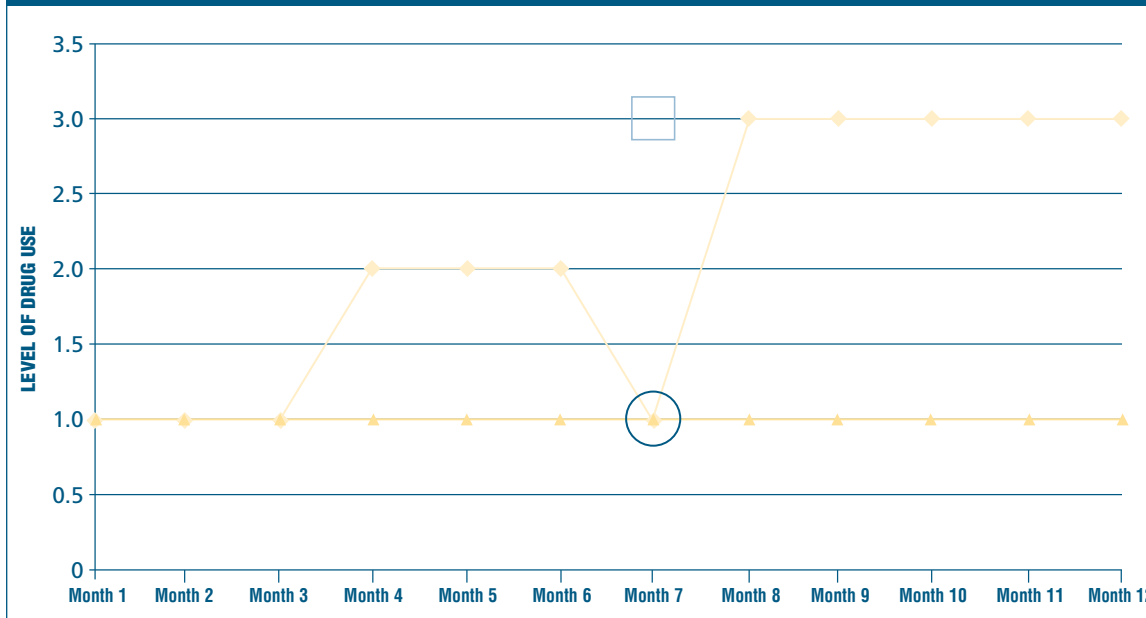
Note: On the y axis, "0" = no drug use; "1" = 1 day/week or 1–7 days/month; "2" = 2–3 days week or 8–12 days/month; "3" = more than 3 days/week or 13–30 days/month.

Level of Heroin Use   Arrest
Outpatient Treatment   Jail Stay

"Calendaring" in ADAM

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NOTES

1. Anglin M., Y. Hser, and C. Chou, "Reliability and Validity of Retrospective Behavioral Self-Report by Narcotics Addicts," *Evaluation Review* 17 (1993): 91–108.

2. McGlothlin, W., M. Anglin, and B. Wilson, "Narcotic Addiction and Crime," *Criminology* 16 (1978): 292–315; and Nurco, D., I. Cisin, and M. Balter, "Addict Careers: A New Typology," *The International Journal of the Addictions* 16 (1981):1305–1325.

3. Freedman, D.A., et al., "The Life History Calendar: A Technique for Collecting Retrospective Data," *Sociological Methodology* 18 (1988): 37–68; and Furstenberg, F., et al., *Adolescent Mothers in Later Life*, New York: Cambridge University Press, 1987.

4. Anglin et al., "Reliability and Validity of Retrospective Behavioral Self-Report"; Freedman et al., "Life History Calendar"; and Collins, L., et al., "Agreement Between Retrospective Accounts of Substance Abuse and Earlier Reported Substance Abuse," *Applied Psychological Measurement* 9 (1985): 301–309.

5. A subset of ADAM sites was selected for ease and simplicity of presentation. No other selection criteria were used.

6. See Chapter 9 for an example of how essential rates of arrest are in estimating hardcore drug use.

7. In DUF and subsequently ADAM, number of arrestees is used as a proxy for number of arrests.

8. In the ADAM program, a user of one drug may also be using another; that is, these categories are not mutually exclusive. Research has shown that drug users may use a particular substance in preference to others, but they may also use other drugs.

9. The National Household Survey on Drug Abuse is conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), U.S. Department of Health and Human Services; the State Treatment Needs Assessment Program is administered by the Center for Substance Abuse Treatment (CSAT) of SAMHSA; SAMHSA also maintains the Treatment Episode Data Set (TEDS).

10. For NHSDA purposes, to be considered a member of a household a person need not own or rent the residence in which he or she is living, and the residence can be one of a variety of types (for example, a trailer, apartment, or house). However, to be included in NHSDA, a person cannot be a transient member of a household. If, for example, the survey respondent is living briefly (less than three months) with a girlfriend or a relative, he or she would not be considered a member of that household.

11. TEDS data come from reports of drug and alcohol treatment as measured by intake in treatment programs. An "episode" of treatment is measured as entry in an outpatient program and/or an overnight stay in an inpatient program. In the ADAM questionnaire, arrestees who say they used drugs are asked, for example, how many nights they stayed in inpatient treatment and how many times they entered outpatient treatment.

12. These drug users include people who may not need treatment.

13. The question was asked of all arrestees, not just those who said they used drugs in the year before their arrest.

IX. Estimating Hardcore Drug Use in the Community

by William Rhodes and Ryan Kling*

Scientists and nonscientists alike seek to estimate prevalence—from the number of stars in the sky to the number of angels on the head of a pin. When policy analysts estimate prevalence, they focus on more prosaic topics. They seek to find out how many times a condition is occurring or an event is taking place because their clients—policymakers—need the information as the basis of reasoned decisions.
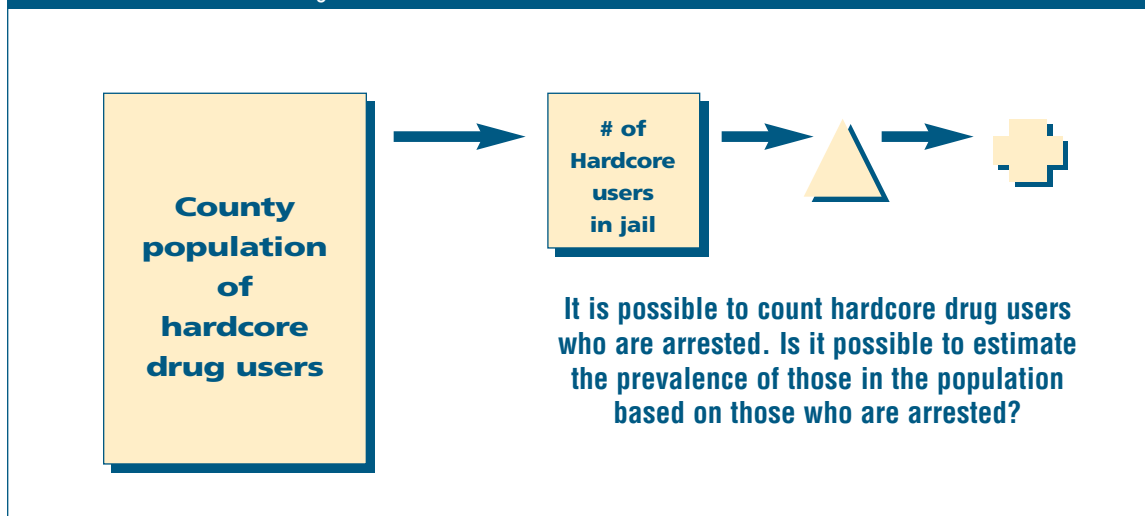
Researchers have used data from ADAM and DUF (the Drug Use Forecasting program, ADAM's predecessor) to understand the prevalence of drug use and related behaviors among arrestees. The redesigned ADAM program now makes it possible to provide additional prevalence estimates, including the number of hardcore drug users in a county that has an ADAM program.

How prevalence is estimated[1]

"Hardcore" can be defined in any appropriate way. For example, a hardcore user might be someone who uses illicit drugs more often than some threshold number; alternatively, a hardcore user might be someone who is seen as needing treatment. To explain the estimation technique used here, a large rectangle represents the number of hardcore users in any ADAM county—the object of the estimation exercise. (See Exhibit 9–1.) Household surveys offer one way to estimate this number. However, these surveys would exclude a large number of hardcore drug users, either because they do not live in a household (as defined by the survey), because they are typically not at home when interviewers call, or because they lie about their drug use.

Instead, inferences must be drawn about the large rectangle from information provided by the small square, which represents

Exhibit 9-1: Hardcore drug users are assumed to all have the same arrest rate

County population of hardcore drug users → **# of Hardcore users in jail** →

It is possible to count hardcore drug users who are arrested. Is it possible to estimate the prevalence of those in the population based on those who are arrested?

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hardcore users who are arrested and booked. An initial assumption is that hardcore drug users all have the same probability of being arrested and booked. (They are said to be "homogenous.") The square is smaller than the rectangle to illustrate the fact that not all hardcore users are arrested and booked during a specific time period (one year, for example). The composition of the rectangle is inferred from information about the composition of the square.

The ADAM data do not enumerate hardcore users booked into jail, because they are a sample. The sample is depicted as a triangle. Because the sample is probability based, the triangle can be weighted to estimate the square. An additional problem is that some hardcore users will deny their drug use or the level of their drug use, so admitted hardcore users in the sample underrepresent the actual number in the sample. The latter is represented with a cross.

The problem stemming from underreporting could be overcome by estimating how frequently hardcore drug users are truthful about using drugs at the hardcore level. If the "truthfulness rate" could be calculated, the triangle could then be estimated on the basis of the cross and, if the sampling weights were known, it would then be possible to estimate the square from the triangle.

Creating a model of the arrest process

For the sake of simplicity, the explanation disregards the two complications of sampling and denial of drug use, and assumes the availability of information about all hardcore drug users arrested and booked in a given year (the square).[2] In practice, of course, neither sampling nor denial can be ignored during estimation.

Estimating the composition of the rectangle from the composition of the square requires a mathematical model of the arrest process through which hardcore drug users move from the rectangle to the square. (See Exhibit 9–2.)

Conceptually, modeling treats the police as if they were samplers, conducting a survey. The goal of the modeling is to determine how hardcore users in the booking population (the square) should be weighted to represent hardcore users in the county population (the rectangle). Data about previous arrests of hardcore drug users (in the square) provide a basis for estimating the rate at which hardcore drug users get arrested and booked. The inverse of that estimated arrest rate provides the means to weight the square to estimate the rectangle. Exhibit 9-3 is a simple illustration.

Exhibit 9-2: The estimate requires creating a model of the arrest process

County population of hardcore drug users

Arrest Process

# of Hardcore users in jail
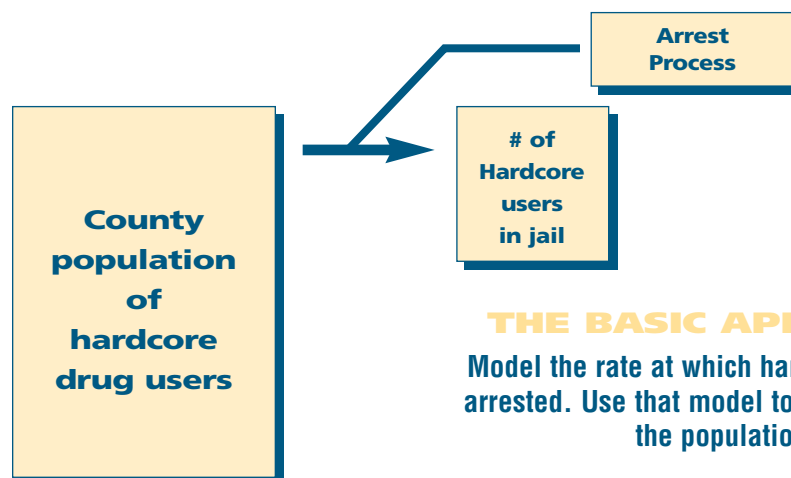
THE BASIC APPROACH:

Model the rate at which hardcore users are arrested. Use that model to infer the size of the population.

The illustration assumes that the rectangle comprises 1,000 hardcore drug users (called "H"). By assumption they are identical with respect to the probability and rate of arrest; that is, each is arrested 0.3 times per year on average (the arrest rate is "R"). Thus, the 1,000 hardcore drug users generate about HxR=300 arrests per year (the number of arrests is "A").

Continuing this illustration, the ADAM data would indicate that the square comprises 300 arrests of people who self-report hardcore drug use, and for them the interviews would reveal that the average arrest rate is 0.3 per year. Because H x R = A, then A/R = H. Thus, 300/0.3 = 1,000—the number of hardcore drug users in the county.

This algebraic calculation illustrates the fundamentals of the estimation. Identifying and counting the 300 hardcore drug users requires a tabulation of the ADAM data (though keeping in mind the two complications, noted above, introduced by sampling and underreporting). The estimate of 0.3 arrests per year is the result of analysis of data about arrest histories obtained during the ADAM interviews.

Exhibit 9-3: The basic logic of the estimation model illustrated

Assumptions about hardcore drug users in the community
- They are homogenous with respect to probability of and rate of arrest.
- Their average annual arrest rate = 0.3 (R).
- They generate about 300 arrests per year (A). H x R = A.

Data from the ADAM calendar*
- ADAM counts 300 arrests per year.
- On the basis of ADAM interviews, the number of arrests per year per arrestee is estimated at 0.3.

The estimate of the number of hardcore drug users in the community
- H = A/R = 300/0.3 = 1,000.

* See Chapter 8 for an explanation of "calendaring" in ADAM.

For the calculation to be correct, not all hardcore drug users need to be arrested. In fact, a hardcore drug user could elude arrest through the entire length of his or her drug use career and still be represented by the "sample" of people booked into jail. The estimation procedure makes no assumption that the booking population enumerates all hardcore drug users.

Introducing measured heterogeneity. Abandoning the unrealistic assumption that hardcore drug users are homogenous in rate of arrest, the estimation methodology remains conceptually the same. This type of heterogeneity is called "measured heterogeneity" because a number of variables could explain the differences in arrest rates of hardcore users. Operationally the methodology is more complex, however.

To illustrate the consequences of measured heterogeneity, the rectangle is divided into two parts (Exhibit 9-4), with the top half representing hardcore users of cocaine and the bottom half representing hardcore users of heroin. (There could, of course, be many types of hardcore drug users, but for illustration purposes, only two types are assumed.) The assumption is that each subgroup is homogenous; that is, all cocaine users are alike and all heroin users are alike. But hardcore heroin users are different from hardcore cocaine users; the former are arrested on average 0.4 times per year, while the latter are arrested on average 0.2 times per year. In this respect, arrest rates are heterogeneous but that heterogeneity can be explained by an observed factor—type of drug use.

Given these assumptions, the booking population (the square) is not representative of the county population (the rectangle). In the booking population, there are two hardcore cocaine users for every hardcore heroin user. By contrast, in the county, there is one hardcore cocaine user for every hardcore heroin user. Thus, the equation used previously, H = A/R, will not produce an accurate estimate because A is the total number of hardcore drug users (A = 300 in this illustration), while R is the average arrest rate in the booking population $(R = (2/3)0.4 + (1/3)0.2 = 0.333$ in this

illustration). The previous calculation would produce an estimate of H = 300/0.333 = 900 hardcore drug users in the county population. Obviously, this is not correct.

Accommodating measured heterogeneity.
The correct approach accommodates measured heterogeneity in the entire population of hardcore drug users. (See Exhibit 9–5.) The type of drug (cocaine or heroin) is the variable differentiating the two groups of hardcore users. ADAM identifies hardcore cocaine and heroin use; hence, heterogeneity is explained by measured variables.
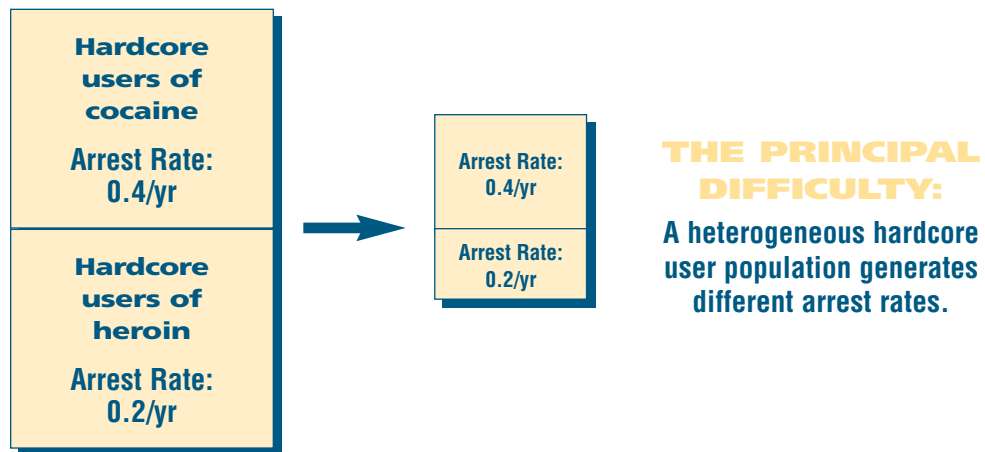
In this example, the booking population consists of 200 hardcore cocaine users, whose average arrest rate is 0.4 per year. This means there are about 200/0.4 = 500 in the county. The booking population also includes 100 hardcore heroin users, whose arrest rate is 0.2. There are 100/0.2 = 500 of them in the county. Thus, there are 500 + 500 = 1,000 hardcore drug users in the county.

Other than type of drug (in this example, heroin and cocaine), there are many measurable variables that should be taken into account when modeling the arrest process. The ADAM interview instrument was designed to obtain information about other major covariates (such as whether arrestees

are employed). When the number of covariates expands beyond a single variable, however, dividing the booking population into mutually exclusive homogenous groups becomes impractical or even infeasible, and estimation then requires the use of regression models. Nevertheless, increased complexity of the model does not alter the basic logic of the approach.

Introducing unmeasured heterogeneity.
Not all factors that explain the arrest process are measurable, or at least not all factors are identified in ADAM. These too must be taken into account in calculating the number of hardcore drug users. To illustrate unmeasured heterogeneity, the rectangle is again redesigned. The upper part still represents hardcore cocaine users and the lower part hardcore heroin users (as in Exhibit 9–4). These two groups are further divided, with the divisions depicted as triangles. Hardcore cocaine users in the upper triangle represent those who have a serious mental illness. This dually diagnosed group has an average annual arrest rate of 0.5. Hardcore cocaine users in the lower triangle represent hardcore cocaine users who do not have a serious mental illness. Their arrest rate is 0.3. Hardcore heroin users are similarly classified. (See Exhibit 9–6.)

Exhibit 9-4: Introducing measured heterogeneity into the estimation

Hardcore users of cocaine **Arrest Rate: 0.4/yr**	**Arrest Rate: 0.4/yr**
Hardcore users of heroin **Arrest Rate: 0.2/yr**	**Arrest Rate: 0.2/yr**

THE PRINCIPAL DIFFICULTY:

A heterogeneous hardcore user population generates different arrest rates.

The booking population (the square) still overrepresents hardcore cocaine users, but now it also overrepresents hardcore users who are mentally ill. ADAM does not include data about mental illness, so the modeling cannot account for this condition in the same way that it accounts for the cocaine-heroin distinction. Although the approach is conceptually the same, taking unmeasured heterogeneity into account requires mathematical modeling that defies a simple illustration. A technical report provides details.[3]

Preliminary estimates of number of hardcore drug users

Because the mathematical and statistical logic of the estimation technique is complex, the estimates of number of hardcore users are best presented visually, in the form of graphics (Exhibits 9–7 and 9–8). (The algebraic terms used are presented in "Key to Algebraic Terms.")

Arrest rates and user rates

As noted, "hardcore drug user" could be defined differently depending on policy objectives. The methodology is invariant with respect to definition. For illustration, hardcore use is defined here as the use of cocaine, heroin, or methamphetamine on ten or more days during the month before the ADAM interview.

Exhibit 9-5: Changing the calculation to accommodate measured heterogeneity

Assumptions
- 300 arrests
- 200 hardcore cocaine users—arrest rate 0.4 per year
- 100 hardcore heroin users—arrest rate 0.2 per year

The new calculation
- 200/0.4 = 500 hardcore cocaine users
- 100/0.2 = 500 hardcore heroin users
- Total = 500 + 500 = 1,000 hardcore drug users in county

Exhibit 9-7 shows estimates of the arrest rate for the average hardcore drug user in each ADAM site. The estimate varies from site to site. Confidence intervals are appreciable, but most of them overlap a value of 0.75 arrests per year. On the basis of these data, it might be said that, in most sites, there are about 750 arrests and bookings per year for every 1,000 hardcore drug users.

For some sites, the confidence intervals are extremely wide. This is largely because sample sizes are small, since several sites did not have data for all four calendar quarters. The presumption is that the confidence intervals will narrow as the ADAM samples grow.

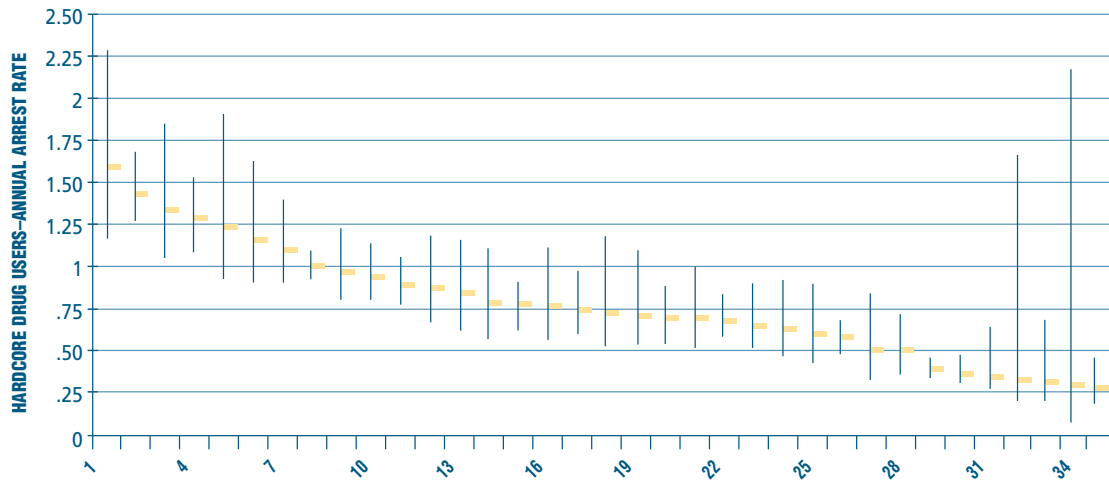**Exhibit 9-6:** Introducing unmeasured heterogeneity into the estimation
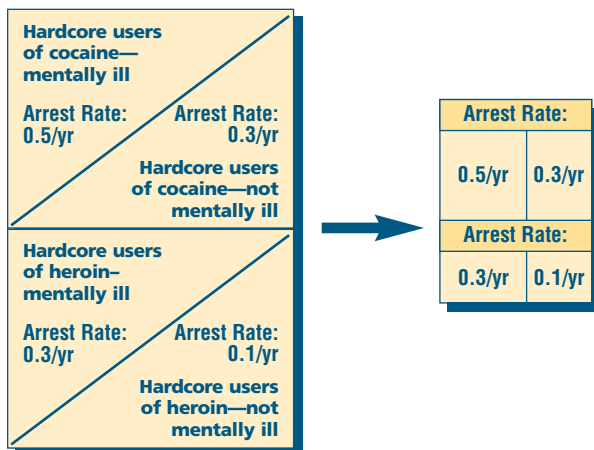
AN ADDITIONAL DIFFICULTY:

Heterogeneity in the hardcore user population generates different arrest rates. Some heterogeneity is measured by ADAM and the rest is not.

Exhibit 9-7: Average annual arrest rate of hardcore drug users in a county

ADAM Sites

1 = Detroit	9 = Portland	18 = Miami	27 = Albany
2 = Seattle	10 = Birmingham	19 = Honolulu	28 = Tucson
3 = Spokane	11 = Phoenix	20 = Albuquerque	29 = Philadelphia
4 = Charlotte	12 = Salt Lake City	21 = New Orleans	30 = San Diego
5 = Minneapolis	13 = San Antonio	22 = Sacramento	31 = Anchorage
6 = Denver	14 = Omaha	23 = Oklahoma City	32 = Chicago
7 = Des Moines	15 = Las Vegas	24 = San Jose	33 = Atlanta
8 = New York	16 = Indianapolis	25 = Houston	34 = Fort Lauderdale
	17 = Cleveland	26 = Dallas	35 = Laredo

Note: The vertical axis shows a point estimate (a single number) and 95 percent confidence interval for the number of arrests and bookings per year. The confidence interval is truncated at 2.5 to preserve scale in this chart.

Key to Algebraic Terms Used in the Estimation

Let $\hat{A}_i$ represent the estimated rate at which hardcore users in the county, who are represented by the ith hardcore user in the sample of booked individuals, are arrested. (See model discussed in the text.)

Let W_i represent the ADAM sampling weight associated with the ith hardcore drug user in the sample. This is derived from the ADAM sampling design.

Let P represent the proportion of hardcore drug users who answer truthfully about whether they are hardcore drug users. The assumption is they either tell the truth or deny drug use altogether.

Then, the ith hardcore drug user in the ADAM sample for a specified site represents $W_i/[\hat{A} P]$

hardcore drug users in the county population. In other words, letting $\hat{H}$ be the represent the estimate of the number of hardcore drug users in the county, then: $\hat{H} = \sum W_i/[\hat{A}_i P]$

The sum above is over the hardcore drug users in the sample.

The average arrest rate for hardcore drug users in the community is depicted as $\hat{A}$ without a subscript: $\hat{A} = \sum [W_i/P]/\hat{H}$

The above equation is the observed number of arrests divided by the estimated number of hardcore drug users in the community. (The arrest rates of hardcore drug users in all ADAM sites are presented in Exhibit 9–7.)

Finally, let $\hat{G}$ represent the average number of hardcore drug users in the county per hardcore drug users in the arrestee population (see Exhibit 9–8): $\hat{G} = \sum W_i(1/\hat{A}_i)/W_i$

Exhibit 9-8 shows estimates of the number of hardcore drug users in the county per hardcore drug user in the booking population. The average of the 35 ADAM sites appears to be about 1,600 hardcore drug users in the county for every 1,000 hardcore drug users who appear among arrestees.

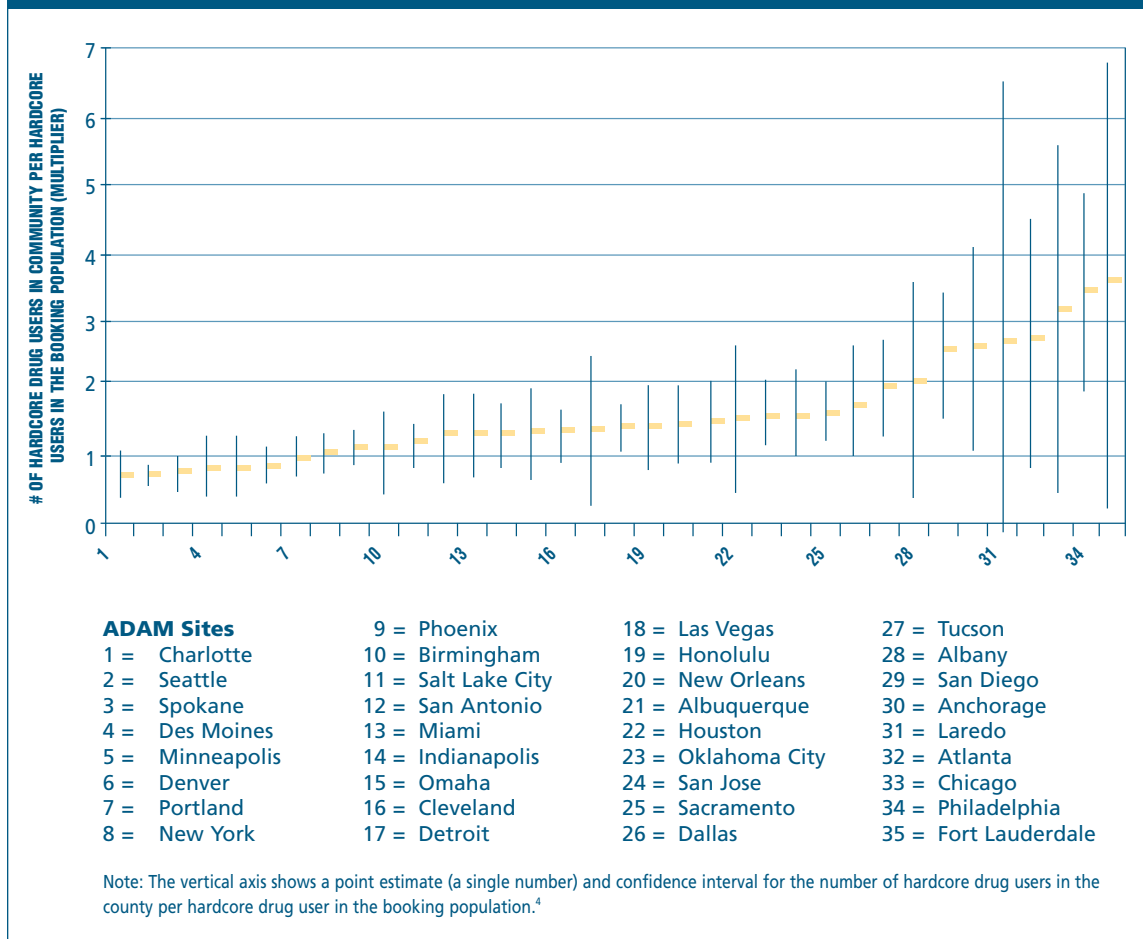## Number of hardcore users in the community

Table 9-1 shows what might be considered the ultimate estimate—the number of hard-core drug users in the county. Caution is advised in interpreting these estimates. One reason is the use of "stratified cluster sampling" in some sites. That is, when counties have many jails, ADAM interviewers cannot go to each of them, so jails themselves must be sampled. (These sites are marked on the table as "S/C," for stratified cluster sampling.) At the time of this study, ADAM had not yet made provisions for adjusting its estimates to account for

nonsampled jails. Thus, in sites that use stratified cluster sampling, the estimates are too low. In one site, New York, the number of hardcore drug users is under-represented because only in Manhattan were data collected in all four calendar quarters; in only one quarter were all five boroughs in the study.

To adjust for the limitation, in the sites that use stratified cluster sampling (the S/C sites) the estimates should be doubled. That is only a crude adjustment. In Cleveland, Des Moines, and Minneapolis, doubling might produce too high a number. By contrast, the Detroit figures probably should be multiplied by a factor of five. For New York, the estimate might be roughly two and one-half times as great as indicated here.

Another reason for caution in interpreting the estimates is that they are of adult males only. Because women constitute about 20 percent of the arrestee population,[5] the

Exhibit 9-8: Hardcore users in the community per hardcore user in the booking population

OF HARDCORE DRUG USERS IN COMMUNITY PER HARDCORE USERS IN THE BOOKING POPULATION (MULTIPLIER)

ADAM Sites	9 = Phoenix	18 = Las Vegas	27 = Tucson
1 = Charlotte	10 = Birmingham	19 = Honolulu	28 = Albany
2 = Seattle	11 = Salt Lake City	20 = New Orleans	29 = San Diego
3 = Spokane	12 = San Antonio	21 = Albuquerque	30 = Anchorage
4 = Des Moines	13 = Miami	22 = Houston	31 = Laredo
5 = Minneapolis	14 = Indianapolis	23 = Oklahoma City	32 = Atlanta
6 = Denver	15 = Omaha	24 = San Jose	33 = Chicago
7 = Portland	16 = Cleveland	25 = Sacramento	34 = Philadelphia
8 = New York	17 = Detroit	26 = Dallas	35 = Fort Lauderdale

Note: The vertical axis shows a point estimate (a single number) and confidence interval for the number of hardcore drug users in the county per hardcore drug user in the booking population.[4]

What Do the Estimation Techniques Mean for the ADAM Sites?

Most nonstatisticians, and perhaps even many statisticians, would consider the model/technique for estimating hardcore drug use sophisticated. Most statisticians would likely agree that applying it is beyond the ability of anyone not trained in statistics. That raises the question of how the approach can be helpful to the ADAM sites.

Although the estimation procedure requires some familiarity with statistics, computing code containing a program to calculate these estimates will be available from NIJ for anyone who requests it. Some ADAM sites may want to use the code to make their own calculations. Researchers may want access to the code to improve it. Most sites are likely not to choose to use the code to replicate or extend the analysis of hardcore drug use. Moreover, it is unnecessary because ADAM will do it for them.

As ADAM data accumulate over the years, the model should be reassessed and improvements made following the most recent assessment. Once the improvements reach a certain point, the only remaining challenge would be to develop weights suitable for estimating the number of hardcore users. After they are developed, the ADAM sites could estimate the number of hardcore drug users, along with confidence intervals, using software designed for statistical calculations. The degree of difficulty would be no greater than what is currently required for the sites to produce the more routine weighted estimates of drug use.

Table 9-1	ESTIMATED NUMBER OF HARDCORE DRUG USERS* IN THE ADAM SITES—ADULT MALE ARRESTEES, 2000		
Primary City	**Estimate**	**Lower 95%**	**Upper 95%**
Albany/Capital Area, NY	6,879	2,077	11,680
Albuquerque, NM	8,605	6,825	10,386
Anchorage, AK	1,629	824	2,434
Atlanta, GA	34,836	16,346	53,326
Birmingham, AL	5,129	4,142	6,117
Charlotte-Metro, NC	4,422	-1,353	10,198
Chicago, IL (S/C)	27,469	5,779	49,160
Cleveland, OH (S/C)	11,561	8,082	15,041
Dallas, TX (S/C)	31,662	26,364	36,959
Denver, CO	2,122	1,446	2,798
Des Moines, IA (S/C)	2,013	1,518	2,508
Detroit, MI (S/C)	6,048	4,599	7,496
Fort Lauderdale, FL	17,394	2,272	32,515
Honolulu, HI	5,145	3,193	7,096
Houston, TX	12,402	7,693	17,110
Indianapolis, IN	8,001	4,915	11,087
Laredo, TX	7,226	4,647	9,806
Las Vegas, NV	17,223	13,714	20,732
Miami, FL	13,441	8,510	18,373
Minneapolis, MN (S/C)	1,538	752	2,324
New Orleans, LA	12,674	7,792	17,556
New York, NY (INC)	125,844	117,465	134,222
Oklahoma City, OK	3,656	2,444	4,868
Omaha, NE	6,436	5,146	7,727
Philadelphia, PA (S/C)	27,847	24,478	31,216
Phoenix, AZ (S/C)	30,200	24,181	36,219
Portland, OR	4,842	3,450	6,234
Sacramento, CA	24,991	20,540	29,443
Salt Lake City, UT	2,668	1,880	3,456
San Antonio, TX	12,098	8,776	15,421
San Diego, CA	42,140	33,948	50,332
San Jose, CA	13,693	7,272	20,114
Seattle, WA	6,934	5,849	8,018
Spokane, WA	2,147	1,484	2,811
Tucson, AZ	4,961	3,268	6,653

* A hardcore drug user is someone who used cocaine, heroin, or methamphetamine in at least 11 of the past 30 days before being interviewed by ADAM.

Note: S/C indicates counties where stratified cluster sampling is used. Numbers are underestimations of level and standard error for prevalence estimates. INC indicates incomplete data. The numbers underrepresent hardcore drug use because the New York sample is limited to Manhattan.

Estimating Hardcore Drug Use

estimates should be inflated by about 1.25. However, precise adjustments would require taking into account the number of bookings of hardcore female drug users and the rate at which they are arrested and booked. When the ADAM redesign extends to women arrestees, the adjustment can be more informed.

The estimates also exclude juvenile detainees, but this is a minor problem because there are good estimates of juvenile hardcore drug users in the annual Monitoring the Future (MTF) survey. Estimates based on the highly selective sample of hardcore drug users among juvenile detainees would probably not be much improvement over estimates based on MTF.

One other limitation is that the methodology used to adjust for underreporting hardcore drug use is provisional. (Recall the step of drawing an inference about the triangle using information provided by the cross.) The ADAM project has not yet developed adjustments for underreporting drug use extending beyond the two or three days before the interview. Such adjustments would be welcome adjuncts to the hardcore user estimation methodology.

Overcoming limitations in the estimation method

Even beyond the limitations, the estimates should be considered provisional. ADAM is in its infancy. Improvements will lead to advances in estimation based on the ADAM data. There is no reason to assume that the method is immutable. Researchers will undoubtedly find ways to improve it. But even with the current limitations, the method of estimating the number of hardcore drug users at a given ADAM site can generate credible figures. And there is no reason that better estimation methods could not be applied retrospectively.

What about people whose risk of arrest is low?

The hardcore user estimation methodology does not require that all hardcore drug users be arrested. In fact, as noted above,

many hardcore users may elude arrest throughout their entire drug-use careers and yet still be represented by the estimates. If the police are viewed as samplers, they no more need to arrest everybody than a sampler conducting a conventional survey needs to interview everybody for the resulting sample to represent the population.

There may be subsets of the population, however, whose risk of arrest is so small that they would not, practically speaking, be represented in the police sample. Celebrities might be an example of one such group. They would either avoid arrest entirely or else the probability of their being arrested would be so small that the resulting prevalence estimate would be too imprecise to be useful. How is this potential "residual" to be handled?

Arguably, a subset so immune to arrest is small or otherwise of marginal interest to policymakers. It is not a group that would make heavy demands on the criminal justice system, the publicly financed treatment system, or the public health system. Perhaps from the standpoint of public policy, it is sufficient to estimate the prevalence of hardcore drug users who run an appreciable risk of arrest.

Avoiding undercounting

If the above argument is not convincing, then undercounting could be corrected by extending the hardcore user methodology. The extension is best explained by way of example. In the example, the current calculation method produces an estimate of 80,000 hardcore drug users in a county in a given year. ADAM data, in this example, indicate that those 80,000 hardcore drug users generate about 20,000 drug treatment admissions per year. A final assumption in the example is that data from local treatment programs show that hardcore users actually account for a higher number of treatment admissions—25,000 per year. This means the estimates of hardcore drug use based on ADAM data understate hardcore drug use by $25,000/20,000 = 1.25$. The ADAM-based estimates would be

recalculated, with the result 1.25 x 80,000 = 100,000 hardcore drug users in a county. The "missing" hardcore drug users are "found" by looking at a second set of data. This would seem to be a way to avoid a gross undercount of hardcore drug use.

Other applications

The estimation method has other applications. Variations could be used, for example, to calculate the proportion of the general population with specific infectious diseases who come into contact with the criminal justice system, and to estimate the price of illicit drugs and the amount of money users spend purchasing drugs. The approach would seem to be useful for ana-

lyzing illicit drug markets and for estimating the number of career criminals in a population, among other applications.

There are applications for which the approach is not suited. It would not be useful for estimating the prevalence of general drug use (that is, hardcore and occasional use combined) in a county. The reason is that for many occasional users of drugs the risk of arrest is negligible, so the numbers would be very imprecise. But for any population that runs an appreciable risk of arrest, this approach to estimation would seem to provide tolerably good estimates of counts of what are otherwise hard-to-study populations.

NOTES

1. Developing prevalence estimates in the ADAM population requires both mathematical modeling and the application of statistical sampling theory. To make this chapter accessible to nonstatisticians, a heuristic explanation rather than a mathematically rigorous justification is presented. The latter is available in a separate publication, Rhodes, W., and R. Kling, "Estimating the Prevalence of Hardcore Drug Use Using ADAM Data," final report submitted to the National Institute of Justice by Abt Associates Inc., Winter 2002 (NIJ grant 88–IJ–CX–C001).

2. These last two complications are discussed in the section of this chapter on preliminary estimates.

3. Rhodes, W., and R. Kling, "Estimating the Prevalence of Hardcore Drug Use Using ADAM Data," final report submitted to the National Institute of Justice by Abt Associates Inc., Winter 2002 (NIJ grant 88–IJ–CX–C001).

4. Hardcore drug users in the community are unique individuals. Hardcore users in the booking population are not necessarily unique; that is, for example, 300 arrests could represent 200 arrestees. If 100 hardcore users are arrested once, 100 are arrested twice, and 100 are arrested three times, then the estimation is 300 hardcore users in the booking population but 100 + 200 + 300 = 600 arrests.

5. *Crime in the United States, 2000: Uniform Crime Reports*, Washington, DC: U.S. Department of Justice, Federal Bureau of Investigation, 2001: 233.